IN THE SUPREME COURT OF TENNESSEE
AT JACKSON
April 5, 2005 Session

CHARLES BROWN, ET AL. v. CROWN EQUIPMENT CORPORATION, A/K/A CROWN EQUIPMENT CORP.

Appeal by Permission from the Court of Appeals
Circuit Court for Shelby County
No. 97528T.D., C.T. 004539-01 Robert L. Childers, Judge

No. W2002-02228-SC-R11-CV - Filed October 27, 2005

We granted appeal in this products liability action to determine whether the trial court erred in excluding as unreliable the testimony of the plaintiffs' two expert witnesses, a mechanical engineer and a biomechanical engineer, and thereafter granting a directed verdict in favor of the defendant. We hold that the trial court erred in applying the nonexclusive list of reliability factors set out in McDaniel v. CSX Transportation, Inc., 955 S.W.2d 257 (Tenn. 1997). These factors are not mandated in every case in which expert evidence is offered and should not be applied unless the factor or factors provide a reasonable measure of the expert's methodology. We further conclude that the trial court erred in granting a directed verdict in favor of the defendant. Accordingly, we reverse the judgment of the Court of Appeals, which affirmed the trial court's judgment. We remand the case to the trial court for further proceedings in accordance with this opinion.

Tenn. R. App. P. 11 Appeal by Permission; Judgment of the Court of Appeals Reversed; Remanded to the Trial Court

JANICE M. HOLDER, J., delivered the opinion of the court, in which WILLIAM M. BARKER, C.J., and FRANK F. DROWOTA, III, E. RILEY ANDERSON, and ADOLPHO A. BIRCH, JR.., JJ., joined.

Gerson H. Smoger, Dallas, Texas, J. Brent Austin, Lexington, Kentucky, Lisa June Cox, Jackson, Tennessee, and Robert David Strickland, Martin, Tennessee, for the appellants, Charles Brown, Barbara Sue Reynolds, and Howard Reynolds.

Adam T. Sampson and Thomas J. Cullen, Jr., Baltimore, Maryland, and Shannon Edward Holbrook and William W. Dunlap, Jr., Memphis, Tennessee, for the appellee, Crown Equipment Corporation a/k/a Crown Equipment.

Andrew Lawrence Berke and Megan C. England, Chattanooga, Tennessee, for the amicus curiae, Tennessee Trial Lawyers Association.

OPINION

Charles Brown ("Mr. Brown") and Barbara Sue Reynolds ("Mrs. Reynolds") sustained injuries to their left legs while operating two different models of stand-up forklifts manufactured by Crown Equipment Corporation ("Crown"). Mr. Brown and Mrs. Reynolds brought product liability claims against Crown alleging that their injuries were caused by the defective nature of the forklifts. Mrs. Reynolds' husband, Howard Reynolds ("Mr. Reynolds"), sought compensation from Crown based upon loss of consortium.

Prior to trial, Mr. Brown, Mrs. Reynolds, and Mr. Reynolds (collectively "the plaintiffs") as well as Crown filed motions in limine seeking to preclude the opposing parties' experts from testifying at trial. The trial court denied the motions and permitted the experts of both parties to testify at trial. During trial, the plaintiffs presented the testimony of Richard Johannson ("Mr. Johannson"), a mechanical engineer, and Dr. Gerald Harris ("Dr. Harris"), a biomechanical engineer. Both Mr. Johannson and Dr. Harris opined that the injuries of Mr. Brown and Mrs. Reynolds would not have occurred had Crown installed rear doors on the operator compartments of the forklifts.

At the close of Crown's proof, Crown renewed its motion to exclude the testimony of Mr. Johannson and Dr. Harris and moved for a directed verdict on all issues of liability. The trial court excluded the expert testimony of Mr. Johannson and Dr. Harris as unreliable under McDaniel v. CSX Transportation, Inc., 955 S.W.2d 257 (Tenn. 1997). The trial court also granted Crown's motion for a directed verdict, finding that without the expert testimony the plaintiffs failed to establish that Crown was negligent or that its forklifts "were defective or unreasonably dangerous or that the forklifts were not merchantable or fit for the particular purpose for which they were manufactured."

The Court of Appeals affirmed the judgment of the trial court. We granted review.

