

Discourse in Older Adults: Influence of Text, Task, and Participant Characteristics

Le discours chez les adultes âgés : influence du texte, de la tâche et des caractéristiques des participants

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Key words: discourse, aging, comprehension, production

Abstract

The goal of this article is not to provide an exhaustive review of the literature on discourse and normal aging. Rather, a set of specific problems related to the question of age-related change in discourse abilities shall be discussed. More specifically, the article will address how factors of text and task influence discourse comprehension and production in older adults. Thus, the article is organized into two sections: discourse and comprehension, and discourse and production.

Abrégé

Nous ne prétendons pas offrir ici un examen exhaustif de ce qui a été publié sur le discours et le vieillissement normal. Nous traiterons plutôt d'un ensemble de problèmes particuliers qui ont trait à la question du changement lié à l'âge dans les aptitudes au discours. Plus particulièrement, nous traiterons de facteurs comme le texte et la tâche et leur influence sur la compréhension et la production du discours chez les adultes âgés. Ainsi, le présent document est structuré en deux parties : discours et compréhension, et discours et production.

The literature on the effects of aging on cognition has become abundant over the last decade. Age-related declines have been documented in several cognitive abilities. Examples of areas of study range from response time studies to the analysis of more complex processing capacities, such as verbal learning and problem solving. At the same time, theories of discourse processing have been elaborated and have been made available for the evaluation of possible changes in this communication ability related to normal aging as well as to pathological conditions associated with aging (e.g., dementia).

For the purpose of this article, the term *discourse* shall refer to a verbal production composed of identifiable units such as letters or phonemes (according to whether com-

munication is written or oral), syllables, words, sentences, and paragraphs. The definition is based on similar concepts discussed by Bloom, Obler, de Santi, and Erlich (1994). Discourse conveys semantic relations based on generic and world knowledge concerning objects, individuals, situations, and/or emotions. The message is encoded by a speaker or a writer and decoded by a listener or a reader. Encoding is referred to as discourse production, while decoding corresponds to discourse comprehension. The term *text* is often used to refer to written discourse. In this article however, following the example of many authors in this area (e.g., Kintsch, 1974), the term *text* is used as a synonym for the term *discourse*.

The goal of this article is to present a set of specific problems related to the question of age-related changes, rather than provide an exhaustive review of the literature on discourse and normal aging. More specifically, the article will address how the factors of text and task influence discourse comprehension and production in older adults. The article is organized into two sections: discourse and comprehension, and discourse and production.

Discourse and Comprehension

Comprehension is always assessed indirectly. It is not possible to study discourse comprehension without considering memory processing. Conversely, for several decades the evaluation of discourse has been embedded within the evaluation of memory abilities. For example, the Wechsler Memory Scale (Wechsler, 1969) includes two texts to be recalled, one in an immediate condition and one in a delayed condition. In this section, the relation between memory and discourse comprehension in older adults will be discussed.

The study of discourse comprehension has developed from efforts to address and model the various cognitive

abilities needed to recall a text (e.g., Frederiksen, 1986; Frederiksen & Donin, 1991; Kintsch, 1974; Meyer, 1975; van Dijk & Kintsch, 1983). Currently, the theoretical bases for the analysis of discourse processing in comprehension are better delineated. As well, memory and discourse abilities continue to be viewed as intimately related. This interdependence presents theoretical and methodological difficulties for researchers, specifically when considering discourse comprehension abilities in normal-aged participants or aged individuals with brain diseases.

The component of memory which is most often discussed in relation to discourse comprehension abilities is working memory. In fact, limitations in the working memory of aged individuals is presented by some authors as the reason that older adults have difficulty processing relationships among concepts in discourse comprehension tasks (Cohen, 1988; Zacks & Hasher, 1988). Most of the evidence in support of a relationship between working memory and discourse comprehension, however, is correlational in nature. Claims that such a relationship exists, therefore, are a source of controversy.

