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The Course of Verbal Memory: A Lifespan Approach

Lisa C. McGuire, K. Warner Schaie, and Sherry L. Willis

The Pennsylvania State University
Human Development and Family Studies
110 Henderson Building South
University Park, PA 18602

Running Head: VERBAL MEMORY

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The developmental trajectory of verbal memory across the adult lifespan was examined. The sample consisted of 1094 individuals ($n = 491$ males and $n = 603$ females) between the ages of 22 and 95 from the Seattle Longitudinal Study (1984 and 1991 assessments). A list of 20 concrete nouns was studied by participants and immediate and delayed free-recall were assessed. Age-related change and age-cohort differences were examined over a 7-year interval (1984 - 1991). Recall protocols were checked for accuracy. Significant main effects for age-cohort, gender, and trials (immediate and delayed recall in 1984 and in 1991) were found to be significant. There was a significant trials and age-cohort interaction.

The Course of Verbal Memory: A Lifespan Approach

Little is known about the development of verbal memory across the adult lifespan. The majority of the research exploring verbal memory examined select age groups of individuals. For example, verbal memory has been investigated in research examining solely older adults' performance (e.g., Colsher & Wallace, 1991; Hultsch, Hertzog, Small, McDonald-Miszczak, & Dixon, 1992), comparing younger and older adults' performance (e.g., Baltes & Kliegl, 1992), or exploring young, young-old, and old-old groups' performance (e.g., Hultsch, Hertzog, & Dixon, 1990). The developmental trajectory of verbal memory across larger age periods has received limited attention.

The purpose of the present investigation was two-fold. First, the developmental trajectory of verbal memory across the adult lifespan was examined for 9 age-cohorts (range = 22 - 95 years). Second, education and verbal ability were statistically controlled to explore whether the expected age-related decrements in verbal memory would be minimized or eliminated when these variables were held constant.

Several hypothesis were made. It was speculated that females would perform at a higher level on verbal memory tasks than males. Younger age-cohorts were hypothesized to perform at higher levels on the tasks than those in the older age-cohorts. It was speculated that recall performance would be greater on the immediate recall tasks than the delayed recall tasks. Older age-cohorts were hypothesized to have higher levels of recall performance on the immediate recall tasks than the delayed recall tasks, while this difference in trials was thought to be minimized for the younger age-cohorts.

Method

Participants

Participants in the present investigation were obtained from the Seattle Longitudinal Study (SLS), which is a large scale longitudinal-sequential study examining adult cognitive development in more than 5,000 participants between the ages of 22 and 95 (Schaie, 1983, 1993) since 1956. Participants were selected randomly from within gender and age-cohort groups from the membership of a large Health Maintenance Organization in the Seattle area. The sampling frame was a community dwelling population

representing a wide range of occupational, educational, and economic backgrounds. The present sample consisted of 1094 individuals ($n = 491$ males and $n = 603$ females) on whom cognitive data was available in 1984 and in 1991. The sample represented a wide range of occupational backgrounds, educational levels ($M = 14.61$, $SD = 3.01$, range = 1 - 20), and income ($M = \$ 27,700$, $SD = \$ 8,160$, range = \$ 2,000 - \$ 34,000).

Materials and Procedure

List-learning task. Participants were administered the same list-learning task both in 1984 and in 1991. Participants studied a list of 20 concrete nouns for 3.5 minutes. Free-recall was conducted immediately following stimulus presentation and after a 1 hour delay. Recall protocols were checked for accuracy. The number of words recalled correctly at immediate and delayed recall in 1984 and 1991 were the dependent variables.

Verbal meaning. The Primary Mental Abilities (PMA) Verbal Meaning test (PMA-V; Thurstone & Thurstone, 1949) was administered to all participants in 1984 and in 1991. This test assesses the ability to understand ideas and to express words. The PMA-V measure consists of 50 multiple-choice formatted items in increasing order of difficulty with a time limit of 4 minutes.

Insert Table 1 about here

Results and Discussion

Participants' age, number of words recalled on immediate and delayed recall tasks, and change scores are shown in Table 1 by age-cohort. Figure 1 illustrates participants' recall performance, while Figures 2 - 4 demonstrate participants' recall performance as a function of the covariates (i.e., education, vocabulary, and education and vocabulary combined).