ANALYSIS

A. Overview of the Admissibility of Expert Testimony

Generally, questions pertaining to the qualifications, admissibility, relevancy, and competency of expert testimony are matters left to the trial court's discretion. McDaniel, 955 S.W.2d at 263. We may not overturn the trial court's ruling admitting or excluding expert testimony unless the trial court abused its discretion. Id. at 263-64. A trial court abuses its discretion if it applies an incorrect legal standard or reaches an illogical or unreasonable decision that causes an injustice to the complaining party. State v. Stevens, 78 S.W.3d 817, 832 (Tenn. 2002).

Tennessee Rules of Evidence 702 and 703 govern the admissibility of expert testimony in Tennessee. Rule 702 states that "[i]f scientific, technical, or other specialized knowledge will substantially assist the trier of fact to understand the evidence or to determine a fact in issue, a

witness qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise." Rule 703 provides:

> The facts or data in the particular case upon which an expert bases an opinion or inference may be those perceived by or made known to the expert at or before the hearing. If of a type reasonably relied upon by experts in the particular field in forming opinions or inferences upon the subject, the facts or data need not be admissible in evidence. The court shall disallow testimony in the form of an opinion or inference if the underlying facts or data indicate lack of trustworthiness.

The trial court, therefore, must determine that the expert testimony is reliable in that the evidence will substantially assist the trier of fact to determine a fact in issue and that the underlying facts and data appear to be trustworthy. In addition to these specific rules, evidence generally must be relevant to be admissible. See Tenn. R. Evid. 401, 402. The issue in the present case concerns the reliability of the testimony of the plaintiffs' expert witnesses, Mr. Johannson and Dr. Harris.

In McDaniel, we listed several nonexclusive factors that courts could consider in determining the reliability of scientific testimony, including

> (1) whether scientific evidence has been tested and the methodology with which it has been tested; (2) whether the evidence has been subjected to peer review or publication; (3) whether a potential rate of error is known; (4) whether . . . the evidence is generally accepted in the scientific community; and (5) whether the expert's research in the field has been conducted independent of litigation.

955 S.W.2d at 265; see also Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579, 593-94 (1993) (applying the first four factors in determining the reliability of scientific expert testimony pursuant to the Federal Rules of Evidence); Daubert v. Merrell Dow Pharmaceuticals, Inc., 43 F.3d 1311, 1317 (9th Cir. 1995) (considering on remand the fifth factor in addition to the first four factors). The McDaniel factors also may be applied to nonscientific expert testimony. Stevens, 78 S.W.3d at 834; see also Kumho Tire Co. v. Carmichael, 526 U.S. 137, 152 (1999) (holding that a trial court may consider the Daubert factors in assessing the reliability of nonscientific expert testimony in accordance with the Federal Rules of Evidence).

In addition to the McDaniel factors, we have identified other nondefinitive factors that a trial court may consider in assessing the reliability of an expert's methodology. One such factor is the expert's qualifications for testifying on the subject at issue. Stevens, 78 S.W.3d at 835. This factor is applicable particularly where the expert's personal experience is essential to the methodology or analysis underlying his or her opinion. We, however, caution that using this factor as the sole basis of reliability would result in a reconsideration of the Rule 702 requirement that the expert witness be qualified by knowledge, skill, experience, training, or education to express an opinion within the limits of the expert's expertise. As a result, the expert testimony would become "perilously close to being admissible based upon the ipse dixit of the expert." Robert J. Goodwin, The Hidden

Significance of Kumho Tire Co. v. Carmichael: A Compass for Problems of Definition and Procedure Created by Daubert v. Merrell Dow Pharmaceuticals, Inc., 52 Baylor L. Rev. 603, 635 (2000); see Gen. Elec. Co. v. Joiner, 522 U.S. 136, 146 (1997) (cautioning against the admission of expert testimony that is connected to existing data only through the "ipse dixit of the expert"). Furthermore, the trial court should distinguish between "'the marginally-qualified full-time expert witness who is testifying about a methodology that she has not employed in real life' and 'the highly credentialed expert who has devoted her life's work to the actual exercise of the methodology upon which her testimony is based.'" Sarah Brew, Where the Rubber Hits the Road: Steering the Trial Court Through a Post-Kumho Tire Evaluation of Expert Testimony, 27 Wm. Mitchell L. Rev. 467, 486 (2000).

