# Driver Response to Peripheral Moving Targets under Mesopic Light Levels

We see differently during the day than during the night. Therefore, the orthodox photometry system, based on daytime vision, is a poor predictor of how well we see at night. The LRC developed the "unified system of photometry," which is based on visual performance and covers photopic (bright) through mesopic to scotopic (dark) light levels.

Using this system, LRC researchers conducted a study to extend fundamental findings about visual performance under mesopic light conditions to a real nighttime driving context.

## Experiment

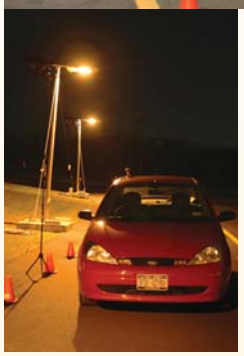
Subjects drove a vehicle along a lighted street while performing a high-order decision-making driving task. Subjects identified the direction of an off-axis moving (detection) target, toward or away from the street, and braked or accelerated accordingly.

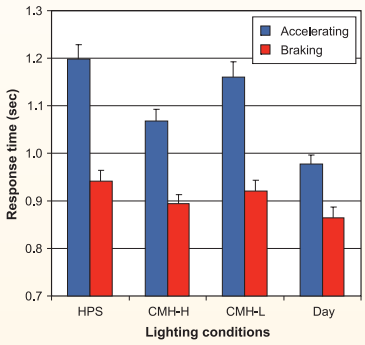
| Lighting condition | S/P ratio | Photopic luminance (cd/m²) | Unified luminance (cd/m²) |
|---|---|---|---|
| 1. HPS | 0.55 | **0.057** | **0.035** |
| 2. CMH_H | 1.17 | **0.057** | 0.065 |
| 3. CMH_L | 1.17 | 0.030 | **0.035** |

**Target luminances under experimental lighting conditions**

The study compared ceramic metal halide (CMH) to high-pressure sodium (HPS) light sources.

The CMH-H lighting condition provided the same photopic luminance as the HPS condition. The CMH-L condition provided a lower photopic luminance but the same unified luminance as the HPS condition. This study was also performed under daytime lighting conditions.




**Mean response times for braking and accelerating**

## Results

The results demonstrated that both braking and acceleration response times for peripheral moving targets decreased as unified luminance increased. Specifically, task performance in this experiment was the same at the same unified luminance, but not at the same photopic luminance.

These findings suggest that unified luminance is a suitable, rectifying variable for different lamp SPDs, not only for simple visual tasks as previously demonstrated, but also for high-order, complex visual tasks.

## Sponsor

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