Psychology and Aging
1996, Vol. 11, No. 1, 74-78

0882-7974/96/$3.00

Age-Related Impairment in an Event-Based Prospective-Memory Task

Elizabeth A. Maylor
Medical Research Council Applied Psychology Unit

Slides of famous people were presented to participants with the instructions to name each face and circle the trial number if the person was wearing glasses (prospective-memory target event). Participants in their 50s and 60s ($n = 56$) were more successful than participants in their 70s and 80s ($n = 59$) at both the naming and prospective-memory tasks. An age-related increase in the probability of forgetting replicated an earlier prospective-memory study (E. A. Maylor, 1993); in the present case, there was also an age-related decrease in the probability of recovery. These effects of age remained significant after other measures of current ability were taken into account, including intelligence, speed, and naming performance. For participants who were in both the earlier study (E. A. Maylor, 1993) and this study ($n = 65$), the correlation between prospective-memory performance on the 2 occasions was significant but only for younger participants. Performance in the prospective-memory task was entirely unrelated to performance in the naming task.

In 1990, Einstein and McDaniel introduced a novel paradigm for investigating prospective memory in the laboratory. Participants were presented with lists of words that they had to recall. They were also instructed to press a response key whenever a specified word (prospective-memory target event) appeared in a list. Even though performance was below ceiling level, there was no difference between younger and older participants on the prospective-memory task. This led Einstein and McDaniel to conclude that "prospective memory seems to be an exciting exception to typically found age-related decrements in memory" (p. 724). They suggested that age-related impairments are not apparent in "event-based" prospective-memory tasks because the target event itself provides a strong external cue to support performance. However, this may not be a sufficient explanation because there are now other studies in the literature that have demonstrated clear age-related decrements in event-based prospective-memory performance (e.g., Mäntylä, 1993; Maylor, 1993).

A potentially significant difference between the studies is that Einstein and McDaniel (1990) reduced the cognitive demands of the nonprospective task for the older participants. In other words, the difficulty of the short-term memory task was equated across age groups by manipulating the number of items in each word list (see also Einstein, Holland, McDaniel, & Guynn, 1992). Thus a possible interpretation of the existing data is that older adults can perform as well as younger adults in event-based prospective-memory tasks in the laboratory if they have equivalent processing resources available to them. When the background task requirements are not adjusted across age groups, then younger adults outperform older adults (see Maylor, 1996, for further discussion).

The existence of conflicting results in the literature also raises a number of more fundamental issues about the assessment of prospective memory in the laboratory, including reliability and sensitivity. For example, it could be argued that a performance measure based on either a single observation (e.g., Cockburn & Smith, 1991) or very few observations (e.g., Einstein & McDaniel, 1990) will almost certainly be unreliable. Also, there is the question of whether prospective-memory performance is adequately reflected by the total number of successes; responding only to the first of three targets may not necessarily be equivalent to responding only to the third. Evidence that interesting effects may indeed be obscured by averaging across trials comes from a recent study (Maylor, 1993). Participants were asked to name 30 famous people four times over the course of an hour and to respond to two targets (a beard and a pipe) by marking the trial number on the response sheet (with a circle and a cross, respectively). Performance was analyzed in terms of forgetting (success followed by failure) and recovery (failure followed by success). Middle-aged participants were significantly less likely to forget than were older participants (rates of .03 and .18, respectively; $t(77) = -3.13, p < .005$), but they were not significantly more likely to recover (rates of .66 and .51, respectively; $t(48) = 1.38, p > .1$).[1] Unfortunately, the analysis of recovery was weakened by the disproportionate loss of younger participants (i.e., those who performed at ceiling level).

This study was designed as a follow-up to the earlier study

Elizabeth A. Maylor, Medical Research Council Applied Psychology Unit, Cambridge, England.

I am grateful to Patrick Rabbitt for the use of the participant panel at North East Age Research (Newcastle-Upon-Tyne) and to Catherine Brennard, Joyce Hunter, Lynn McInnes, and Louise Turner for their assistance in the recruiting and testing of participants. Judi Ellis provided helpful comments on an earlier version of the article.

Correspondence concerning this article should be addressed to Elizabeth A. Maylor, who is now at the Department of Psychology, University of Warwick, Coventry CV4 7AL England. Electronic mail may be sent to Elizabeth.Maylor@warwick.ac.uk.

