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#### **Authors**

Dixon, Roger A.

Backman, Lars

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## Language Experience and Prose Processing in Adulthood

Roger A. Dixon  
University of Victoria

Lars Bäckman  
Stockholm Gerontology Research Center

For decades psychologists have administered a variety of cognitive tasks and psychometric intelligence tests to adults of all ages and backgrounds. One goal in this research was to answer such global cognitive developmental questions as: Is there ineluctable, generalized decline in cognitive performance with advancing age? Although exceptions are scattered throughout the literature, one frequently observed result is that, indeed, older adults perform worse than younger adults on numerous complex cognitive tasks. Prior to proffering firm conclusions regarding the generality of aging-related decline, however, cognitive psychologists have recently begun to examine the exceptions to the apparent pattern. In so doing the following arguments are among those that have been noted: (a) Some longitudinal studies have detected substantial individual differences in rate and magnitude of decline; (b) Some cross-sectional studies have reported considerable overlap in distributions, with some older adults performing as well or better than some younger adults on selected tasks; (c) Several investigators have noted that the trajectories of change patterns are not uniform across domains; and (d) Several observers have identified a discrepancy between the apparent everyday (including professional and leisure) competency of many normal older adults and their relatively low observed performance on numerous laboratory cognitive tasks (e.g., Salthouse, 1987). A viable (albeit vague) conclusion may be that, although cognitive aging certainly involves decline in numerous component and complex cognitive processes, there is some evidence for some stabilization for some people in some tasks. A derivative research question then becomes: What are the conditions under which adults might develop or maintain highly skilled levels of performance for cognitively demanding tasks? It is this question that the present brief report addresses.

The specific cognitive activity of interest is reading and recall of prose. In this (as in other) areas there is some evidence that under selected conditions typical age differences (in which young adults perform at a superior level to older adults) may be attenuated for particular performance measures (e.g., Dixon & Bäckman, in press). The conditions considered in the present report are those related to the experience or expertise of older adults. In particular, the interest is in the effects of experience or expertise on the attenuation of age differences in measures of prose reading and recall. It is evident that research on skilled discourse processing and prose recall is not as complete or conclusive as it is for other cognitive skills. This may be due in part to difficulties in providing conceptual constraints on an ambiguous skill, identifying and measuring the performances that indicate that skill, identifying and operationally defining the components, and modeling the connections and patterns of influence. Although a formal model is as yet unavailable, progress in identifying relevant features of the model is summarized.

## SKILLED PROSE READING AND RECALL IN ADULTHOOD

There has been little empirical or formal analysis of exceptional prose reading and memory skill. The work that is available ranges from descriptions of legendary performances stemming from the oral tradition of former times to studies of individual performances of contemporary actors or memory specialists. In a previous review (Dixon & Bäckman, in press), we noted that, although cognitive development in adulthood was not a major concern of most of the available studies, in some cases middle-aged and older adults were found to perform at highly skilled levels. In the few studies that have examined prose processing skill and adult age, expertise was conceived of within a normal range of functioning and usually as a variable with which to compare and differentiate within and across adult age groups. For example, after identifying a relevant skill, researchers might divide old and young adult age groups into roughly equivalent high and low skill groups and compare them on selected measures of reading or recall of stories. This literature suggests that there are at least two categories of skills (maintained in adulthood) that could act as cognitive support systems for reading and prose memory in older adults: domain specific (e.g., availability of pertinent prior knowledge or schemata) and domain general (e.g., language experience and verbal skill). Following a brief summary of one study in the domain specific category, we describe recent efforts to examine the influence of the domain general category.

**Prior Knowledge**

The presence of prior knowledge about the content of text materials could make the reader analogous to the expert in other domains of memory (Ericsson, 1986). The question is whether older adults can, like young adults, use their prior knowledge about the content of passages to provide a semantically rich context in which to encode and retrieve the information actually presented in the text. A subsequent question, of course, is whether successful older adults use the same mechanisms to achieve a high performance level. An additional question is whether under these conditions they perform as well as younger adults, whether experts or novices in the content domain. Of the two studies are relevant to this category, one investigating the effects of prior knowledge and memory for domain-specific stories is summarized (Hultsch & Dixon, 1983). In this study we devised short, structurally equivalent biographical sketches about three entertainment figures for whom young, middle-aged, and older adults possessed significantly more or less prior knowledge than did their counterparts (the figures were Steve Martin (young adults), Susan Hayward (middle-aged adults), and Mary Pickford (old adults)). A fourth biographical sketch of an entertainment figure (Bob Hope) known equivalently by all three age groups was included. The results were encouraging to this line of investigation. Specifically, although there was an overall main effect for age (in favor of young adults), the old adults performed as well as the young adults in remembering what they had read of the stories about Mary Pickford and Bob Hope. Given certain qualifications, this initial manipulation of expertise permits the following interpretation. Age differences in prose recall performance may be present or absent depending on the level of prior knowledge regarding the to-be-remembered material possessed by the various age groups.

