

Beyond Porridge

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Ensuring that an expert does not stray too close to medical causation or too far from the facts of the case is vital to getting this evidence admitted.

The “Goldilocks Zone” for Biomechanical Opinions

In the field of astronomy, the term the “Goldilocks zone” refers to the habitable zone around a star where the temperature is just right—not too hot and not too cold—for liquid water to exist on a planet. This concept takes its

name from the nineteenth-century fairytale about a little blond girl named Goldilocks who enters the home of three bears while they are out and eats their porridge and takes a nap. Deciding which of the bowls of porridge to eat, she tested each one to make sure that it was not too hot or too cold. Likewise, she did not want to nap in a bed that was too hard or too soft, so she tried each one and picked the bed which was “just right.”

To be admissible, biomechanical opinions need to fall into a “Goldilocks zone” of their own. Attorneys seeking to offer the testimony of an expert in the field of biomechanics who is not a physician must ensure that their expert’s proffer is not too specific, wandering into the realm of medical causation, or too general, not helping a lay jury. A biomechanical expert who is not a medical doctor must find the middle

ground that is “just right” for the opinions to be admissible.

What Is Biomechanical Engineering?

Biomechanical engineering is a field that combines biological and mechanical engineering principals to understand better how these areas intersect. In a litigation setting, biomechanical engineers are often asked to assess the forces involved in a particular incident and explain the effect that those loads, or forces, would have on the human body. The types of cases in which attorneys have involved biomechanical engineers as expert witnesses are wide ranging, and they include product liability, motor vehicle personal injury, premises liability, wrongful death, and criminal cases.

Biomechanics can be helpful in determining whether a party is embellishing his or her injuries, or whether the acci-



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dent could have occurred in the manner described. For instance, a biomechanical expert can assess whether the force experienced during an accident was sufficient to break a human bone or cause a particular level of head injury. A biomechanical expert can compare the accident forces imparted on the body to everyday experiences such as sneezing, bending over, carrying groceries, or falling from a particular height to give the jury some context for the plaintiff's claims. Looking at the injury sustained, a biomechanical engineer can also discern whether the accident scenario would result in that type of injury, and thus, such an expert can provide valuable assistance in establishing what did or did not happen.

Parties seeking to preclude the admission of expert biomechanical testimony often attempt to label the field as "junk science," arguing that it is neither the field of medicine nor the field of engineering. However, both federal and state courts have largely rejected such arguments as inaccurate and without merit. *See, e.g., Ensley v. Costco Wholesale Corporation*, 1 Wash. App. 2d 852, 856–60 (Wash. Ct. App. 2017); *Kelham v. CSX Transportation, Inc.*, 840 F.3d 469, 471–72 (7th Cir. 2016); *Cabrera v. E. 33rd Street Realty, LLC*, 2018 WL 4470860, at *3 (N.Y. City Civ. Ct. 2018) (noting that biomechanical engineering is not considered "junk science" and the admissibility of testimony regarding the effects of force on plaintiffs from accidents have been consistently affirmed).

Standards for Admission of Expert Testimony

While the standards for the admission of expert testimony vary among jurisdictions, there are certain touchstones that remain constant. Whether in the federal courts that follow *Daubert* as mandatory authority, or in the state courts following *Daubert*, *Frye*, or some other iteration, the key factors for admissibility of expert testimony largely remain the same: qualification to testify competently, reliable methodology, usefulness to the trier of fact, and relevance to the matters at issue in the case.

Challenges to the admissibility of biomechanical expert testimony largely focus on two questions. First, is the biomechanical expert qualified to testify to all the opinions he or she proposes to offer? Sec-

ond, is the proposed testimony useful to the trier of fact? The first question normally concerns whether a biomechanical expert's proposed testimony is too specific in that it impermissibly ventures into the realm of medical causation (*i.e.*, did *this* accident cause *this* injury to *this* plaintiff), while the second question concerns whether the proposed testimony is too general in that it consists of mere precepts of physical science or fails to account for the particularities of the specific injuries or plaintiff at issue (*e.g.*, no allowances for abnormal height, weight, medical history, etc.). To be admissible, biomechanical expert testimony must avoid being too specific by offering medical causation testimony or being too general by ignoring the particular attributes of the given plaintiff or the accident. In other words, it must fall within the biomechanical "Goldilocks zone": not too specific, not too general, but just right.

