Rider Behaviour

Ryerson University's THRILL Laboratory is helping to keep amusement park rides safe and enjoyable

Image of Professor Kathryn Woodcock, Ryerson University's School of Occupational and Public Health. Courtesy of Ryerson University.

A trip to a theme park or carnival is often the highlight for families and friends every year. Although amusement riders are rarely injured on rides, most investigation reports have found that the riders behaved incorrectly prior to the accident event. A Canadian researcher is looking to change this through her research on amusement ride safety.

Ryerson University Professor Kathryn Woodcock, School of Occupational and Public Health (OPH), Director of the University's THRILL (Tools for Holistic Ride Inspection Learning and Leadership) lab and a certified professional ergonomist/human factors engineer, is investigating how a ride's features might be adapted to rider behaviour to make the ride experience both safe and enjoyable.

As Woodcock explains "we began the THRILL project focusing primarily on the act of inspecting the mechanical device. It is a complex inspection environment, and expertise takes a while to develop. Our inspection strategy studies are helping us to understand what the challenges are and work toward more appropriate ways to support novice amusement ride inspectors in this job. While we were studying inspection, we began to appreciate the significant role rider behaviour played in the accidents that do occur, and also recognised that it too was an opportunity to apply human factors engineering." (Human factors engineering, also known as ergonomics, applies knowledge about human capabilities and limitations from psychology to physiology, to benefit human performance and well-being).

In several studies, Woodcock and her team have examined media reports of accidents and official investigation reports. They also observed riders on the carnival rides to identify not only what rider actions are putting them into unsafe positions, but why the investigation feedback loop is not preventing those occurrences. Media reports about rider injuries tended to focus on the equipment more than the rider, the rider's social environment, or the riding activity combined. In comparison, official reports included more information, particularly on rider behaviour, both correct and incorrect, than to devices. In the case of contributing factors identified as errors, more than half lacked precise clarification or in-depth exploration by accident investigators. Moreover, many of these 'missing links' in the causal chains could have pointed toward the type of design modifications needed to reduce the incidence of human error.

THRILL studies observing rider behaviour noted that the specific unsafe actions appeared to reflect several patterns. Some actions, such as riding in alternative positions, swinging in seats, or reaching to touch parts of the ride seemed to be efforts to experience more thrilling sensations. Other actions, particularly reaching or leaning out of the seat, waving and making eye contact with a companion on the ground or in another ride vehicle, were classified as socially motivated. Riders sometimes carried loose objects that could be dropped, left property where someone might trip on it, or chewed gum on the ride at risk

of choking. These actions were examples of focusing on the benefits to conservation of effort or property rather than the negative safety implications. Some errors were not mistakes at all, but simply physical slips, when the action was too difficult for the guest, such as closing a lap-bar latch while a finger was in the way, or stumbling on an uneven step.

"We commonly see strategies of signage and restraints used in response to human errors," says Woodcock, adding "this treats all errors alike, and there are many different types of errors. Errors are often treated as poor decisions but many errors are not decisions at all. People forget things, or never knew the thing in the first place, or try to do a thing and fail to execute it correctly. Particularly in this setting where many guests are children, most guests are distracted with having fun and socializing, rather than choosing to take a risk. Even the guests who are conscious of 'bending' a rule believe that the action is safe, because it seems possible and likely to accomplish their immediate goal, and perhaps they have done it before or seen others do it."

Children and adolescents are a major segment of the market for amusement rides. Woodcock points out that the primary 'job' of childhood is to learn what is and isn't possible. "Children are urged to confront their fears and test their boundaries. This is how we learned and it is how they learn." Curiosity and mistaken inferences are major factors in child rider errors on amusement rides. For instance, a popular children's ride is a replica train that loops two or more times around a track. Woodcock notes that it is common to see children on their second loop of the track begin looking at the undercarriage of the train or reaching to touch interesting-looking scenery. Once they have seen the route, their curiosity turns to other things. Unfortunately, this exposes them to risk of ejection in a sharp turn of the track, or to finger injuries. While the basic structure of the ride is classic equipment, Woodcock suggests that a creative solution might be adding new show effects that would keep their interest through the second loop.

Patrons can often make mistaken inferences about safe behaviours based on the appearance of the ride. Woodcock used the example of inflatable slides, often treated as trampolines because they respond like trampolines when a child jumps on them. Parents don't give their safety a second thought because the inflatables resemble safety cushions used in sports such as track and field or gymnastics.

Ride owners may be exasperated that children disregard posted safety warnings and their parents don't correct them, but the properties of the device are telling the children that those actions are possible and no harm will come to them. Consistent attendant supervision is therefore critical.

Woodcock expresses reservations about attraction operators relying on warnings and instructions. While these are essential, "parks and fairs market themselves as the place for guests to fulfill their social and sensory goals, and it doesn't seem feasible at the last minute before taking a ride to try to talk the guest out of any part of those goals." Besides, she points out, by the time the ride is underway, the sights, sounds and sensations of the ride can dominate the rider's attention to the point that even the best intentions can be forgotten. The ride ideally must communicate safe boundaries in "real time". "If something is unsafe, it should seem unsafe or at least undesirable or ineffective in relation to the guest's goals," recommends Woodcock.

Another strategy she recommends for attraction operators is 'behaviour shaping' by anticipating guests' goals and providing rewarding and safe options to achieve those goals rather than focusing on preventing the rider from pursuing those goals. She cites the classic 'teacup' ride as an example. The spin-control wheel keeps the rider's hands inside the vehicle. The very guests who would be inclined to enhance their thrill by improvising alternative postures would find the thrilling spinning comes to a stop if they were not properly seated and holding the wheel.

Innovation continues in the amusement industry, and many new amusement devices have adapted to riders' goals and intuition in various ways. For instance, floorless coasters provide a thrill effect while removing the structure riders can push against to raise off the seat. Target-shooting show effects in dark rides keep the guest both cognitively engaged with the ride and rewarded with an activity they can share with companions. New customisable ride experiences are another innovation to tailor the sensory experience to the appetite of the guest. The challenge is to find which minor enhancements can be incorporated into the beloved legacy rides to reduce incidence of specific errors.

To support better analysis of rider injury events, Woodcock and her researchers have developed an error-tracing method for their research, and are currently adapting this as an interactive menu-based tool to assist accident investigators who may have little knowledge of human-factors engineering. Using this tool, investigators will know immediately whether or not they have collected enough information to classify a particular rider error. The tool will also advise these investigators how to further probe factors contributing to these errors and suggest appropriate solutions, leading to better quality data and improved evidence-based interventions.

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For more information go to www.ryerson.ca/thrill