European Automobile Manufacturers Association

AEBS/LDWS-09-05

Collision Avoidance Warnings on Brake Response Times of Commercial Motor Vehicle Drivers

IG Meeting

Tokyo, 25-29 October 2010

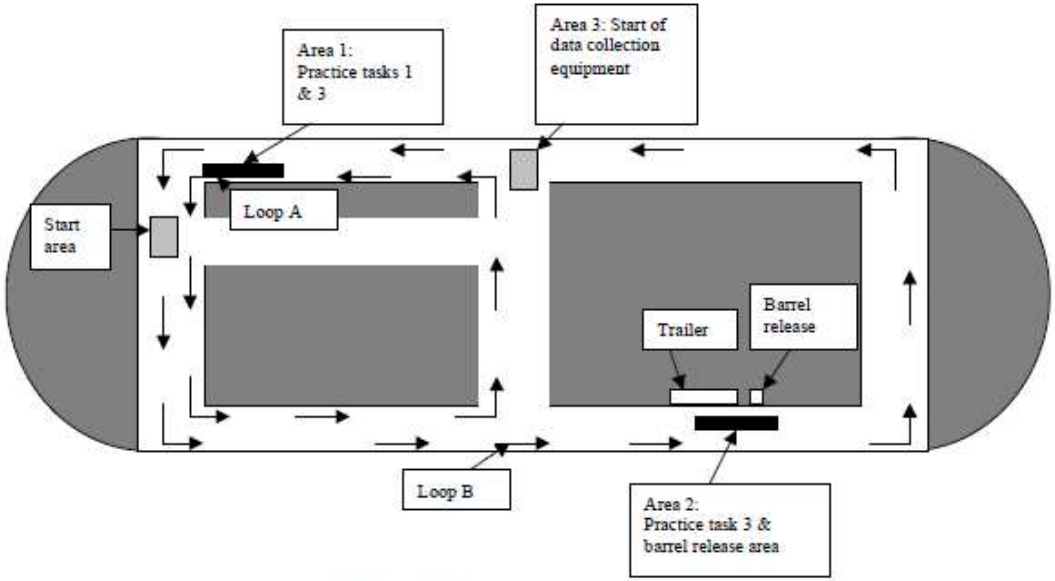
Firstname Lastname

Function

Experimental design

- Warning (3 levels): 3 warning conditions were used in this experiment:
  - No Warning;
  - Auditory - Tire Skid Warning;
  - One Second Brake Pulse Warning conditions;
- Participant Population: 49 participants (professional drivers) took part in this experiment.
  - 14 participants in the No Warning condition;
  - 15 participants in the Auditory - Tire Skid Warning condition;
  - 20 participants in the One Second Brake Pulse Warning condition;

Test Area


Area 1:
Practice tasks 1 & 3
Area 3: Start of data collection equipment
Start area
Loop A
Trailer
Barrel release
Loop B
Area 2:
Practice task 3 & barrel release area

