COMMENTARY / COMMENTAIRE

Commentary on *Cognitive Mediation of Discourse Processing in Later Life* by Kwong See and Ryan

Commentaire sur Médiation intellectuelle du traitement de la conversation vers la fin de la vie par Kwong See et Ryan

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In this issue of *JSLPA*, Kwong See and Ryan seek a cognitivist explanation for the widespread observation that discourse processing changes with advancing age. They first propose a general framework of discourse processing that takes the form of a cognitive model of discourse processing; then, they briefly review literature pertaining to cognitive components which purportedly best account for age-related decreases in discourse processing performance. They focus on the working memory system with particular emphasis on inhibitory efficiency, working memory capacity and speed of information processing. Kwong See and Ryan summarize their own empirical work on young and old adults (Kwong See & Ryan, 1995) in which they concluded that, among the three cognitive components under investigation, inhibition and speed of processing account for the greatest proportion of age-related variance in discourse comprehension. Their conclusion is supported by a growing literature devoted to working memory changes with advancing age (e.g., Kahn & Cordon, 1993; McDowd, Oseas-Kreger, & Filion, 1995). The main contribution of their earlier work (Kwong See and Ryan, 1995) is that it investigated the relative contribution of the three components in working memory to age differences, simultaneously in the same study. Finally, Kwong See and Ryan (this issue) conclude that their general model of discourse processing would be helpful for the investigation, rehabilitation, and management of age-related changes in communication performance.

This commentary addresses issues that might encourage further research in the same direction as Kwong See and Ryan and other current work in discourse and aging (Dempster & Brainerd, 1995; Kemper, 1992; Light, 1990; Peach, 1987). These issues concern the validity and the generalizability of the model proposed by Kwong See and Ryan. Since their article in the current issue of *JSLPA* includes, reorganizes and somewhat extends an earlier empirical study published by the same authors (Kwong See and Ryan, 1995) it should be noted that many of our comments are relevant to both articles. Readers who desire a more complete understanding of the thesis developed by Kwong See and Ryan would benefit from reading both Kwong See and Ryan (1995) as well as their current article in this issue.

A General Framework for Discourse Processing

Kwong See and Ryan (this issue) depict their theoretical model in a graphic figure that includes the boxes and arrows used by most cognitive psychologists who are implicitly or explicitly inspired by the computer metaphor of information processing. When such a model is proposed, whether it speculates on developmental or pathological changes, basic assumptions of validity of the model should be applied. The first assumption concerns the theoretical basis on which the model has been devised. One method for constructing a model is to consider the theoretical and empirical information already provided in the literature and bring the information together in graphic form. This is the method chosen by Kwong See and Ryan. The next step in model construction is empirical validation, in which one designs an experiment that tests one or more aspects of a model, and then considers whether the results are congruent with the components of the model. In our view, Kwong See and Ryan have successfully compiled the empirical and theoretical literature to form a graphic model, but it is does not appear that they empirically tested the general framework that is proposed. Without denying the value of the Kwong See and Ryan general framework, it should be stressed that their hypotheses lack precision. For example, models in cognitive neuropsychology make specific predictions regarding the consequences of "functional lesions" (Caramazza, 1991b). Kwong See and Ryan's general framework could profit from this sort of explicitness. The predictions made by Kwong See and Ryan are quite general in nature: the cognitive components on which they focus their attention are predicted to mediate age differences in language. Testing precise predictions based on a description of the relationship that

exists between inhibition of irrelevant information and decreased performance on cued recall of texts (cf. Kwong See and Ryan, 1995) would yield more information about the validity of their model. Similarly, to show that the Kwong See and Ryan hypothesized model is valid and useful, it would have been advantageous to describe the relationship between delayed processing and older adults' propensity for inaccurate gist recall or elaboration (cf. Kwong See and Ryan, 1995). We realize, of course, that discourse processing and aging is a relatively underdeveloped research area and has not yet had the benefit of model development within cognitive neuropsychology, as is the case with dyslexia or lexical access (e.g., Caramazza, 1991a, Caramazza, 1991b). Future studies would certainly benefit from formulating more precise hypotheses in operationalized terms.

We believe that rather than looking for congruent results, it is better to validate a model by developing hypotheses that are empirically falsifiable. For example, in Kwong See and Ryan (1995), the reported relationship between inefficient inhibition and discourse processing, or between latency of information processing and discourse interpretation, could be empirically falsified by including individuals who perform normally on discourse processing tasks despite decrements on speed and inhibition measures.