Working memory deficits have been proposed as the explanation for differences in discourse comprehension performance among young and old adults (e.g., Norman, Kemper, & Kynette, 1992; Stine, 1990; Zabrocky & Moore, 1994, 1995). Several studies are presented to illustrate the disparity of findings in the literature (Hartley, 1986, 1988; Tun, Wingfield, & Stine, 1991). Reading span described by Daneman and Carpenter (1980) was used to measure working memory by both Hartley (1988) and Tun et al. In this procedure, a series of sentences, which increase in number with successive trials, is read aloud to the participant. After the last sentence is read, the participant has to report the last word of each sentence in correct serial order. Hartley's results (1986, 1988) showed that working memory ability, as measured by reading span, was not related to text recall performance. On the other hand, Tun et al. (1991) found the reading span procedure provided an estimate of working memory ability which constituted a good predictor of text recall performance.

The contribution of working memory to discourse comprehension is not questioned by the previous observations. A reading span measure assesses only some of the cognitive components necessary for working memory. As Salthouse (1988) emphasizes, "there is still little consensus about how the capacity of working memory is best assessed" (p. 32). Current models of working memory (e.g., Baddeley, 1986; Just & Carpenter, 1992; Salthouse, 1990) distinguish it from short-term memory, the former being characterized as having both storage and processing functions (Zacks & Hasher, 1988; also see Kwong See &

Ryan, this issue). There remains a need for future studies that use a clear paradigm to better understand the relationships between working memory and discourse processing abilities.

Another set of investigations has tested a possible working memory deficit by varying memory load within the discourse comprehension task itself. Such an approach is promising because the design allows for the observation of quantitative and qualitative differences between participants. Works by Zelinski (1988) and Kahn and Cordon (1993) illustrate this approach. Zelinski used co-referential relationships as the bases of her approach. The identification of the antecedents and the referents to a given concept, such as in the use of pronouns, is crucial to discourse comprehension. During discourse comprehension, the information on the antecedent is kept in working memory and thereafter referred to in such a way that all subsequent information is compared to it until a match between old and new information produces a co-reference link. Consequently, the load imposed on working memory varies, with components of the load related to the antecedent and the newly added information.

Zelinski (1988) evaluated the time needed to comprehend and identify pairs of sentences as referring to each other. In a first experiment, Zelinski varied the word used to refer to a co-referent in different sentences. In some cases, the words were the same (e.g., alligator-alligator), whereas in other cases, they were different, though strongly related (e.g., appliance-refrigerator). In a second experiment, the author looked at the influence of the generality of one term (e.g., some money) and the typicality of the other term (e.g., a dollar). Thus, either the antecedent was general and the referent typical, or the antecedent was typical and the referent a general name. In a third experiment, the number of interpolated sentences (zero, two, or four) between the antecedent and the co-referent was examined. In all three experiments, the outcome measure was the reading time of a target sentence containing the co-referent term. Surprisingly, results in all cases showed no reliable age differences. The results could be due partly to a biased selection of the older participants, since these participants were highly educated and active readers. An alternative explanation could be that the stimuli requiring retention in working memory did not sufficiently overload the abilities of the older participants to cause a decrement in performance.

The experimental approach of Kahn and Cordon (1993) is based on the premise that the nature of the information to be remembered can affect discourse comprehension abilities. These authors varied the degree of *expectedness*, based on prior knowledge, in the attribution of a referent to a pronoun. Prior knowledge referred to stored semantic representations

of the participant's world knowledge acquired through experience and learning. The levels of expectedness were strong, neutral, or weak. In the strong expectedness condition, the pronoun referent could be predicted by prior knowledge. In the neutral expectedness condition, the pronoun referent was ambiguous because more than one antecedent could be a candidate for the co-reference. In the weak expectedness condition, the pronoun referent was contradictory to prior knowledge. The second aspect of the study which looked at working memory load was the number of interpolated sentences that separated the antecedent and the target sentence. Results showed that older participants spent more time reading the text with neutral and weak expectedness, and produced more errors in pronoun resolution when the expectedness was weak. The participants' age did not affect the number of sentences that were interpolated. However, the results of a reading span test (Daneman & Carpenter, 1980) showed that older adults scored significantly lower than the young adults. The authors account for these results in terms of a resource allocation deficit. That is, reduced reading span on the one hand and increased processing time and error production on the other, are manifestations of reduced resources in working memory in older adults.