Insert Figures 1 - 4 about here

To investigate the role of gender, age-cohort, and trials on participants' recall, a repeated measures 2 (gender) x 9 (age-cohort) x 4 (trials) Analysis of Variance (ANOVA) was calculated. Repeated measures 2 (gender) x 9 (age-cohort) x 4 (trials) Analysis of Covariance (ANCOVA) were calculated separately to statistically control education, verbal ability (PMA-V score for both 1984 and 1991 were used), and the combination of education and verbal ability. Tukey's honestly significant difference test (HST) for unequal *ns* was computed for the significant main effects and interactions. The ANOVA and ANCOVA results are presented in Table 2.

Insert Table 2 about here

The same pattern of results was found for ANOVA and ANCOVA analyses. Significant main effects for age-cohort were found. No difference in level of performance was found between the two oldest age-cohorts (i.e., age-cohorts 3 - 4; $p = 0.691$) or between the younger age-cohorts (i.e., age-cohorts 8 - 11; $ps = 0.111 - 0.999$); however, significant differences in recall performance were found between the remaining age-cohorts (i.e., age-cohorts 5 - 7; $ps = 0.001 - 0.020$). The gender main effects were significant, as females recalled more words than did males ($p = 0.001$).

The trials main effects were found to be significant. Participants' recall performance on the 1984 immediate recall and 1991 immediate recall was not statistically different ($p = 0.215$), while 1984 delayed recall and 1991 delayed recall performance were significantly different ($p = 0.011$). This suggests that immediate recall performance remains relatively stable across 7 years. However, the individual characteristics and age-related declines in the information processing system of the participants might be responsible for the variability in delayed recall performance. Significant differences in participants' recall

performance was found between 1984 immediate and delayed recall ($p = 0.001$) and between 1991 immediate and delayed recall ($p = 0.000$).

Trials and age-cohort interacted significantly. Younger age-cohorts' (i.e., age-cohorts 7 - 11) recall performance on the trials was equivalent ($ps = 0.284 - 0.999$), with no difference in word recall found between immediate and delayed recall tasks. The two oldest age-cohorts' (i.e., age-cohorts 3 - 4) recall performance on immediate recall tasks were not significantly different ($ps = 0.103 - 0.999$); however, the oldest age-cohorts' performance on immediate recall tasks was equivalent to the delayed recall task performance of individuals from younger age-cohorts (i.e., age-cohorts 5 - 10). Additionally, as shown in Figures 1 - 4, the younger age-cohorts' (i.e., age-cohorts 7 - 11) recall performance in 1991 surpassed their 1984 level of recall performance on immediate and delayed recall tasks. The 1984 recall performance for the older age-cohorts (i.e., age-cohorts 3 - 6) was higher than their level of 1991 performance. The similarity between the oldest age-cohorts' immediate recall performance and younger adults' recall performance is interesting. The results suggest that the oldest adults' verbal memory experiences the greatest magnitude of age-related deficits. Implications for theory and practice will be discussed.

References

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Table 1

Mean Age, Recall Scores, and Recall Change Scores (Immediate vs. Delayed) as a Function of Age-cohort.

