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LETTER TO THE EDITOR

Span of temporal continuity as a measure of personal and present existence

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Severely impaired memory deprives amnesics of a sense of personal continuity in their daily lives, yet there are no tests that accurately measure this impairment (see Lezak, 1995). Several neuropsychological tasks have been developed to document the severity of memory loss in terms of memory span, such as the Brown–Peterson Technique (Peterson & Peterson, 1959), but the ecological validity of such tasks as measures of personal or temporal continuity is not obvious (see Heinrichs, 1990). Instead they measure memory in terms of how much information could be held in working or short-term memory, not memory span in the sense of continuity. To develop a new measure of amnesia with greater relation to everyday function, we had to examine the integrity of memory function in terms of temporal continuity in a way that would engage the patient in everyday behavior, such as informal conversation, and still allow memory function to be quantifiable. Thus, we set out to create a bedside task that could measure the span in which the patient with amnesia experiences temporal continuity. We call this measure the "span of temporal continuity," or "personal and present span of existence."

We tested 3 patients. Our first patient, D.T., is a 58-year-old man who contracted herpes simplex encephalitis, which left him with a severe episodic memory impairment on admission. At discharge, he was able to recall no items after a short and 20-min delay on the California Verbal Learning Test (CVLT; Delis et al., 1987). His Wechsler Adult Intelligence Scale (WAIS–R; Wechsler, 1981) Verbal IQ was 93. Our 2nd patient, U.R., is a 31-year-old man who was admitted to hospital with streptococcal meningioencephalitis. On neuropsychological evaluation, he was able to recall no more than three CVLT items after a short delay and no items after a 20-min delay at both admission and discharge. His WAIS–R Verbal IQ was 94. Our 3rd patient, M.O., a 49-year-old woman, suffered an anterior communicating artery aneurysm rupture. Neuropsychological evaluation during her stay on the unit revealed improved performance on all CVLT variables, and a fluctuating WAIS–R Verbal IQ with a mean of 88.

Span of temporal continuity was tested once a week at bedside over a period of 8 weeks. The initial task of the experimenter was to obtain a "fact" from both the patient and family that could be reliably recalled by the patient. That fact concerned either the patient's occupation or spouse's name. Having asked the patient a question regarding that fact (e.g., "What did you do for a living?"), the examiner engages the patient in conversation for a few minutes and then repeats the question 5 min later. If the patient answered the question without any indication of being aware that he or she answered it previously, this was taken to suggest that the patient's span of temporal continuity was less than 5 min. If the patient recalled being asked the question (e.g., if the patient said "You just asked me that," or "I just told you," or answered the question with "Were you not listening?" or anything else that indicated examiner oversight or incompetence), this was taken to suggest that the patient's span of temporal continuity was greater than 5 min. If span of temporal continuity was less than five min, the question was posed in decrements of 1 min in order to approximate the exact span. That is, the question ("What did you do for a living?") was asked again 4 min later. If the patient still answered as if it were the first time that he or she had heard the question, it was asked again 3 min later, 2 min later, 1 min later, then in decrements of 10 s from 60 to 10 s until the patient indicated that he or she had been asked the question previously. Once this span was approximated (e.g., at 60 s), the question was posed at decrements of 1 s (that is, the question was repeated 69 s later, 68 s later, and

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Table 1. Span of temporal continuity across 8 weeks (minutes:seconds)

	Week								
Patient	1	2	3	4	5	6	7	8	*M*
D.T.	0:20	0:22	0:28	0:20	0:22	0:28	0:22	0:18	0:22
U.R.	3:20	3:30	3:25	3:48	3:35	3:50	3:20	3:42	3:34
M.O.	0:45	0:50	1:49	1:58	3:10	6:10	>10:00	>10:00	–

M = mean span of temporal continuity.
Note. Mean differences between the decrement and the increment span measures were 6 s for patient D.T., 19 s for patient U.R., and 55 s for patient M.O.

so on) until the patient indicated that they had answered the question previously (which should be within 60 and 70 s in keeping with the example). This decrement span was used as our approximation of temporal continuity. However, to insure reliability of the measure, we also used an increment rather than decrement procedure with the same span intervals only in reverse order. The final span of temporal continuity was determined by averaging the decrement and increment span measures.

Table 1 provides span of temporal continuity measures across 8 weeks for patients D.T., U.R., and M.O. It can be seen from the table that the measure is quite reliable across weeks for D.T. and U.R., whereas patient M.O.'s span of temporal continuity grew during her recovery in hospital. These measures are consistent with our neuropsychological evaluation of these patients: D.T. displays a more profound impairment on testing than U.R., and M.O. continues to improve on testing during her recovery. That is, on admission to our unit, M.O. was unable to recall more than one CVLT item after a 20-min delay, whereas on discharge, she was able to recall nine items after a similar delay.

The results indicate that this simple technique provides a reliable and ecologically valid measure of memory impairment in terms of span of temporal continuity. It also is consistent with the severity of the patient's amnesia as indexed by tests such as the CVLT and with our impression of the patient's behaviors in everyday life. As such, our measure may prove useful in preclinical diagnosis and rehabilitation. For example, we have begun to address the ability of our measure to index onset and progression of dementia by documenting a shrinking span of temporal continuity in patients with possible Alzheimer's disease.

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