MORE JUNK SCIENCE IN LOW SPEED IMPACT CASES: The Amount Of Force Needed To Injure Any Single Individual Is Not Known

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The defense engineer's entire analysis in a low speed impact case is founded on the assumption that scientists have proven how much force is required to cause injury to all people and to your patient in particular. The engineers cite a number of human volunteer studies and claim that they have established the level of force required to injury all people, called the "human the threshold of injury." Force is quantified and reported as Delta V.

Delta V is defined as change in velocity. For example, if you are stopped at a red light going 0 mph and then rear-ended with your final top speed at 5 mph, the change in velocity is 5 mph and so the Delta V is 5 mph. If you are going 20 mph and struck from behind and your final top speed is 30 mph, your change in speed is 10 mph and so the Delta V is 10 mph. Defense engineers always report a figure for Delta V and from that figure alone claim they can predict injury likelihood and severity. This is an unfounded, junk science argument.

The truth is that the amount of force needed to cause injury for any particular individual is not known and so no one can predict injury likelihood or severity based on Delta V alone. This is because insufficient human volunteer testing has been performed to date. Here is a typical statement in a report from a defense engineer with the human volunteer tests cited by virtually all engineers across the country, along with the rebuttal language from an actual report prepared for the plaintiff's attorney.

"The defense engineer stated: 'The above biomechanical opinions can be tested by examining the results of human volunteer research.' This would be true if human volunteer testing of adequate number of subjects had been conducted to date. However, examining the engineer's list of studies, one can see that in the eleven studies cited, the number of volunteers tested to date has been insufficient to form conclusions about the entire population or any particular individual. The number of subjects tested per study was 1 in one study, 3 in another, 4 in a third, 5 in three studies, 7 in two studies, 10 in one, 17 in one, and 42 in one. According to the science of statistics, it would be necessary to test hundreds or thousands of individuals to have results that could be applied to any particular individual. (Freeman et al, 1999) This has not been done to date. Because the number of subjects tested in the studies reported by the engineer is so low per study, the results cannot be applied to the entire population or any particular individual and so are meaningless in the context of this case.

Of the eleven human volunteer studies cited by the engineer, see table below, the following seven were published by the Society of Automotive Engineers (SAE): Braun et al, 2001; Fugger et al, 2003; McConnell et al, 1993; McConnell et al, 1995; Szabo and Welcher, 1996; Szabo et al, 1994; and Welcher et al, 2001. SAE takes the position that any opinions or positions advanced by an author of a paper published by SAE are not necessarily statistically representative of the response of the general public. Therefore, one cannot apply the results of these studies to any single individual, yet that is exactly what the engineer has done in his report. Attached to this report is an affidavit from Steven Daum, the legal administrator for SAE, confirming these facts, and confirming that SAE articles are not subject to statistical analysis or methodological scrutiny. (SAE affidavit available online at http://www.azchiropractors.org/pages/medicolegal-biodynamic-research-corporation-low-speed-impact-rebuttal.php, #23).

Table 1: Human Subject Research Data. Rear impacts.

Reference	Subjects M/F/Total	Total Exposures	Age Range	ΔV Range (mph)
Brault *et al.* (1998)	21/21/42	81	20-40	2.5-5.0
Braun *et al.* (2001)	6/1/7	21	29-61	1.5-4.5
Castro *et al.* (1997)	13/4/17	17	26-47	4.0-8.9
Fugger *et al.* (2003)	0/5/5	10	21-26	2.0-6.0
Kaneoka *et al.* (1999)	10/0/10	10	19-29	2.4-2.9
McConnell *et al.* (1993)	4/0/4	20	45-56	2.5-5.0
McConnell *et al.* (1995)	7/0/7	28	32-59	3.6-6.8
Szabo and Welcher (1996)	4/1/5	10	22-54	4.7-6.2
Szabo *et al.* (1994)	3/2/5	7	27-58	5.0
Welcher and Szabo (2001)	2/1/3	30	21-32	2.5-5.0
Welcher *et al.* (2001)	0/1/1	5	33	1.0-5.0
TOTAL	**70/36/106**	**239**	**19-61**	**1.0-8.9**

In 1999, a peer-reviewed journal study was published in *The Spine Journal* entitled "A Review and Methodologic Critique of the Literature Refuting Whiplash Syndrome." It examined each of the studies cited by the engineer and found methodologic flaws. It also concluded that far too few volunteers had been tested to establish a human threshold of injury for all individuals. (Freeman et al, 1999).

