

Shift work unwinds body clocks, leading to more severe strokes

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Emergency vehicles stopped on a street at night. Credit: Texas A&M Health Science Center

Statistics show that some 15 million Americans don't work the typical nine-to-five. These employees (or shift workers), who punch in for graveyard or rotating shifts, are more prone to numerous health hazards, from heart attacks to obesity, and now, new research, published in *Endocrinology*, shows shift work may also have serious implications for

the brain.

"The body is synchronized to night and day by circadian rhythms—24-hour cycles controlled by internal biological clocks that tell our bodies when to sleep, when to eat and when to perform numerous physiological processes," said David Earnest, Ph.D., professor in the Department of Neuroscience and Experimental Therapeutics at the Texas A&M Health Science Center College of Medicine. "A person on a [shift work](#) schedule, especially on rotating shifts, challenges, or confuses, their internal [body clocks](#) by having irregular sleep-wake patterns or meal times."

According to Earnest, it's not the longer hours—or the weird hours—necessarily that is the problem. Instead, it is the change in the timing of waking, sleeping and eating every few days that "unwinds" our body clocks and makes it difficult for them to maintain their natural, 24-hour cycle. When body clocks are disrupted, as they are when people go to bed and get up at radically different times every few days, there can be a major impact on health. Earnest and his colleagues have found that shift work can lead to more severe ischemic strokes, the leading cause of disability in the United States, which occur when blood flow is cut off to part of the brain.

Using an animal model, Earnest and his team, including colleague Farida Sohrabji, Ph.D., also a professor in the Department of Neuroscience and Experimental Therapeutics and director of the Women's Health in Neuroscience Program, found that subjects on shift work schedules had more severe stroke outcomes, in terms of both brain damage and loss of sensation and limb movement than controls on regular 24-hour cycles of day and night.

Of interest, their study—supported by the American Heart Association—found that males and females show major differences in

the degree to which the stroke was exacerbated by circadian rhythm disruption; in males, the gravity of stroke outcomes in response to shift work schedules was much worse than in females.

"These sex differences might be related to reproductive hormones. Young women are less likely to suffer strokes, as compared with men of a similar age, and when they do, the stroke outcomes are likely to be less severe. In females, estrogen is thought to be responsible for this greater degree of neuroprotection," Sohrabji said. "Essentially, estrogen helps shield the brain in response to stroke." However, older women approaching menopause show increasing incidence of ischemic stroke and poor prognosis for recovery, compared with men at the same age.

Some of Earnest's [previous work](#) has shown that a high-fat diet can also alter the timing of internal body clocks, as well as dramatically increase inflammatory responses that can be a problem in cardio- and cerebrovascular disease (conditions caused by problems that affect the blood supply to the brain—which includes stroke).

"Next we would like to explore whether inflammation is a key link between circadian rhythm disruption and increased stroke severity," Earnest said. "With this information, we may be able to identify therapeutic interventions that limit damage after a stroke in patients with a history of shift work."

"This research has clear implications for shift workers with odd schedules, but probably extends to many of us who keep schedules that differ greatly from day-to-day, especially from weekdays to weekends," Earnest added. "These irregular schedules can produce what is known as 'social jet lag,' which similarly unwinds our body clocks so they no longer keep accurate time, and thus can lead to the same effects on human health as shift work."

An immediate impact of these studies on human health is that individuals in shift work-type professions should be monitored more closely and more frequently for cardio- and cerebrovascular disease and risk factors such as hypertension and [obesity](#).

In the meantime, Earnest suggests that those with irregular sleeping patterns should at least try to maintain regular mealtimes, in addition to avoiding the usual [cardiovascular risk factors](#) like a high-fat diet, inactivity and tobacco use.

Provided by Texas A&M University

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