In order for a model to be valid and useful, it should include all components that are deemed relevant to a given type of functioning. This is especially true when the method of analysis is regression. Although the model proposed by Kwong See and Ryan is quite general in nature, it includes components that are common to conceptualizations available in the literature; however, they do not provide information about the exact relevance of these components, and include other, less common, candidates. Note that in Kwong See and Ryan (1995), an important predictor is chronological age. In fact, chronological age makes a large contribution to the variance and remains significant whenever other factors are entered into the regression equation that were particularly relevant to the study (e.g., speed of processing, inhibition, and capacity of working memory). Unfortunately, chronological age is not only a large predictor, but it also cannot be considered to have any direct contribution to cognitive performance; it merely refers to the passing of time. One could speculate about other factors besides chronological age that are not identified by Kwong See and Ryan: for example, motivation, occupational background, or socioeconomic status. It would be important, in future studies, to examine not only the influence of speed of processing, inhibition, and working memory capacity, but also to enter other factors into the equation that may be important predictors of discourse processing.

Individual Differences in Discourse Processing

Components that are frequently missing from cognitive models include those factors related to attitudes, motivations, and goals that a participant brings to any given task. Perhaps one reason for this omission is that an operational definition of such intrinsic yet individualistic behaviours is difficult (although not impossible) to realize. However, according to Kausler (1990) and others (see also Hasher & Zacks, 1988) motivation is an important consideration when testing older participants. Kausler (1990) believes that the motivational state of participants when confronted by laboratory tasks may account for a certain proportion of the age-related decrements found on certain tasks. For instance, Kamin (1957) reported that some older participants are particularly sensitive to compensation in the form of money prizes when word fluency tasks are administered. According to van Dijk and Kintsch (1983) such attitudinal factors can be considered part of the general knowledge on which discourse processing depends. In general, these principles are implicitly understood in most research on aging (see Ryan & Kwong See, 1993), but they are absent from any discussion related to the three cognitive factors under investigation in Kwong See and Ryan (1995 and this issue).

Limits of the Kwong See and Ryan General Framework

Salthouse (1990) recently made the point that little consensus has been reached in the literature with regard to the nature of working memory despite considerable interest in this construct (see Baddeley, 1993 for discussion of different constructs of working memory). He added that clear conclusions regarding the influence of age on working memory as a processing resource would be possible only after such a consensus has been reached. To date, this consensus is still unachieved which would seem to limit validity, usefulness, and generalizability of the Kwong See and Ryan framework of discourse processing. One might extend Salthouse's (1990) point and note that similar problems exist for other components of the Kwong See and Ryan framework, such as speed of processing and inhibition.

The direct relationship between speed of processing and age is well supported in the literature (Birren, Woods, & Williams, 1980; Cerella, 1985; Salthouse, 1985, 1996) and Kwong See and Ryan provide information that is congruent with this relationship. However, there are other issues regarding age and speed of processing that should be resolved before one can propose an adequate and valid model of discourse processing. One of these concerns the controversy over whether speed of processing is a general factor underlying all aspects of cognitive processing as

opposed to individual speed factors underlying various cognitive mechanisms such as working memory or inhibition (Salthouse, 1996). Consider the fact that different cognitive tasks — for instance, free recall after listening to a story vs. cued recall — may load differently on one common speed factor. Thus, the contribution of speed of processing to age differences in discourse processing may vary according to the types of tasks used to evaluate the variance of age-related speed. Further, according to Salthouse (1996), it is empirically difficult to isolate the variability associated with speed from that associated with other sources of variability if the weight of the speed factor varies with the task that is administered. One consequence of such a possibility is that speed may be confounded with other factors (e.g., inhibition) when analyses are based on correlation or regression, as is the case of Kwong See and Ryan (1995).

The nature of the mechanisms underlying speed is even more problematic, since we do not yet have a complete understanding of the physiology of information processing. For instance, should we attribute the cognitive slowing found among older participants to decrements in synaptic transmission in the central and/or peripheral nervous system or to the information loss at the level of transmission between proposed cognitive components (Hartley, 1992)? An alternative suggestion is to attribute the response latencies on a given task to the organization (e.g., serial, parallel, cascade, length and weight of the associative links in a postulated cognitive network) of the cognitive steps required by a task. If a computer metaphor is again invoked, the question becomes whether speed of processing (and the inherent variations in time) is reflected in hardware (the nervous system) or software (the cognitive system). While this question regarding the nature of speed of information processing may seem simplistic, it is particularly relevant with regard to clinical practice. The application is obvious - in a normal older adult, it is more pragmatic to focus on the cognitive resources needed to complete the task, and not on the speed of the task itself. Older adults are slower in processing than the young, and once this is accepted as given, a clinician can move on to focusing on the cognitive mechanisms that subserve a task. The extension of this principle can be applied to the older adult with pathological changes, e.g., aphasia or Alzheimer's disease. Clinical interventions based on speed of processing, for instance, would benefit from a better description of the nature and the specificity of the mechanisms underlying speed of information processing.