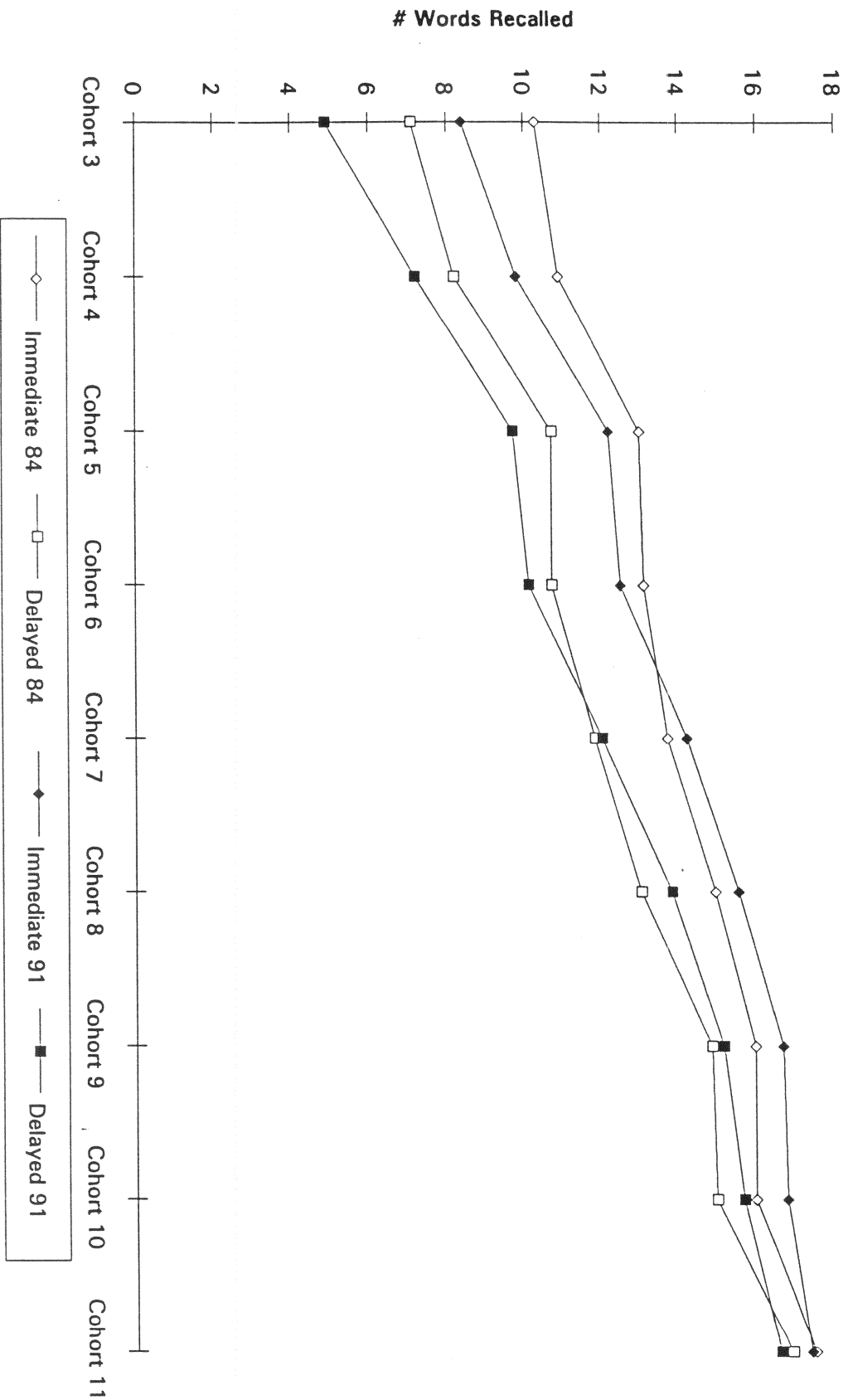
	Age-cohort 3	Age-cohort 4	Age-cohort 5	Age-cohort 6	Age-cohort 7	Age-cohort 8	Age-cohort 9	Age-cohort 10	Age-cohort 11
<i>n</i>	41	139	201	199	155	135	102	57	50
1984 Age	<i>M</i> = 80.15 <i>SD</i> = 2.41 <i>n</i> = 41	<i>M</i> = 73.50 <i>SD</i> = 1.92 <i>n</i> = 141	<i>M</i> = 66.71 <i>SD</i> = 1.93 <i>n</i> = 201	<i>M</i> = 60.33 <i>SD</i> = 1.97 <i>n</i> = 200	<i>M</i> = 53.55 <i>SD</i> = 1.97 <i>n</i> = 155	<i>M</i> = 46.02 <i>SD</i> = 2.03 <i>n</i> = 137	<i>M</i> = 39.35 <i>SD</i> = 2.01 <i>n</i> = 103	<i>M</i> = 32.39 <i>SD</i> = 2.15 <i>n</i> = 61	<i>M</i> = 25.67 <i>SD</i> = 2.13 <i>n</i> = 52
1991 Age	<i>M</i> = 87.14 <i>SD</i> = 2.41 <i>n</i> = 41	<i>M</i> = 80.50 <i>SD</i> = 1.92 <i>n</i> = 141	<i>M</i> = 73.77 <i>SD</i> = 1.93 <i>n</i> = 201	<i>M</i> = 67.33 <i>SD</i> = 1.91 <i>n</i> = 200	<i>M</i> = 60.55 <i>SD</i> = 1.97 <i>n</i> = 155	<i>M</i> = 53.02 <i>SD</i> = 2.03 <i>n</i> = 137	<i>M</i> = 46.35 <i>SD</i> = 2.01 <i>n</i> = 103	<i>M</i> = 39.39 <i>SD</i> = 2.15 <i>n</i> = 61	<i>M</i> = 32.67 <i>SD</i> = 2.13 <i>n</i> = 52
1984 Immediate Recall	<i>M</i> = 10.73 <i>SD</i> = 3.37 <i>n</i> = 40	<i>M</i> = 10.99 <i>SD</i> = 3.59 <i>n</i> = 139	<i>M</i> = 13.11 <i>SD</i> = 3.89 <i>n</i> = 198	<i>M</i> = 13.05 <i>SD</i> = 3.77 <i>n</i> = 191	<i>M</i> = 13.78 <i>SD</i> = 3.42 <i>n</i> = 148	<i>M</i> = 14.99 <i>SD</i> = 3.55 <i>n</i> = 129	<i>M</i> = 16.05 <i>SD</i> = 3.16 <i>n</i> = 92	<i>M</i> = 15.86 <i>SD</i> = 3.19 <i>n</i> = 57	<i>M</i> = 17.36 <i>SD</i> = 2.82 <i>n</i> = 22
1984 Delayed Recall	<i>M</i> = 7.28 <i>SD</i> = 3.13 <i>n</i> = 39	<i>M</i> = 8.26 <i>SD</i> = 3.63 <i>n</i> = 139	<i>M</i> = 10.87 <i>SD</i> = 4.49 <i>n</i> = 198	<i>M</i> = 10.69 <i>SD</i> = 4.29 <i>n</i> = 191	<i>M</i> = 11.95 <i>SD</i> = 4.21 <i>n</i> = 148	<i>M</i> = 13.14 <i>SD</i> = 4.39 <i>n</i> = 129	<i>M</i> = 14.93 <i>SD</i> = 3.88 <i>n</i> = 92	<i>M</i> = 14.86 <i>SD</i> = 3.96 <i>n</i> = 57	<i>M</i> = 16.59 <i>SD</i> = 3.49 <i>n</i> = 22