Not Too Specific

Federal and state courts have frequently held that the testimony from a biomechanical expert who is not a physician that specifically addresses the medical cause of a particular injury is inadmissible as beyond the expertise and qualifications of a biomechanical engineer. Courts generally view specific injury causation testimony as an area that is exclusively reserved for medical doctors. The Sixth Circuit's decision in *Smelser v. Norfolk Southern Railway Company*, 105 F.3d 299 (6th Cir. 1997), is one of the leading cases concerning the limits of a biomechanical engineer's qualification to opine on the issue of specific injury causation. There, an employee brought a claim against his employer, alleging that the employer's negligent failure to maintain the safety equipment in a company vehicle caused him to sustain personal injuries when the vehicle was rear-ended. *Id.* at 301–02. The trial court permitted the plaintiff's biomechanical engineering expert to testify that the defective seatbelt was the direct cause of the specific injuries alleged by the plaintiff. *Id.* The Sixth Circuit reversed the trial court's ruling, stating that while the biomechanical engineer was qualified to render an opinion that made use of his discipline's general principles, described the forces generated in the... rear-end collision, and spoke in

general about the types of injuries those forces would generate... his expertise in biomechanics did not qualify him to testify about the cause of [the plaintiff's] specific injuries.

Id. at 305.

Federal and state courts have explained the precise nature of the limitation on a biomechanical engineer's ability to testify

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on specific injury causation in a number of ways. For example, Virginia state courts view the issue from a statutory perspective. Specifically, Virginia's highest court has held that biomechanical engineers (and other nonmedical doctor expert witnesses) cannot permissibly testify to specific injury causation because doing so is directly analogous to making a medical diagnosis, which, in turn, is a function exclusively reserved for those engaged in the statutorily defined "practice of medicine." *See Hollingsworth v. Norfolk Southern Railway Company*, 279 Va. 360, 364–66 (Va. 2010) (citing Va. Code §54.1-2900, defining the practice of medicine). Other courts have taken a more generalized approach in determining that "biomechanical engineers lack the medical training necessary to identify [and account for] the different tolerance levels and preexisting conditions" that affect different individuals' susceptibility to incur an injury as a result of a given event. *See, e.g., Burke v. TransAm Trucking, Inc.*, 617 F. Supp. 2d 327, 333 (M.D. Pa. 2009) (citing *Bowers v. Norfolk Southern Corp.*, 537 F.Supp.2d 1343, 1377 (M.D. Ga. 2007)). *See also Gostyla v. Chambers*, 176 Conn. App. 506 (Conn. App. Ct. 2017). Nonetheless, however contextualized,

this limitation centers around the fact that specific injury causation is a medical determination, and biomechanical engineers who are not medical doctors are not qualified to opine on this topic.

With this well-recognized limitation on permissible biomechanical engineering expert testimony established, the question becomes, “To what extent may a biomechanical engineer offer causation-related opinions without flying too close to the sun?” The answer reached by most courts is that biomechanical engineers can offer a considerable amount causation-related testimony without exceeding their qualifications. Generally speaking, courts allow biomechanical engineers to testify as to the level of force that was caused by a specific incident and was inflicted on a specific plaintiff’s body during such an incident. Further, biomechanical engineers have been permitted to testify that specific levels of force are capable (or incapable) of causing specific types of injuries.

For example, in *Berner v. Carnival Corp.*, 632 F. Supp. 2d 1208 (S.D. Fla. 2009), a passenger brought suit against a cruise-line company after being physically assaulted by another passenger aboard a ship. The plaintiff sought to offer a biomechanical engineering expert’s testimony that the force of his head hitting the ground was sufficient to cause a brain injury. *Id.* at 1209–10. The biomechanical engineer testified that according to Newton’s laws of physics, the plaintiff’s head would have struck the floor moving at approximately 12 mph, which would have resulted in an impact energy of 56 lbs/ft. *Id.* at 1213. The biomechanical engineer then relied on a medical study on the dynamics of concussive head impacts that stated that concussion can result from head impacts involving forces between 36–44 lbs/ft. *Id.* From this methodology, the biomechanical engineer was permitted to testify that the energy involved in the accident was sufficient to cause an injury of the type suffered by the plaintiff. *Id.* at 1214–16.

Courts across the country are generally in agreement with the *Berner* court’s assessment of the permissible scope of biomechanical causation-related testimony. See, e.g., *Wagoner v. Schlumberger Tech. Corp.*, 2008 WL 5120750, at *1 (D. Wyo. 2008) (“[Biomechanical experts] may, for example, testify as to the forces involved in the... accident

and how those forces may affect an individual or object...”); *Shires v. King*, 2006 WL 5171770, at *3 (E.D. Tenn. 2006) (“[A biomechanical engineer] clearly should be allowed to testify regarding the forces applied to plaintiff’s head... and how a hypothetical person’s body would respond to that force.”); *Bowers v. Norfolk S. Corp.*, 537 F.Supp.2d 1343, 1377 (M.D. Ga. 2007) (“[A biomechanical engineer] may testify as to the effect of locomotive vibration on the human body and the types of injuries that may result from exposure to various levels of vibration.”); *Brown v. Old Castle Precast East*, 2003 WL 22999302 (E.D. Pa. 2003) (allowing a biomechanical engineer to testify that the forces involved were above injury-level criteria for causing mechanical injury to the brain); *Yarchak v. Trek Bicycle Corp.*, 208 F. Supp. 2d 470 (D.N.J. 2002) (finding the biomechanical engineer qualified to testify as to the effect of a bicycle seat design on male anatomy).

