



WORK SCHEDULES AND SLEEP PATTERNS OF TRAIN AND ENGINE EMPLOYEES IN PASSENGER OPERATIONS

SUMMARY

The Federal Railroad Administration's (FRA) Office of Research and Development sponsored a project to study the work schedules and sleep patterns of U.S. railroad train and engine (T&E) employees in passenger operations. A prior study of all T&E employees, both passenger and freight, had an inadequate number of T&E workers in passenger service to make meaningful conclusions about this subgroup of T&E workers, so the present study was undertaken. FRA used the results of this study to inform proposed regulations for revised Hours of Service regulations.

The methodology for this study was similar to prior studies of other groups of railroad workers. A random sample of currently employed U.S. T&E workers in passenger service completed a background survey and kept a daily log for 2 weeks.

Approximately 10 percent of all T&E employees work in passenger operations. For the most part, these individuals return to their starting location at the end of the workday. There are five types of positions in passenger service; all are subject to the Hours of Service Law if their duties relate to the movement of a train. Two-thirds work a straight thru assignment with the remainder divided between split assignments and extra board assignments.

Those working straight thru assignments had the longest daily work period (8:44, hours: minutes) and those on split assignments the

shortest (8:08). The interim release period for split assignments averaged 5:26.

As a group, passenger T&E workers get more sleep than U.S. working adults (see Figure 1). Those on split assignments have shorter nighttime sleep periods but take advantage of the interim release to supplement their nighttime sleep.

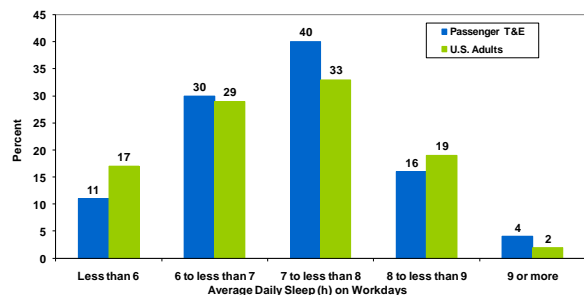


Figure 1. Daily Sleep on Workdays Compared with U.S. Working Adults

Effectiveness measures, based on the Sleep, Activity, Fatigue, and Task Effectiveness (SAFTE) model, indicate that passenger T&E employees, regardless of the type of assignment, work at an acceptable effectiveness level more than 97 percent of their work time. Effectiveness at both the beginning and end of a work assignment decreases as the number of consecutive days on the job increases.



BACKGROUND

Federal laws governing railroad employees' hours of service date back to passage of the Hours of Service Act in 1907. These laws, collectively referred to as the Hours of Service (HOS) Law, govern the duty hours of T&E employees who work in passenger operations.

Passage of the Rail Safety Improvement Act of 2008 (RSIA) changed the statutory limits on work hours for T&E workers in freight service and kept T&E workers in passenger service temporarily subject to pre-RSIA statutory limits pending exercise of FRA authority to prescribe different regulations for passenger T&E workers. FRA undertook this study to develop scientific data on which FRA could base its recommendations regarding HOS limitations for passenger T&E workers.

The work schedules of passenger T&E employees are highly predictable because the trains operate on a planned train schedule. Jobs in passenger service may involve either a straight thru or a split assignment. A straight thru assignment has one continuous on-duty period. With a split assignment, the individual works the morning rush, has time off in the middle of the day, and returns to work the evening rush. The period of time between the two work periods, interim release, is at least 4 hours (h). As is the case in freight operations, passenger railroads maintain an extra board of individuals who are available to fill in for regularly scheduled employees.

OBJECTIVES

The objectives of the study were to:

- Design and conduct a survey to collect work schedule and sleep data from T&E employees in passenger service.
- Analyze the survey data to characterize the work/sleep patterns and to identify work-schedule-related fatigue issues.

METHODS

The research involved a survey of actively working T&E employees in passenger service at U.S. railroads. The study used two survey instruments, a background survey and a daily log. Survey participants used the background survey to provide demographic information, descriptive data for their job type and work schedule, and a self-assessment of overall health. The daily log provided a place for recording sleep and work periods as well as personal time on both workdays and rest days for a 2-week period.

Mailing of the survey materials to a random sample of the 7,175 T&E workers in passenger service occurred on December 31, 2009. The sampling frame was adjusted to ensure that an adequate number of individuals working split assignments would be included, since this subpopulation was of particular interest to FRA. The overall response rate was 21 percent.

