



# The Forensic Biomechanics Chronicle: Insights into Motion and Injury

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## DESCRIPTION

Forensic biomechanics is a critical field that connects science and law, offering valuable insights into the mechanics of motion and injury. This discipline applies biomechanics principles to legal cases, particularly those involving accidents, personal injuries and product liability. By analyzing the forces acting on the human body during various incidents, forensic biomechanists assist in reconstructing events and identifying the factors that contribute to injuries. This exploration delves into key concepts and case studies that highlight the importance of forensic biomechanics in understanding motion and injury.

At the heart of forensic biomechanics lies the study of motion, which can be divided into two primary categories: kinematics and kinetics. Kinematics focuses on describing motion without considering the forces that cause it, analysing parameters like position, velocity and acceleration. In a forensic context, kinematic analysis is vital for understanding how a victim moved before and during an incident. For example, in slip and fall cases, kinematic data can help determine how a person's gait and balance were affected by factors such as wet surfaces or obstacles.

Kinetics, on the other hand, examines the forces that produce or alter motion. This includes analysing the magnitude and direction of forces acting on the body during an event. For instance, in motor vehicle collisions, understanding the forces involved can help assess the likelihood of injury based on factors such as vehicle speed and impact angles. Kinetic analysis aids in determining whether an injury could reasonably have occurred given the specific circumstances of the event.

Forensic biomechanics also provides valuable insights into the mechanisms of injury, emphasizing the relationship between motion and injury processes. Every tissue in the body has specific thresholds for injury, which can be influenced by factors like age, health and activity level. By studying how various forces interact with biological tissues, forensic biomechanists can assess whether the forces in a particular incident were sufficient to cause the injuries claimed. For example, in a fall case, biomechanical

analysis might reveal that the forces exerted on the body were too low to cause the reported injuries, challenging the validity of the claims.

Additionally, forensic biomechanical analysis helps identify complex injury patterns resulting from multiple factors. In a sports-related injury, for instance, a combination of improper technique, environmental conditions and pre-existing conditions may contribute to the injury. By examining the interaction of these factors, experts can offer a more comprehensive understanding of how the injury occurred and whether negligence or unsafe conditions played a role.

Several real-world case studies illustrate the practical applications of forensic biomechanics in legal investigations. In one case, a plaintiff claimed severe injuries after slipping on a wet floor in a grocery store. A forensic biomechanist conducted a kinematic analysis of the fall, assessing the angle and forces exerted on the body. The analysis revealed that the individual's footwear and gait significantly contributed to the incident, leading to a settlement that acknowledged shared liability. This case demonstrates the importance of understanding the mechanics of motion in determining liability.

In another case involving a rear-end motor vehicle collision, the plaintiff alleged that the impact caused a severe neck injury. Forensic biomechanists used computer simulations to recreate the collision and analyzed the impact forces and occupant motion. Their findings indicated that the forces involved were insufficient to cause the alleged injury, supporting the defence's argument. This case exemplifies how biomechanics can provide objective evidence to challenge injury claims.

A third case involved an electric tool where design flaws were blamed for repetitive strain injuries. Forensic biomechanists analyzed the tool's ergonomics and assessed the forces exerted during typical use. While the analysis identified potential design improvements, it concluded that the injuries were primarily due to improper usage rather than a clear defect, influencing the court's decision. This case underscores the role of biomechanics in evaluating product safety and user responsibility.

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