Studies that have tested working memory deficits in older adults by varying the memory load within a discourse comprehension task are of particular interest, because they take into account several linguistic characteristics of the text itself. However, it is difficult to compare the results of different studies because of variability in the measures used. Another common problem is the selection of participants. When the group of older participants is relatively homogeneous (e.g., Zelinski, 1988 presented above), the conclusions are less generalizable. Furthermore, the frequent goal of uncovering group effects should take into account the fact that cognitive abilities vary considerably among aged individuals (Ska, Poissant, & Joanette, in press; Valdois, Joanette, Poissant, Ska, & Dehaut, 1990). While it is agreed that working memory appears to be one of the cognitive components that can affect discourse comprehension in normal aging, results on this topic are far from conclusive. One of the main weaknesses of these studies is the absence of an explicit theory or model of text processing.

The difference between the group of studies reported in the following section and those previously discussed is the types of text and the tasks used to assess comprehension. Memory capacities are not ignored in these next studies, but attention is focused on structures (e.g., narrative text) or characteristics (e.g., syntactic complexity) of the texts to be processed. These studies are not always based explicitly on discourse processing models (e.g., Frederiksen, 1986; Frederiksen & Donin, 1991; Kintsch, 1974; Meyer, 1975;

van Dijk & Kintsch, 1983). Some researchers have analysed linguistic units such as syntactic complexity (Norman et al., 1992), segment size (e.g., clause) (Wingfield & Lindfield, 1995), or text length (Hartley, 1993). Others have analysed expository versus narrative texts (Adams, 1991; Hartley, 1986; Luszcz, 1993) or descriptive versus procedural texts (Jackson & Kemper, 1993). Text recall tasks (e.g., Hartley, 1986; Riggs, Wingfield, & Tun, 1993) or text summary tasks (e.g., Adams, 1991; Byrd, 1985; Jackson & Kemper, 1993) are most frequently used.

In general, text recall abilities are found to be poorer among older than younger participants (e.g., Byrd, 1985; Hartley, 1993; Wingfield & Lindfield, 1995). Qualitative differences are present as well, and vary relative to the type of text and task. For example, Luszcz (1993) reports that age differences are more pronounced for expository texts than for narrative texts. Within expository texts, Jackson and Kemper (1993) compared the summaries of procedural and descriptive texts. The outcome measures were the number of ideas reproduced from the original text and the number of central ideas reproduced. Results revealed that older adults showed better performance globally than younger adults and were better able to reproduce central ideas. Nonetheless, older adults read more slowly than younger adults. Another qualitative difference appears when the content in recalls or summaries are analysed. Adams (1991) examined participants' responses with respect to reproductive, elaborative, and interpretive content. Participants were divided into four age groups: early adolescence (12-15 years), late adolescence (16-19 years), mid-age adulthood (35-56 years), and late adulthood (60-78 years). Results revealed that younger participants (early and late adolescents) provided text recalls and summaries containing more reproductive and text-based information, whereas adults and older participants produced texts with more reconstructive and interpretive content. Thus, these types of studies show that adults and older adults behave differently from adolescents. Adolescents seem to process information provided by the text more exclusively, whereas older adults seem to use their world knowledge more to interpret the text.

The level of difficulty of various text materials must be comparable before they can be used in a study of discourse processing. One of the most often studied processes in discourse comprehension is the ability to infer. Theoretical models such as that of van Dijk and Kintsch (1983) distinguish two levels of inference: local and global. Local inference is necessary to maintain intersentential coherence. It links information within consecutive sentences, and is based on explicit or implicit information. Global inference refers to coherence at the macrostructural level, and is based on world knowledge and knowledge of text structure. There are several types of global inferences. One is referred to as

the *bridging inference*. This refers to information that is implicit in the original text and which is stated explicitly in the recall of the participant, providing evidence that the participant "bridges" two or more units of information when processing the text. Studying the discourse processing of one patient with right hemisphere brain-damage, Frederiksen and Stemmer (1993) used three texts that required the participant to use bridging inferences. They observed that the patient had problems when new information required her to make a shift in her interpretation of the text. However, the authors did not draw generalized conclusions because of the design of the study (case study), and because of questions about the validity of text materials. Furthermore, they suggested that more stimulus materials must be developed, validated, and tested before accurate statements can be made to advance the notion of pathology affecting discourse processes.

