The Roles of Retroreflective Arm Treatments and Arm Motion in Nighttime Pedestrian Conspicuity

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A naturalistic, nighttime field study was conducted to assess the effects of retroreflective arm treatments, pedestrian arm motion, scene complexity, and pedestrian orientation on detection distances for older drivers. Participants drove instrumented vehicles in real traffic, along a fixed 38-km route, in search of pedestrians wearing one of three retroreflective trimmed safety garments. Participants had no prior knowledge of where along the route pedestrians would be located, nor the number of pedestrians positioned along the route. All of the challenges normally encountered when driving at night on public roadways were present during the study (oncoming traffic, traffic entering the flow, and distracters such as traffic signals, lights, signs, pedestrians, and bicyclists), imposing an ecologically valid level of workload on participants.

The results show that both arm motion and scene complexity significantly affected the distances at which pedestrians were detected at night. Pedestrians with their arms in motion were detected on average 32% farther away than those who stood motionless. Pedestrians located in the low complexity environments were on average detected at distances that were 30% farther than the medium complexity conditions. Yet, there were no main effects of either the type of retroreflective arm treatment or the way the pedestrian was oriented relative to the flow of traffic. Interactions involving arm motion and pedestrian orientation as well as scene complexity and arm motion were found.

Overall, the results of this study continue to support the benefits to pedestrians from wearing retroreflective safety garments when in the vicinity of traffic at night. However, further study is needed to better understand the role of reflective markings in combination with garment background materials on pedestrian conspicuity in daytime conditions and in higher complexity nighttime scenes.