[1] Forgetting rate for each participant was calculated as the number of instances of forgetting divided by the number of opportunities for forgetting. Similarly, recovery rate was the number of instances of recovery divided by the number of opportunities for recovery. These rates were not explicitly reported in the original study (Maylor, 1993). They are provided here for comparability with the data to be presented later.

(Maylor, 1993), with the most important procedural change being that instead of repeating the same 30 stimuli four times, 120 different stimuli were each presented only once. This was expected to reduce overall performance and allow a more satisfactory test of the effect of age on recovery than was possible before. In addition, this study addressed two important issues so far neglected in the prospective-memory literature. As mentioned earlier, one is that of reliability. This was examined here in terms of consistency in performance: (a) across different sessions and (b) across different prospective memory items within the same session. The former was made possible by the inclusion of participants in the present study who also had participated in the related earlier study (Maylor, 1993). Another neglected area is that of the relationship between performance on the prospective memory task and performance on the background task in which it is embedded. Einstein and McDaniel (1990) found no evidence of a relationship across participants. However, another possibility is that there is a relationship at the item level, so that, in the context of the present study, a prospective-memory success may be more likely if the item is relatively easy to name. If this is the case, it could provide an explanation for observed age differences in prospective memory because there are clear age-related impairments in naming (e.g., Maylor, 1990).

Table 1
Mean Scores for the Two Age Groups

Measure	50s–60s (n = 56) *M*	*SD*	70s–80s (n = 59) *M*	*SD*
Background measures				
Age	59.4	2.4	76.1	3.6
Vocabulary[a]	53.9	8.4	53.9	8.1
Fluid intelligence[b]	29.9	4.6	23.3	6.3
Speed[c]	249.1	45.1	204.1	46.1
Prospective-memory hits				
Block 1	1.14	0.88	0.52	0.77
Block 2	1.29	0.82	0.49	0.73
Block 3	1.34	0.79	0.54	0.70
Block 4	1.20	0.86	0.56	0.77
Prospective-memory probabilities				
Forgetting[d]	0.27	0.30	0.54	0.37
Recovery[e]	0.57	0.40	0.25	0.33

[a] Wechsler Adult Intelligence Scale—Revised (Wechsler, 1981) Vocabulary subtest, adapted slightly for use with British participants. Maximum score = 74. [b] Culture Fair Intelligence Test, Scale 2, Form B (Cattell & Cattell, 1960). Maximum score = 46. [c] Total number of correct substitutions (4 runs, each of 2 min) on a letter–letter coding task (Savage, 1984). [d] 50–60s, n = 49; 70–80s, n = 32. [e] 50–60s, n = 42; 70–80s, n = 56.

Method

Participants

Participants were selected from a panel of volunteers who were taking part in a longitudinal study of cognitive aging at the University of Newcastle-upon-Tyne. It was possible to contact and recruit 66 of the 86 participants from the prospective-memory experiment conducted 22 months earlier (Maylor, 1993); these will be referred to as *second timers*. An additional 51 participants were recruited who had not previously participated in a prospective-memory experiment, herein after called *first timers*. They were selected to match the second timers in terms of age and vocabulary. Participants were each paid £4 (approximately $6) for taking part in the study.

There were two age groups: 50s–60s (age range = 53.5–63.5) and 70s–80s (age range = 71.0–84.8). Background data available from previous testing sessions are shown in the upper panel of Table 1 (not including 2 participants who did not perform the present tasks as instructed). The two age groups did not differ in terms of vocabulary, $t(113) = -0.02$, but the younger group exceeded the older group in terms of fluid intelligence, $t(113) = 6.39$, and speed, $t(113) = 5.28$. (There were no differences between the first and second timers in each age group.)

Apparatus and Stimuli

The stimuli were 120 black-and-white slides of famous faces. Thirty of these had been used as the stimuli in the previous study (Maylor, 1993). The slides were divided into four sets of 30, with each set including depictions of 2 people wearing glasses. Slides were projected from a Kodak carousel projector onto a large screen so that each face measured approximately 1.25 m wide and 1.92 m high. There were eight separate response sheets for the present task, two for each block of trials. The two sheets for each block corresponded to Trials 1–15 and Trials 16–30.

