

Effects of Fatigue on Performance in a Driving Device

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ABRIDGMENT

It is commonly thought that after a number of hours of operating a vehicle, certain physiological and mental changes occur in the driver which collectively constitute driver fatigue. However, there is little evidence to support the view that driver fatigue results in a performance decrement. The present investigation was designed to determine the effects of fatigue on several performance tasks required in the operation of a driving simulator.

Sixty male subjects (paid undergraduates, average age 19) were randomly assigned to one of six experimental conditions and were tested in a driving device patterned after the AAA device. Measures of tracking error, speed maintenance, and reaction time were obtained for each subject. Test sessions involved either 4 or 6 hr. In the 4A condition, subjects operated the device for 4 hr but were required to perform all the tasks only during the first and last hour. During the second and third hour the only requirement imposed was that the subject perform the tracking task. In condition 4B, subjects operated the device for the first and last hour of the 4-hr session and were excused during the second and third hour. In condition 4C, subjects operated the device for the entire session and were required to perform all tasks during the session. Conditions 6A, 6B, and 6C were similar except a 6-hr session was involved. In the case of subjects in the 6A condition, the device was operated for the entire session, but only the tracking task was performed during the second through the fifth hour. Subjects in 6B were excused during the second through the fifth hour, whereas subjects in the 6C condition operated the device for the entire period and performed all tasks during the session.

Performance decrements were obtained in the tracking task for subjects in several conditions. The most obvious decrements occurred in the 6-hr conditions (6A and 6C) where performance during the first hour was significantly better than that shown during the last hour. In the speed maintenance task, performance during the first hour also tended to be superior to performance during the last hour. In only the 6C condition were these differences significant, however. Surprisingly, subjects showed a decrease in reaction time during the driving sessions. In each condition, reaction time was faster during the last hour than during the first hour of the task. These differences were significant in the 4C and 6A conditions.

The present investigation tends to indicate that there may be considerable differences between tasks in their demonstrated sensitivity to fatigue. Some tasks required of the operator showed a performance decrement, others showed no decrement, whereas a definite improvement in performance was shown on other tasks. In addition, the results suggest that subjects adjust their effort to the expected duration of the task, since subjects in the long sessions did not perform as well as subjects in the shorter conditions during the initial periods. This was the case for all of the performance tasks. Therefore, motivational factors may be of considerable importance in determining the performance of subjects on tasks such as those used in the present investigation.