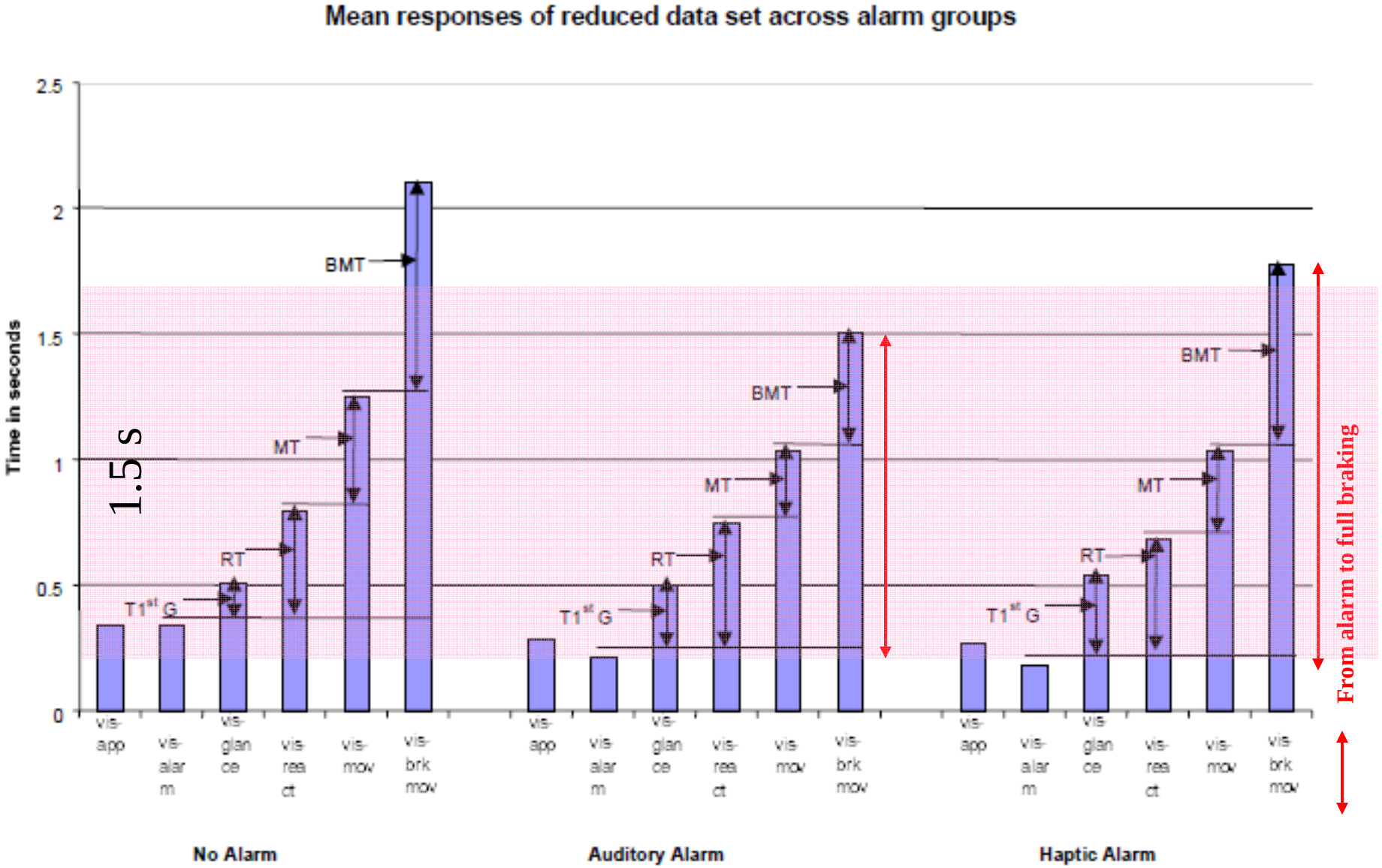
Test Procedure

- Orientation
  - Each experimental session consisted of an orientation segment, experimental testing, and a debriefing segment. The entire experiment lasted approximately one hour.
- Unalerted, Imminent Crash BRT Measurement.
  - After the equipment was turned on, the driver was notified that the experiment begun, and he/she was notified of the first task.
  - The driver was also told that the first task would be completed in area 2, and he/she was instructed to proceed along loop B to area 2.
  - During this task, the barrels were released.

Test Procedure

- Debriefing.
  - The participants were all debriefed at the end of the experiment, where they stopped the truck for the barrels. At this time, the participants were informed of the purpose of the obstacle presentation
- IVIS and Distraction Tasks.
  - The IVIS tasks that were performed during the experiment involved route selection to either a hospital or an airport. The displays used in this experiment were the displays that were found to be the most visually dense. The distraction task was chosen because it was determined to be the most visually dense of the displays. It is assumed that as the drivers continue to perform the tasks, they will be willing to increase the time in which their eyes glance towards the display, thus increasing the chances that their attention will not be directed towards the roadway when performing the distraction task.

