C8 Appearances Are Deceiving: Physical Handicaps? Diminished Braking Capabilities

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The goal of this presentation is to show how impressions based upon physical appearance can convey messages regarding potential specific human performance or the lack thereof, but such appearances can be deceiving. This prospective laboratory study quantitatively exemplified this point and showed that the braking abilities of a one-legged driver are indistinct from normal two-legged drivers. Objective testing, not appearances, are needed to quantify the extent (if any) of altered human performance accompanying a physical handicap.

This presentation will impact the forensic science community by presenting results which will clearly show that: 1) certain physical handi- caps are not necessarily the cause of vehicular accidents; 2) individuals can overcome certain physical handicaps to the extent that the resulting human performance is indistinguishable to those without handicaps; 3) objective biodynamic testing is useful to quantify the extent (if any) in which a physical handicap affects performance of a specific task; and 4) visual appearances are poor indicators of human biodynamic performance.

A one-legged truck driver was involved in a fatal vehicular accident. Questions arose regarding his physical ability to adequately brake a commercial tractor-trailer. The specific aim of this study was to test the null hypotheses that there were no differences in the reaction time or the braking time of this driver as compared to other one- and two-legged drivers.

Four truck drivers (two normals and two amputees – including the subject) volunteered for this prospective study. A commercial 18-wheel tractor-trailer was parked in the right lane of an actively used 4 lane commercial track. Accelerometers were fixed to the pedals. A red/green lighting system, similar to a traffic light, was positioned 100' ahead of the driver. Subjects seated themselves and prepared for normal driving. The tractor engine was running, but the vehicle remained stationary at all times. The green light meant "all clear, proceed with normal driving", but the red light meant an emergency stop (no evasive maneuvers allowed). Written instructions were read aloud to each subject before testing, but details of objectives, measurements, analyses, etc. were not revealed. Each subject was asked to "drive" for a period, then within a randomly chosen 5 – 30 second window, an "emergency" (signaled by the red light) would occur requiring braking. Five "practice" braking sessions preceded a set of ten "actual" test measurements. Reaction time (red light to accelerator release) and brake time (accelerator release to brake application) were measured. Subjects did not discuss the experiment. One person converted all voltage- time data and quantified the parameters. Data were analyzed with power analyses and repeated measures ANOVA.

Mean reaction time and total times of the subject were 17.2% ($p=0.006$) and 15.5% ($p<0.001$), respectively, better than the other one-legged driver, but were within ± 4.2% (typically ~1%) of the mean time values observed for either control driver. These results showed that the subject's braking ability was superior to the one-legged driver and indistinguishable from the control drivers.

These data clearly show that a priori assumptions regarding diminished braking performance due to the absence of a lower extremity are gratuitous. Individuals can compensate for physical handicaps in a manner resulting in specific task performance that is indistinguishable from that of the normal population.

Biomechanics, Human Performance, Braking Abilities

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