

Biomechanical Accident Reconstruction

Overview

Exponent has considerable expertise in evaluating accidents and injuries. In accidents involving personal injury, biomechanics can be used to reconstruct the accident. A biomechanical accident reconstruction can be especially helpful in events that are unwitnessed or in which witness testimony conflicts about the events leading up to the injury.

The biomechanical accident reconstruction uses the same tools as other reconstruction techniques: the application of engineering principles and the scientific method to the analysis of factual information. The sources of information that distinguish the biomechanical accident reconstruction are the medical records and medical imaging films. These records provide the foundational evidence for the biomechanical accident reconstruction. Biomechanical engineers do not diagnose the injuries; rather, they analyze the diagnoses made by medical personnel and determine the forces, torques, and exact injury mechanisms that created the injuries. Traumatic injuries can be differentiated from chronic or degenerative conditions. The injuries described in the medical records can thus be used as a "damage assessment" for the injured party, separating what happened in the accident from injuries that might have happened due to other causes.



Exponent performs biomechanical accident reconstructions in both collision and non-collision events, involving passenger cars, light and heavy trucks (including SUVs and vans), bicycles, and motorcycles. When performing these types of injury analyses, we use medical data, as well as information from vehicle and scene inspections, accident reconstruction information, crash and sled testing, and computer modeling to answer biomechanical questions related to the use and performance of seats, seatbelts, airbags, roof structures, glazing, child restraint systems, and other vehicle components. We use this information to evaluate occupant kinematics, contacts, and injuries during an event. We use field accident data from the National Automotive Sampling System (NASS), the Fatal Analysis Reporting System (FARS), and

state databases to evaluate relationships between collision, vehicle, and occupant parameters and injury risk. Exponent's biomechanical engineers are also active in the automotive injury research community and have published numerous peer-reviewed articles pertaining to injuries in the automotive environment, addressing areas such as rollovers, glazing, vehicle restraints (seatbelts, airbags), low-energy collisions, and child restraint systems.

Biomechanical engineers can introduce a whole body of evidence beyond what a traditional engineer can testify to, and can reconstruct events leading up to and during non-vehicular injury-producing events. Typical accidents include slips and trips, falls and throws, criminal investigations involving injury or death, workplace injuries, and others. Human injury tolerance information including bone breaking strengths, joint ranges of motion and injury thresholds, and soft tissue properties provide additional evidence beyond what is obtained from the accident scene. Findings related to the user's position and actions at the time of the event are used to address issues related to product use. We use our expertise in pediatric injury and the functional capabilities and the anthropometry of children to evaluate injuries to children and address biomechanical questions pertaining to age-appropriate strength and capability.