RESULTS

Survey participants reported an average age of 47 years (yr) with 40 percent 50 yr or older. Nearly all (93 percent) are involved in train operation with the remainder working in yards or on work trains. Overall, the group has 15.7 yr of experience. Those with the most experience work split assignments. Over 6 percent



reported having a diagnosed sleep disorder, a level not statistically different from U.S. working adults. Over half have had no fatigue education.

Job Characteristics. Two-thirds work a straight thru assignment with the remainder divided between split assignments and extra board assignments. On average, during the 2-week period of the survey, the straight thru group worked the most (90:05), and the split assignment group the least (78:40). The straight thru group also had the most daily duty hours (8:44). Interim release periods average 5:26 with a quarter exceeding 6 h. One-third reported working on a rest day in the past month. Nearly all had guaranteed rest days with 15 percent of the extra board group having none.

By extrapolating the 2 weeks of survey data to 30 days, it was possible to assess the extent to which these individuals would fail to conform to the new freight HOS limitations if they applied. Three individuals (1 percent) exceeded the 276-hour monthly limit and 46 (19 percent) had work patterns that would violate the freight rest provisions of RSIA if they had applied.

Sleep Characteristics. The three schedule groups obtain similar amounts of total daily sleep but have different strategies to obtain their sleep (see Figure 2). Straight thru workers sleep longer on rest days than on workdays. Split assignment workers supplement their workday sleep with naps, and extra board workers have similar sleep on both work and rest days. Ten percent of breaks overlapped with sleep, whereas 65 percent of interim release periods did. When compared with U.S. working adults, the passenger T&E group is less

likely to be sleep deprived on workdays. Forty percent get less than 7 h of sleep on workdays in contrast to 46 percent of U.S. working adults (see Figure 1).

Alertness. Study participants rated their alertness at the start and end of each work period. Statistical analysis found that ratings of alertness declined from the start to the end of work for straight thru and extra board workers but not split assignment.

Effectiveness. Application of the Fatigue Avoidance Scheduling Tool model to this data found that none of the schedule groups worked at or below an effectiveness level of 70 more than 2.5 percent of their work time. From the effectiveness scores at the start and end of a work period, results show that effectiveness declines with succeeding days of work.

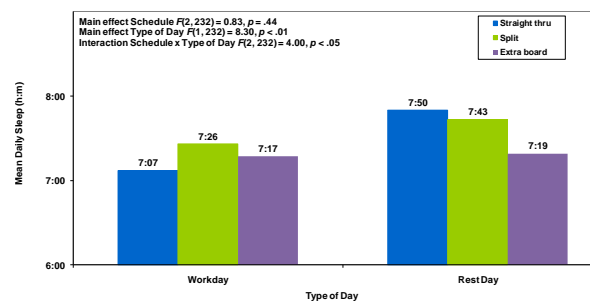


Figure 2. Total Daily Sleep by Type of Day and Work Schedule

CONCLUSIONS

Findings of this study include the following:

- T&E employees average more lost workdays because of sickness in contrast with all U.S. working adults and adult males.



The availability of paid sick time for passenger service employees is a possible explanation.

- The reported incidence of sleep apnea among this population does not differ from that among U.S. working adults. This is somewhat surprising since the job of a locomotive engineer is a sedentary one, predisposing the individual to weight gain, which increases the risk of developing sleep apnea.
- Over half of the study participants reported never receiving any type of fatigue education. The opportunity exists for the industry to expand its education efforts on this important subject.
- Overall, 17 percent had work patterns that would violate the new HOS limitations regarding consecutive days worked for freight operations, if those limitations applied to passenger T&E workers.
- Passenger T&E employees are working at an acceptable effectiveness level more than 97 percent of the time. Based on these results, the group does not have a high risk of impaired performance due to fatigue.
- Those working split assignments sleep more on workdays than their counterparts with different schedules, but this group has more daily sleep periods and a shorter primary sleep period, indicating that they take advantage of their midday break to supplement their nighttime sleep.

The results of the present study, as well as the four earlier studies, provide a baseline for comparison after the new HOS regulations for passenger T&E workers take effect.

REFERENCES

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KEYWORDS

Commuter rail, train and engine service, locomotive engineer, conductor, split assignment, fatigue, work schedule, sleep pattern, sleep disorder, hours of service, passenger rail

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