Another factor that we have identified is the connection between the expert's knowledge and the basis for the expert's opinion. Stevens, 78 S.W.3d at 835. The purpose of this factor is to ensure that an "analytical gap" does not exist between the data relied upon and the opinion offered. Id.; see Gen. Elec. Co., 522 U.S. at 146 (holding that experts, who opined that the plaintiff's exposure to certain chemicals and toxins in the workplace contributed to his cancer, relied upon studies that either were too dissimilar to the facts of the case or failed to link the cancer with the chemical exposure). This factor is important particularly when the expert's opinions are based upon experience or observations as these areas are not easily verifiable. Stevens, 78 S.W.3d at 834. A trial court, however, may conclude that an expert's opinions are reliable "if the expert's conclusions are sufficiently straightforward and supported by a 'rational explanation which reasonable [persons] could accept as more correct than not correct.'" Id. (quoting Wood v. Stihl, 705 F.2d 1101, 1107-08 (9th Cir. 1983)).

We continue to emphasize, however, that these factors are non-exclusive and that a trial court need not consider all of these factors in making a reliability determination. Rather, the trial court enjoys the same latitude in determining how to test the reliability of an expert as the trial court possesses in deciding whether the expert's relevant testimony is reliable. Kumho Tire Co., 526 U.S. at 152. The objective of the trial court's gatekeeping function is to ensure that "an expert, whether basing testimony upon professional studies or personal experience, employs in the courtroom the same level of intellectual rigor that characterizes the practice of an expert in the relevant field." Id. Furthermore, upon admission, expert testimony will be subject to vigorous cross-examination and countervailing proof. Stevens, 78 S.W.3d at 835; McDaniel, 955 S.W.2d at 265. The weight of the theories and the resolution of legitimate but competing expert opinions are matters entrusted to the trier of fact. See McDaniel, 955 S.W.2d at 265. With these principles in mind, we turn to the trial court's rulings in the present case.

B. Expert Testimony: Trial Court Proceedings

Mr. Johannson is a mechanical engineer with a professional engineering license. In 1970, Caterpillar hired him to aid in the redesign of its sit-down forklifts. While at Caterpillar, Mr. Johannson obtained sixteen patents for various devices on forklifts. In 1989, Mr. Johannson formed Concept Engineering, a private consulting firm that designs various machines for businesses.

Mr. Johannson offered two opinions regarding the circumstances surrounding the injuries to Mr. Brown and Mrs. Reynolds. He testified that: 1) Crown was aware of the problem with left leg injuries and failed to take action to remedy the problem; and 2) a stand-up forklift with a properly latched door would have prevented the injuries suffered by Mr. Brown and Mrs. Reynolds.

The trial court found that it was required to apply all five of the McDaniel factors to Mr. Johannson's testimony.[1] The trial court first found that Mr. Johannson failed to test his door design and offered "no evidence except for his bareboned opinion regarding the pretrial testimony of the plaintiffs, various witnesses and the defendant's accident reports." As to factors two and three, the trial court reasoned that Mr. Johannson's preliminary drawing of a door design could not be subjected to peer review and that the potential rate of error is unknown due to the lack of testing. In examining whether the evidence is generally accepted in the scientific community, factor four, the trial court explained that the scientific community "cannot possibly have any knowledge" of Mr. Johannson's drawing and has rejected Mr. Johannson's proposal to "'just add doors and safety follows'" on prior occasions. Finally, the trial court found that Mr. Johannson had created his preliminary sketch for purposes of litigation. The trial court concluded its examination of Mr. Johannson's testimony by stating,

> The Court does not dispute that the witness is an expert in his chosen field of engineering. The Court would not exclude this if he had any testing to back up his opinions; however, he does not. And the fact that he may be able to make a far more educated guess than a layperson, this does not make his opinion trustworthy.

Dr. Harris is a professor of biomedical engineering at Marquette University where he teaches courses in biomechanical engineering. He is also a licensed professional engineer. Dr. Harris' work as a biomedical/biomechanical engineer involves the application of mechanical engineering principles to the human body and the biomechanics of trauma or the study of the amount of force necessary to cause injuries to different parts of the body. This branch of biomechanics also evaluates the body's position and how the position changes upon the occurrence of an accident or the application of a force. Dr. Harris also serves as director of research in the Department of Orthopedic Surgery at the Medical College of Wisconsin and collaborates with the Shriner's Hospital in Chicago. He supervises two gait laboratories where he examines the movements and forces of a person's legs, as well as a person's ability to stand and maintain balance.

