DAYLIGHT SAVINGS TIME AND TRAFFIC ACCIDENTS

To the Editor: It has become increasingly clear that insufficient sleep and disrupted circadian rhythms are a major public health problem. For instance, in 1988 the cost of sleep related accidents exceeded $56 billion and included 24,318 deaths and 2,474,430 disabling injuries.[1] Major disasters, including the nuclear accident at Chernobyl, the *Exxon Valdez* oil spill, and the destruction of the space shuttle *Challenger*, have been linked to insufficient sleep, disrupted circadian rhythms, or both on the part of involved supervisors and staff.[2,3] It has been suggested that as a society we are chronically sleep deprived[4] and that small additional losses of sleep may have consequences for public and individual safety.[2]

We can use noninvasive techniques to examine the effects of minor disruptions of circadian rhythms on normal activities if we take advantage of annual shifts in time keeping. More than 25 countries shift to daylight savings time each spring and return to standard time in the fall. The spring shift results in the loss of one hour of sleep time (the equivalent in terms of jet lag of traveling one time zone to the east), where as the fall shift permits an additional hour of sleep (the equivalent of traveling one time zone to the west). Although one hour's change may seem like a minor disruption in the cycle of sleep and wakefulness, measurable changes in sleep pattern persist for up to five days after each time shift.[5] This leads to the prediction that the spring shift, involving a loss of an hour's sleep, might lead to an increased number of “micro sleeps,” or lapses of attention, during daily activities and thus might cause an increase in the probability of accidents, especially in traffic. The additional hour of sleep gained in the fall might then lead conversely to a reduction in accident rates.

We used data from a tabulation of all traffic accidents in Canada as they were reported to the Canadian Ministry of Transport for the years 1991 and 1992 by all 10 provinces. A total of 1,398,784 accidents were coded according to the date of occurrence. Data for analysis were restricted to the Monday preceding the week of the change due to daylight savings time, the Monday immediately after, and the Monday one week after the change, for both spring and fall time shifts. Data from the province of Saskatchewan were excluded because it does not observe daylight savings time. The analysis of the spring shift included 9593 accidents and that of the fall shift 12,010. The resulting data are shown in Figure 1.

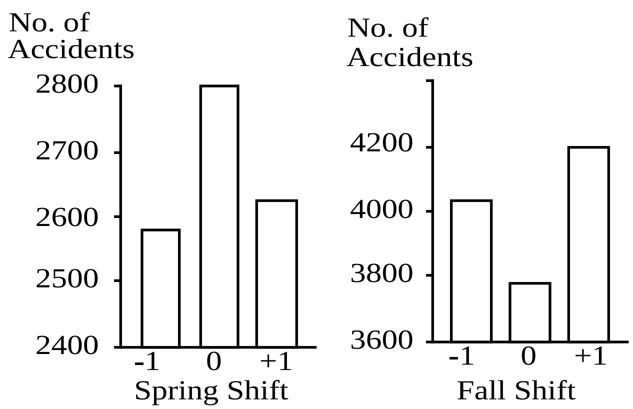

Figure 1. Numbers of Traffic Accidents on the Mondays before(-1wk), immediately after (0) and 1 week after (+1) the Shifts to and from Daylight Savings Time for the Years 1991 and 1992. There is an increase in accidents after the spring shift (when an hour of sleep is lost) and a decrease in the fall (when an hour of sleep is gained).

The loss of one hour's sleep associated with the spring shift to daylight savings time increased the risk of accidents. The Monday immediately after the shift showed a relative risk of 1.086 (95 percent confidence interval, 1.029 to 1.145, x^2 = 9.01, 1 df, P<0.01). As compared with the accident rate a week later, the relative risk for the Monday immediately after the shift was 1.070 (95 percent confidence interval, 1.015 to 1.129; x^2=6.l9, 1 df; P<0.05). Conversely, there was a reduction in the risk of traffic accidents after the fall shift from daylight savings time when an hour of sleep-was gained. In the fall, the relative risk on the Monday of the change was 0.937 (95 percent confidence interval, 0.897 to 0.980; x^2=8.07, 1 df; P<0.01) when compared with the preceding Monday and 0.896 (95 percent confidence interval, 0.858 to 0937; x^2=23.69, P<0.001) when compared with the Monday one week later. Thus, the spring shift to daylight savings time, and the concomitant loss of one hour of sleep, resulted in an average increase in traffic accidents of approximately 8 percent, whereas the fall shift resulted in a decrease in accidents of approximately the same magnitude immediately after the time shift.

These data show that small changes in the amount of sleep that people get can have major consequences in everyday activities. The loss of merely one hour of sleep can increase the risk of traffic accidents. It is likely that the effects are due to sleep loss rather than a nonspecific disruption in circadian rhythm, since gaining an additional hour of sleep at the fall time shift seems to decrease the risk of accidents.

STANLEY COREN, PH.D. University of British Columbia
Vancouver, BC V6T 1Z4,Canada
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