

What Do Human Factors/Ergonomics Experts Have to Tell Juries That They Don't Know – But May Think They Know?

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Product liability and personal injury litigation frequently involves circumstances where an injury or property damage occurred as humans were interacting with products and/or environments while performing some task. Human Factors/Ergonomics (HFE) professionals are often involved as experts in these cases. The question addressed here is what benefits do juries derive from HFE expert testimony. In this session five panelists with experience as expert witnesses each describe a case that illustrates HFE testimony. Examples of issues addressed are sensory/perceptual limitations, attention capture and capacity, and induced errors. The presentations focus on issues where expert testimony would likely benefit jury understanding technical topics about which jurors may know little about or have misconceptions.

INTRODUCTION

Human factors/ergonomics (HFE) specialists serve as expert witnesses in product liability and personal injury litigation. The rules of jurisprudence are specific about the role of an expert: the role is to educate the trier of fact, the jury (or in some cases, the judge), with regard to information that is beyond their “common sense” or personal experience. Stated slightly differently, the expert is there to educate and/or advise the jurors about matters they cannot be expected to understand or discover on their own. But what do human factors/ergonomics experts have to tell juries that they don't already know – but may think they know? This question is the title and theme of the panel session.

When a mechanical engineering expert gets on the witness stand to tell the jury about some complex hardware design issue, it is generally expected that the jury would not be able to analyze the issue without expert help. Similarly, when a chemist or toxicologist is to testify about the toxicity of some substance, most would agree that the jury probably needs such guidance. But when the HFE expert takes the stand, what does he/she have to say that members of the jury do not know from their lifetime experiences?

Several examples of issues addressed by HFE experts in actual cases are presented. The examples are intended to be representative, but not exhaustive, of topics often

addressed. They are also intended to illustrate topics or issues about which juries often have an incomplete or incorrect understanding. Examples include induced error, attention capacity or overload, sensory and perceptual limitations, incomplete or incorrect knowledge and beliefs, and memory failures. The benefit of HFE expert testimony is to expand and elaborate on important factors relevant to the case and sometimes to correct misconceptions that the jury might otherwise hold.

This article is written in anticipation of a panel presentation followed by a discussion of attendees in a session of the Forensic Professional Group at the 55th Annual Meeting of the Human Factors and Ergonomics Society in Las Vegas, Nevada in September 2011.

SEAT RECLINE – HAZARD PERCEPTION, INDUCED ERROR

Kenneth R. Laughery, Sr.

Jill Davis was riding in the right front passenger seat of a late model vehicle sedan. It was late in the evening, and she and her husband were returning home from an all-day gathering of some friends. Her husband Jack was driving, and she had her seat fully reclined to rest. Both had their seatbelts engaged. As they approached the top of a hill, a vehicle coming over the crest of the hill

towards them was passing another vehicle and was in their lane. Jack swerved to the right, lost control, went off the road, and the vehicle rolled twice. Jill was partially ejected and suffered fatal head injuries. A lawsuit was filed by her husband Jack against the vehicle manufacturer in which a major issue was the hazards associated with riding in a reclined seat while the vehicle is moving. The following information was revealed during discovery:

- When the seatback is fully reclined, the shoulder belt does not contact the torso and the belt restraint is compromised;
- The vehicle manufacturer's promotional materials for the vehicle state "the reclined seat is a comfort feature on long trips."
- The Owner's Manual for the vehicle contained a warning addressing the hazard of having the seat reclined while the vehicle is moving;
- There were no on-vehicle warnings addressing the reclined seat hazard.

The HFE expert witness testified at trial and noted that research relevant to the reclined seat hazard has been carried out. He noted the following findings:

- Studies show that a significant majority of adults report that they have ridden in a vehicle with the seat reclined;
- Studies show that most adults do not perceive the reclined seat as hazardous;
- Studies show that the vast majority of people report that they do not read their vehicle Owner's Manual cover to cover, but use it as a reference document;
- Studies show that if called to their attention (warned), people understand the hazard.

After communicating the above information and findings to the jury, the HFE expert testified that the fact that the seat reclines and is a comfort feature creates a false sense of security; that is, the hazard issue is not known or considered, and certainly not "common sense" or common knowledge. Further, the fact that the reclined seat is comfortable, promoted as a comfort feature, and perceived to be safe is a form of "induced error", where the error is riding with the seat reclined. The expert testified that if the seat is to be permitted to recline, a more adequate warning system is needed.