1991 Immediate Recall	<i>M</i> = 8.63 <i>SD</i> = 3.43 <i>n</i> = 41	<i>M</i> = 9.81 <i>SD</i> = 3.97 <i>n</i> = 139	<i>M</i> = 12.28 <i>SD</i> = 4.12 <i>n</i> = 201	<i>M</i> = 12.48 <i>SD</i> = 3.85 <i>n</i> = 199	<i>M</i> = 14.38 <i>SD</i> = 3.46 <i>n</i> = 155	<i>M</i> = 15.59 <i>SD</i> = 3.39 <i>n</i> = 135	<i>M</i> = 16.62 <i>SD</i> = 2.49 <i>n</i> = 102	<i>M</i> = 16.63 <i>SD</i> = 3.09 <i>n</i> = 61	<i>M</i> = 17.52 <i>SD</i> = 3.03 <i>n</i> = 50
1991 Delayed Recall	<i>M</i> = 5.09 <i>SD</i> = 2.95 <i>n</i> = 41	<i>M</i> = 7.36 <i>SD</i> = 4.38 <i>n</i> = 139	<i>M</i> = 9.83 <i>SD</i> = 4.45 <i>n</i> = 201	<i>M</i> = 10.05 <i>SD</i> = 4.35 <i>n</i> = 199	<i>M</i> = 12.23 <i>SD</i> = 4.15 <i>n</i> = 155	<i>M</i> = 13.88 <i>SD</i> = 4.16 <i>n</i> = 135	<i>M</i> = 15.21 <i>SD</i> = 3.83 <i>n</i> = 102	<i>M</i> = 15.48 <i>SD</i> = 3.60 <i>n</i> = 61	<i>M</i> = 16.60 <i>SD</i> = 3.56 <i>n</i> = 50
1984 Change Scores	<i>M</i> = 3.28 <i>SD</i> = 1.93 <i>n</i> = 39	<i>M</i> = 2.72 <i>SD</i> = 2.21 <i>n</i> = 139	<i>M</i> = 2.24 <i>SD</i> = 2.31 <i>n</i> = 198	<i>M</i> = 2.37 <i>SD</i> = 2.24 <i>n</i> = 191	<i>M</i> = 1.84 <i>SD</i> = 2.07 <i>n</i> = 148	<i>M</i> = 1.85 <i>SD</i> = 2.14 <i>n</i> = 129	<i>M</i> = 1.13 <i>SD</i> = 2.02 <i>n</i> = 92	<i>M</i> = 1.00 <i>SD</i> = 1.76 <i>n</i> = 57	<i>M</i> = 0.77 <i>SD</i> = 1.44 <i>n</i> = 22
1991 Change Scores	<i>M</i> = 3.54 <i>SD</i> = 1.66 <i>n</i> = 41	<i>M</i> = 2.45 <i>SD</i> = 2.10 <i>n</i> = 139	<i>M</i> = 2.44 <i>SD</i> = 2.23 <i>n</i> = 201	<i>M</i> = 2.43 <i>SD</i> = 2.17 <i>n</i> = 199	<i>M</i> = 2.15 <i>SD</i> = 2.35 <i>n</i> = 155	<i>M</i> = 1.70 <i>SD</i> = 2.29 <i>n</i> = 135	<i>M</i> = 1.41 <i>SD</i> = 2.59 <i>n</i> = 102	<i>M</i> = 1.16 <i>SD</i> = 2.08 <i>n</i> = 57	<i>M</i> = 0.92 <i>SD</i> = 1.97 <i>n</i> = 50