### Language Experience and Verbal Skill

The second category is that of language experience and verbal skill, both of which may be positively correlated with adult age. It is a typical finding that experience with language and measures of verbal ability (e.g., vocabulary score) increase with advancing age. Initial efforts to examine whether such skills could support text processing in older adults yielded some promising results (e.g., Dixon, Hultsch, Simon, & von Eye, 1984; Meyer & Rice, 1983). In one of these studies (Dixon et al., 1984), we compared high verbal and low verbal younger and older adults on free recall of information from a series of expository texts. There were clear main effects for age (in favor of young adults), verbal skill (in favor of high ability adults), and level of information (where main ideas were recalled better than subordinate ideas). For present purposes, the most pertinent finding was a three-way interaction among age, verbal ability, and level of information. For high verbal subjects (and not low verbal subjects) there were no age differences in recall of the main ideas of the texts, but there were age differences at the level of text details. Thus, high verbal older adults were able to identify and recall the main ideas of these texts as well as young adults, but failed to remember as many of the details.

More recent efforts have been directed at elaborating the operational definition of language experience and at expanding the domain of response measures. Two recent projects are described in somewhat more detail. In the first project, an hypothesis pertaining to whether experience with language and discourse, which increases with normal aging irrespective of professional specialization, could contribute to the development of aging-related cognitive compensatory processing mechanisms. The second project is distinguished from the first in that language experience of a more specific variety is examined in terms of its potential contribution to maintenance of cognitive performance levels. In this project, adults who have had regular experience at remembering, analyzing, and recording the "narratives" of daily life (i.e., diarists) were tested on a series of cognitive tasks.

**Metaphoric Processing as Potential Compensatory Component:** In a recent chapter, we described a conceptualization of cognitive compensation, especially as it applied to the area of prose reading and recall (Dixon & Bäckman, in press). A brief overview of the logic of this conceptualization follows. Prose reading and recall may be considered molar cognitive tasks, the successful performance of which requires competence in numerous molecular components. Several components of fluent reading and prose recall have been identified (e.g., Baddeley, Logie, Nimmo-Smith, & Brereton, 1985). In normal (young) adults when such components (as indicated by, e.g., working memory span, lexical decision, and letter matching tests) are operating effectively fluent prose reading and recall may result. There is considerable evidence, however, that older adults have impaired abilities in such components. Decrements in these components should have the effect of diminishing performance levels on the molar tasks. As noted above, however, there are some conditions under which older adults seem to have maintained relatively high performance levels for reading and prose recall tasks. This maintenance of molar performance levels could be due to maintenance of performance on the molecular components or to the activation of substitutable molecular components or related skills. In brief, if older adults, suffering decrements in the typical components, employ substitutable molecular components in

processing prose materials then cognitive compensation may be indicated. In a series of studies we examined hypotheses derived from this logic (see Dixon & Bäckman, in press, for an overview).

The first study was designed to investigate whether preliminary evidence for such compensation could be observed in a large sample of unselected young and older adults. Given that there is some evidence for a generalized aging-related increase (or at least maintenance) in metaphoric processing (specifically, metaphor interpretation), we reasoned that, for older adults who perform relatively poorly on typical molecular components, this skill might support performance in reading and remembering metaphoric (but probably not nonmetaphoric) passages. Given certain limitations in the design of the study, a particular pattern of age-related results was required before an inference of compensation could be made (see Dixon & Bäckman, in press). This pattern included the following elements: (a) Positive correlations between measures of molecular components and molar tasks; (b) Significant age differences (young > old adults) on the molecular tasks; (c) Positive correlations (for old adults) between metaphor interpretation and molar tasks; (d) Significant age differences (old > young adults) on metaphor interpretation; (e) Significant age differences (young > old adults on prose recall measures for nonmetaphoric passages); and (f) Significant age differences (old > young adults) or age group equivalence on prose recall measures for metaphoric passages.