Following this suggestion, Ska, Turmel et al. (in submission) developed a French version of the three texts used by Frederiksen and Stemmer (1993) and added a fourth text. Using the same methodology as Frederiksen and Stemmer, they tested two groups of 14 normal participants each: adults (mean age: 38 years, educational level: 13.5 years) and older adults (mean age: 67 years, educational level: 12 years). The experimental variable was the ability to produce the bridging inference within a text recall task. The results showed that the four texts were not comparable because the performance of each group of participants varied as a function of text. With the first text, the expected inference was produced by 13 adults and 12 older adults. Only 10 adults and five older adults produced the inference in the second text. With the third and fourth texts, a difference was observed between the two groups: 12 and 13 adults, and six and four adults, respectively, produced the inference. What is clear is that the fourth text was not comparable to the first three and that almost all of the older adults were able to produce the expected behaviour for the first text only. In contrast, if the results of the third and fourth texts are considered in isolation, the conclusion would have been that older adults are less able than the younger ones to produce a bridging inference. The conclusions to be drawn from this body of research regarding the discourse comprehension behaviour of older adults are limited. However, the conclusions regarding the nature of the texts to be used in such studies are obvious; different texts do not appear to show the same level of difficulty.

In summary, the results of studies on discourse comprehension in aging are no more conclusive than those on memory and discourse processing. On the one hand, some studies show that older adults' performance in discourse comprehension is poorer than the performance of younger adults. On the other hand, several studies show qualitative differences between older and younger participants, or better

performance by older participants. Quantitative effects of normal aging on text comprehension are probably due in part to memory problems. Indeed, these effects are reported mainly when text recall is the experimental task used to assess comprehension. However, qualitative differences are evident when the content of text recalls or summaries of text are considered. The information from the text is processed and integrated into personal knowledge more often by older than younger adults. Discrepancies between these results can be attributed primarily to the methodology.

One major obstacle to overcome in evaluating discourse comprehension is bypassing the memory problems associated with aging. As Light, Valencia-Laver, and Zavis (1991) emphasized, the determination of whether processing occurred during reading or listening to a text must involve testing during or immediately after administration of the task. As the research of Ska, Turmel et al. (in submission) demonstrated, other methodological aspects appear to limit the possibility of drawing conclusions from discourse comprehension studies. In general, studies in this area lack information about instructions, materials, and participant characteristics. In fact, comparisons between studies of discourse comprehension are problematic because of the heterogeneity of the experimental protocols and theoretical frameworks used (Dixon, Hertzog, Friesen, & Hultsch, 1993). When studying discourse comprehension, explicit reference to a theoretical model and meticulous control of the variables are imperative in order to make a logical and reasonable interpretation of the observed results.

Discourse and Production

There are multiple situations where discourse is produced. The factors influencing discourse production vary with the context and the conditions of production. For example, the characteristics of dialogues between individuals are influenced by the social, educational, and cultural status of the participants (Gould & Dixon, 1993; Ska, Montellier, & Nespolous, 1991). Despite the importance of this topic, the next section will be limited to a discussion of studies on discourse produced in non-interactive situations (i.e., monologue) where the characteristics of the production do not vary with social factors.

Within the context of non-interactive situations, the study of the effects of aging on discourse production is based essentially on two kinds of experimental set-ups. Discourse is produced either without a visual support or with a visual support, such as the *Cookie Theft* picture from the Boston Diagnostic Aphasia Battery (Goodglass & Kaplan, 1983) or the *Hold-up* picture from the Montreal-Toulouse Aphasia Battery (Lecours, Rascol, Nespolous, Joanette, & Puel,

1986). In the non-visually-supported situation, participants are asked to tell a known story, such as a tale (e.g., *Little Red Riding Hood*), or to recount an event they lived in the past, such as a memorable trip. These productions are useful for the clinical assessment of the effects of cerebral pathology, because they allow clinicians to look for the presence of deficits such as impairments in cohesion or coherence. However, if the analysis has to be more controlled and standardized, the use of a nonvisually supported approach raises a series of problems. Indeed, it is difficult to anticipate or control for the content of such productions given individual differences regarding specific knowledge of a given topic, and because of the absence of prior guidelines from the examiner with regard to a personal event. The use of visually supported discourse production partly bypasses these problems because the information provided for the construction of the discourse is the same for all participants.