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[1] In its written order excluding the testimony of both Mr. Johannson and Dr. Harris, the trial court stated,

> Tennessee has not adopted the Daubert standards, but instead *requires* a consideration of a nonexclusive list of factors to determine an expert witness's reliability. Among the factors that the Court *must* consider are those set out in the case of McDaniel v. CSX Transp., Inc., 955 S.W.2d 257 (Tenn. 1997), rehearing denied, 955 S.W.2d 257 (Tenn. 1997), cert. denied, 524 U.S. 915 (1998).

(Emphasis added).

Dr. Harris offered opinions as to how Mr. Brown and Mrs. Reynolds were injured. Dr. Harris opined that 1) Mr. Brown and Mrs. Reynolds would not have been injured had their forklifts been equipped with doors; 2) the addition of a door would not increase the chances of injury during a tip-over or off-the-dock accident; and 3) the operator should remain inside the operator's compartment during a tip-over or off-the-dock accident.

As with Mr. Johannson's testimony, the trial court found that it was required to apply all five of the McDaniel factors to Dr. Harris' testimony and addressed each factor in turn. The trial court concluded that 1) the doctor failed to offer support in the form of data and testing of his conclusion that the injuries would not have occurred if the forklifts had been equipped with doors; 2) Dr. Harris' hypothesis had not been subjected to peer review; 3) the rate of error was unknown due to the doctor's failure to test the hypothesis; 4) a determination of whether the evidence is generally accepted in the scientific community could not be obtained due to Dr. Harris' failure to submit any evidence; and 5) Dr. Harris' opinions and conclusions came about through litigation. The trial court reasoned that:

> Dr. Harris has conducted no testing, and he does not purport to rely on any testing which would support any of his conclusions. Dr. Harris has merely relied on his knowledge in the field of biomechanics. And, again, the Court has no reason to question Dr. Harris' expertise as an expert in the field of biomechanics, but more is involved in this case than an expertise in the field of biomechanics. In this type of litigation, where the machinery in question is a highly specialized piece of equipment, an expert witness cannot rely on supposition or theories. An expert testifying that he knows what happened and how it could have been prevented may not do so absent any tests or research or reliable scientific method. Dr. Harris' methodology appears to the Court to be little more than a consideration of the facts presented.

C. Application of the McDaniel Factors to the Testimony of Mr. Johannson and Dr. Harris

In the present case, the trial court concluded that it was required to apply all five of the McDaniel factors in assessing the reliability of the testimony of Mr. Johannson and Dr. Harris. Although a trial court has great latitude in assessing the reliability of expert testimony, we have never required a rigid application of the McDaniel factors in a reliability determination involving scientific or nonscientific expert evidence. See Stevens, 78 S.W.3d at 834; McDaniel, 955 S.W.2d at 265. Rather, we have characterized the factors as a "non-exclusive list" that a trial court "may" consider in determining reliability. McDaniel, 955 S.W.2d at 265.

The rigid application of the McDaniel factors to all expert testimony is problematic because all expert testimony may not "fit" within the factors. We agree with the United States Supreme Court that "we can neither rule out, nor rule in, for all cases and for all time the applicability of the factors . . . nor can we now do so for subsets of cases categorized by category of expert or by kind

of evidence." Kumho Tire Co., 526 U.S. at 150. The reasonableness of the McDaniel factors in assessing reliability depends upon the nature of the issue, the witness's particular expertise, and the subject of the expert's testimony. See Stevens, 78 S.W.3d at 833; see also Kumho Tire Co., 526 U.S. at 150. The McDaniel factors may apply, subject to the trial court's discretion, when they are reasonable measures of the reliability of the expert testimony. Stevens, 78 S.W.3d at 834.

Upon reviewing the record, we conclude that both Mr. Johannson and Dr. Harris based their testimony primarily upon their practical experiences in their respective professions and that the testimony of neither expert fits neatly within the McDaniel factors. An expert may reach a conclusion from observations based upon his or her extensive and specialized experience. Kumho Tire Co., 526 U.S. at 156. Opinions derived in this manner, however, "do not easily lend themselves to scholarly review or to traditional scientific evaluation." First Tenn. Bank Nat'l Ass'n v. Barreto, 268 F.3d 319, 335 (6th Cir. 2001).

