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Acceleration and Deceleration Behavior in the Vicinity of a Speed Camera, and Speed Section Control

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Abstract : Speeding or inappropriate speed is a major problem worldwide, contributing to 10-15% of road crashes and 30% of fatal injury crashes. The consequences of speeding put the driver's life at risk and the lives of other road users like motorists, cyclists, and pedestrians. To control vehicle speeds, governments, and traffic authorities enforced speed regulations through speed cameras and speed section control, which monitor all vehicle speeds and detect plate numbers to levy penalties. However, speed limit violations are prevalent, even on motorways with speed cameras. The problem with speed cameras is that they alter driver behaviors, and their effect declines with increasing distance from the speed camera location. Drivers decelerate short distances before the camera and vigorously accelerate above the speed limit just after passing by the camera. The sudden decelerating near cameras causes the drivers to try to make up for lost time after passing it, and they do this by speeding up, resulting in a phenomenon known as the "Kangaroo jump" or "V-profile" around camera/ASSC areas. This study investigated the impact of speed enforcement devices, specifically Average Speed Section Control (ASSCs) and fixed cameras, on acceleration and deceleration events within their vicinity. The research employed advanced statistical and Geographic Information System (GIS) analysis on naturalistic driving data, to uncover speeding patterns near the speed enforcement systems. The study revealed a notable concentration of events within a 600-meter radius of enforcement devices, suggesting their influence on driver behaviors within a specific range. However, most of these events are of low severity, suggesting that drivers may not significantly alter their speed upon encountering these devices. This behavior could be attributed to several reasons, such as consistently maintaining safe speeds or using real-time in-vehicle intervention systems. The complexity of driver behavior is also highlighted, indicating the potential influence of factors like traffic density, road conditions, weather, time of day, and driver characteristics. Further, the study highlighted that high-severity events often occurred outside speed enforcement zones, particularly around intersections, indicating these as potential hotspots for drastic speed changes. These findings call for a broader perspective on traffic safety interventions beyond reliance on speed enforcement devices. However, the study acknowledges certain limitations, such as its reliance on a specific geographical focus, which may impact the broad applicability of the findings. Additionally, the severity of speed modification events was categorized into low, medium, and high, which could oversimplify the continuum of speed changes and potentially mask trends within each category. This research contributes valuable insights to traffic safety and driver behavior literature, illuminating the complexity of driver behavior and the potential influence of factors beyond the presence of speed enforcement devices. Future research directions may employ various categories of event severity. They may also explore the role of in-vehicle technologies, driver characteristics, and a broader set of environmental variables in driving behavior and traffic safety.

Keywords : acceleration, deceleration, speeding, inappropriate speed, speed enforcement cameras
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