Importantly for the product liability defense bar, biomechanical engineers are equally qualified to testify that the forces imparted during a specific incident were insufficient to cause a particular plaintiff’s alleged injuries. In *Thoens v. Safeco Ins. Co. of Oregon*, 272 Or. App. 512, 544 (Or. Ct. App. 2015), the appeals court specifically held that the trial court did not err “in admitting the testimony of a biomechanical engineer that the forces in the collision were insufficient to cause plaintiff’s alleged injuries.” The *Thoens* court permitted this testimony based on a finding that the biomechanical engineer had done the following:

established adequate “knowledge, skill, experience, training [and] education” to qualify him to calculate and testify to the impact speed in the collision, the forces transmitted to plaintiff in her car in the collision, the forces plaintiff’s body experienced in her daily activities before the collision, and the forces generally tolerated by human joints and tissues without injury as reflected in the literature in his field.

Id. Most courts addressing the issue of biomechanical testimony concerning causation-related issues from the defense side agree with the *Thoens* court’s articulation of such testimony’s permissible scope. See, e.g., *Valentine v. Grossman*, 283 N.Y.S.2d 504 (N.Y. App. Div. 2001) (find-

ing biomechanical testimony that forces involved in the incident were insufficient to cause injury was admissible).

Having a thorough understanding of the permissible limits of biomechanical causation testimony is critical for the product liability defense attorney, both as a proponent of biomechanical expert testimony and as the party seeking to limit, preclude, or appeal the admission of such testimony.

As the proponent, an attorney should seek to get as much out of their biomechanical expert in the way of causation-related testimony as possible (*i.e.*, “I have calculated the forces involved in this incident and they are insufficient to cause the type of injury alleged by the plaintiff.”). A medical expert can then take the biomechanical engineer’s testimony over the goal line and into the realm of specific injury causation (*e.g.*, “These findings are consistent with, and indeed corroborate, my conclusion to a reasonable degree of medical certainty that this incident did not cause this plaintiff’s alleged injury.”). Allowing this tandem expert testimony to work hand in glove will make for a powerful presentation to the jury and protect a hard-won defense verdict from challenge on appeal.

As the opponent of biomechanical testimony, the defense attorney should keenly scrutinize any proposed testimony that impermissibly oversteps the line from causation-related opinions to testimony concerning specific, medical causation.

But Not Too General

Although less frequently challenged on grounds of being “too general,” biomechanical opinions or methodologies that do not bear a sufficient nexus to the particular attributes of a specific plaintiff or incident are subject to exclusion on the grounds that such abstract testimony would not be helpful to the jury. In *Eskin v. Carden*, 842 A.2d 1222, 1228 (Del. 2004), the Supreme Court of Delaware held the generalized conclusions of a biomechanical expert that the physics of a particular accident could not cause injury must be applicable to the particular plaintiff before such testimony may be admitted. The court recognized that allowing the finder of fact to take in mere engineering or physics concepts or purported expert testimony that failed to account for a specific plaintiff’s at-

Biomechanics, continued on page 63

Biomechanics, from page 48

tributes, would not be helpful to the jury and would risk confusing the jury. *Id.* at 1231–32.

Approximately one month later, the Delaware Supreme Court expanded on its *Eskin* ruling in *Mason v. Rizzi*, 89 A.3d 32 (Del. 2004). In *Mason*, the defendant sought to offer biomechanical expert testimony stating that the forces generated and imparted during the subject incident would not have been sufficient to cause the back injuries alleged by the plaintiff. *Id.* at 33–34. However, the particular plaintiff in *Mason* had a medical history that included preexisting back ailments. *Id.* at 34. The court ruled that the proposed biomechanical testimony was inadmissible because it failed to account for these particularized characteristics; instead the testimony relied on studies indicating that the forces at issue in the incident would not be sufficient to cause a person without a history of back conditions to incur the specific injuries alleged by the plaintiff. *Id.* at 35–38.

These cases demonstrate that although biomechanical testimony cannot permissibly go so far as to venture into the realm of specific medical causation, the proposed testimony must be tailored to the specific incident, the specific plaintiff, and the alleged injuries to avoid potential exclusion on the grounds that it is too general, and thus, not helpful to the jury. This issue is particularly significant for the defense bar because those defending product liability cases most often will argue that the forces in a given incident were incapable of causing the injuries alleged by a specific plaintiff. Therefore, it is highly important to identify and account for any attributes of a specific plaintiff or incident that distinguish them from the norm.

Conclusion

Biomechanical engineering testimony can be a powerful tool in a product liability defense attorney's arsenal. A scientist who can confirm by citing peer-reviewed studies and by using a reliable, scientific methodology that a minor fender bender or fall cannot cause of the type of catastrophic injury claimed can be invaluable in persuading a jury. Keeping an eye on the "Goldilocks zone" and ensuring that the expert does not stray too close to medical causation or too far from the facts of the case is vital to getting this evidence admitted. 