Cognitive-flexibility in macrostructure processing by older adults

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Introduction

Macrostructure generation, including lesson and summary production, reflects higher order language processing (Kintsch, 1998). Moreover, successful macrostructure generation requires the ability to 'read the world' as well as 'read the words' (Friere & Macdeo, 1987). This 'reading the world' requires not only good comprehension of the text itself, but also the ability to integrate this textual knowledge with culture-specific world and personal knowledge. Furthermore, this integration requires the involvement of many cognitive processes.

Although macrostructure generation tasks have been used in clinical populations (e.g., see Ulatowska, Sadowska, Kordys, & Kadzielawa, 1993) to study the effects of aphasia or dementia, few studies have addressed the processing strategies involved in specific cognitive processes using the macrostructure paradigm. Given current knowledge of text interpretation, multiple representations may be available for a given text in normal populations (Sherman & Kulhavy, 1980); however, such cognitive flexibility may be impaired in individuals with right hemisphere brain damage (Tompkins, Fassbinder, Blake, Baumgaertner, & Jayaram, 2004) or in aging (Kray & Lindenberger, 2000).

This study was designed to examine the cognitive flexibility of older, normally aging, people when generating multiple text macrostructures in the form of fable lessons.

Population studied

This study included 20 healthy-aging individuals between the ages of 62 and 85 years (mean = 72.1 years, $SD = 6.8$ years), who passed cognitive and linguistic screening prior to entering the study. All participants had comparable education levels, with most participants completing some university-level training (mean 16.6 years, $SD = 3.6$ years). Socio-economic status using the Featherman and Stevens (1980) 7-point scale of occupational categories was also comparable (mean = 6.4, $SD = 0.9$).

Task

Participants were asked to generate the best lesson and an alternate lesson for each of 12 fables. All fables shared the following characteristics: (1) employed two characters in the form of an antagonist and protagonist, (2) employed two episodes, (3) had different primary themes, and (4) had no specific mention of the fable lesson.

Analysis and findings

Qualitative techniques were used to analyze properties elucidating the cognitive strategies used when generating the two types of fable lessons. Lessons were scored for: (1) level of linguistic abstraction, (2) level of inference, interpretation, and evaluation, (3) manipulation of character viewpoints through the adoption of either the protagonist's or antagonist's perspective, (4) representation of primary and other thematic content of the fable, and (5) pragmatic intent of the lesson.

Results of the qualitative analysis showed that best lesson responses had more frequent use of metaphorical language, the pragmatic intent of directing the listener (e.g., "Don't cry wolf"), and themes entailing goal achievement. In contrast, alternate lesson responses showed greater use of the antagonist's perspective, the pragmatic intent of advising the listener, and themes entailing positive personal attributes of actors, such as creativity, confidence, and self-reliance.

Lesson responses were also analysed using correspondence analysis (CA) to examine the variation in response patterns. CA is a descriptive statistic that allows relationships between variables and observations to be visualized graphically (LeRoux & Rouanet, 2004). CA searches for new factors or components in the data and plots the variables and observations as points along these new components. Points in close proximity represent similar patterns of response.

Results showed similar overall use of linguistic abstraction, level of inference, manipulation of character, representation of theme, pragmatic intent, and efficiency when producing best and alternate lessons. However, patterns of individual differences did emerge, with some participants showing a wide dispersion in their response patterns indicating cognitive flexibility in their approach to generating lessons, while others adopted similar strategies across lesson types and between different fables. Participants showing a reduction in cognitive flexibility had lessons representing the viewpoint of only one of the two characters, frequent use of the same thematic category, and use of the same pragmatic intent. However, the predominant character's viewpoint, thematic category, and pragmatic intent used varied across individuals showing this pattern of lesson responses.

Discussion

This study suggests that cognitive flexibility can be seen in the dispersion of both best and alternate lesson responses within participants, with a

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lack of flexibility manifesting itself as frequent use of a given strategy. Moreover, participants showing a lack of cognitive flexibility tended to show difficulty switching to new strategies. This pattern was evident even though little actual difference was seen between lesson types themselves. These findings are consistent with studies showing an overall reduction in cognitive flexibility associated with aging (e.g., Byrd, 1988; Collins & Tellier, 1994). In addition, this investigation contributes towards our understanding of tools for assessing cognitive-linguistic phenomena using naturalistic text and the strategies or component skills underlying those phenomena.

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