Alcoholism and HIV infection have different effects on visuomotor procedural memory processes

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The different effects on memory processes by chronic alcoholism and HIV infection likely reflect the specific neuropathology associated with each condition: frontocerebellar dysfunction in alcoholism and frontostriatal dysfunction in HIV infection. A study of the separate and combined contribution of injury related to chronic alcoholism and HIV infection has found they differently affect the processes involved in procedural learning and memory of visuomotor information.

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

"Chronic alcoholism and HIV infection affect some different and some overlapping brain systems," explained Edith V. Sullivan, a professor in the department of psychiatry and behavioral sciences at Stanford University School of Medicine as well as corresponding author for the study. "In general, alcoholism can disrupt hippocampal-limbic and frontocerebellar systems functions, and underlie difficulties in explicit memory – meaning learning of new information – particularly learning of visual information. HIV infection can disrupt frontostriatal systems and underlie difficulties in working memory – meaning ability to hold information in mind for a short period of time so that a person can work effectively with that information – such as mental arithmetic."

Sullivan said that visuomotor procedural memory is used when engaging in activities that require vision, spatial orientation, motor coordination, and motor memory – such as driving a car, riding a bike, and using a computer mouse.

"This study is an example of the process by which research with clinical populations provides critical insight regarding the integration of neural systems more generally," added Sara Jo Nixon, a professor in the department of psychiatry at the University of Florida. "In addition, this work exemplifies the fact that in attempting to 'understand' the neurobehavioral compromise associated with brain insult, it is insufficient to apply general statements regarding overall performance deficits. Instead, we must examine sub-/or component processes which are ultimately integrated in complex behavior. These researchers have demonstrated the clinical efficacy of identifying neurobehavioral patterns across conceptually integrated tasks."

Sullivan and her colleagues used the rotary pursuit task, a visuomotor speed and learning task that required participants to use a stylus to track a spot of light as it rotated counterclockwise on a turntable, to test four study groups: 29 men with chronic alcoholism, 23 men with HIV infection, 28 men with both conditions, and 20 healthy control men. All participants had four motor learning sessions, two sessions per day over two testing days, typically separated by one week.

"We found that chronic alcoholism and HIV infection differently affect the processes involved in procedural learning and memory of visuomotor information," said Sullivan. "Individuals with chronic alcoholism do not show as much learning over a short period of time – for example, within hours – as individuals with HIV infection on visuomotor tasks. By contrast, after a day or week, even without additional exposure to the material, alcoholics show significant improvement in task performance, and this 'consolidation' effect is not observed in the HIV individuals.

Thus, it appears that individuals with chronic alcoholism and those with HIV infection can learn visuomotor information, but their patterns of learning differ from each other."

"In other words," said Nixon, "persons with HIV may require repeated and on-going practice on specific types of tasks, if they are to achieve maximum benefit. In contrast, those with alcoholism appear to demonstrate the benefit of the consolidation process; itself a process not fully understood."

Sullivan agreed: "Chronic alcoholism affects memory in many ways, including the ability to perform visually based motor tasks," she said. "Learning of such tasks may be best accomplished if training sessions were distributed across days and weeks rather than grouped within a single day, as learning appears to be enhanced with temporally distributed sessions across days."

Those individuals with both conditions experience "double jeopardy," note the study's authors.

"As we have often found in our cognitive and motor studies, individuals who have both chronic alcoholism and HIV infection achieve lower test scores, that is, have greater difficulty than either those with chronic alcoholism or HIV infection alone," Sullivan added. "Having both conditions puts an individual at heightened risk of cognitive problems, including visuomotor procedural learning and memory problems."

Provided by Alcoholism: Clinical & Experimental Research

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