Serial Position Profiles May Have Promise as a Cognitive Marker of Preclinical Alzheimer's Disease

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**Background**

In rote list learning, the serial position curve (SPC) provides information regarding relative dependence on primary memory (recency effect) versus secondary memory (primacy and middle region).

Alterations of the SPC are seen in Alzheimer’s disease (AD); namely, an exaggerated recency effect.

Abnormal SPC can reflect hippocampal disease, and as a result, it is reasonable to look at SPC as a preclinical AD sign.

The purpose of this investigation was to determine whether asymptomatic persons at increased risk for AD exhibit alterations in the SPC.

**Methods**

Subjects included:
- 623 asymptomatic middle-aged individuals with a parent with AD (positive family history, FH+) (median age = 53 years).
- 157 control participants with a negative family history (FH-) of AD whose parents survived to at least age 70 without AD or other memory disorders.

All participants were administered the Rey Auditory Verbal Learning Test which requires learning and recall of 15 unrelated nouns.

**Results**

<table>
<thead>
<tr>
<th>Cognitive Measure</th>
<th>AD Children (n = 623)</th>
<th>Controls (n = 157)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard AVLT Scores</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AVLT learning total (sum of 5 trials)</td>
<td>51.41 (8.08)</td>
<td>51.89 (8.08)</td>
</tr>
<tr>
<td>AVLT delayed recall</td>
<td>10.65 (2.93)</td>
<td>10.47 (2.75)</td>
</tr>
<tr>
<td><strong>AVLT Serial Position Scores</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primacy (% recalled)</td>
<td>72.96 (14.63)</td>
<td>74.55 (14.16)*</td>
</tr>
<tr>
<td>Middle Region (% recalled)</td>
<td>60.19 (15.24)</td>
<td>61.24 (15.59)</td>
</tr>
<tr>
<td>Recency (% recalled)</td>
<td>77.69 (13.01)</td>
<td>76.43 (13.28)</td>
</tr>
<tr>
<td>Recency - Primacy (difference in % recalled)</td>
<td>4.73 (19.18)</td>
<td>1.88 (19.31)*</td>
</tr>
<tr>
<td>Recency - Middle Region (difference in % recalled)</td>
<td>17.50 (17.65)</td>
<td>15.20 (17.96)*</td>
</tr>
</tbody>
</table>

**Discussion**

There was no significant difference in total words recalled between the FH+ and FH- groups.

Examining SPC effects in FH+ and FH- subjects, the FH+ group showed a significantly greater tendency to recall words from the end (recency) versus beginning (primacy) of the list (4.7% vs. 1.9%, p < .05), as well as the end versus the middle of the list (17.8% vs. 15.2%, p < .05). See Figure 1.

Serial position effects in FH+ subjects were unrelated to APOE, age, gender, and education (all p's > .10).

Additionally, there were no significant associations between serial position scores and depression ratings, blood pressure, or cholesterol levels.

**Conclusion**

Middle-aged asymptomatic individuals at risk for AD do not show a difference in total words recalled compared to controls.

However, individuals with a family history of AD exhibit a distinctly different serial position curve suggesting greater reliance on immediate as opposed to secondary memory.

These findings raise the possibility of subtle hippocampal dysfunction and a potential indicator of disease risk.

Whether alterations in serial position recall, a known correlate of AD, will serve as a promising marker of preclinical AD remains to be determined.

These participants will be studied prospectively following a 4-year test-retest interval.

**Acknowledgements**

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