

UMTRI Technical Report 00-13
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ISSUES

1. What is the effect of HUD message position on response time to messages (and errors), on concurrent driving performance, and on driver subjective preference?
2. What is the effect of driving workload on response time to messages and on concurrent driving performance as a function of message location?
3. How do driver age and gender affect performance?
4. How do drivers tradeoff their performance in the driving (primary) and response time (secondary) tasks?

TEST PLAN

16 Subjects

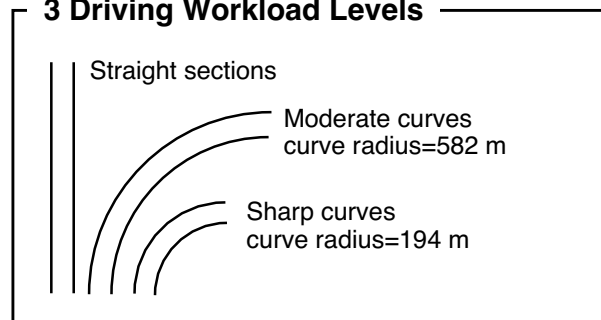
	Female	Male
Young (21-30)	4	4
Old (over 65)	4	4

2 Task Types

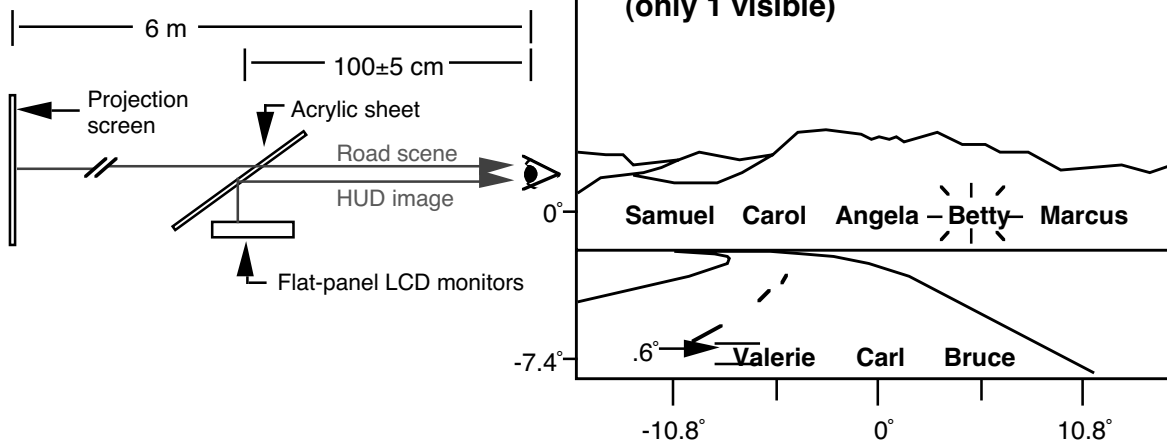
Detection: As soon as a scrambled word appears on the HUD - press the finger mounted switch (only one mounted)

Naming: As soon as a name appears on the HUD - read it, determine if it is male or female, and respond by pressing one of two finger mounted switches