Almost all studies on discourse production by aged participants are convergent on two points. Older participants produce more indefinite words and longer pauses (Cohen, 1979; Cooper, 1990; Heller & Dobbs, 1993; Obler & Albert, 1981; Ulatowska, Cannito, Hayashi, & Fleming, 1985; Walker, Robert, & Hedrick, 1988). These characteristics are interpreted as reflecting word-finding difficulty. The discourse production performance of older participants, when other aspects of discourse are considered, are less clear. For example, their discourse appears more elaborate (e.g., Obler & Albert, 1984) or less syntactically complex (e.g., Kemper, 1987). These discrepancies are discussed by Obler et al. (1994). The authors point to methodological aspects and the variability among participants as the main explanations for the differences observed between studies. The next section will illustrate the manipulation of discourse production conditions and demonstrate how visual versus non-visual support or instructions influence discourse production by older adults.

Nearly all theoretical frameworks of discourse abilities suggest the existence of several levels of cognitive processing (e.g., Frederiksen, 1986; Frederiksen & Donin, 1991; Kintsch, 1974; Meyer, 1975; van Dijk & Kintsch, 1983). The analysis of discourse production has to focus on one particular level, independently of the others. One of these levels is the existence of a cognitive structure (macro-structural level) which guides the construction of a text. One way of referring to this macrostructure is the now well-established concept of *story schema* (see Fayol & Lemaire, 1993 for a discussion). Using the story schema described by Stein and Glenn (1979), Ska and Guénard (1993) compared the discourse production of normal-aged controls and participants with a dementia of the Alzheimer's type (DAT). Each participant was required to generate three stories: a story without visual support (*Little Red Riding Hood*), a

story prompted by seven ordered pictures representing a car accident, and a story from a single picture illustrating a bank hold-up (Lecours et al., 1986). The authors observed that the DAT participants generated fewer story-schema components than the normal-aged control participants. However, the control participants did not have a perfect performance and the production for the two groups was influenced greatly by the nature of the narrative. The *Little Red Riding Hood* stories were usually incomplete. Story schema components such as internal response, consequence, and reaction were neglected by half of the normal control participants. Producing discourse without visual support, however, is a condition that assesses memory abilities more than discourse production abilities per se. In contrast, the sequence of pictures of the car accident scenario constrains the structure of the story, and resulted in more schema components being generated by all participants. Finally, the single-picture, bank hold-up story induced a preference for providing a description of events rather than a story. Indeed, two schema components were never produced by participants, including the conclusion to the story, which is not illustrated explicitly in the picture. Furthermore, in the last condition, the instructions asked the participant to "Tell me what happens in the picture" rather than to tell a story. Given this observation, Trahan (1994) designed a single-picture, visually-supported discourse production task in which the varying condition was the instructions provided to older and aphasic participants. In the first condition, participants were asked to tell what was happening in the picture, while in the second condition the participants were asked to invent a story using the information illustrated in the picture. The observed variable in the production of normal-aged controls and participants with fluent aphasia was the ability to respect the story schema components. The results showed that the participants with aphasia were not influenced by the instructions. Their stories remained incomplete even when the request to construct a complete story was made explicit. In contrast, the normal-aged controls modified their production and added components that were missing in the first condition (e.g., consequence and reaction). Trahan (1994) concluded that the cognitive structure known as the story schema is intact in the normal-aged participants. However, these participants need specific prompting to make active use of this structure.