Table 2

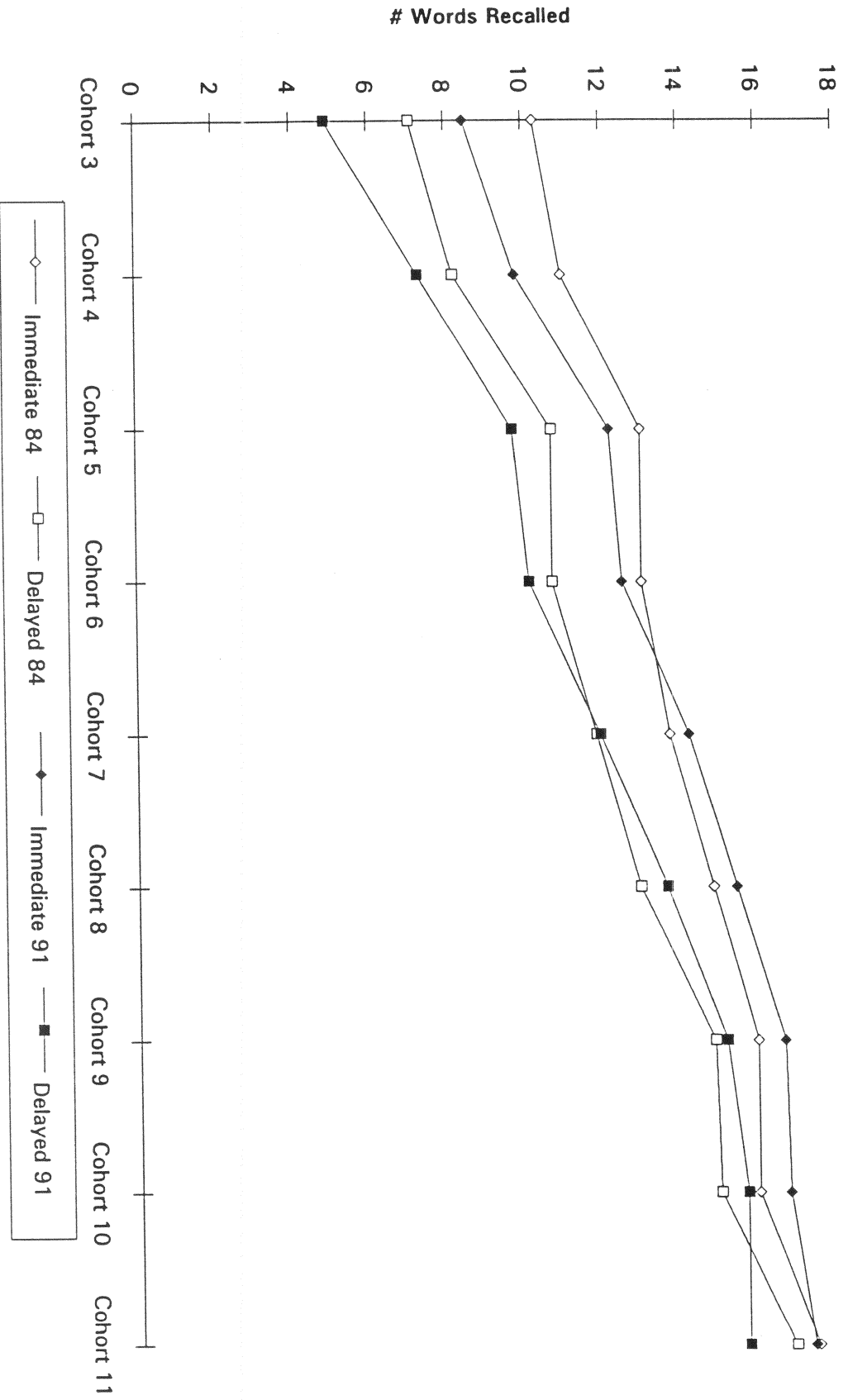
Longitudinal Results for 1984 & 1991 Recall Data with Education, Vocabulary, and Education and Vocabulary Covaried.

