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An Apparatus for Measuring Reaction Time Under Conditions of Preoccupation*

By RICHARD E. FREY

PROBLEM

It seems axiomatic that visual, auditory, or other stimuli are not reacted to as quickly when the observer is preoccupied. Students of accident prevention have pointed out that laboratory measures of reaction time are not representative of everyday life situations where preoccupation and distractions present an entirely different situation from that of controlled laboratory conditions. The present apparatus was designed to measure various response times under controlled conditions, both with and without preoccupation.

APPARATUS

The apparatus used consists of the following parts: (1) a light-tight, triangular room, or booth, approximately 18 feet at the widest side, 4 feet at the narrowest side, and 16 feet on the equal sides, constructed as the experimental booth and designated as the attention-perception booth, (2) the Iowa State Drivometer, described by Lauer (6) (1932) and (1947), a testing device simulating actual driving in which the subject, or observer, is placed at the steering wheel and controls a miniature car over a moving belt, (3) a miniature landscape surrounding the moving belt on either side and in front in which tracks of an electric train are laid so that it travels over the landscape into view of the observer and is controlled by the experimenter, (4) a warning signal in front and to the right of the driver which may be controlled to flash an amber light at any given time interval before the appearance of the train or to set off green, amber, and red traffic signals periodically during the time of operation of the Drivometer.

RECORDING UNITS AND PROCEDURE

Above the traveling belt seven sets of directions for the subject to follow through are placed on a rotating drum. These are set at a distance of about 11 feet at eye-level of the observer, or "driver." The directions are centered to show through an aperture in the painted landscape surrounding the Drivometer and are uniformly

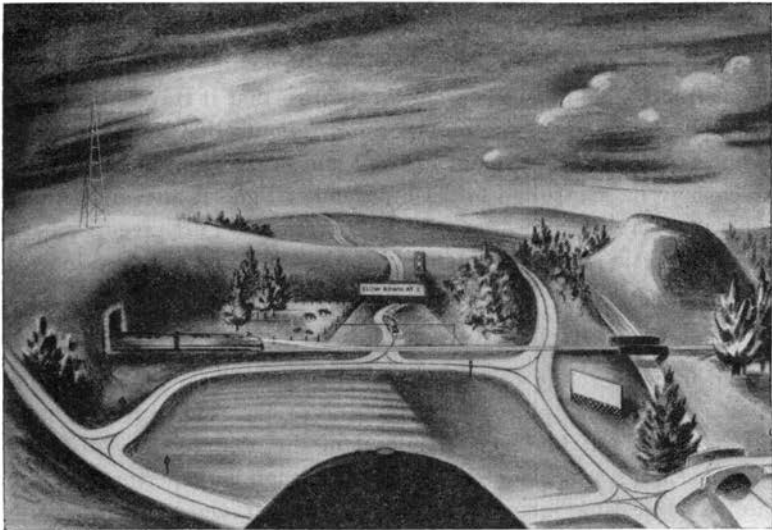
*This study is being carried out in the Driving Laboratory under the direction of Dr. A. R. Lauer through a grant from the Outdoor Advertising Co. of America.

illuminated by Mazda lights. With each revolution of the traveling belt a new set of directions is shown on the drum. The total time for the subject to make a "trip," consisting of seven revolutions of the traveling belt, is recorded by a special electric time clock, the circuit of which is closed when the drum starts to rotate and is opened at the completion of the run, or "trip". Various directions for turning, stopping, backing, and sounding the horn, as well as *Stop* and *Go* signals, are present with each revolution of the belt.

A second record of performance is a measure of the ability of the subject to keep the car in the right-hand lane of the highway. This is recorded by an electric counter; a system of contacts on the belt actuating an all-position switch in the small car being guided by the driver determines the score for the "trip".

The third measure of performance is an accumulation of the time required by the observer to note each set of directions as presented. The subject must respond to the instructions by: (1) inserting a plug in a jack, labelled exactly as the particular set of directions on the drum, in the panel on the right of the operator, and (2) executing the directions. The time that is spent in noting directions and inserting the plug in the proper jack is recorded by means of a 1/100 minute timer in the plug-and-jack circuit.

The illumination may be controlled by two Variacs to insure equal light intensity for all subjects, or to vary the amount of illumination



Landscape for Presenting Varied Stimuli

Most driving situations involve the stimuli of an ever-changing landscape in addition to the operation of controls on the car. Here various elements of the landscape may be controlled as desired for experimental purposes.

for purposes of experimentation. A tape recorder is used to feed in normal traffic and motor sounds heard while driving.

At the beginning of the test the subject is placed alone in the apparatus, given standard instructions by means of a tape recording, and, after a short practice period, allowed to make one "trip" of seven revolutions of the roadway (as described) in which he responds to all stimuli presented as in actual driving.

Next he is asked to continue driving. At irregular intervals while he is driving the electric train appears at the side after a warning signal. His reaction time is measured by a Stoelting Precision Timer which is started with the appearance of the train and stops at the instant his heel is raised from the accelerator. A sufficient number of trials are made to give a stable measure.

Third, the driver merely sits at the wheel and is given another series of trials while merely fixating the warning signal to standardize the point of stimulation in the periphery of vision but when not preoccupied by maneuvering the apparatus. The three conditions are rotated to avoid systematic error.

SUMMARY

An apparatus and procedure are described for measuring reaction time under preoccupation. Conditions simulating actual highway experience are introduced for trials given under preoccupation.

The attention-perception booth may be used for various other problems involving visual measurements, recognition time, efficiency of peripheral vision, and distinction involving perception, attention and motor performance.

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