Alcoholism's short-term effects on memory functioning are harmful

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Alcoholism can disrupt memory functioning well before incurring the profound amnesia of Korsakoff's syndrome. For example, associative memory – used in remembering face-name associations – can be impaired in alcoholics. A study of the cognitive and brain mechanisms underlying this deficit, through testing of associative memory performance and processing in study participants during structural magnetic resonance imaging (MRI) scanning, have found that impaired learning abilities are predominantly associated with cerebellar brain volumes.

Results will be published in the July 2012 issue of *Alcoholism: Clinical & Experimental Research* and are currently available at Early View.

"There are several memory systems and alcoholism does not disrupt all of them," explained Edith V. Sullivan, a professor in the department of psychiatry and behavioral sciences at Stanford University School of Medicine, and corresponding author for the study. "Chronic alcohol consumption mainly affects episodic memory and working memory."

Episodic memory is the memory system that 'files' personally experienced events associated with a precise spatial and temporal context of encoding, and it appears to have an unlimited capacity. "For example, episodic memory includes memories of vacation such as: 'when I went to Paris with my husband, I ate a delicious ratatouille for dinner in a very cute restaurant; I can remember the place, how I was dressed, and how I burned my tongue when I tasted the meal,'" said Sullivan, quoting Anne-

Lise Pitel, the lead author. "Such memories are unique to the individual. Episodic memory is impaired in some alcoholics, who may have difficulties in remembering a grocery list, a route to a new restaurant, or new face-name associations as encountered in a new job." Associative memory is a component of episodic memory, she added.

Conversely, working memory is a short-term memory system with a limited capacity, which enables temporary storage and manipulation of information, which is quickly forgotten unless consolidated into a long-term storage system. "Alcoholics have deficits of working memory resulting in difficulties like holding a phone number in mind while dialing it," Sullivan said.

"This study focused on a cognitive process essential in daily living," added said Sara Jo Nixon, a professor in the department of psychiatry at the University of Florida. "Effective associative learning and memory processes such as learning that two items 'go' together and remembering this link or association later are essential for successful interactions throughout our personal and professional environments. Learning the names of new friends, colleagues or acquaintances is only one example of this type of learning, but it is of particular social and personal importance."

Sullivan, Pitel, and their colleagues presented learning tasks to two groups: 10 alcoholics (8 men, 2 women) recruited from community treatment centers, outpatient clinics, and hospitals, as well as 10 "controls" or non-alcoholics (5 men, 5 women) recruited from the local community. Tasks were either associative such as face-name, or single-item such as face or name. The participants' recognition retrieval was designated as "shallow encoding" if the face was recalled as that of a "man," or "deep encoding" if the face was recalled as "honest."

"Learning new face-name associations was more difficult than learning

new single faces or names whether a control or an alcoholic," said Sullivan. "Alcoholics had impaired learning abilities for both face-name association and single face or name. Learning performances correlated with different brain regions in alcoholics from those of controls; in particular, associative learning in alcoholics was related to cerebellar brain volumes measured on MRI. This pattern was different from associations we observed in controls, who showed relations between associative learning and limbic system volumes."

"Mnemonists suggest that our ability to remember face-name associations can be improved if we engage processes such as imagery during learning such as deep processing rather than rely on rote learning or shallow processing," said Nixon. "These authors asked participants to not only learn the face-name association, but to also judge whether the picture was a man or a woman, which is shallow processing. In another set, while learning the pair, participants were asked to judge whether the person looked 'honest or not,' which is deep processing. As Edie notes, alcoholics and controls performed similarly during encoding, requiring more time to complete deep processes vs. shallow processing. Alcoholics, however, were inferior to controls in the accuracy of their memory whether they were asked to recognize the correct face-name pair or simply asked to identify which face they had seen earlier in the task."

Both Sullivan and Nixon noted that this study helps to underscore the complexities of alcohol's effects on the brain.

"Even though prompting alcoholics to encode memoranda at a deep level resulted in more specific relations with regional brain volumes than shallow encoding," said Sullivan, "it did not enable them to take advantage of this strategy and both single-item and associative recognition were impaired."

"These analyses support and extend previous work suggesting that neurocognitive performance in alcoholics may approach or even match that of controls by utilizing alternative neurobehavioral systems," added Nixon. "For alcoholics, performance on relatively simple cognitive tasks is positively and widely associated with brain volume; associations not observed in controls. In contrast, brain volumes are associated with performance for controls primarily in more difficult or complex tasks. Furthermore, certain brain areas, such as the cerebellum, appear related to performance only for alcoholics. These differential associations are both provocative and relevant."

"Impaired memory abilities can have harmful consequences on an alcoholic's day-to-day functioning," emphasized Sullivan and Pitel. "At work, alcoholics who have a job with a high cognitive load may have difficulties in learning new tasks. At home, memory disorders may be considered as disinterest in family life and may result in conflicts. Finally, from a clinical perspective, impaired episodic memory in alcoholics may hamper obtaining full benefits from rehabilitation efforts because successful treatment requires: one, learning new knowledge such as the meaning, self-awareness, and consequences of 'addiction' or 'drug;' and two, to 're-experience' episodes when previously drinking, which enables anticipation and recognition of potentially risky situations."

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