Design and Procedure

The experiment was conducted largely as before (see Maylor, 1993, for details). Briefly, participants were tested in small groups. The session began with the instructions for two tasks, a "faces" task and a "letter" task, and these were read out twice by the experimenter. In the faces task, participants were told that they would see slides of famous faces, one at a time. Their task was to write down the person's name and then fold the response sheet so as to cover up their previous responses. The time between the appearance of each slide and the instruction to "stop writing, and fold over" was 10 s (but note that participants were allowed to finish what they were writing if they had started within the 10 s). The prospective-memory instructions were worded as follows: "If you see a person wearing glasses, then I want you to put a circle around the number of that slide." In the letter task, participants were asked to write down as many words beginning with the letter *s* as they could in 4 min. The faces task was conducted four times over the course of the experimental session, alternating with the letter task, which was conducted three times. There was a silent break of 1 min between tasks.

The 120 stimuli in the faces task (4 blocks of 30) were presented in the same order to each group of participants, with the exception of the eight critical prospective memory stimuli. There were eight presentation orders for the stimuli wearing glasses, such that the first stimulus to appear with glasses was different for each group of participants. These target slides for the prospective-memory task were always Numbers 18 and 29 in Block 1, 9 and 22 in Block 2, 6 and 23 in Block 3, and 10 and 26 in Block 4. The target slides from the earlier prospective-memory task (the pipe and the beard) were presented as Numbers 28 and 30 in Block 4, that is, after all the stimuli with glasses had appeared.

Results

Naming Performance

As expected from previous studies (e.g., Maylor, 1990), naming responses in terms of surnames were either correct or left blank, with very few errors (5% in both age groups). For the eight prospective memory items, the numbers of correct responses were analyzed with age group (50s–60s vs. 70s–80s) and experience (first vs. second timers) as the between-subjects factors, and block number (1–4) as the within-subjects factor. There was a highly significant effect of age group, $F(1, 111) = 28.10$, $MSE = 1.01$, $p < .0001$. Of the two prospective memory items in each block, the 50s–60s group named an average of 1.30 ($SD = 0.73$), whereas the 70s–80s group named an average of 0.80 ($SD = 0.78$). There were no significant main effects of experience, $F(1, 111) = 1.33$, $MSE = 1.01$, $p > .05$, or block, $F < 1$, and no interactions (all $ps > .05$). Comparing the 8 critical items with the 112 noncritical items, the former were easier to name than the latter: 52% and 42% correct, respectively; $F(1, 113) = 38.77$, $MSE = 157.03$, $p < .0001$. Younger participants were much more successful than were older participants—59% and 35% correct, respectively, $F(1, 113) = 41.14$, $MSE = 759.41$, $p < .0001$—but there was no interaction, $F < 1$.

Prospective-Memory Performance

The numbers of critical items that were circled as instructed (i.e., prospective-memory hits) were analyzed with age group, experience, and block number (1–4) as factors. Again, the only significant effect was that of age group, $F(1, 111) = 33.42$, $MSE = 1.68$, $p < .0001$. There were no significant main effects of experience and block (both $Fs < 1$) and no interactions (all $ps > .1$).[2] The means for the two age groups across the four blocks are shown in the middle panel of Table 1 (cf. Figure 1 of Maylor, 1993).

The changes in methodology from the earlier study achieved the aim of reducing the overall level of performance. Analyzing the total numbers of prospective memory hits out of eight (second timers only), performance differed across age group, $F(1, 63) = 27.31$, $MSE = 5.58$, $p < .0001$, and across the two studies, $F(1, 63) = 79.30$, $MSE = 3.50$, $p < .0001$. There was also an interaction, $F(1, 63) = 5.34$, $MSE = 3.50$, $p < .05$, such that the decline in prospective-memory performance from the earlier study to the present study was less for the 50s–60s group (from 7.0 to 4.8 hits out of 8) than for the 70s–80s group (from 5.6 to 1.9).