1. Testing

In excluding the testimony of Mr. Johannson and Dr. Harris, the trial court emphasized their lack of testing to support their opinions. In rendering their opinions, however, both Mr. Johannson and Dr. Harris relied upon their review of Crown's accident reports and reporting system, tests conducted by Crown, and other documents and materials from Crown. An expert may rely upon both data collected by others and tests performed by others in reaching his or her conclusions. See Gussack Realty Co. v. Xerox Corp., 224 F.3d 85, 94-95 (2d Cir. 2000); Walker v. Soo Line R.R. Co., 208 F.3d 581, 588-89 (7th Cir. 2000); Kinser v. Gehl Co., 184 F.3d 1259, 1272 (10th Cir. 1999). Although Crown expresses disapproval of the conclusions that Mr. Johannson and Dr. Harris drew from this information, the fact that Crown's experts may have reached different conclusions from the same information does not render the testimony of Mr. Johannson and Dr. Harris inadmissible. See Walker, 208 F.3d at 589. Furthermore, Dr. Harris properly relied upon the factual events of the accidents as reported by Mr. Brown and Mrs. Reynolds. See id. at 586 (holding that medical experts may rely upon self-reported patient histories). Any inaccuracies in these events may be explored through cross-examination. Id.

In regard to the testing factor, the trial court also faulted Mr. Johannson's failure to develop and test the sketch of a door that he had presented. We recognize that some courts have excluded expert testimony of a safer alternative design where the expert did not create detailed drawings of the design or perform tests. See, e.g., Zaremba v. Gen. Motors Corp., 360 F.3d 355, 358-59 (2d Cir. 2004). Mr. Johannson, however, did not submit his sketch of a door as a safer alternative design. Rather, Mr. Johannson presented the sketch in connection with his testimony regarding the steps that he maintained Crown should have taken to remedy the problem of left leg injuries resulting from stand-up forklift accidents. Mr. Johannson testified that while he was employed at Caterpillar he participated in the Kepman Traylor Problem Solution Analysis Approach as a method of resolving design issues with its forklifts. One of the steps involved a brainstorming session during which members of a design team would identify possible solutions. Mr. Johannson clearly stated that the purpose of the sketch was to illustrate the activities that Crown failed to perform as part of the

brainstorming stage. Under these circumstances, we do not believe Mr. Johannson's failure to test his sketch renders his testimony inadmissible.

Furthermore, both Mr. Johannson and Dr. Harris testified that Crown has sold models of its stand-up forklifts equipped with doors. The fact that stand-up forklifts equipped with doors have been manufactured and placed on the market diminishes the need for tests, a prototype, and design development. See McPike v. Corghi S.P.A., 87 F. Supp. 2d 890, 893-94 (E.D. Ark. 1999); cf. Jaurequi v. Carter Mfg. Co., 173 F.3d 1076, 1084 (8th Cir. 1999) (expert failed to construct, draw, or test the device or identify any manufacturer who had incorporated the device into its product); Dancy v. Hyster Co., 127 F.3d 649, 651-52 (8th Cir. 1997) (expert did not design the proposed safety device or point to its use on similar machines). Thus, the idea of a stand-up forklift equipped with a door is not merely an untested theory for which there is no support. Rather, it is a design that has been incorporated to some degree by Crown itself.

The trial court also emphasized Dr. Harris' failure to test his conclusions regarding the actions that an operator should take in the event of a tip-over or off-the-dock emergency. Dr. Harris testified that from a biomechanic standpoint, an operator involved in a tip-over or off-the-dock emergency should attempt to regain control of the forklift. If there is no time to react, the operator should stiffen and lean away from the impact zone. Dr. Harris stated that training a wide variety of people to successfully jump off a forklift in the event of an emergency would be impossible due to differing work environments, work surfaces, operating speeds, and physical characteristics and reaction times of operators.

Contrary to Dr. Harris' opinion, safety regulations instruct operators to exit compartments during these types of accidents. When an expert proposes a theory that modifies otherwise well-established knowledge, the importance of testing as a factor in determining reliability is at its highest. Bitler v. A.O. Smith Corp., 400 F.3d 1227, 1235-36 (10th Cir. 2004). In addition to biomechanical engineering principles, Dr. Harris relied upon his observations of a test conducted by John Sevart[2] in which a human being remained inside the operator's compartment of a Yale stand-up forklift equipped with a door during a tip-over. During the demonstration, tip-overs were conducted at smaller angles before a full tip-over was conducted. Dr. Harris stated the operator was not injured during the demonstration and did not appear to have hit his head. According to Dr. Harris, the demonstration illustrated "the use of a door to complete the protection zone in a tip-over environment where the operator . . . [s]tays safe within the compartment of the forklift." Dr. Harris indicated that the results of tests involving human beings are more accurate than the results of tests