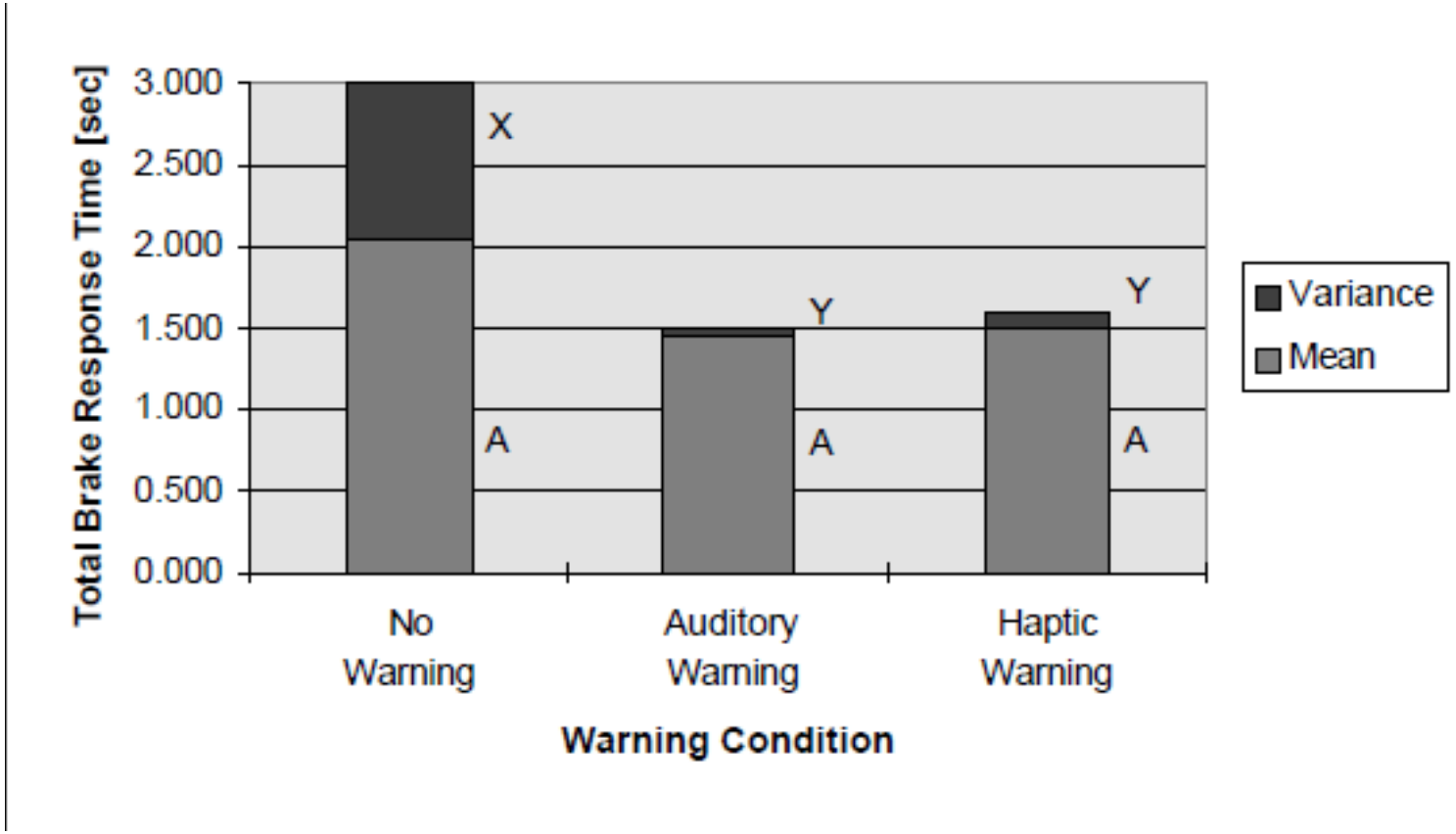
Results


Mean responses of reduced data set across alarm groups
Time in seconds
2.5
2
1.5
1
0.5
0
1.5 s
BMT
MT
RT
T1st G
vis-app
vis-alarm
vis-glance
vis-react
vis-mov
vis-brk mov
From alarm to full braking
No Alarm
Auditory Alarm
Haptic Alarm

note

- RT = Accelerator Reaction Time,
- MT = Movement Time,
- T 1st G = Time to First Glance,
- BMT = Brake Movement Time
- vis - app = time from when barrels are visible to when they appeared,
- vis - warning = time from when barrels are visible to when the
- warning sounded,
- vis - glance = time from when barrels are visible to when the participant's first glance forward occurred,
- vis – react = time from when the barrels are visible to when the participants reacted,
- vis - mov = time from when barrels are visible to when the
- participants first contacted the brake,
- vis - brk mov = time from when barrels are visible to when the participants fully depressed the brake

Results 2


Total Brake Response Time [sec]
3.000
2.500
2.000
1.500
1.000
0.500
0.000
X
Y
Y
A
A
A
No Warning
Auditory Warning
Haptic Warning
Warning Condition
Variance
Mean

