



# OLDER DEMENTIA CAREGIVERS IMPAIRED ON EXPLICIT MEMORY BUT NOT ON IMPLICIT LEARNING?



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## Background

Older individuals who care for loved ones with memory problems are part of a dramatically expanding population worldwide. In the US, currently 8.9 million informal caregivers, typically spouses or adult children, care for individuals 50 and older who have dementia (Family Caregiver Alliance, 2005). This estimate will significantly increase as the incidence of Alzheimer's disease grows from 4.5 million to 13.2 million Americans in 2050 (Herbert et al., 2003).

Caring for a progressively dementing individual is considered to be a chronic stressor, defined as frequent, long-term exposure to events perceived to be stressful. Caregivers must manage a complicated and progressive illness which demands emotional, physical and cognitive resources. The impact of chronic caregiver stress on psychosocial and physical attributes of caregivers has been well studied, but little research has focused on its impact on cognition. Given evidence that chronic stress affects the hippocampus and frontal lobes (Lupien, 2007; Shors, 2006), we predicted that dementia caregivers would perform more poorly than non-caregivers on tests of episodic memory and category fluency. On the other hand, implicit learning has not been found to be dependent on the hippocampus (Gagnon et al., 2004; O'Shea & Clegg, 2006); therefore, we predicted that there will be no difference between the two groups on the implicit learning component of the Hebb Digits Task.

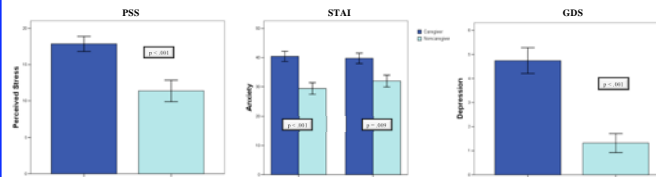
## Methods

58 informal caregivers recruited from local support groups and 22 noncaregivers from the local community completed a take-home packet of seven standardized clinical measures and a cognitive battery administered over the phone (Tun & Lachman, 2006). The following were used for the analyses reported here:

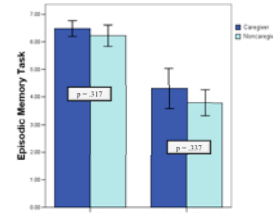
- 1. Perceived Stress Scale (PSS):** Measures the perception of stress. The items are designed to tap into how unpredictable, uncontrollable, and overloaded respondents find their lives during the past month.
- 2. Geriatric Depression Scale (GDS):** Identifies depressive symptoms in older adults. The items cover a range of depressive symptoms including mood quality, level of energy and motivation, hopelessness, social initiative and subjective evaluation of various cognitive functions.
- 3. State-Trait Anxiety Inventory (STAI Y-1 & STAI Y-2):** Measures levels of state and trait anxiety, respectively. Items ask respondents how they *feel at this moment* and how they *generally* feel about a range of emotions, thoughts and decisions.
- 4. Word List Recall (WLR) & Delayed WLR:** Respondents are asked to recall 15 words immediately and again in a delayed task approximately 20 minutes after. Previous research has demonstrated age-related deficits in recall (Geffen et al., 1990). This task of episodic memory is thought to depend on the hippocampus.
- 5. Category Fluency (CF):** Respondents are given one minute to generate as many items as possible within a category. CF is commonly used as an index of executive function, which is linked with frontal lobe function.
- 6. Hebb Digits Task (Hebb):** Respondents are read 24 sequences in which the same sequence is repeated every 3<sup>rd</sup> trial. Participants are asked to immediately recall each string of novel (**New**) and repeated (**Rep**) sequences.

## Results

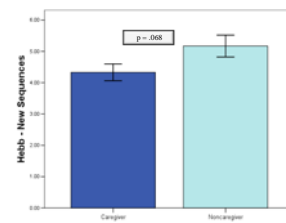
**Figure 1.**  
Higher levels of stress, anxiety and depression for Caregivers than Non-caregivers.



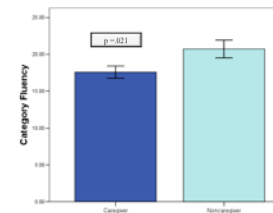
**Figure 2.**  
No difference between Caregivers and Noncaregivers in WLR, a hippocampus-related task.



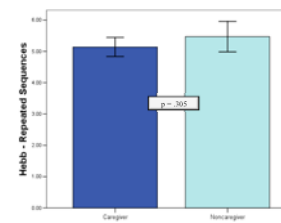
**Figure 4.**  
Caregivers perform marginally significantly worse than Noncaregivers on Hebb-New, a measure of working memory known to be linked to frontal lobes.



**Figure 3.**  
Caregivers perform significantly worse on CF, a measure of executive function known to be linked to frontal lobes.



**Figure 5.**  
No difference between Caregivers and Noncaregivers in Hebb-Rep, a measure of implicit learning not dependent on the hippocampus.



## Participants

Participants (Means & SDs)	Caregivers	Non-Caregivers
Gender	51F, 7M	11F, 11M
Age	66.83 (1.30)	69.41 (2.07)
Education Level	15.78 (.372)	17.23 (.566)

## Conclusions

- Caregivers scored significantly higher on Perceived Stress, State and Trait Anxiety and Depression than noncaregivers, suggesting that caregiving has a negative impact on psychological well-being (Figure 1).
- Caregivers did NOT differ from noncaregivers on Word List Recall, a measure of episodic memory. We did not support our hypothesis that stress affects hippocampus-related tasks. However, given our small sample size of noncaregivers (CG=58; NCG=22), these results are tentative (Figure 2).
- Caregivers did perform significantly worse on Category Fluency, a measure of executive functioning. Our findings are consistent with evidence that stress affects frontal lobes (Shors, 2006) (Figure 3).
- Caregivers were marginally significantly worse on Hebb-New, a measure of working memory, also known to be linked to frontal lobes (Figure 4).
- Caregivers did not differ from noncaregivers on Hebb-Rep, a measure of implicit learning. Our findings support our hypothesis that this learning is not affected by the hippocampus (Figure 5).

## Future Directions

- Our findings were robust, even when we removed age and education differences, for the impact of stress on frontal lobe-related tasks. This area deserves further exploration as evidence is just emerging to support this connection.
- Additional noncaregivers will help to draw more definitive conclusions about the impact of stress on hippocampus-related tasks.

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