[2] John Sevart is a mechanical engineer who did not testify at trial. The plaintiffs contend that the trial court's placement of rigid time constraints along with the trial court's requirements regarding the order of proof prevented the plaintiffs from presenting the expert testimony of John Sevart. According to the plaintiffs, Sevart would have testified regarding the propriety of a compartment door and the tests that he had conducted. The plaintiffs, however, failed to cite to the portion of the record where they sought to present Sevart's testimony and where the trial court denied their request or provided the basis upon which the request was denied. Although Sevart's affidavit is included in the record, the record does not contain an offer of proof by the plaintiffs suggesting that Sevart's testimony would be consistent with his affidavit. Accordingly, we decline to address the issue.

involving dummies due to the biomechanical difference in the reaction of the subjects. Furthermore, Dr. Harris explained that the sit-down forklift industry uses the same process when testing its products. Due to this testimony, we do not believe that the fact of conflicting instructions in the safety regulations alone provides a sufficient basis for exclusion of Dr. Harris' testimony.

2. Peer Review

Although the trial court found that the opinions of neither Mr. Johannson nor Dr. Harris had been subjected to peer review, the lack of peer review does not necessarily render an expert's opinion unreliable. See Daubert, 509 U.S. at 593-94; First Tenn. Bank Nat'l Ass'n, 268 F.3d at 334. "It might not be surprising in a particular case . . . that a claim made by a scientific witness has never been the subject of peer review, for the particular application at issue may never previously have interested any scientist." Kumho Tire Co., 526 U.S. at 151. The trial court failed to indicate whether publication is typical for the methodologies that Mr. Johannson and Dr. Harris purported to employ. The trial court's failure to explain the connection between lack of peer review and the reliability of these experts' testimony prevents us from examining the extent to which this factor affects the reliability of the methodologies employed by Mr. Johannson and Dr. Harris. See Smith v. Ford Motor Co., 215 F.3d 713, 720-21 (7th Cir. 2000). We recognize, however, that Dr. Harris has published numerous articles regarding the principles of biomechanics, even though he has not subjected the application of these principles to forklifts to peer review. With regard to Mr. Johannson, the failure to submit to publication opinions based upon well-established engineering techniques or extensive practical experience, rather than novel methodology, rarely casts doubt upon the reliability of the opinions. See id.

3. Potential Rate of Error

The trial court found that the potential rate of error for the conclusions of Mr. Johannson and Dr. Harris is unknown due to lack of testing. The experienced-based methodology of the two experts, combined with Crown's incorporation of a door on some of its stand-up forklifts, lessens the relevancy of the rate of error factor. See Pipitone v. Biomatrix, Inc., 288 F.3d 239, 246 (5th Cir. 2002) (holding that the rate-of-error factor is not particularly relevant where the expert bases his or her testimony upon first-hand observations and professional experience).

4. General Acceptance

The trial court considered the general acceptance of the two experts' opinions regarding the safety of stand-up forklifts that are not equipped with doors. In its ruling, the trial court referred to safety standards that do not require doors on stand-up forklifts. Those standards include the American Society of Mechanical Engineers (ASME), the Occupational Safety and Health Administration (OSHA), the American National Standards Institute (ANSI), the National Institute for Occupational Safety and Health (NIOSH), and the military. ANSI and ASME are private,

professional organizations,[3] and ANSI's standards are "voluntary."[4] Regulations from both OSHA and NIOSH are applicable to an employer's conduct and not to a manufacturer's conduct. See 29 U.S.C. §§ 651-54, 669-71; see also Minichello v. U.S. Indus., Inc., 756 F.2d 26, 28-30 (6th Cir. 1985). While these regulatory authorities do not mandate the incorporation of a door, they also do not prohibit doors. Cf. Giles v. Miners, Inc., 242 F.3d 810, 812-13 (8th Cir. 2001) (excluding expert testimony regarding alternative design due to various shortcomings including the fact that the design would violate industry design standards). Furthermore, military specifications do not regulate Crown's conduct in designing and manufacturing stand-up forklifts for non-military use. See McEuin v. Crown Equip. Corp., 328 F.3d 1028, 1033 (9th Cir. 2003) ("The military specifications at issue, not having the force of law, could not have required Crown to manufacture its non-military 30RC forklifts to any particular specification.").