Most of these small studies concluded that the threshold for injury was a Delta V of 5 mph. However, consider the 1998 Brault study cited by the engineer. In the largest study, researchers recruited 42 volunteers through the newspaper. They found that approximately 29% of the subjects exposed to the 2.5 mph Delta V forces experienced whiplash associated disorder symptoms, with cervical symptoms and headaches dominating. (Brault et al, 1998)

The authors of this peer-reviewed study had the following extremely important conclusion: "The presence of WAD (whiplash-associated disorder) at the 4km/h (2.5 mph) speed change conflicts with all previously published accounts of low-speed rear-end automobile testing involving human subjects. (18-21) The different results found in our study may be explained by the small sample size, predominately male population, variable age range, variables speed changes (18, 19, 21), multiple impact exposures and failure to perform a complete pre-impact and post impact objective clinical examination in the previous studies. In addition, in all cases, the subjects were either the investigators or professionally associated with the investigators, which could potentially introduce research bias. Although these studies provide the groundwork for understanding occupant response to low-speed rear-end impacts, the results are difficult to apply to any subset of the general population given these limitations." Brault's study found a group with a threshold of injury with a Delta V of 2.5 mph. It is possible when much larger groups are studied, for example 500 rather than only 42, there will be some people found who are injured when the Delta V is lower than 2.5 mph. In addition, there will probably be some people found who can withstand Delta V's over 5 mph and not experience injury. This is because every human body is different.

This means that if the engineer in this case was correct in calculating his figure of Delta V 4.9 mph (and he most certainly was not) and if Ms. Plaintiff falls into the category of the individuals whose threshold of injury is Delta V 2.5 mph then the engineer calculated an injury-producing Delta V in this case. A Delta V 4.9 mph impact is four times more severe an impact than a Delta V 2.5 mph impact using an energy analysis (you must first square the numbers before comparing them – 4.9 squared equals 24, 2.5 squared equals 6.25, 24/6.25 equals 4). Any impact four times more severe than the threshold of injury is considered sufficient to cause

significant injury in some individuals.

Human crash tests certainly have some value. However, the fact that human volunteer crash testing has occurred without serious injury reported in the literature is irrelevant as to whether injury can or has occurred in a specific crash. A crash test in which 5, 10, or even 100 volunteers do not sustain injury simply demonstrates that it is possible to participate in a crash test without significant injury. It does not prove that it is impossible to be injured in any other crash.

Human volunteer crash testing is designed to not produce injury, and the utmost care is taken to insure that injury is unlikely. Real world crashes involve occupants who are typically not prepared for the crash, out of their ideal seating position, with their head rotated, with prior history of injury or other health problems, and a variety of other factors that make them more susceptible to injury than an individual who is sitting in an ideal position in a vehicle waiting for an impact.

Because insufficient testing has been performed on human beings, there is no known Delta V threshold of injury that can be applied to any particular individual. No defense engineer knows the amount of force required to cause injury to the plaintiff in any individual case based on the amount of human volunteer testing performed to date. Without this information, no engineer can accurately predict injury likelihood or severity by calculating a figure for Delta V. Using this argument alone, you can defeat defense engineers in low speed impact cases.

(For all of the arguments to defeat defense engineers, go to http://www.shop.azchiropractors.org/ Dr. Immerman has testified in 64 trials in the past 15 years. His most recent low speed impact trial resulted in a $70,000 plaintiff's verdict. He is available for consultation at 602-368-9496 or aimmerman1@cox.net. Dr. Immerman's MedicoLegal Services is online at http://arizonachiropracticso.intuitwebsites.com/index.html.)

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