Prospective-memory hits in the present study correlated with age, $r(113) = -.539$, and also with fluid intelligence (.34), speed (.28), and fluency as measured by the number of *s* words generated in the first run (.21); all $ps < .05$. A multiple-regression analysis was performed on prospective-memory hits in which the predictor variables were as follows: three background measures (vocabulary, fluid intelligence, and speed), two current measures (fluency and the number of critical items correctly named), and age. Together, they accounted for 28.9% of the variance in prospective memory, $F(6, 106) = 7.17$, $MSE = 6.44$, $p < .0001$. The only variable to make a significant independent contribution was age, which accounted for an additional 17.2% of the variance after all the other variables were included in the regression equation, $t = -5.05$, $p < .0001$.[3]

Forgetting and Recovery

If a participant succeeded in responding to a critical prospective-memory item but then failed to respond to the next, this was counted as an instance of forgetting. The probability of forgetting was then calculated by dividing the number of instances of forgetting by the number of opportunities for forgetting. For example, for the sequence SSFFFSSF (where S = success; F = failure), the probability of forgetting is 2 out of 4. Similarly, if a participant failed to respond to a critical prospective-memory item but then succeeded in responding to the next, this was counted as an instance of recovery. The probability of recovery was then calculated by dividing the number of instances of recovery by the number of opportunities for recovery. For the example just given, the probability of recovery is 1 out of 3. Obviously, participants with zero opportunities for forgetting (i.e., FFFFFFFF or FFFFFFFS) or zero opportunities for recovery (i.e., SSSSSSSS or SSSSSSSF) could not be included in the analyses of forgetting and recovery, respectively.

The means are presented in the lower panel of Table 1. The members of the 50s–60s group were less likely to forget than were those in the 70s–80s group, $t(79) = -3.59$, $p < .001$. Also, those in the 50s–60s group were more likely to recover than the members of the 70s–80s group, $t(96) = 4.35$, $p < .0001$. Note that these age differences emerged despite the exclusion of participants at floor level in the analysis of forgetting (mainly older participants) and participants at ceiling level in the analysis of recovery (mainly younger participants). In separate multiple-regression analyses on forgetting and recovery, with the same predictor variables as before, age was the only significant independent predictor in both cases. For the probability of forgetting, age accounted for an additional 16.1% of the variance with the other variables already included in the regression equation, $t = 3.90$, $p < .0005$. For the probability of recovery, age accounted for an additional 9.8% of the variance, $t = -3.31$, $p < .002$.

Reliability

There are two aspects of reliability of interest here: (a) test-retest reliability and (b) internal-consistency or split-half reliability. The primary concern is with prospective memory, but some equivalent analyses for naming and fluency are also presented for comparison purposes (see Table 2). First, the numbers of prospective-memory hits out of eight in the earlier study (Maylor, 1993) were correlated with the numbers of prospective-memory hits out of eight in the present study (second timers only, of course). This is labeled *test-retest reliability* in Table 2, although this is not strictly correct because different items were used on the two occasions (beard and pipe vs. glasses). It can be seen that there was a significant association between performance on the two occasions over the whole sample. Looking separately at each age group, the correlation was significant for the 50s–60s group but not for the 70s–80s group.

---

[2] Fifteen participants, all in the 70s–80s age group, failed to mention the prospective memory component when asked at the end of the experiment to "write down everything you had to remember to do in the faces task," although 13 of these were subsequently able to select the correct feature (i.e., glasses) from a set of five plausible alternatives. The present analyses were repeated but without the 15 participants who did not spontaneously recall the prospective memory requirements. In all cases, the results were not significantly affected by their removal.

[3] The result was the same when the number of noncritical items correctly named was also present in the regression equation.

Table 2
Test–Retest Reliability and Reliability Coefficients Based on Split-Half for Two Age Groups Separately and Combined

Reliability	50s–60s	70s–80s	Both groups
Test–retest[a]			
n	31	34	65
Prospective memory	.46	.09[c]	.37
Naming	.53	.54	.60
Fluency	.59	.52	.62
Split-half[b]			
n	56	59	115
Prospective memory	.86	.85	.89
Naming	.62	.79	.77

[a] Data are for second timers only. [b] Data include results for first and second timers. [c] Not significant. All other correlations significant at $p < .01$.

To examine test–retest reliability for naming performance, the numbers of correct naming responses for the eight critical items in the present study were correlated with the numbers of correct naming responses for a different set of eight items selected at random from the first block of trials in the earlier study. As can be seen from Table 2, the correlations for naming were all slightly greater than for prospective memory, with the separate correlations for the two age groups being very similar. The same pattern emerged for fluency, in which the numbers of words beginning with the letter *s* generated in the first run of the present study were correlated with the numbers of "towns and cities anywhere in the world" generated in the first run of the earlier study.

