

LOT predicted list recall equally across genders ( $p < .001$ ;  $p = .97$  for gender;  $p = .80$  for interaction). Correlations between LOT and list recall were  $r = -.50$  for men ( $p < .001$ ) and  $r = -.60$  for women ( $p < .001$ ). LOT also predicted DMI equally across genders ( $p < .001$ ;  $p = .084$  for gender;  $p = .159$  for interaction). Correlations between LOT and DMI were  $r = -.46$  for men ( $p < .001$ ) and  $r = -.49$  for women ( $p < .001$ ).

**Conclusions:** Of the three process variables, LR was the only one that did not show gender differences and was related to delayed memory outcomes with medium to large effect across both genders. Results suggest that LR can be used consistently across genders. As this sample consisted of healthy, independently-living older adults, future study should examine LR by gender in MCI and dementia samples.

**Categories:** Memory Functions/Amnesia

**Keyword 1:** aging (normal)

**Keyword 2:** learning

**Keyword 3:** memory: normal

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## 2 Examining Gender Differences in the Serial Position Effect and its Relationship to Memory Outcomes

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**Objective:** There are gender-related disparities in age of diagnosis of Mild Cognitive Impairment (MCI) or dementia, with women often receiving delayed diagnoses compared to men. These delays may be related to the general female advantage in episodic verbal memory across aging. Thus, it is important to identify methods of examining memory performance that can help to reduce disparities in diagnosis. The serial position effect, a pattern where individuals tend to remember more words at the beginning (primacy) and end (recency) of a list, is predictive of dementia and may provide an avenue for this endeavor. Whereas healthy adults tend to exhibit a prototypical U-shaped serial position profile, those with MCI or dementia tend to show reduced primacy relative to recency (i.e., a J-shaped profile). To date, few studies have examined gender differences in the serial position effect. There is some evidence to

suggest that older, cognitively healthy women perform better than men on middle and recency, but more research is needed to clarify the relationship between gender and the serial position effect, which was the focus of this study.

**Participants and Methods:** We utilized data across three archival datasets, which included a total of 338 participants (67.5% female;  $\text{Mage} = 66.9$ ,  $\text{SDage} = 9.4$ ) divided into three age groups (50-64, 65-75, 76+). Scores on the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) immediate and delayed memory indices (IMI and DMI, respectively) were used to assess verbal episodic memory abilities. Performances across learning trials of the List Learning task were utilized to examine the serial position effect. ANCOVA analyses were conducted and utilized regional scoring of list learning performance, which examined the percentage of correctly recalled words in each portion of the list (primacy, middle, and recency). We also calculated the relative strength of primacy to list learning to examine the relationship between J-curve performance and gender. Years of education was included as a covariate in all analyses.

**Results:** Consistent with prior literature, men performed worse performance on both IMI  $F(1, 331) = 17.20$ ,  $p < .001$ , and DMI,  $F(1, 331) = 6.87$ ,  $p = .009$ , across aging. Repeated measured GLM showed that the serial position effect was seen across the full sample,  $F(1.93, 639.874) = 5.66$ ,  $p = .004$ , and interacted with gender,  $F(1.933, 639.874) = 5.70$ ,  $p = .004$ , and education,  $F(1.933, 639.874) = 6.13$ ,  $p = .003$ . Although men and women did not differ in primacy,  $p = .67$ , women performed better in middle,  $p < .001$ , and recency,  $p = .03$ , performance. Higher education was associated with better primacy, but not middle or recency, performance. Additionally, 23.1% of the sample exhibited a J-curve pattern, and there was a main effect of J-curve pattern for both IMI,  $F(1, 334) = 12.33$ ,  $p < .001$ , and DMI,  $F(1, 334) = 15.62$ ,  $p < .001$ , with those showing a J-curve having worse memory performance.

**Conclusions:** Our finding of no gender difference in primacy suggests that focusing on primacy performance in verbal list learning may help to address gender-related disparities in MCI or dementia diagnosis. Additionally, given evidence of education being associated with primacy, but not middle or recency, performance, future research should investigate the development of education-based normative data for primacy performance.

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### 3 Relation of Stress and Cortisol to Primacy and Recency Performance Patterns in Older Adult Caregivers of People with Dementia

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**Objective:** The serial position effect is the tendency to recall items at the beginning (primacy) and end (recency) of a word list best and middle items the worst, demonstrated by a 'U-shaped' profile. Individuals with memory impairment often demonstrate a 'J-shaped' profile, with a diminished primacy effect. An attenuated primacy effect could be one of the earliest indicators of cognitive decline in older adults. Chronic elevations in cortisol are related to hippocampal atrophy and decreased learning and recall. Given the rehearsal and encoding required to recall words at the beginning of a list, we hypothesized that reduced primacy would be related to higher cortisol levels, measured via hair cortisol concentration, in older adults, particularly caregivers of people with dementia (PWD), who are under increased stress.

**Participants and Methods:** Data were taken from a deidentified dataset of 60 community-dwelling older adults ( $\geq 50$ ) with no evidence of dementia who participated in a larger study on memory and caregiving stress; 26 identified themselves as caregivers of PWD. The sample was 83% women and 98% White, with a mean age of 67.58 (SD=8.85) and 80% holding at least a college degree. Stress was measured with the Perceived Stress Scale. The List Learning and List Recall subtests from the Repeatable Battery for the Assessment of Neuropsychological Status were used to assess the serial position effect. Primacy and recency were determined by the first three and last three words on the list, respectively, and were measured for trials 1-4. Relative strength of

primacy versus recency at delayed recall was also calculated such that positive scores indicate better primacy than recency and negative scores indicate worse primacy than recency (J-shaped profile). Hair samples were collected, and the first one cm of hair was used to assay hair cortisol concentration, reflecting the past month of cortisol.

**Results:** Caregivers were younger than non-caregivers ( $p < .001$ ), but groups did not differ in gender ( $p = .412$ ). Age was controlled for in all subsequent analyses. Caregivers reported more stress ( $p < .001$ ), but groups were not different in hair cortisol ( $p = .093$ ). On memory tasks, caregivers showed lower list learning raw scores ( $p = .002$ ) and lower list recall raw score ( $p = .046$ ); groups were not different in primacy learning ( $p = .114$ ), but caregivers showed worse recency over learning trials ( $p < .001$ ). Caregivers were not more likely to show the J-shaped serial position profile at recall ( $p = .285$ ). Collapsed across groups, perceived stress was not related to cortisol ( $p = .124$ ) but was related to recency ( $p = .001$ ) and list learning raw ( $p = .004$ ), but not list recall raw ( $p = .485$ ) or primacy ( $p = .109$ ). Cortisol was not related to primacy ( $p = .277$ ) or recency ( $p = .538$ ).

**Conclusions:** Contrary to predictions, caregivers were not worse on primacy but were worse on recency. Caregivers also reported more stress; collapsed across groups, stress was associated with recency performance. This may suggest that stress is related more to poor attention and short-term memory (recency) than encoding and recall related memory problems (primacy).

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### 4 Comparing Learning Process Variables to Memory Performance and Salivary Cortisol: Is Gender a Moderator of Relationships?

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