Materials pertaining to each of the logical elements (and predictions) were administered to a sample of young ( $n = 70$ ;  $M$  age = 25.6 years) and old ( $n = 66$ ;  $M$  age = 68.8 years) normal, community-dwelling adults. Of the four structurally equivalent texts, two were metaphoric and two were nonmetaphoric. Participants were asked to read each passage, rate each on a series of dimensions, and then re-tell (in writing) the passages in their own words. Among the response measures for this re-telling of the passages were the following: (a) gist recall, (b) elaborations, or extra-text statements that are consistent with the topic, (c) metaphorical statements not originally in the texts, and (d) macrostatements or summary statements. Component tasks were adapted from those described elsewhere in the literature (e.g., Baddeley et al., 1985). With respect to gist recall, the results matched closely the predicted pattern but, because of two critical variations from the pattern, did not provide even preliminary evidence of compensation via preserved skill in metaphor interpretation. The variations were: (a) although old adults performed better than young adults on metaphor interpretation, their performance on this task was generally uncorrelated to their performance on the prose processing measures, and (b) young adults performed better than old adults on remembering propositions from both metaphoric ( $M = 12.0$  vs. 5.0, respectively) and nonmetaphoric ( $M = 13.5$  vs. 7.9, respectively) passages. With respect to the other response measures, it was found that for two of them (elaborations and metaphor production) young and old adults performed at equivalent levels. Two qualifications discourage an interpretation of compensation in the case of these important variables: (a) metaphor interpretation was generally uncorrelated with these measures as well, and (b) the frequency of incidences was quite small for both young and old adults.

We are concentrating on two complementary interpretations. First, given that metaphoric skill is not a unitary construct, metaphor interpretation may draw on a different aspect than does metaphoric prose memory. This may account for the fact that the two variables are empirically unrelated. In

another recent study, similar results were found for recall of metaphoric sentences. A second possible interpretation is that the conceptual analysis was overdrawn. The relationship may work, but only for a select sample, not for the unselected sample described above. One avenue presently being pursued is the analysis of individual older adults, each of whom has an unusual constellation of professional and leisure experiences in manipulating and using language (e.g., editors, linguists, and lawyers). As a first step in this direction, data from highly skilled (on metaphor interpretation) older adults from the above study were selected from the sample. Ten subjects constituted this select group of metaphorically skilled older adults. Their mean scores on all text performance measures (four stories by six measures) were compared to those for the remaining old subjects, a similarly select group of young subjects, and the total group of young subjects. The select older subjects performed at a uniformly higher level than the remaining old subjects and in some cases as high as the total group of young subjects. In addition, the correlational pattern was considerably different for the select group of old subjects than for the unselected young and old samples. The correlations between the two domains of variables ranged from  $-.7$  to  $.7$  (as compared to predominantly zero order correlations for the unselected groups). Our tentative conclusion is that further analysis of individual older adults, with extended information on their language experience and on-line measures of reading and recall activities, is in order.

**Diary-keeping as Potential Compensatory Experience:** In a recent study (Dixon, Fox, & Gould, 1988) we sought to examine a set of language experiences associated with a variety of diary-keeping activities. There were three major objectives. The first goal was to develop measures of experience in diary keeping. Given such measures it would be possible to construct an operational definition of diary-keeping style or (possibly) skill. The second goal was to develop procedures and tasks for measuring a series of cognitive characteristics associated with diary-keeping practice. The third goal was to examine the extent to which diary-keeping experience was associated with (or would support) performance by older adults on selected tasks, arrayed on a continuum from those that were designed to be closely related to diary-keeping activity (near transfer) to those that were not (control or far transfer tasks). A global expectation was that continual practice at remembering, analyzing, and recording one's own daily events (or the narrative of one's daily life) would be related to performance on such tasks as: (a) Production of diary entries for presented hypothetical events, (b) Chronological ordering of randomly presented lists of activities, (c) Recalling lists of daily life events, (d) Recalling narrative stories of daily life and a business dilemma, and (e) Solving life problems presented as diary entries. In this summary we will mention only results pertaining to task (d). It should be noted, then, that two narrative stories presented as diary entries of fictitious protagonists experiencing minor life crises and one structurally equivalent story describing a new business in the midst of an important decision were presented to the participants. Subjects were asked to think aloud as they offered their solutions to the dilemmas in each story. The recall of the stimulus stories was therefore an incidental task. In addition, one control, normed narrative story was presented to each subject with instructions to read and intentionally remember the information presented therein.

