Those with episodic amnesia are not 'stuck in time,' says philosopher Carl Craver

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In 1981, a motorcycle accident left Toronto native Kent Cochrane with severe brain damage and dramatically impaired episodic memory. Following the accident, Cochrane could no longer remember events from his past. Nor could he predict specific events that might happen in the future.

When neuroscientist Endel Tulving, PhD, asked him to describe what he would do tomorrow, Cochrane could not answer and described his state of mind as "blank."

Psychologists and neuroscientists came to know Cochrane, who passed away earlier this year, simply as "KC." Many scientists have described

KC as "stuck in time," or trapped in a permanent present.

It has generally been assumed that people with episodic amnesia experience time much differently than those with more typical memory function.

However, a recent paper in *Neuropsychologia* co-authored by Carl F. Craver, PhD, professor of philosophy and of philosophy-neuroscience-psychology, both in Arts & Sciences at Washington University in St. Louis, disputes this type of claim.

"It's our whole way of thinking about these people that we wanted to bring under pressure," Craver said. "There are sets of claims that sound empirical, like 'These people are stuck in time.' But if you ask, 'Have you actually tested what they know about time?' the answer is no."

Time and consciousness

A series of experiments convinced Craver and his co-authors that although KC could not remember specific past experiences, he did in fact have an understanding of time and an appreciation of its significance to his life.

Interviews with KC by Craver and his colleagues revealed that KC retained much of what psychologists refer to as "temporal consciousness." KC could order significant events from his life on a timeline, and he seemed to have complete mastery of central temporal concepts.

For example, KC understood that events in the past have already happened, that they influence the future, and that once they happen, they cannot be changed.

He also knew that events in the future don't remain in the future, but eventually become present. Even more interestingly, KC's understanding of time influenced his decision-making.

If KC truly had no understanding of time, Craver argues, then he and others with his type of amnesia would act as if only the present mattered. Without understanding that present actions have future consequences or rewards, KC would have based his actions only upon immediate outcomes. However, this was not the case.

On a personality test, KC scored as low as possible on measures of hedonism, or the tendency to be a self-indulgent pleasure-seeker.

In systematic tests of his decision-making, carried out with WUSTL's Len Green, PhD, professor of psychology, and Joel Myerson, PhD, research professor of psychology, and researchers at York University in Toronto, KC also showed that he was willing to trade a smaller, sooner reward for a larger, later reward.

In other words, KC's inability to remember past events did not affect his ability to appreciate the value of future rewards.

'Questions are now wide open'

KC's case reveals how much is left to discover about memory and how it relates to human understanding of time.

"If you think about memory long enough it starts to sound magical," Craver said. "How is it that we can replay these events from our lives? And what's going on in our brains that allows us to re-experience these events from our past?"

Craver hopes that this article—the last to be published about KC during

his lifetime—brings these types of questions to the forefront.

"These findings open up a whole new set of questions about people with amnesia," Craver said. "Things that we previously thought were closed questions are now wide open."

The study, "Individuals with episodic amnesia are not stuck in time," was co-authored with York University's Donna Kwan and R. Shayna Rosenbaum, PhD; and Chloe Steindam, a former undergraduate student of Craver's who graduated from WUSTL in 2013. The article appeared in *Neuropsychologia* on March 26, 2014.

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