D40 Forensic Motor Vehicle Accident Investigation

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Learning Overview: After attending this presentation, attendees will have gained an awareness of current knowledge regarding the relationship between automobile body paint color and motor vehicle accident prevalence and severity.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by raising awareness of the importance of automobile body paint color and its relationship to motor vehicle accident prevalence and severity.

Engineers have long sought to improve occupant safety by inventing vehicle crash avoidance or crash energy mitigation strategies, structures, systems, or devices. Numerous studies have shown that high center-mounted third brake lights, stability control systems, seat belts, and crush zones (to name a few) help prevent accidents or reduce injury severity. However, few studies have addressed automobile body paint color as a factor. This is unfortunate because automobile body paint color is among the simplest and least expensive means of enhancing vehicle visibility. Despite public demand for increased vehicle safety, automobile body paint color and its relationship to motor vehicle accident prevalence and severity is largely unaddressed.

Color of consumer goods has deep roots in society. From the days when only quality fabrics could take dark dyes to Henry Ford's statement that "…the customer could have any color wanted as long as it was black," color has played a role in consumer choice. Ford's "black" strategy worked for low-cost mass production. Black (and gray) also work as important accent colors in the clothing and automobile industries. Consumers feel these colors suggest dignity, formality, solemnity, and power.

Mid-century consumers witnessed a wider array of automobile body paint colors to show product distinctiveness (two-tone color schemes), owner personality (bright psychedelic reds, pinks, yellows), or increasing technological sophistication (metallic or pearlescent colors enabled by metal particle suspension or multi-layering). Recent (2018) data shows consumer preferences for new automobile paint colors: white: (19.3%), silver (18%), black (12.4%), dark blue (11.4%), dark gray (7.5%), red (7.1%), dark green (6.7%), and brown (5.1%). Since 2006, white has been the primary color choice of the American automobile consumer. The popularity of this color is also increasing internationally.

So what's color got to do with forensic analyses of automobile crashes? Plenty, according to a decade-old study by the Monash University Accident Research Centre. They assessed the relationship between vehicle color and crash risk. Actual crash data reported to police in two Australian states were stratified by vehicle type, light conditions, and legal jurisdiction. The results showed a statistically significant relationship between vehicle color and crash risk. White vehicles had the least reported crashes, and thus the risk of all crashes were indexed to such vehicles. Compared to white cars, black, blue, gray, green, red, and silver were associated with greater crash risk. Crash risk associated with other colors were statistically indistinguishable from white, but this may be a Type II statistical error. The association between vehicle color and crash risk was strongest during daylight hours when relative crash risks were as much as 10% greater for black vehicles compared to white vehicles. The data also suggested that environmental factors are potential covariates modifying the relationship between vehicle color and crash risk. Crash severity was also related to vehicle color: lower visibility vehicle colors were associated with greater risk of more severe crashes.

Strength of the relationship between various automobile body paint colors and crash prevalence or severity was unclear. Although the Insurance Institute for Highway Safety and federal government studies estimated that crash reduction due to Daytime Running Lights (DRLs) is 3% to 5%, DRL data is distinct from automobile paint color data because other factors, such as vehicle shape, size, orientation, surroundings, backlighting, etc., may also be involved in relationship with crash prevalence and severity.

The Uniform Police Traffic Collision Report form includes vehicle color; however, Red, Orange, Yellow, Green, Blue, Indigo, and Violet (ROY G. BIV) type entries are generally insufficient given the wide variety of paint colors (and visibility) with the same name. The investigating forensic engineer should also record the manufacturer's paint code number to identify vehicle color. This code is typically a three-digit number printed (embossed) on the metal specifications tag riveted to the driver's B-pillar. Colors of the surrounding environment at the time of the accident, given the perspective and lighting conditions seen by the observer, also must be documented and considered.

Forensic Motor Vehicle Accidents, Motor Vehicle Body Color, Automobile Visibility

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