Note 2

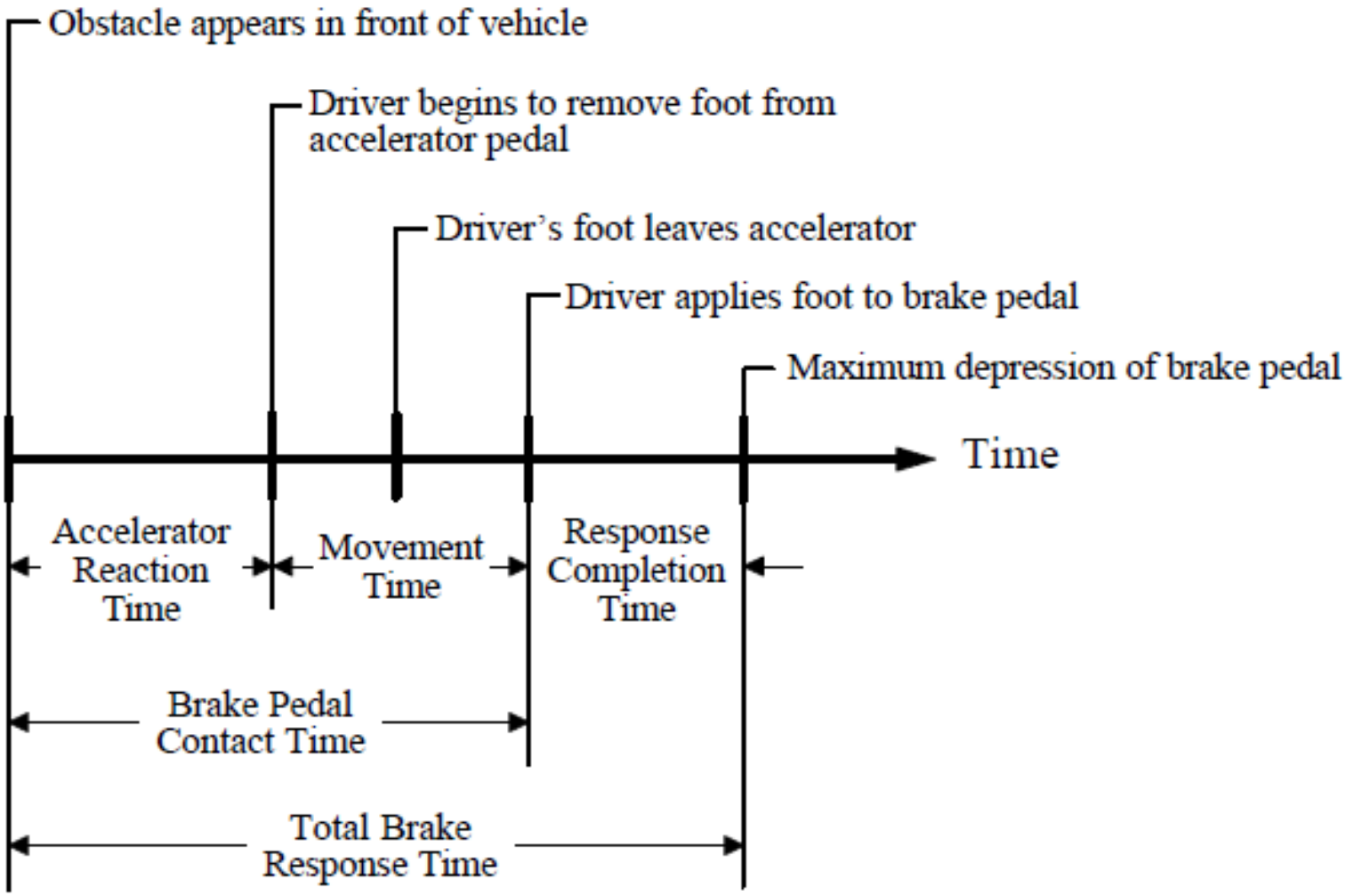


Figure 1. Components of Total Brake Response Time (TBRT).

Bibliography

- AN INVESTIGATION OF AUDITORY ICONS AND BRAKE RESPONSE TIMES IN A COMMERCIAL TRUCK-CAB ENVIRONMENT
  - By John Jacob Winters Thesis submitted to the Faculty of the Virginia Polytechnic Institute and State University in partial fulfilment of the requirements for the degree of MASTER OF SCIENCE in Industrial and Systems Engineering
- AN INVESTIGATION OF COLLISION AVOIDANCE WARNINGS ON BRAKE RESPONSE TIMES OF COMMERCIAL MOTOR VEHICLE DRIVERS
  - By John Shutko Master's thesis submitted to the Faculty of Virginia Polytechnic Institute and State University in partial fulfilment of the requirements for the degree of Master of Science in Industrial and Systems Engineering

Thank you!

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