5. Research Conducted Independent of Litigation

Finally, the trial court found that the conclusions of Mr. Johannson and Dr. Harris were derived from litigation. Much of their testimony, however, was derived from pre-litigation personal experiences in their respective fields. As a result, the relevancy of this factor is lessened.

Accordingly, we conclude that the trial court erred in holding that application of all five of the McDaniel factors was mandated and in applying the McDaniel factors when the factors did not provide an adequate measure of the reliability of the methodologies employed by Mr. Johannson and Dr. Harris. During the trial, the trial court expressed reservations as to the reliability of the testimony of Mr. Johannson and Dr. Harris. We, however, are unable to separate these expressions from the trial court's mistaken belief that it was required to apply all five of the McDaniel factors. Rather, a trial court need only apply those McDaniel factors that it finds reasonably measure the reliability of the particular expert's methodology. Therefore, we conclude that the trial court erred in excluding the testimony of both Mr. Johannson and Dr. Harris.

D. Directed Verdict

Having concluded that the trial court erred in excluding the testimony of Mr. Johannson and Dr. Harris, we now turn to the trial court's decision to grant Crown's motion for a directed verdict on the plaintiffs' claims that the stand-up forklifts were defective or unreasonably dangerous.[5] We review a trial court's decision to grant a directed verdict de novo, applying the same standards as employed by the trial court. See Gaston v. Tenn. Farmers Mut. Ins. Co., 120 S.W.3d 815, 819 (Tenn.

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[3] See "ANSI Overview," available at http://www.ansi.org/about_ansi/overview/overview.aspx?menuid=1 (last visited Sept. 26, 2005); "About ASME," available at http://www.asme.org/about (last visited Oct. 24, 2005).

[4] See "ANSI Overview," supra note 3.

[5] The plaintiffs also contend that the trial court erred in granting a directed verdict on their failure to warn and failure to train claims. The plaintiffs, however, failed to raise these issues in the Court of Appeals. We decline to address these issues.

2003). We will affirm a directed verdict when the evidence is susceptible to only one conclusion. Childress v. Currie, 74 S.W.3d 324, 328 (Tenn. 2002). We must take the strongest legitimate view of the evidence and accept all reasonable inferences in favor of the nonmoving party. Id. We may affirm the directed verdict "only if, after assessing the evidence according to the foregoing standards, [we] determine[] that reasonable minds could not differ as to the conclusions to be drawn from the evidence." Id. (citation omitted).

Under the Tennessee Products Liability Act of 1978, "[a] manufacturer or seller of a product shall not be liable for any injury to a person or property caused by the product unless the product is determined to be in a defective condition or unreasonably dangerous at the time it left the control of the manufacturer or seller." Tenn. Code Ann. § 29-28-105(a) (1980). Thus, the Act provides for recovery for injuries caused by a product that either is in a "defective" condition or is "unreasonably dangerous." Davis v. Komatsu Am. Indus. Corp., 42 S.W.3d 34, 42 n.7 (Tenn. 2001); Ray ex rel. Holman v. BIC Corp., 925 S.W.2d 527, 529 n.3 (Tenn. 1996). A product is in a "defective condition" if it is "unsafe for normal or anticipatable handling and consumption." Tenn. Code Ann. § 29-28-102(2) (1980). The term "unreasonably dangerous" means that

> a product is dangerous to an extent beyond that which would be contemplated by the ordinary consumer who purchases it, with the ordinary knowledge common to the community as to its characteristics, or that the product because of its dangerous condition would not be put on the market by a reasonably prudent manufacturer or seller, assuming that the manufacturer or seller knew of its dangerous condition.

Id. at (8).

In determining whether a product is defective or unreasonably dangerous as to warrant liability, "the state of scientific and technological knowledge available to the manufacturer or seller at the time the product was placed on the market, rather than at the time of injury, is applicable." Tenn. Code Ann. § 29-28-105(b) (1980). Moreover, "[c]onsideration is given . . . to the customary designs, methods, standards and techniques of manufacturing, inspecting and testing by other manufacturers or sellers of similar products." Id. Evidence of a better, safer, or different design that might have avoided injury is insufficient to establish a design defect. Shoemake v. Omniquip Int'l Inc., 152 S.W.3d 567, 573 (Tenn. Ct. App. 2003). A manufacturer is not required to design a product that is perfect, accident-proof, or incapable of causing injury. See id. Instead, the plaintiff must show that the product was "unsafe for normal or anticipatable handling." Tenn. Code Ann. § 29-28-102(2). The plaintiff also must trace his or her injury to the defect. King v. Danek Med., Inc., 37 S.W.3d 429, 435 (Tenn. Ct. App. 2000).