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Young ( $n = 15$ ,  $M$  age = 26.2 years) and old ( $n = 15$ ,  $M$  age = 61.9 years) adult nondiarists and young ( $n = 15$ ,  $M$  age = 24.5 years) and old ( $n = 15$ ,  $M$  age = 60.6 years) adult diarists were tested individually on a series of cognitive tasks. Four measures of diary-keeping experience were developed. The first was a simple measure of duration (in consecutive months) of regular diary keeping experience. Although many of the (nondiarist) respondents had kept a diary for some period of time at one or more points in their lives, diarists ( $M = 205.4$  months) had significantly more experience than nondiarists ( $M = 9.4$  months). Initial analyses of the prose processing data were concentrated on the age and experience (diarist/nondiarist) factors, where the latter factor was defined in this simple way. Overall, younger adults recalled a greater proportion of propositions from the texts than did older adults. Although several interactions pertaining to other dependent measures were encouraging to the line of investigation, for the text recall measures the old subjects performed similarly, whether they were diarists or not. For example, age differences were attenuated for proportion of propositions recalled of the diary entries (young > old by 4%) as compared to the business problem (young > old by 13%) and the narrative (young > old by 14%). Subsequent analyses concentrated on the adult age and experience factors, where the latter was operationally defined in terms of diary-keeping style (as measured by self-ratings of own diary entries and by independent ratings of produced diary entries). Using a composite measure of diary-keeping style or skill we found that select older diarists were among the highest performing individuals on some of the complex cognitive tasks. In what way would such measures of diary-keeping style or skill be related to the prose processing measures? To investigate this question we computed hierarchical multiple regressions. Entered in the first block for each dependent measure were selected predictor components (or main effects): verbal ability, age, and, as appropriate, the various measures of diary-keeping experience. The interactions (product variables) were entered in the second block. The main results may be summarized as follows. When only the diarists (young and old) were included in the analysis, the composite "skill" variable was not a significant predictor of prose recall performance. When all subjects were included, however, duration of diary keeping and produced diary style (as rated by independent observers) were often significant predictors and, furthermore, interacted with age and verbal ability.

Given the design of this study, it is impossible to disentangle competing potential causal relationships. It appears, however, that there is a recoverable relationship between diary-keeping experience--which is an activity that, at the very least, requires frequent and regular use of language, recall and formulation of naturally occurring and varying narratives, and practice at writing such passages--and cognitive performance. Additional analyses have been directed at the extent to which this relationship is observed in far-transfer, as well as near-transfer, tasks.

### SUMMARY

As a field of inquiry, the cognitive psychology of adulthood and aging has undergone numerous conceptual shifts and empirical revelations. To some extent the transitions have run parallel to those apparent in related areas of the cognitive sciences. In this paper we have summarized some recent efforts to understand a particular constellation of mechanisms and influences

on specific examples of complex cognitive functioning. A paramount (and complicating) concern is with changes in the mechanisms, influence patterns, and cognitive performance levels that occur as a function of advancing age. The general issue we have focussed on in this report is the conditions under which normal old adults might maintain skills in reading and memory for prose. We have suggested elsewhere (Dixon & Bäckman, in press) that there are individual differences in (a) the level attained in such demanding cognitive activities, (b) whether the skill is maintained, and (c) the cognitive profile (or reasons for) the maintenance. It is possible that some older adults may rely on the same molecular components (in the performance of molar tasks) as younger adults. It is also possible that some older adults may compensate (either deliberately or automatically) via substitution of alternative, aging-related, cognitively supportive skills (or components thereof).

After summarizing some previous work, we described briefly two sets of studies pertaining to the use of experience (and compensation) in reading and memory for prose. In both it was found that global hypotheses regarding the importance of language-related experience or skill were not supported. Instead, more specific, fine-grained analyses of the components, experience, and the molar skill produced more promising results. We are not prepared to answer the question of whether experience in reading and related activities support skilled levels of performance throughout adulthood. Based on the more recent analyses of the above data, however, we are confident it is a question worthy of continued conceptual and empirical attention.

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