Three separate multiple regression analyses were performed on prospective memory, naming, and fluency performance in the present study, with age, performance in the earlier study, and Age × Performance in the earlier study as predictor variables (after centering to reduce multicollinearity). Only in the case of prospective memory did the interaction make a significant independent contribution to the regression equation, accounting for 4.1% of the variance, $t = -2.04$, $p < .05$. Recall that prospective memory performance in the present study was worse than in the earlier study, particularly for the older participants. It seems that in the present (apparently more difficult) task, large numbers of older participants were at floor level, including some of those who had performed well on the earlier occasion.

Split-half reliability for the present study was assessed using both first and second timers. For prospective memory, performance on half of the trials was correlated with performance on the other half and then adjusted using the Spearman-Brown formula to obtain reliability for the whole test. Numbers 1, 4, 6, and 7 were compared with Numbers 2, 3, 5, and 8, thereby matching the two sets of four in several ways (e.g., first vs. second target item in a block). These reliability coefficients were high for both age groups (see Table 2). A slightly different procedure was applied to the naming data because (unlike prospective memory) naming difficulty varied hugely across items. In this case, performance for half of the items (randomly selected, but the same for all participants) was correlated with performance for the other half and then adjusted (Spearman-Brown). Again, reliability was high, and certainly it was no lower for the 70s–80s group than for the 50s–60s group (Table 2).

Relationship Between Naming and Prospective Memory

This relationship was addressed in two ways. First, with respect to participants, there was no correlation between the number of correct naming responses out of eight and the number of prospective-memory hits out of eight, $r(54) = -.08$ for 50s–60s; $r(57) = -.04$ for 70s–80s. Thus, participants who had named many stimuli were no more likely to circle the glasses than were participants who had named few stimuli. Second, with respect to items, this was examined in terms of the conditional probabilities of naming and circling. For the 50s–60s group, the probability of circling an item, given that it was correctly named, was .62 (180/291); the probability of circling an item when it was not correctly named was also .62 (98/157). The corresponding probabilities for the 70s–80s group were .24 (45 circled out of 190 correctly named) and .28 (80 circled out of 282 not correctly named), which did not differ, $\chi^2(1, N = 472) = 1.28$, $p > .1$. In other words, participants in both age groups were equally likely to circle an easy-to-name stimulus with glasses as a difficult-to-name stimulus.

Discussion

First, this study achieved its aim of reducing overall prospective-memory performance in comparison with the earlier study (Maylor, 1993). Although not presented here, there was evidence that two changes in procedure were responsible for this (i.e., from repeated to nonrepeated presentation of stimuli, and from circling the beard and crossing out the pipe to circling the glasses). However, the important point is that sensitive age comparisons of both forgetting and recovery rates were possible in the present study without losing too many participants at floor or ceiling levels, respectively. The 50s–60s group members were not only less likely to forget (succeed then fail) than the 70s–80s group, they were also more likely to recover (fail then succeed). As before (Maylor, 1993), the results with regard to forgetting provide a striking contrast with the retrospective-memory literature in which the rate of forgetting is only minimally affected by old age over comparable delays (e.g., Giambra & Arenberg, 1993). Another notable feature of the present results, whether in terms of total hits or in terms of forgetting and recovery, is that the influence of age remained significant after several measures of cognitive ability were taken into account, including intelligence and speed. Again, this contrasts with the literature on aging and retrospective memory (see Maylor, 1995, for a summary). At least in these two respects, it appears that event-based prospective memory may be exceptionally impaired in older people, rather than preserved, as suggested by Einstein and McDaniel (1990).

The second issue concerned the reliability of prospective-memory measures. On the basis of split-half correlations, test reliability was high for both age groups in the present study. On the other hand, test–retest reliability was not significant for the 70s–80s group. This was specific to the prospective-memory task and was probably due to the use of a more difficult version of the task on the second occasion, resulting in a large proportion of older participants dropping to floor level. However, test–retest reliability was at least significant for the 50s–60s group, despite the interval of 22 months between testing occasions. Clearly, further data on reliability are needed, but the present results suggest that laboratory measures of prospective memory are not necessarily as unreliable as some have feared (e.g., Morris, 1991).

