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Language Processing in the Aged

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The past several decades of aging research has witnessed an increase in studies devoted to exploring the effects of normal, healthy aging on verbal abilities, including comprehending written and spoken communication. Outcomes from these investigations provide insight into how these abilities change with age and, in some cases, potential strategies for helping older adults and practitioners cope with the effects of these changes. For example, researchers have applied laboratory-derived outcomes and theory to everyday issues, such as medication adherence in older adults (Morrow & Leirer, 1999). Thus, interest in the verbal abilities of the aged is a multidisciplinary approach, drawing from a variety of academic disciplines, including psychology, cognitive science, linguistics, education, geriatric medicine, communication, and speech and language pathology. This review focuses on recent research from cognitive psychology.

The current state of knowledge about the status of healthy older adults' language abilities has benefited from isolating the key variables in language processing, namely the ability to comprehend information at the word-, sentence-, and discourse-levels of communication. The majority of these studies are cross-sectional in nature, including a comparative sample of elderly and college-age adults that are matched for years of education and other relevant cognitive abilities. To date, outcomes from these investigations largely suggest that while some language abilities appear to remain relatively stable throughout most of adulthood, others may decline. Although perceptual changes in hearing and vision that accompany normal aging may account for some of the observed age-related variance in language performance (Wingfield & Stine-Morrow, 2001), it has been routinely found that important age differences emerge when

participants are required to read and/or recall experimental stimuli (e.g. stimuli or situations appropriate for a laboratory setting but not typically encountered in everyday contexts; although interested readers should see Salthouse (2006) for a critical perspective on the relationship between daily activities (e.g., crossword puzzles) and cognitive status in the aged).

Here I present a brief overview of the major findings in geriatric psycholinguistics.

Word-level language processing

A common finding in the aging literature is that older adults exhibit equal, if not superior, vocabulary knowledge as compared with younger adults (see Verhaeghen 2003 for a meta-analysis on the subject). Likewise, older adults generally perform comparably to younger adults on other word-level measures, such as lexical decision tasks (Bowles & Poon, 1981, 1985; Howard, 1983), generating word associations (Bowles, Williams, & Poon, 1983; Burke & Peters, 1986), and word naming tasks (Laver & Burke, 1993). However, when instructed to recall words, age-related discrepancies emerge. Thus, it is of little surprise that older people often report greater instances of tip-of-the-tongue experiences or forgetting names (Burke, MacKay, Worthley, & Wade, 1991), are less likely to demonstrate semantic satiation (Balota & Black, 1997), or struggle with recall for lists of words (Multhaup, Balota, & Cowan, 1996; Kynette, Kemper, Norman, & Cheung, 1990). These deficits perhaps reflect impairments in short-term memory or difficulty encoding items into memory (Kutas & Federmeier, 2001).

Sentence-level language processing

Age-related deficits on sentence processing tasks are often evident when the sentence stimuli strain the language system or when recall is required (Wingfield & Stine-Morrow, 2001; Kemper, 1986, 1992; Light, 1991). Complex syntactic forms requiring effortful parsing, such as left-branching sentences (*The man the woman the girl knew cursed died*) tend to be more problematic for older readers as compared with right-branching sentences (*The girl knew the woman who cursed the man who died*) (Kemper & Kemtes, 1999). Relative to young adults, older adults exhibit greater difficulty imitating (Kemper, 1986), producing (Kemper, Herman, Lian, 2003; Kemper, 1987), and comprehending complex sentence structures (Norman, Kemper, & Kynette, 1992; Kemper, 1987). The finding that comprehension of complex syntactic structures declines with age has received widespread attention in the cognitive aging domain and may be symptomatic of reductions in working memory capacity (Kemtes & Kemper, 1997; Norman, et al., 1992), although this claim remains in dispute (Waters & Caplan, 2001; Kemtes, 1999). Several theories have been proposed to account for these findings (c.f., Waters & Caplan, 2001; Hasher & Zacks, 1988; Salthouse, 1996).

Discourse-level processing

Although outcomes from previous studies suggest that older adults are generally less efficient at processing materials requiring the generation of surface- (i.e., exact words used) or textbase-level (i.e., ideas expressed in text) representations (i.e., Kemper, 1987; Kemtes & Kemper, 1997; Light & Capps, 1986; Radvansky, Zwaan, Curiel, & Copeland, 2001; Stine & Wingfield, 1988; 1990), there appears to be minimal age-related decline in processing material that promotes the situation model level of representation

(Radvansky & Dijkstra, 2007; Radvansky, et al., 2001; however, see Copeland & Radvansky, 2007). Situation models differ from the other levels of representation in that they include a combination of what is being described in the text as well as what is inferred from the text. Radvansky, Copeland, and Zwaan (2003) posited two potential explanations for this paradox. One possibility is that the wealth of comprehension experience that accompanies increased age helps older adults to become more efficient readers by attuning to only the most essential information to supplement the situation model; whereas younger adults are more focused on textbase-level information (particularly college students who memorize information for exams). A second possibility is that older adults may allocate greater processing resources for situation model-level information because of cognitive deficits that make it too difficult to process surface and textbase information. It is currently uncertain which possibility best accounts for the observed age-associated differences in processing textbase-level information (or if, in fact, both possibilities may account for the discrepancies in study outcomes).

A better understanding of how older adults use situation models to comprehend written information has a number of important practical implications. For example, older adults rely on situation models to facilitate reasoning and decision-making processes (Gilinsky & Judd, 1994; Radvansky, Gerard, Zacks, & Hasher, 1990), as well as processing emotional information from texts (Soederberg & Stine, 1995). Moreover, there is some evidence suggestive of older adults' use of situation models when processing spatial information from text and pictures (Morrow, Leirer, Altieri, & Fitzsimmons, 1994; Morrow, Stine-Morrow, Leirer, Andrassy, & Kahn, 1997; Stine-Morrow, Morrow, & Leno, 2002). Outcomes from these experiments indicate that older

adults are differentially sensitive to spatial distance effects during narrative reading, as compared with their younger counterparts.

Conclusion

Discussions about the verbal abilities of older adults often tend to focus on the impact of age-associated pathologies, such as Alzheimer's disease or aphasia. While numerous studies have sought to uncover the causes and consequences of these devastating pathological conditions, a parallel line of research has sought to understand changes in the communication abilities of healthy older adults. Outcomes from studies with non-pathological aging samples indicate that, while processing information at the discourse level remains relatively unimpaired, immediate recall for word or sentence-level information may suffer as a consequence of changes in short-term or working memory resources.

To give the reader a sense of the breadth, diversity, and interest in healthy aging and communication research, one need look no further than the March 2009 issue of *Psychology and Aging*, wherein three articles directly assess different aspects of language and communication in the aged. Likewise, one may also refer to the program of the premier meeting of experts in the field: the 2008 Cognitive Aging Conference held once every two years in Atlanta, Georgia (<http://www.cos.gatech.edu/cac/program.pdf>). Each day of this conference included at least one plenary session that explicitly addressed communication issues including: text comprehension, language, and reading; in addition to related sessions on working memory and learning. Both of these resources provide an excellent introduction to the current topics in cognitive aging research in general, and language issues in particular.

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