

CHAPTER 3. PILOT STUDY

As this investigation was a “proof of concept” study, the strobe light chosen for this investigation was intentionally large, bright, and flashed at an optimal rate to maximize any potential positive effects of this type of light. This section describes the informal pilot tests that were conducted to determine the optimal flash rate (as there were several options available) and the one chosen had to be optimal at attracting the attention of a visually distracted driver.

Eight subjects, with a mean age of 29, were taken onto the Smart Road. A Crown Victoria was parked 150 feet away from the subject’s vehicle (a Chevrolet Cavalier). A strobe light was placed in the rear window of the Crown Victoria. The strobe had an intensity of 100 watts and had the dimensions 7.75"x 7.75"x 8." The intensity was variable and so four flash rates were chosen to test their conspicuity to obtain an optimal flash rate.

Subjects were provided with a goniometer (a tool normally used in biomechanic applications to measure angles) to measure the angles at which they were looking away from the roadway. Four different flash rates were chosen (1Hz, 3Hz, 4Hz, 7Hz) and were displayed randomly to the subjects twice while subjects looked left, right and down the midline of the interior of the vehicle. Subjects were asked to turn their head at ninety degrees in three directional planes (to the left, to the right, and vertically down towards the radio). Once the subject’s head was turned at 90 degrees in either of these directions from the light, subjects were asked to slowly turn their eyes towards the flashing strobe positioned in the Crown Victoria. Once they could detect the light and recognize it as a flashing signal, they were asked to read out the value on the goniometer that corresponded with the angle of their eyes to the strobe light in each direction (left, right and midline). The viewing angles that subjects could just detect the strobe were recorded and averages were calculated (see Appendix A, Table A-1).

All of the flash rates provided comparable viewing angles (see Figure 3.1).

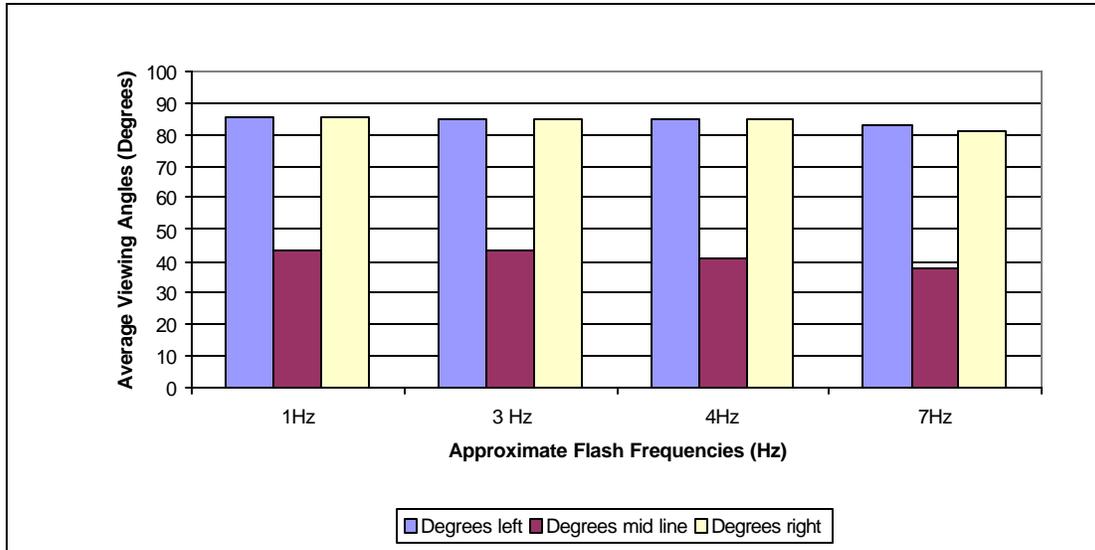


Figure 3.1. Average viewing angles for each flash frequency

However, viewing angles were not the only criteria used to select a flash rate. Urgency also had to be considered. As the viewing angles were so comparable, the urgency rating was given more weight (see Appendix A, Figure A-1). Average urgency ratings were calculated for each frequency (see Appendix A, Table A-2) and are graphed in Figure 3.2.

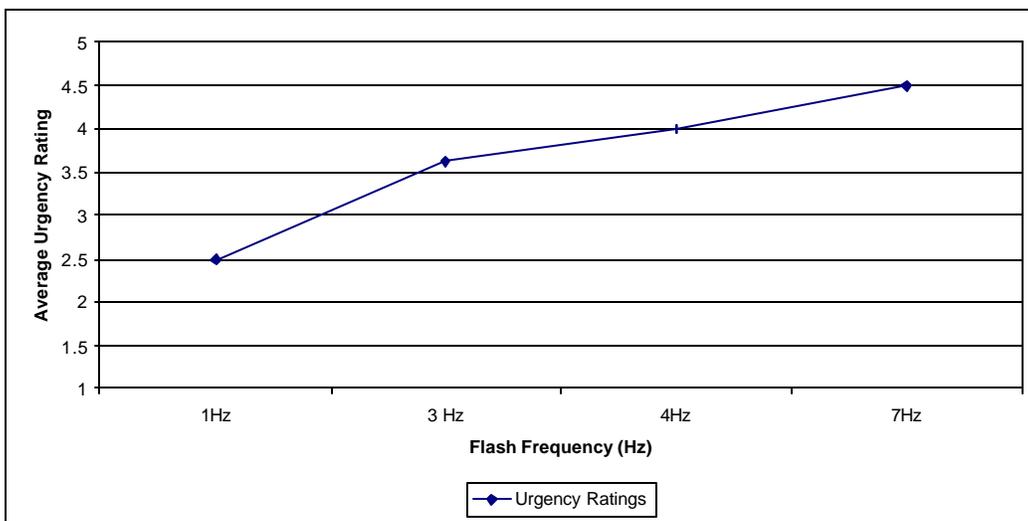


Figure 3.2. Average urgency ratings

This pilot study provided important findings concerning the conspicuity of the strobe light regardless of frequency. The strobe was detected at angles consistently higher than 81 degrees while subjects were looking to the right or left of the signal. When subjects were looking down they were able to see the strobe at visual angles of between 38 and 43 degrees. These angles would mean that drivers would be able to detect the strobe while operating the radio or other controls on the center console. As the strobe has been found to be superior to headlights at attracting attention in psychophysical tests (Howett, 1979), the large angles obtained in this pilot study shows the great potential this strobe had at attracting the attention of a visually distracted driver.

As mentioned in the literature review a good warning should relay to a driver what is wrong and what action to take (Morgan, Chapanis, Lund and Cook, 1963). Therefore, the urgency with which drivers initiate an avoidance response needed to be conveyed. The higher frequencies provided the greater sense of urgency that would engage the driver in the correct timely response. Higher frequencies however, also provided shorter on-off periods that were less conspicuous to drivers. Although 7Hz may have been an optimal choice, it was difficult to administer this frequency rate due to rapid overheating of the equipment. As a result of many trade-offs 4Hz provided the best angles that conveyed an urgent message that would evoke a rapid response from distracted drivers. This rate was also beneficial as it avoided flash rates that could induce seizure, such as flash rates of 10 to 20 flashes per second (the threshold for causing seizures in adults) and 3Hz (potential for causing seizures in children).

The distracter task used in this study was designed with the goal of having about half of the subjects looking down away from the roadway. It was designed to support this stationary pre-test of the light at attracting attention by examining the benefits of the strobe signal in a real life emergency-braking situation.