	No Covariates	Education Covaried	Vocabulary Covaried	Education and Vocabulary Covaried
Age-cohort	$F(8, 992) = 58.99$ $p = 0.0000$	$F(8, 975) = 49.07$ $p = 0.0000$	$F(8, 989) = 24.63$ $p = 0.0000$	$F(8, 973) = 24.42$ $p = 0.0000$
Gender	$F(1, 992) = 31.43$ $p = 0.0000$	$F(1, 975) = 41.28$ $p = 0.0000$	$F(1, 989) = 28.57$ $p = 0.0000$	$F(1, 973) = 32.56$ $p = 0.0000$
Age-cohort x Gender	$F(8, 2976) = 1.35$ $p = 0.2138$	$F(8, 975) = 1.30$ $p = 0.2374$	$F(8, 989) = 0.84$ $p = 0.5768$	$F(8, 973) = 0.83$ $p = 0.5747$
Recall	$F(1, 2976) = 175.12$ $p = 0.0000$	$F(3, 2982) = 174.83$ $p = 0.0000$	$F(3, 2973) = 175.56$ $p = 0.0000$	$F(3, 2928) = 174.84$ $p = 0.0000$
Trials x Age-cohort	$F(24, 2976) = 7.88$ $p = 0.0000$	$F(24, 2982) = 7.77$ $p = 0.0000$	$F(24, 2973) = 7.86$ $p = 0.0000$	$F(24, 2928) = 7.77$ $p = 0.0000$
Trials x Gender	$F(3, 2976) = 1.27$ $p = 0.2833$	$F(3, 2982) = 1.38$ $p = 0.2432$	$F(3, 2973) = 1.23$ $p = 0.2969$	$F(3, 2928) = 1.39$ $p = 0.2432$
Trials x Age-cohort x Gender	$F(24, 2976) = 0.86$ $p = 0.6553$	$F(24, 2982) = 0.83$ $p = 0.6996$	$F(24, 2973) = 0.86$ $p = 0.6634$	$F(24, 2928) = 0.83$ $p = 0.6917$

