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Introduction

Studies have shown that there is a definite tendency for a driver to lose in steering efficiency when he takes one hand off the wheel. Johnson and Lauer (1) found either hand alone to be 91.4 per cent as efficient in manipulative ability as both hands used together. Their findings were confirmed in a lesser degree by Lauer and Suhr (2) for both simple and complex driving.

The present study was made to determine whether or not a loss in steering efficiency occurs when driving speed is increased.

Method and Procedure

Thirty subjects were taken through a testing cycle lasting approximately 15 minutes. The experimental procedure began by having the subject sit behind the wheel of the Auto Trainer, made by the American Automobile Association, and adjusting the seat until he was in the proper position for driving. The following instructions were read to each of the 30 subjects.

> "You are taking part in a study of the effect of speed on steering efficiency. You will drive at three speeds—average speed, 50 per cent above average speed, and double average speed.
>
> Operate the controls as you would in an ordinary car. Release the hand brake when you start.
>
> After you have driven for a short time, a green light will appear at the right of the signal box. Keep driving as long as the light is green for a trial. You will not need to stop between trials.
>
> Pay no attention to the instruction in the aperture. Your task is to keep the car in the center of the white lane so as to cross over as many copper bars as possible. The task will involve straight driving in high gear. Always take the road to the left but keep in the center of the lane.
>
> Remember the contact device set beneath the miniature car. The steering score is accumulated by this device crossing the bars. Now press the white button to actuate the starter."

Practice was given to afford an opportunity to get used to driving the Auto Trainer. Two or three trips around were made. The driving speed was set by the experimenter. The task was to keep the green car in the center of the white lane so that the car might strike the contacts. The driving speeds used were average speed, 50 per cent above average speed, and double average speed, as calculated by the builders of the Auto Trainer.

As soon as the instructions were read and practice given, each driver was given a practice session during which time he drove a distance of three belt revolutions on the Auto Trainer at average speed. The Auto Trainer was then set to measure steering performance. The score accumulated over a distance of ten belt revolutions was recorded.

This was followed by a practice session for a distance of three belt revolutions at 50 per cent above average speed. The Auto Trainer was again set to measure steering performance and the score accumulated for a distance of ten belt revolutions was recorded. The same procedure was followed for double average speed.

The experiment was continued until the subject had driven six trips of ten belt revolutions each. The order of driving speeds was average speed, 50 per cent above average speed, double average speed, double average speed, 50 per cent above average speed, and average speed. Each type of driving was thus used twice.

The steering score for each trip was recorded. There were two trips for each driving speed. The sum of the scores for the two trips was taken as the score for the particular speed.

Results

In order to obtain some index of consistency of measurement, the scores for the first trip were correlated with the scores for the second trip for each speed. The results are shown in Table 1.

Table 1

Correlation Between Scores on First and Second Trips

Driving Speed	*Correlation*
Average speed	.726
50 per cent above average speed	.726
Double average speed	.647

Inspection of Table 1 will reveal that performance is somewhat less consistent at the higher speed. There are probably greater individual differences.

The mean score for the 30 subjects when they were driving at average speed was taken as 100 per cent efficiency. The mean score

for 50 per cent above average speed was divided by the mean score for average speed and the result, expressed as a per cent was taken as the measure of efficiency. Likewise, the mean score for double average speed was divided by the mean score for average speed and again the result, expressed as a per cent, was taken as the measure of efficiency. The findings are summarized in Table 2.

Table 2

Steering Efficiency in Terms of Mean Score at Average Speed

Driving Speed	*Per Cent Efficiency*
Average speed	100
50 per cent above average	58
Double average speed	47

An inspection of Figure 1 will reveal that loss in steering efficiency is not directly proportional to increase in speed. The greatest loss occurred when average speed was increased by 50 per cent.

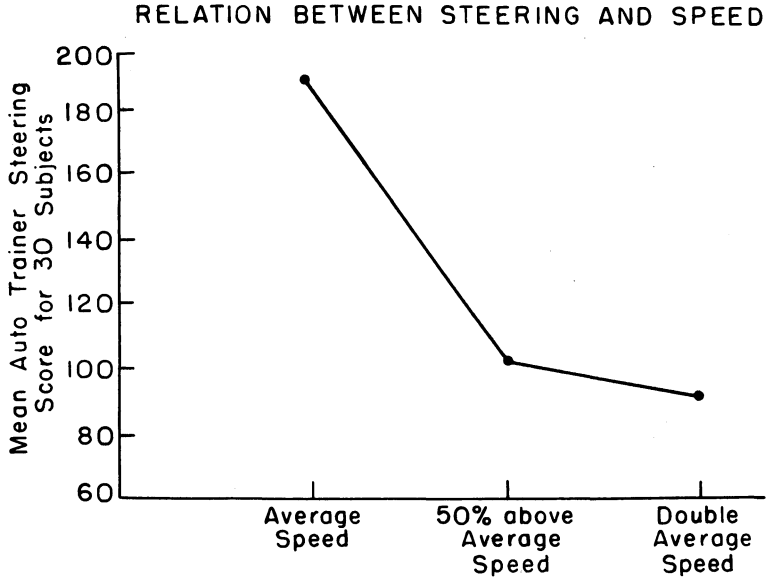

Figure 1

It is noted that over half of the drivers made a lower steering score when driving at average speed after having driven at a higher rate than they did initially. It might be implied that some drivers may not steer as efficiently when they enter a speed zone after having been driving on the open highway as they would had the entire trip been at the same speed. Further investigation would seem warranted.

Conclusions

Within the limitations of the design, numbers of subjects and other conditions of the study, the following tentative conclusions are drawn.

1. Steering efficiency as measured in this study tends to decrease as Auto Trainer speed increases.

2. Decrease in steering efficiency as measured in this study is not directly proportional to increase in speed as simulated on the Auto Trainer.

3. There is considerable loss in steering efficiency at higher driving speeds.

References

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