

## Aging of attention: Does the ability to divide decline?

TIMOTHY A. SALTHOUSE, NATHANAEL M. FRISTOE,  
TARA T. LINEWEAVER, and VICKY E. COON  
*Georgia Institute of Technology, Atlanta, Georgia*

Previous research has yielded conflicting results regarding the relationship between adult age and the ability to divide attention between two concurrent tasks. At least some of the inconsistency is probably attributable to methodological variations, such as the manner in which divided-attention ability has been assessed, how single-task performance has been considered, and the degree of control over relative emphasis placed on each task. Two experiments employing procedures sensitive to these concerns were conducted in which a speeded decision task was performed during the retention interval of a letter-memory task. The results of both experiments indicated that there were relatively few age-related influences on dual-task performance vis-à-vis those on single-task performance.

The basic question motivating the present research was whether there were age-related differences in the ability to perform two concurrent tasks above and beyond the ability to perform the tasks in isolation. One reason why this question is of interest stems from Baddeley's (e.g., 1986, 1992; Baddeley, Logie, Bressi, Della Sala, & Spinnler, 1986) hypothesis that the ability to coordinate two concurrent tasks is a function of a central executive in a working memory system, and that the efficiency or effectiveness of the central executive might decline with increased age. The plausibility of this proposal would obviously decrease if few or no age differences were found in dual-task performance after taking single-task performance into account. Accordingly, a major purpose of the present study was to attempt to assess the effectiveness of the hypothesized executive independently of performance in the constituent tasks.

Another reason why the influence of age on the relationship between single- and dual-task performance is of interest is that it is related to a larger issue concerning the extent to which age differences in complex cognitive activities are predictable from age differences found in the performance of elementary cognitive tasks. That is, an important consideration in research on aging and cognition is the level at which age-related influences are manifested. One possibility is that there are direct and independent age-related effects on both simple and complex cognitive activities, suggesting that higher order cognitive processes are more affected by age-related influences than are lower order, or elementary, processes. An alternative possibility is that all of the age-related influ-

ences on the performance of complex cognitive tasks are mediated by effects exerted on elementary processes. These two alternatives are difficult to distinguish, because it is not always clear what elementary processes are involved in a particular complex cognitive activity. However, the problem of the identifiability of constituents may be more tractable when the complex activity involves the combination of two simpler tasks, as is the case in dual-task performance.

Although one might hope that examination of the research literature could resolve these issues, the existing literature on adult age differences in dual-task performance is confusing, in large part because of differences in a number of methodological characteristics (see Somberg & Salthouse, 1982). First, there has been considerable variation in the types of tasks used in dual-task comparisons. For example, the tasks have ranged from two perceptual discrimination ones (Somberg & Salthouse, 1982), to sentence verification and memory span (e.g., Morris, Craik, & Gick, 1990), to sentence recall and picture recognition (e.g., Tun, Wingfield, Stine, & Meccas, 1992). Second, there have been inconsistencies in terms of whether performance in each task was assessed only in combination with the other task or both alone and in combination. Third, several different analytical methods have been used to evaluate dual-task performance. And fourth, the studies have varied with respect to how the possibility of dual-task tradeoffs has been examined.

The particular combination of tasks used in dual-task studies is potentially important, because it is quite possible that different "pools" of attentional resources are required for different types of tasks (see, e.g., Wickens, 1984). In fact, in two studies involving similar procedures but different combinations of tasks, different patterns of results were obtained with regard to age differences in divided-attention ability. That is, older adults

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