Finally, there was no evidence in the present study of a relationship between performance on the prospective-memory task and performance on the background naming task in which it was embedded, either across participants or across items. Of course, this does not rule out the possibility that other situations may exist for which a trade-off between the prospective and nonprospective components might occur. The important result here is that the age-related deficit in naming was unable to account for the age-related deficit in prospective memory. Thus, the contribution from age in the multiple regressions on prospective-memory performance remained highly significant even with the naming of both critical and noncritical items included in the equation. This raises problems for the explanation offered earlier for the results of Einstein and McDaniel (1990), that is, that they failed to find any influence of age on prospective memory because they manipulated the difficulty of the background task to equate younger and older participants. In the present study, the younger participants outperformed the older participants in terms of prospective memory even when statistically matched for success in the background naming task. Some other factor or factors must therefore be responsible for the absence of an age-related impairment in the studies by Einstein and his colleagues (Einstein & McDaniel, 1990; Einstein et al., 1992).

There is perhaps one crucial difference between the studies conducted thus far that may hold the key to a future understanding of age differences in prospective memory: Procedures vary in terms of the relationship between stimulus processing required to perform the background task and stimulus processing required to perform the prospective-memory task. In Einstein's studies (Einstein & McDaniel, 1990; Einstein et al., 1992), the background task was to memorize lists of words, whereas the prospective-memory task was to respond to a previously specified word or words. Thus the two tasks would seem to require a similar type or level of stimulus processing. In contrast, the present paradigm involves a shift in the level of stimulus analysis from the background task (semantic) to the prospective-memory task (structural). Similarly, in Mäntylä's (1993) study, the background task was word association, and the prospective-memory target was any member of a particular category (e.g., liquids). Again, this requires a shift in the level of processing from the generation of a semantically related word (ink–pen) to the categorization of that word as a member of a specific group (ink–liquid). A tentative suggestion would be that an age-related impairment occurs whenever the prospective-memory task and the background task in which it is embedded demand that stimuli are processed in qualitatively different ways. In other words, older adults may be particularly impaired at shifting constantly (which must be self-initiated) from one level or type of stimulus analysis to another. Einstein and McDaniel (1990) may have failed to observe age differences, not because their prospective-memory task was event-based but because there was considerable overlap between the stimulus processing necessary (although not sufficient) to perform each task. Further research is necessary to test this "task-appropriate processing" explanation. However, the present conclusion is that substantial age-related impairment can be demonstrated in a simple event-based prospective-memory task.

References

Cattell, R. B., & Cattell, A. K. S. (1960). *Handbook for the individual or group culture fair intelligence test.* Champaign, IL: Institute for Personality and Ability Testing.

Cockburn, J., & Smith, P. T. (1991). The relative influence of intelligence and age on everyday memory. *Journal of Gerontology: Psychological Sciences, 46,* P31–P36.

Einstein, G. O., Holland, L. J., McDaniel, M. A., & Guynn, M. J. (1992). Age-related deficits in prospective memory: The influence of task complexity. *Psychology and Aging, 7,* 471–478.

Einstein, G. O., & McDaniel, M. A. (1990). Normal aging and prospective memory. *Journal of Experimental Psychology: Learning, Memory and Cognition, 16,* 717–726.

Giambra, L. M., & Arenberg, D. (1993). Adult age differences in forgetting sentences. *Psychology and Aging, 8,* 451–462.

Mäntylä, T. (1993). Priming effects in prospective memory. *Memory, 1,* 203–218.

Maylor, E. A. (1990). Recognizing and naming faces: Aging, memory retrieval, and the tip of the tongue state. *Journal of Gerontology: Psychological Sciences, 45,* P215–P226.

Maylor, E. A. (1993). Aging and forgetting in prospective and retrospective memory tasks. *Psychology and Aging, 8,* 420–428.

Maylor, E. A. (1995). Prospective memory in normal aging and dementia. *Neurocase, 1,* 285–289.

Maylor, E. A. (1996). Does prospective memory decline with age? In M. A. Brandimonte, G. O. Einstein, & M. A. McDaniel (Eds.), *Prospective memory: Theory and applications* (pp. 173–197). Mahwah, NJ: Erlbaum.

Morris, P. E. (1991, July). *Individual differences in memory ability.* Paper presented at the International Conference on Memory, Lancaster, England.

Savage, R. D. (1984). *Alphabet Coding Task-15.* Unpublished manuscript, Murdoch University, Perth, Western Australia.

Wechsler, D. (1981). *Manual for the Wechsler Adult Intelligence Scale—Revised.* New York: Psychological Corporation.

Received March 1, 1995
Revision received May 29, 1995
Accepted May 29, 1995 ■