

# Biomechanics Information Every Attorney Should Know: Part 2

## Occupant Factors to Consider

In part 2 of this newsletter series, I address some of the occupant factors that should be considered when examining injury potential. Occupant factors, as you may have already figured out, are considerations specifically related to your client and not external factors that also have an effect on your client's injury potential. I have listed the most commonly considered occupant factors although given a specific case history there are likely others which are appropriate. For now, these should be a good start.

- **Awareness:** Some studies have shown that the risk of injury in an unaware occupant can be as much as 15 times greater when compared to an aware occupant. Forget about the old wives tale about relaxed occupants being better off than occupants that brace themselves. The fact is that pre-tensioning the muscles reduces stress on the ligaments and other connective tissues thereby reducing injury potential on vital structures that effect joint stability. Was your client aware if the impending impact?
- **Head Position:** The position of the occupant's head at the time of impact is extremely important both with regard to proximity to the head restraint and in relation to a neutral position. Nearly all research is conducted with test subjects using properly positioned head restraint position with the head in a neutral position looking straight ahead. Rotation, flexion, extension, side bending or any coupling of these movements increases injury potential and has not been adequately studied. What was your client's head position at the moment of impact?
- **Trunk Position:** Similar to head position considerations, an out of positioned torso results in different application of external forces. As an example, a rear end impact collision to a person leaning and twisting to buckle a child seat would result in dynamic loading of joints very different than an occupant with their back against the seat back and sitting midline with a properly adjusted seat back angle. Was your client twisted or bending forward when the impact occurred?
- **Gender:** Females have twice the risk of injury than males. It is presumed to do be related to the average mass of the male body and general muscular conditioning but these contributing factors are not well researched other than the prevalence of the different gender roles.

- **Age:** Increasing age results in increased injury potential. This is likely due to decreased strength and conditioning with age as well as the effects of aging on the body's connective tissues' elasticity and recuperative potential. A person with age appropriate disc degeneration has a greater injury potential than a normally hydrated disc in a 25 year old.
- **Body Morphology and Conditioning:** A short, stocky, muscular person is less likely to have the same injury severity as a tall, deconditioned, lanky person. Similarly, a muscular athlete is less likely to sustain injury than a coach potato. Body morphology (ie. ectomorphic, mesomorphic endomorphic or any combination) and related body mass and conditioning are related to injury potential. As indicated before, this is likely related to gender since most women have a lesser mass than most men.
- **History of Prior Injuries:** A prior injury makes an occupant more likely to sustain a new and more significant injury. Every injury heals with some degree of scar tissue. The scar tissue is less elastic and has less efficient viscoelastic capabilities. This results in a reduced tolerance to withstand rapid application of forces when compared to a previously uninjured occupant. Many prior injuries also are associated with a lowered pain threshold.
- **Co-Morbidities:** Patients with otherwise unrelated medical conditions may be at greater risk. Diabetics do not heal well due to nutritional and vascular issues. Rheumatoid arthritis can result in ligamentous laxity and instability. Late term pregnancy women have hormones released that make ligaments more pliable for child birth degenerative joint diseases result in limitation of ranges of motion and shortening of the joints connective tissues reducing capacity to withstand "normal" movements before failure. The list goes on.
- **Prior Surgery:** Some surgeries, such as spinal fusions, contribute to injury potential by focusing the energy of an impact on the spine levels adjacent to the fusion site. All surgeries result in some degree of scarring which limits the soft tissue's ability to withstand otherwise normal forces such as stretching (:i.e. inguinal hernia surgery). Trauma has the potential to dislodge implanted clips, devices filters, stents, etc.

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