PROPANE GAS ODOR DETECTION – SENSORY LIMITATIONS

Michael S. Wogalter

Liz Saunders died from an explosion and fire that quickly engulfed her home in a rural area 25 miles south of Topeka, Kansas. She was able to escape the house, but she was seriously burned and died several hours later. A propane gas pipe outside her house near the garden was found to have been broken. Apparently, gas had seeped into the masonry walls of her basement and was ignited by a spark from the clothes dryer that she was starting at the time. Her husband John filed a lawsuit against the propane gas company. Human Factors issues involved two areas: people's ability to smell the gas odorant and hazard warnings provided to consumers.

Propane is an odorless gas. Since people cannot smell it, a chemical, ethyl mercaptan, is added to give it odor to help with leak detection. Some gas companies periodically send customers a scratch and sniff patch so people will learn what odorized propane gas smells like. The gas company serving Liz Saunders only sent these patches to new customers. Liz was a customer for 15 years, and she was not sent the patch.

The odorant warning system is not always effective, because detecting gas by smell is not 100% reliable. An HFE expert testified to the jury describing some the reasons for the possible failure of the odorant:

- Some people are born without the ability to detect some or all odors;
- Illness and syndromes (e.g., colds, allergies) can limit odors from reaching the olfactory receptors;
- Chronological age reduces olfactory sensitivity;
- Competing odors in the environment such as tobacco smoke and cooking smells could disguise, mask, or interfere with detection;
- There could be "odor fade," a phenomenon in which the ethyl mercaptan odorant is lost due to adsorption onto surfaces or absorption into materials;
- There could be "odor fatigue" when the olfactory sense adapts or habituates reducing awareness of the odor's presence;
- People may not smell the odor during sleep;
- People may detect an odor but not recognize it as propane gas.

The expert testified that the above reasons were not adequately communicated to customers by the gas company. Further, the availability of gas detectors was not communicated or encouraged. These detectors create a loud sound warning in the presence of propane gas; thus, given the potential failure of the odorant warning, they are an important component of the warning system.

TRIP AND FALL – PEDESTRIAN PERCEPTION, ATTENTION AND GAIT

Kenneth E. Nemire

On the first day of her vacation, Jean exited a side door of her hotel, walked on a sidewalk and descended a short flight of stairs to the boardwalk below. After enjoying the sights for a few hours, she returned to the hotel the same way. Jean ascended the stairs, took a few steps, stumbled and fell forward onto her right knee, fracturing it. While on the ground, Jean noticed a large crack near her foot that extended across the width of the sidewalk. Jean filed a lawsuit against the hotel for failing to provide a safe walkway.

Jurors may think that because the sidewalk crack was visible, Jean must have been careless to fail to notice the crack and avoid it. However, an HFE expert helped educate jurors about the capabilities and limitations of perception and attention relevant to a seemingly simple task of walking on a sidewalk. Such information may enable jurors understand how anyone might trip over that same crack. Some critical issues that were shared with jurors:

- The crack resulted from the displacement of one section of sidewalk one-half inch over the adjacent section, creating a change in level that would be considered a trip hazard according to gait biomechanics research and various walkway standards. Explanations of how the toes of the swinging foot may clear a walkway by as little as one-quarter inch may enable jurors to understand the hazards of a one-half inch change in level.
- When encountering the displacement from the hotel--the east--Jean approached from the high side of the displacement. From that perspective, she might be able to see a crack in the pavement, but not that there was a change in level. When approaching the displacement from the west, Jean would be able to see the one-half inch vertical face of the displacement. If Jean had noticed the slight

change in elevation as she stepped from the higher to the lower section of sidewalk, there would be no reason for her to remember it. She successfully navigated the slight drop, and the drop would no longer be relevant to her task.

- As Jean returned to the hotel and ascended the stairs, her gaze would be directed straight ahead such that the displacement, four feet east of the top landing, would be out of her field of view. Further, pedestrians expect a clear and unobstructed walkway at a hotel. Such an expectation would decrease the frequency and duration of visual scans of the sidewalk. Unless marked with fluorescent orange paint or some other conspicuity aid, which it was not, the displacement would be less noticeable.
- A trestle cast shadows across the width of the sidewalk. These shadows acted to camouflage the crack, making it even less likely that a pedestrian would notice it.

For most, the act of walking is fairly uneventful and there is little consideration for everything our brain must do to make it so. Cognitive HFE experts possess the unique scientific background that is needed to help explain the complexities of perception, attention and gait that may make the seemingly effortless act of walking go so wrong when confronted by such a small defect in the environment.

