



Age-Related Differences on a New Test of Temporal Order Memory for Everyday Tasks

P. Michelle Seewald¹, Petra Taylor¹, Shannon Y. DeJesus¹, Lauren MacDonnell¹, Charles C. Moreno¹, and Paul E. Gilbert^{1,5}

¹Department of Psychology, San Diego State University, San Diego, CA
⁵SDSU-UCSD Joint Doctoral Program in Clinical Psychology, San Diego, CA



INTRODUCTION

- Temporal order memory involves the ability to remember the order in which events or stimuli are experienced across time.
- The frontal lobes (Fuster, 1989; Milner et al., 1985; Shimamura et al., 1990) and the temporal lobes (Downes et al., 2002; Mayes et al., 2001; Spiers et al., 2001) have been shown to play a role in memory for temporal sequences.
- Age-related changes in temporal order memory have been well documented in older adults (Kessels et al., 2007; Old and Naveh-Benjamin 2008) and are hypothesized to stem from changes in the frontal and temporal lobes.
- Temporal order was found to be a unique predictor of certain activities of daily living such as food preparation, medication use, and household activities (Schmitter-Edgecombe et al., 2009).
- Temporal order memory deficits have been reported in older adults diagnosed with mild cognitive impairment (Gillis et al., 2013) and may be a selective behavioral marker of Alzheimer's disease (Bellassen et al., 2012).
- Despite the importance of temporal order memory for daily living tasks and the potential as a behavioral indicator of cognitive impairment in older adults, our ability to assess this construct using standardized neuropsychological tests is limited.
- A number of laboratory-based, experimental tests have been developed that vary in the degree to which the tasks relate to everyday tasks.
- We designed a new test to examine age-related differences in incidental temporal order memory for a self-generated sequence of tasks (i.e. a "to do" list) one might complete in everyday life.

OBJECTIVES

- Aim 1:** To develop a new temporal order test that simulates everyday experience
- Aim 2:** To assess age-related changes in test performance
- Aim 3:** Conduct correlational analyses with standardized neuropsychological tests to assess relationships with other constructs theoretically of interest

PARTICIPANTS

	YA 18-25 years (n = 45)	OA 65+ years (n = 30)
Demographics		
Age (years)	19.73 (1.71)	72.37 (6.23)
Education (years)	12.91 (1.08)	15.4 (2.31)
Gender (M/F)	21/24	13/17
Depression Scores	BDI 7.71 (5.27)	GDS 1.9 (2.26)
Mattis Dementia Rating Scale	N/A	139.4 (3.68)

Healthy YA (n = 45) participants were recruited from the San Diego State University pool of Psychology 101 undergraduate students. Healthy OA (n = 30) participants were recruited from multiple community centers in the greater San Diego area.

METHODS

Temporal Order of Everyday Events Test (TOEV)

- 10 cards, each listing task accomplished in a typical day
- Self-generate "to do" list
 - Cards placed in a temporal sequence
- Not informed of subsequent memory test during encoding
- Cards removed from view, 30 s delay then immediate free recall of sequence
- 20 min delay, then delayed free recall of sequence
- Recognition memory of items
 - 20 event cards (10 original, 10 distractor)
- Cued-Delayed Recall of sequence
 - 10 original event cards; replicate original "to do" list

Scoring Criteria

- Number of events placed in correct order

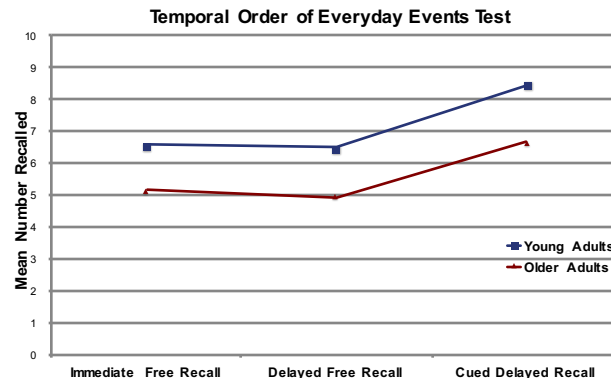
Standardized Neuropsychological Measures

- Hopkins Verbal Learning Test-Revised (Memory)
- Delis-Kaplan Executive Functioning System (Executive function)
- Wide Range Achievement Test-4: Reading (Word reading)
- Benton Judgment of Line Orientation (Visuospatial)

RESULTS

TOEV	YA (n = 45)	OA (n = 30)	p	d
TOEV Immediate Free Recall	6.53 (2.38)	5.13 (2.56)	<.018	0.57
TOEV Delayed Free Recall	6.47 (2.46)	4.90 (2.44)	<.008	0.64
TOEV Cued-Delayed Recall	8.44 (1.94)	6.63 (2.72)	<.001	0.77

Older adults were significantly impaired relative to young adults on immediate recall ($p < .05$), delayed recall ($p < .01$), and cued delayed recall ($p < .001$) of the sequence. However, all participants correctly recognized 90% or more of the events from the sequence. The average for young adults was 10 and the average for older adults was 9.9.



RESULTS

Correlations	TOEV Immediate Recall		TOEV Delayed Recall		TOEV Cued Delayed Recall	
	r	p	r	p	r	p
Verbal Memory						
HVLT Immediate Recall	.36	.001**	.38	.001**	.36	.002**
HVLT Delayed Recall	.37	.001**	.46	.000**	.43	.000**
Executive Functioning						
D-KEFS Category Fluency	.30	.01**	.29	.012*	.22	.054
Visuospatial Perception						
Benton JOLO	.03	.828	.10	.417	.10	.396
Word Reading						
WRAT-4: Reading	-.10	.382	-.06	.588	.01	.939

*significant at the .05.

**significant at the .01 level or lower.

CONCLUSIONS

- Compared to young adults, older adults demonstrated significantly worse immediate recall, delayed recall, and delayed cued recall of the events from the self-generated sequence on the TOEV.
- However, recognition memory for the events from the sequence was comparable in young and older adults.
- Therefore, age-related differences in temporal order memory were not due solely to poorer memory for the events in older adults.
- The TOEV may be useful for assessing temporal order memory in older adults and other populations.
- Performance on the TOEV was significantly correlated with standardized measures of verbal memory and verbal fluency.
- However, performance on the TOEV did not correlate significantly with standardized measures of word reading or visuospatial perception.
- The TOEV is a new test that can be rapidly administered in a laboratory or clinical setting.
- Future research is needed with larger samples to further examine the psychometric properties of the TOEV and the incremental value of the test compared to existing standardized measures in assessing age-related cognitive change.

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