3 Driving Workload Levels

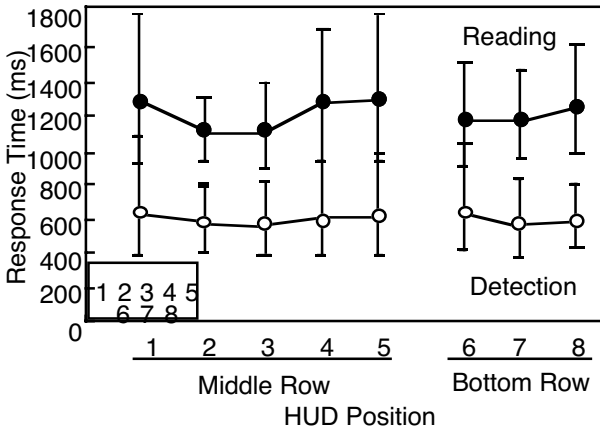


8 HUD Positions (only 1 visible)

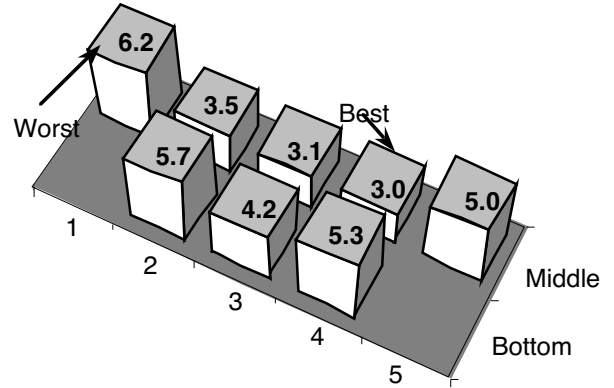


RESULTS

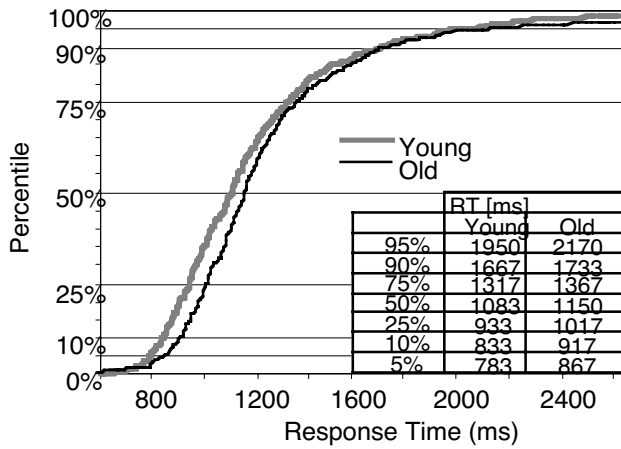
Response time by HUD position



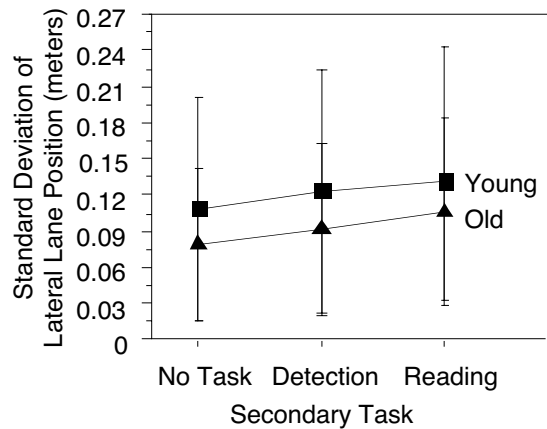
Preference for HUD position



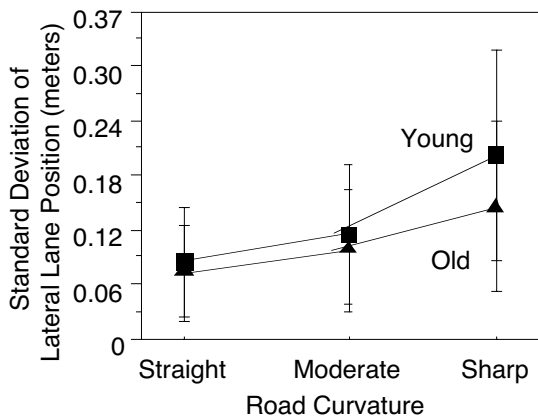
Response time by age



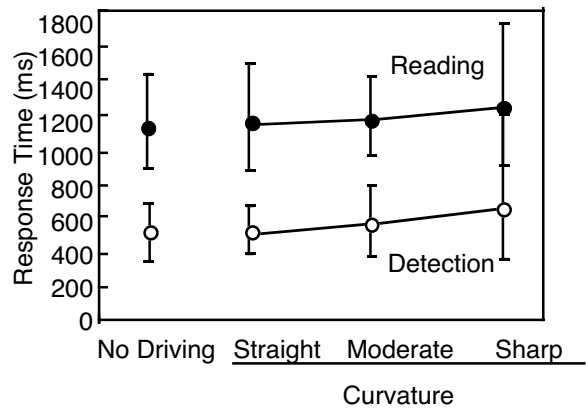
Driving performance by task



Driving performance by curvature

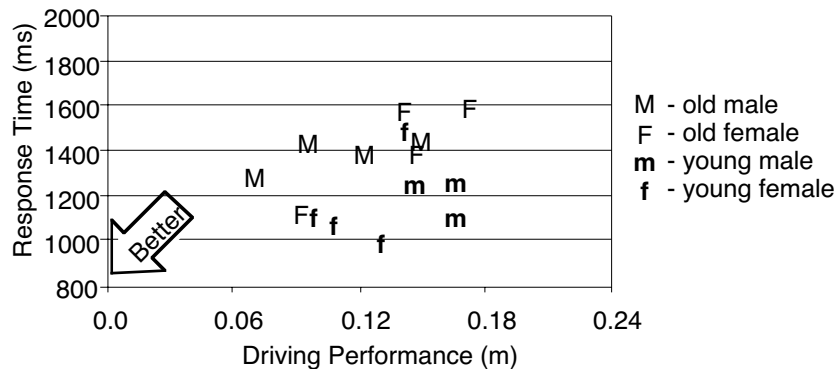


Response time by curvature



RESULTS (CONTINUED)

Tradeoff between response time and driving performance



4 CONCLUSIONS

Overall, the central location and other locations within 5 degrees of straight ahead gave the best performance and were more likely to be preferred, followed by the other two locations on the bottom row. The particular location that is best for a specific application depends upon the relative importance attributed by designers to the measures collected.

Response times to names at the center were faster (1100 ms) than at outer positions (1250 ms), but detection times were not affected by this eccentricity effect.

Driving performance was only degraded when the HUD appeared at the center position.

Subject preferred the center positions of the middle row better than the outer positions or the bottom row.

Sharper curves significantly increased detection time, but there was no additional increase for response time to names.

On sharp curves, more HUD messages were missed, but there were not more errors of pressing the wrong switch.

Driving performance was degraded on sharp curves. The effect of driving workload on driving performance was larger for younger subjects

Subjects reported that performing the HUD task was more difficult on sharper curves.

Old subjects typically performed worse than younger subjects on the HUD task but their driving performance was better