The conclusions drawn in studies which examined the production of discourse by normal-aged participants are more convergent on several aspects than are the studies on discourse comprehension or memory and discourse. The normal-aged participants produce more indefinite words and longer pauses. These behaviours are interpreted as reflecting word-finding difficulty. The results of the studies that assess the syntactical level are less clear. In some cases, the production is more elaborate (e.g., Obler & Albert, 1984),

while in other cases it appears less complex (e.g., Kemper, 1987). When the macrostructure of discourse is considered, no impairment appears if relevant instructions are provided to the normal-aged participants. Thus, the linguistic levels of discourse illustrated by lexical choices and syntactical organization are influenced or may be influenced by aging. The cognitive levels such as macrostructure production are affected in the normal-aged participants, unless specific conditions (e.g., explicit instructions) activate them. However, these conclusions also have to be confirmed by future studies using strong theoretical frameworks and rigorous methodology.

Conclusion

This brief overview of the salient literature emphasizes the fact that the study of discourse abilities in normal aging is far from complete. Theoretical models are now available to support hypotheses and innovative methodologies. Many questions, however, remain unanswered. There are inconsistencies among current results. Moreover, some aspects of the problem are ignored. For example, few studies have looked at the strategies used by older participants to compensate for word finding difficulties or memory impairments. In this respect, case studies and qualitative analyses should be more informative in illuminating differences between young and older adults. More importantly, such analyses could provide partial explanations to help account for the variability between participant groups often observed in studies on aging. The research topic of discourse abilities in normal aging is, in fact, ready for an important development. It is imperative to increase the knowledge in this domain in order to contribute to the diagnosis and treatment of communicative disorders that occur following acquired and degenerative diseases in the aged population.

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References

- Adams, C. (1991). Qualitative age differences in memory for text : A life-span developmental perspective. *Psychology and Aging, 6*(3), 323-336.
- Baddeley, A. (1986). *Working memory*. London, England: Oxford University Press.
- Bloom, R. L., Obler, L. K., de Santi, S., & Erlich, J. S. (1994). *Discourse analysis and applications*. Hillsdale, NJ: Erlbaum.
- Byrd, M. (1985). Age differences in the ability to recall and summarize textual information. *Experimental Aging Research, 11*(2), 87-91.
- Cohen, G. (1979). Language comprehension in old age. *Cognitive Psychology, 11*, 412-429.
- Cohen, G. (1988). Age differences in memory for texts: Production deficiency or processing limitations? In L. L. Light & D. M. Burke (Eds.), *Language, memory and aging* (pp. 171-190). Cambridge, MA: Cambridge University Press.
- Cooper, P. V. (1990). Discourse production in normal aging: Performance on oral picture description tasks. *Journal of Gerontology: Psychological Sciences, 45*, 5, 210-214.
- Daneman, M., & Carpenter P. A. (1980). Individual differences in working memory and reading. *Journal of Verbal Learning and Verbal Behavior, 19*, 450-466.
- Dixon, R. A., Hertzog, C., Friesen, I. C., & Hultsch, D. H. (1993). Assessment of intra-individual change in text recall of elderly adults. In H. H. Brownell & Y. Joanette (Eds.), *Narrative discourse in neurologically impaired and normal aging adults* (pp. 77-101). San Diego, CA: Singular.
- Fayol, M., & Lemaire, P. (1993). Levels of approach to discourse. In H. H. Brownell & Y. Joanette (Eds.), *Narrative discourse in neurologically impaired and normal aging adults* (pp. 3-21). San Diego, CA: Singular.
- Frederiksen, C. H. (1986). Cognitive models and discourse analysis. In C. R. Cooper & S. Greenbaum (Eds.). *Written communication annual, Vol. 1: Studying writing: Linguistic approaches* (pp. 227-267). Beverly Hills, CA: Sage.
- Frederiksen, C. H., & Donin, J. (1991). Constructing multiple semantic representations in comprehending and producing discourse. In G. Denhière & J. P. Rossi (Eds.), *Texts and text processing* (pp. 19-44). Amsterdam: North Holland.
- Frederiksen, C. H., & Stemmer, B. (1993). Conceptual processing of discourse by a right hemisphere brain-damaged patient. In H. H. Brownell & Y. Joanette (Eds.), *Narrative discourse in neurologically impaired and normal aging adults* (pp. 239-278). San Diego, CA: Singular.
- Goodglass, H., & Kaplan, E. (1983). *The Boston diagnostic aphasia examination*. Philadelphia, PA: Lea and Febiger.
- Gould, O. N., & Dixon, R. A. (1993). How we spent our vacation: Collaborative storytelling by young and old adults. *Psychology and Aging, 8*(1), 10-17.
- Hartley, J. T. (1986). Reader and text variables as determinants of discourse memory in adulthood. *Psychology and Aging, 1*, 150-158.
- Hartley, J. T. (1988). Aging and individual differences in memory for written discourse. In L. L. Light & D. M. Burke (Eds.), *Language, memory and aging* (pp. 36-57). Cambridge, MA: Cambridge University Press.
- Hartley, J. T. (1993). Aging and prose memory: Tests of the resource-deficit hypothesis. *Psychology and Aging, 8*(4), 538-551.
- Heller, R. B., & Dobbs, A. R. (1993). Age differences in word finding in discourse and non-discourse situations. *Psychological Review, 8*(3), 443-450.