Inhibition or Resistance to Interference

Similarly, scientists and practitioners would benefit from a better understanding of the inhibitory component proposed by Kwong See and Ryan (this issue). For instance, it might be relevant to dissociate inhibition at the behavioural level, i.e., ignoring irrelevant information, from other conceptualizations of the mechanisms underlying inhibition. Confounding a behaviour with its underlying cognitive counterpart induces little progress in theory development from a cognitivist perspective. For instance, one might ask whether the inhibitory component postulated by Kwong See and Ryan (this issue) is peculiar to the working memory system itself, or whether inhibition is involved in a more general way in discourse or language processing. Several different conceptualizations of inhibition have been hypothesized (see Dempster, 1991 and Dempster & Brainerd, 1995 for an application of the different forms of inhibition; see Neil, Valdes & Terry, 1995; for a model related to discourse processing, see Kintsch, 1988; also see a special issue of Brain and Cognition on inhibitory mechanisms, Clark, 1996). For instance, active inhibition might be distinguished from a time-related decrease in activation or progressive deactivation. Further, the distinction between inhibition and resistance to interference is an important issue. According to Harnishfeger (1995), inhibition results from the active suppression or removal of task-irrelevant information from working memory. In contrast, resistance to interference is invoked under conditions of multiple distracting stimuli, such as dual-task performance or selective attention. Given this definition, the classical Stroop paradigm, used by Kwong See and Ryan (1995) would then seem to measure resistance to interference rather than inhibition. The distinction between inhibition and resistance to interference suggests that the inhibition of extraneous stimuli for instance, reading the word and inhibiting the colour name in the conventional Stroop task would be different from the inhibition of endogenous stimuli which include irrelevant thoughts or cognitive associations that might occur during discourse processing. Kwong See and Ryan (1995) used the classical form of the Stroop task to empirically test inhibition with the intent of examining the variance shared with the discourse comprehension task. No direct test of the inhibition of irrelevant thoughts during discourse processing was made. Because they examine only the shared variance of the two tasks, on a theoretical level, it is apparent that the inhibition or resistance to interference needed to accomplish the Stroop task vs. the discourse comprehension task is not equal. It would be helpful, then, if Kwong See and Ryan (or other researchers) would be more precise in considering not only theoretical aspects of inhibition, but also the task itself that calls for some sort of inhibitory process. Such precision would be particularly beneficial with regard to the clinical management of inefficient strategies in older patients, such as a patient's decreased ability to select a stimulus among several competing stimuli.

Generalization of the Discourse Processing Framework of Kwong See and Ryan

The last question in our commentary asks whether the Kwong See and Ryan framework of discourse processing can be generalized on an individual basis. We find several points on which the claim of generalization of their framework is uncertain. First, the cognitive factors under study (working memory capacity, speed of processing, and inhibition) account for less variance than the chronological age factor in all of the regression analyses performed in Kwong See and Ryan (1995). Second, there are likely to have been interindividual differences among members of each age group. For example, concerning the role of cognitive slowing, ineffective inhibition, and reduction in working memory capacity, the relative contribution to impairments in discourse processing may be different for certain older individuals. This appears particularly relevant in light of the interindividual variability in discourse processing that has been reported in the literature (Dixon, Hertzog, Friesen, & Hultsch, 1993). It is a common issue that is frequently found in group studies like that of Kwong See and Ryan (1995), and the reader should keep this in mind when considering the results of studies on any aspect of cognitive processing and advancing age. Even with these concerns, however, we believe that Kwong See and Ryan have proposed a theoretical framework that is potentially useful for investigating such issues while we wait for a more complete and valid model of discourse processing and aging.

Conclusion

In this commentary we have provided a critique of the framework of discourse processing proposed by Kwong See and Ryan and outline some examples of contributions as well as possible limitations, many of which deserve further investigation. Research into how cognitive processing changes with advancing age will be accomplished progressively, and the contribution of Kwong See and Ryan is one of these steps. Other steps must be taken in order to find a model that is more complete or a better approximation of the multiple factors underlying age differences in discourse processing. For the present, it is recommended that one accept the framework proposed by Kwong See and Ryan with caution, at least in a clinical sense, until more empirical work is done.

Authors' Note

The order of authorship is arbitrary. Both authors made equal contributions to this commentary.

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