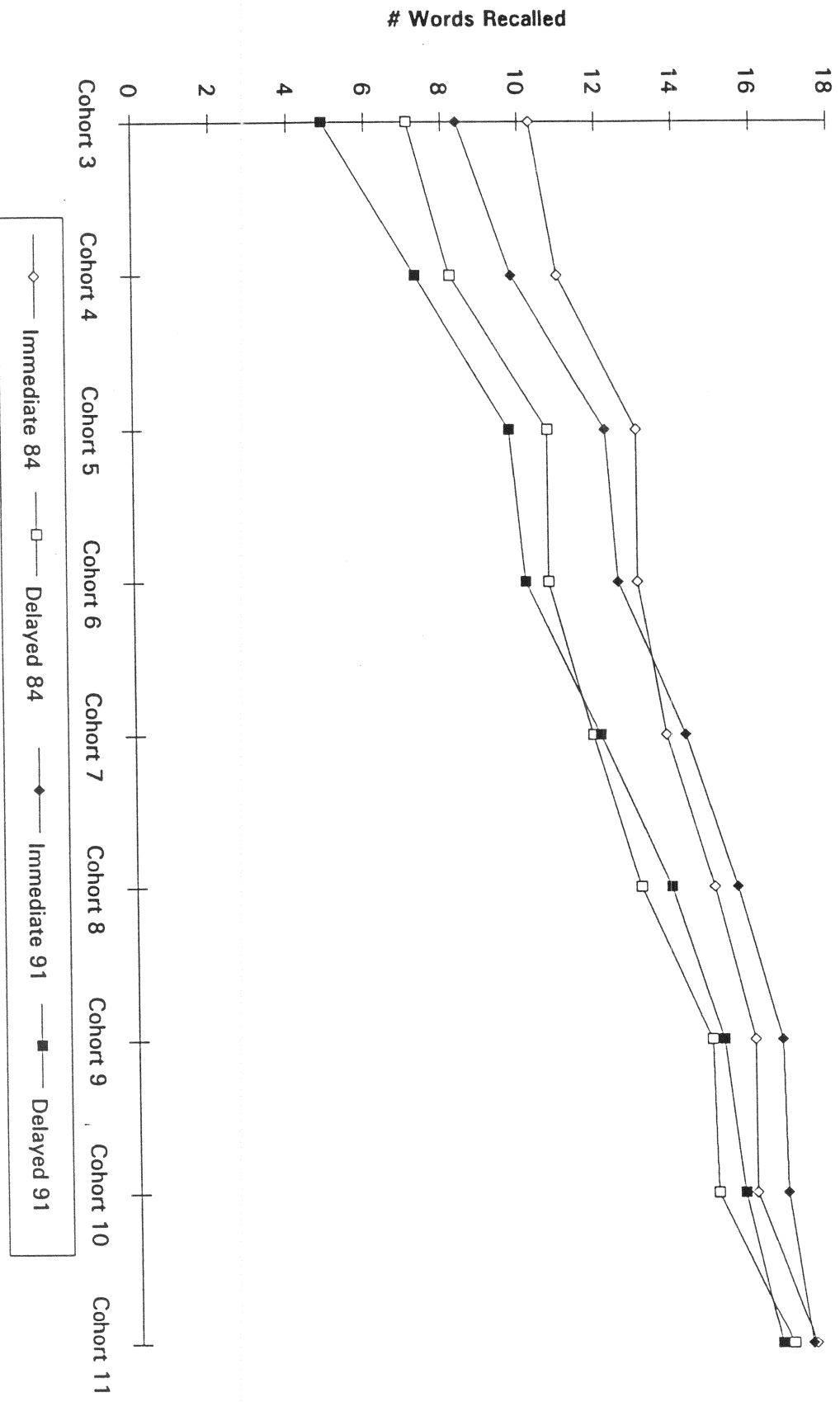
1984 & 1991



1984 & 1991 Data with Education Covered



1984 & 1991 Data with Vocabulary Covaried



1984 & 1991 Data with Education and Vocabulary Covaried

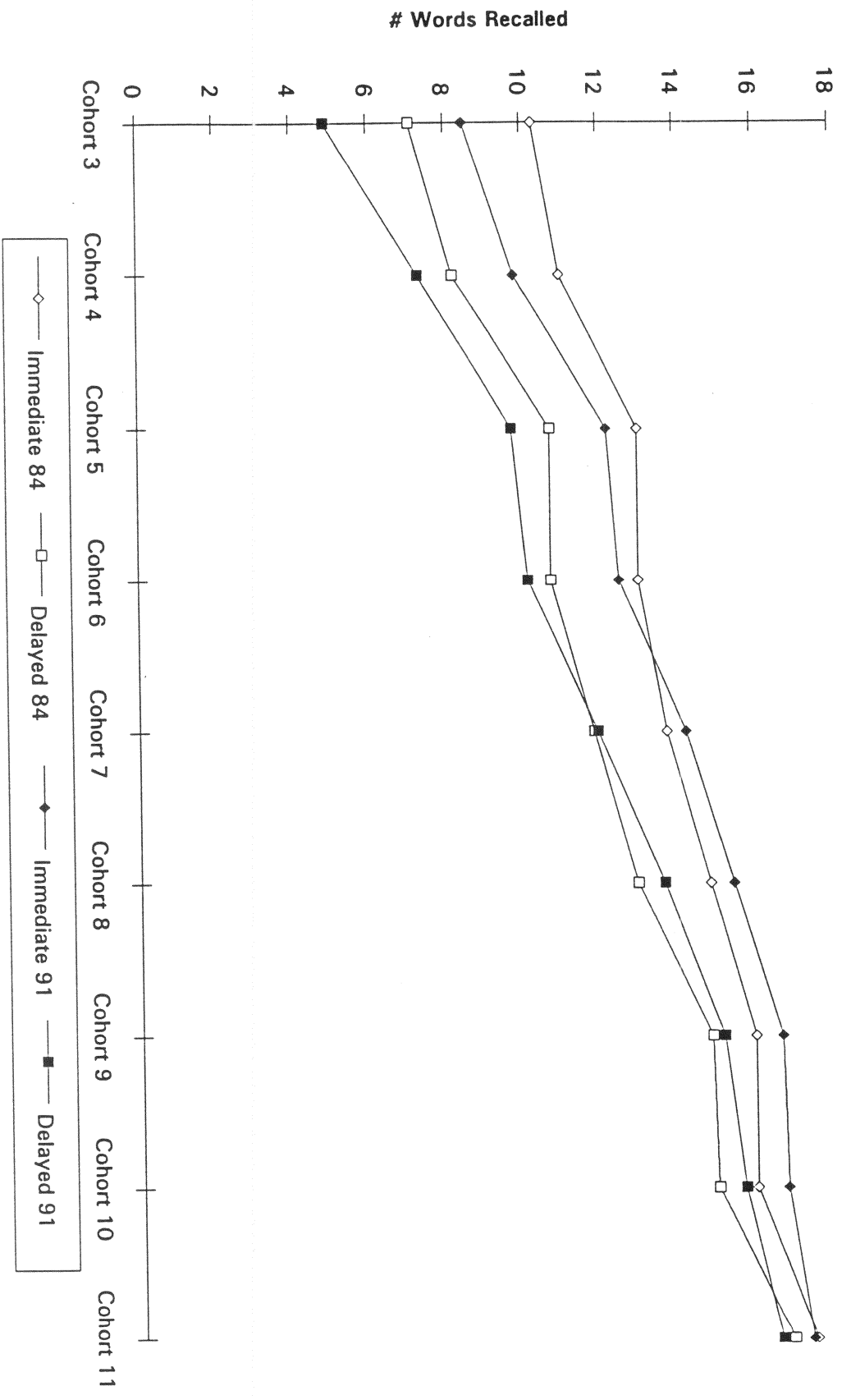


Figure Captions

Figure 1. 1984 and 1991 Immediate and Delayed Recall Performance.

Figure 2. 1984 and 1991 Immediate and Delayed Recall Performance with Education Covaried.

Figure 3. 1984 and 1991 Immediate and Delayed Recall Performance with Vocabulary Covaried.

Figure 4. 1984 and 1991 Immediate and Delayed Recall Performance with Education and Vocabulary Covaried.