- Jackson, J. D., & Kemper, S. (1993). Age differences in summarizing descriptive and procedural texts. *Experimental Aging Research*, 19(1), 39-51.
- Just, M. A., & Carpenter P. A. (1992). A capacity theory of comprehension: Individual differences in working memory. *Journal of Experimental Psychology: General*, 111, 228-238.
- Kahn, H. J., & Cordon, D. (1993). Qualitative differences in working memory and discourse comprehension in normal aging. In H. H. Brownell & Y. Joanette (Eds.), *Narrative discourse in neurologically impaired and normal aging adults* (pp. 104-114). San Diego, CA: Singular.
- Kemper, S. (1987). Life-span changes in syntactic complexity. *Journal of Gerontology*, 42, 232-238.
- Kintsch, W. (1974). *The representation of meaning in memory*. Hillsdale, NJ: Erlbaum.
- Kwong See, S.T., & Ryan, E.B. (1996). Cognitive mediation of discourse processing in later life. *Journal of Speech-Language Pathology and Audiology*, 20, 109-117.
- Lecours, A. R., Rascol, A., Nespolous, J. L., Joanette, Y., & Puel, M. (1986). *Protocole Montréal-Toulouse. Examen de l'Aphasie, version Beta modifiée*. Montréal: Université de Montréal.
- Light, L. L., Valencia-Laver, D., & Zavis D. (1991). Instantiation of general terms in young and older adults. *Psychology and Aging*, 6, 337-351.
- Luszcz, M. A. (1993). Orienting tasks as moderators of narrative and expository text recall in adulthood. *Psychology and Aging*, 8(1), 56-58.
- Meyer, B. J. F. (1975). *The organization of prose and its effects on memory*. Amsterdam: North Holland.
- Norman, S., Kemper, S., & Kynette D. (1992). Adults' reading comprehension: Effects of syntactic complexity and working memory. *Journal of Gerontology: Psychological Sciences*, 47, 258-265.
- Obler, L. K., & Albert, M. L. (1981). Language and aging, a neurobehavioral analysis. In D. S. Beasley & D. A. Davis (Eds.), *Aging: Communication processes and disorders* (pp. 107-121). New York: Grune and Stratton.
- Obler, L. K., & Albert, M. L. (1984). Language in aging. In M. L. Albert (Ed.), *Neurology of aging*. New York: Oxford.
- Obler, L. K., Au, R., Kugler, J., Melvold, J., Tocco, M., & Albert, M. L. (1994). Intersubject variability in adult normal discourse. In R. L. Bloom, L. K. Obler, S. DeSanti & J. S. Ehrlich (Eds.), *Discourse analysis and applications* (pp. 15-27). Hillsdale, NJ: Erlbaum.
- Riggs, K. M., Wingfield, A., & Tun, P. A. (1993). Passage difficulty, speech rate, and age differences in memory for spoken text: Speech recall and the complexity hypothesis. *Experimental Aging Research*, 19(2), 111-128.
- Salthouse, T. A. (1988). Effects of aging on verbal abilities: Examination of the psychometric literature. In L. L. Light & D. M. Burke (Eds.), *Language, memory and aging* (pp. 17-35). Cambridge, MA: Cambridge University Press.
- Salthouse T. A. (1990). Working memory as a processing resource in cognitive aging. *Developmental Review*, 10, 101-124.
- Ska, B., & Guénard, D. (1993). Narrative schema in dementia of the Alzheimer's type. In H. H. Brownell & Y. Joanette (Eds.), *Narrative discourse in neurologically impaired and normal aging adults* (pp. 299-316). San Diego, CA: Singular.