MEDICAL DEVICE USABILITY – JUDGING TERMINOLOGY

Alison G. Vredenburg

Plaintiff, Mark Johnson underwent surgery on his right knee. Immediately post-op, his surgeon prescribed “cold therapy” to be used 24/7. Mr. Johnson brought home the cold therapy unit that had been used in the hospital and continued around-the-clock use. The pads for the cold therapy were wrapped around his knee over the dressings (bandage). After a few days, he went to have his knee rechecked by his surgeon; it was black with tissue damage caused by a non-freezing cold injury that required skin grafts. The label on the cold therapy device allows for continuous use; it states, “Common operating temperature is 45° to 55° F for continuous use.” The unit does not allow the patient or clinician to set a specified temperature. The control to “set” the temperature ranges from “Cold” to Coldest.”

An HFE expert testified to a jury describing some of the reasons for this incident:

- The ambiguous control does not give feedback to the user. Nowhere does the device indicate the temperature when the dial is positioned to any given setting.
- The user population has changed as this medical device is now used for home healthcare instead of solely in a clinical environment.
- These users may differ from clinicians in their training, education, English language skills, medication use, etc.
- The users do not have a clear concept of how to interpret non-explicit terms such as “Continuous,” “Cold” or “Coldest.”
- With transfer of training from other types of cold therapy such as ice packs, users may consider this a benign product and may not appreciate the risk of frostbite when the dial is set to “Coldest” with “Continuous” use.
- Safer technologies were readily available.

RAILYARD – PERCEPTUAL LIMITATIONS, MISINFORMATION

Michael J. Kalsher

Mr. “Z”, a truck driver employed by an small, independent trucking company, was performing a work assignment along with a coworker at a busy intermodal railyard. The men had been dispatched by their employer to move empty chassis from the railyard to another facility located 40 miles away. During the second trip of the day, the men had located two chassis parked adjacent to a particular track. Mr. Z connected the tractor he was driving to a chassis and then went to assist his coworker in doing the same. While performing the work, Mr. Z was struck and fatally injured by a relatively slow-moving (approximately 10 mph) train. The subject train, approximately 5,700 feet in length, was shoving (backing up) along the track when the incident occurred. Mr. Z was struck by the first car in the shove and then dragged approximately 100 feet before his body was ejected from the train. The deceased family filed a law suit against the company that was responsible for coordinating the railroad activities.

It is tempting to conclude that, while tragic, most of the blame for this incident could be ascribed to inattention and/or carelessness on the part of the fatally injured person. Discovery revealed the following facts and circumstances: The work at the railyard was actually carried out by several separate entities. One entity had primary responsibility for coordinating the work at the railyard, a second operated the trains, a third focused

solely on loading and unloading the trains and chassis, and a fourth was the independent trucking company that employed Mr. Z. Each of these entities had different and sometimes competing interests and expectations that was frequently the source of considerable disagreement and miscommunication. A physical characteristic of the railyard is sets of yellow lines painted parallel to the tracks that run through the railyard.

The HFE expert testified that there were policies and practices in place at the railyard that did not serve a hazard control function, but instead were contributing factors to the accident. For example, the railyard allowed several different methods for conductors to control a train in a shove move and the method chosen in this instance was a contributing factor to the accident. The expert also opined that laypersons might assume the yellow lines in the railyard serve a safety function; instead, they are intended as an operational guide tied to the operating characteristics of the equipment used to load and unload trains and not for safety. Further, there was no prohibition against placement of chassis inside the yellow lines, nor was there a prohibition barring truck drivers from working inside the yellow lines. A lack of standardization of the location of the crank-arm that lifts/lowers the chassis’ support leg also contributed to the overall problem. Finally, the experts testimony noted that intermodal railyards can be busy, noisy places, and there were a number of contributing factors that required a sophisticated understanding of human sensory, perceptual, and cognitive capabilities and limitations.

GENERAL DISCUSSION

The examples of cases presented here are intended to illustrate expert HFE testimony in product liability and personal injury litigation. There are, of course, issues other than those described here that are encompassed by HFE expertise. Matters involving reaction time, memory failures, physical abilities or limitations, etc. are examples of topics about which HFE experts frequently provide expert testimony.

As noted, the role of the expert in the context of litigation is to educate and/or advise the trier of fact, the jury. However, many of the issues that are the subject of expert HFE testimony, are matters about which jurors will have, or believe they have, information and knowledge. Given the information or knowledge may be incomplete or incorrect; therein lies the challenge and need for the HFE expert.