In granting Crown's motion for a directed verdict, the trial court found that absent expert testimony, the plaintiffs failed to offer evidence that Crown's forklifts were defective. The plaintiffs presented evidence through expert testimony, which we have held to be admissible, that Crown's stand-up forklifts were unsafe for normal and reasonably anticipated handling and use due to the absence of a door. The plaintiffs' experts further testified that the injuries to Mr. Brown and Mrs.

Reynolds would not have occurred had the forklifts they were operating been equipped with doors. Upon viewing the evidence in a light most favorable to the plaintiffs as the nonmoving parties, we conclude that reasonable minds could disagree with the trial court's conclusion that the plaintiffs failed to present proof of a defect.

In determining whether a product is unreasonably dangerous, we have interpreted the Tennessee Products Liability Act of 1978 as providing for two tests: the consumer expectation test and the prudent manufacturer test. Ray ex rel. Holman, 925 S.W.2d at 531. These two tests are not exclusive of one another, and either or both are applicable to claims of unreasonably dangerous products. Jackson v. Gen. Motors Corp., 60 S.W.3d 800, 806 (Tenn. 2001). In the present case, the plaintiffs relied upon the prudent manufacturer test in contending that Crown's stand-up forklifts were unreasonably dangerous.

Under the prudent manufacturer test, liability is imposed "in circumstances in which a reasonably prudent manufacturer with knowledge of a product's dangerousness would not place the product in the stream of commerce." Ray ex rel. Holman, 925 S.W.2d at 532. Thus, the prudent manufacturer test imputes knowledge of the product's condition to the manufacturer and requires proof concerning the reasonableness of the decision of the manufacturer to market the product in light of this knowledge. Id. at 530-31. The buyer's expectations are irrelevant. Id. at 531.

Application of the prudent manufacturer test requires a risk-utility balancing of a number of factors, including (1) the product's usefulness and desirability; (2) the product's safety aspects–the likelihood and probable seriousness of injury; (3) the availability of a substitute product that would safely meet the same need; (4) the manufacturer's ability to eliminate the product's unsafe character without hindering its usefulness or causing the maintenance of its utility to be too expensive; (5) the ability of the operator or user to avoid danger through the exercise of care in using the product; (6) the user's anticipated awareness of the product's inherent dangers and their avoidability; and (7) the feasibility of the manufacturer spreading the loss by setting the price of the product or maintaining liability insurance. Id. at 532-33, 533 n. 10.

In granting a directed verdict in favor of Crown, the trial court held that absent expert testimony the plaintiffs failed to offer proof that Crown's forklifts were unreasonably dangerous. Through admissible expert testimony, the plaintiffs presented evidence regarding the likelihood and probable seriousness of injury to an operator of a stand-up forklift without a door and the operator's inability to avoid the danger. The plaintiffs also provided expert proof that the inclusion of a door would prevent the injury without hindering the overall usefulness and safety of the product. Upon viewing the evidence in a light most favorable to the plaintiffs as the nonmoving parties, we conclude that reasonable minds could disagree with the trial court's conclusion that the plaintiffs failed to present proof that Crown's stand-up forklifts were unreasonably dangerous. Accordingly, the trial court erred in granting Crown's motion for a directed verdict on the plaintiffs' claims that Crown's stand-up forklifts were defective and unreasonably dangerous.

CONCLUSION

We hold that the trial court erred in finding that application of all the McDaniel factors was mandated and in applying those factors when they failed to provide a reasonable measure of the reliability of the experts' methodologies. We further conclude that the trial court erred in granting Crown's motion for a directed verdict on the plaintiffs' claims that Crown's stand-up forklifts are defective and unreasonably dangerous. Accordingly, we reverse the judgment of the Court of Appeals and remand the case to the trial court for further proceedings consistent with this opinion.

Costs of appeal are taxed to the appellee, Crown Equipment Corporation, and its sureties, for which execution may issue if necessary.

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JANICE M. HOLDER, JUSTICE