- Ska, B., Montellier, M., & Nespolous, J. L. (1991). Communication et vieillissement normal. In M. Habib, Y. Joanette, & M. Puel (Eds.), *Démences et syndromes démentiels* (pp. 145-152). Paris: Masson.
- Ska, B., Poissant, A., & Joanette Y. (in press). La variabilité interindividuelle dans les modifications cognitives liées à l'âge. *Année gérontologique/ Facts and Research in Gerontology*.
- Ska, B., Turmel, C. A., Marchand, N., Litalien, S., Stemmer, B., Poissant, A., & Joanette, Y. (in submission). Utilisation de textes pour l'évaluation des habiletés discursives : Effets de l'âge et de la nature du texte. *Journal of Speech-Language Pathology and Audiology*.
- Stein, N. L., & Glenn, C. G. (1979). An analysis of story comprehension in elementary school children. In R. O. Freedle (Ed.), *New directions in discourse processing* (pp. 53-120). Norwood, NJ: Ablex.
- Stine, E. A. (1990). On-line processing of written test by younger and older adults. *Psychology and Aging*, 5, 68-78.
- Trahan, M. C. (1994). *Effet de la consigne sur le respect du schéma narratif chez des sujets normaux et aphasiques*. Unpublished master's thesis, Université de Montréal, Montréal.
- Tun, P. A., Wingfield, A., & Stine, E. A. L. (1991). Speech processing capacity in young and older adults: A dual task study. *Psychology and Aging*, 6(1), 3-9.
- Ulatowska, H. K., Cannito, M. P., Hayashi, M. M., & Fleming, S. G. (1985). Language abilities in the elderly. In H. K. Ulatowska (Ed.), *The aging brain: Communication in the elderly* (pp. 125-139). San Diego, CA: College-Hill Press.
- Valdois, S., Joanette, Y., Poissant, A., Ska, B., & Dehaut, F. (1990). Heterogeneity in the neuropsychological patterning of normal elderly. *Journal of Clinical and Experimental Neuropsychology*, 12(3), 587-612.
- van Dijk, T. A., & Kintsch, W. (1983). *Strategies of discourse comprehension*. New York, NY: Academic Press.
- Walker, V. G., Robert, P. M., & Hedrick, D. L. (1988). Linguistic analyses of the discourse narratives of young and aged women. *Folia Phoniatrica*, 40, 58-64.
- Wechsler, D. (1969). *Manuel de l'échelle clinique de mémoire de D. Wechsler*. Paris: Les éditions du Centre de psychologie appliquée.

Discourse in older adults

Wingfield, A., & Lindfield, K. C. (1995). Multiple memory systems in the processing of speech: Evidence from aging. *Experimental Aging Research, 21*(2), 101-121.

Zabrusky, K., & Moore, D. (1994). Contributions of working memory and evaluation and regulation of understanding to adults' recall of texts. *Journal of Gerontology: Psychological Sciences, 49*(5), 201-212.

Zabrusky, K., & Moore, D. (1995). Elaborations in adults' text recall: Relations to working memory and text recall. *Experimental Aging Research, 21*, 143-158.

Zacks, R. T., & Hasher, L. (1988). Capacity theory and the processing of inferences. In L. L. Light & D. M. Burke (Eds.), *Language, memory and aging* (pp. 154-170). Cambridge, MA: Cambridge University Press.

Zelinski, E. M. (1988). Aging and integration of information from discourse. In L. L. Light & D. M. Burke (Eds.), *Language, memory and aging* (pp. 117-132). Cambridge, MA: Cambridge University Press.