Do We Compensate for Safety?

When people feel more protected do they adjust their behavior and take more risks? For example, does protection from safety belts, air bags, and antilock brakes lead to more risky driving? This is one of the most controversial questions in the field of safety. It's an issue many safety professionals ignore or deny. Obviously, the notion that an individual's behavior could off-set the safety benefits of personal protective equipment (PPE) is extremely repugnant to a safety professional. Could this mean that efforts to make environments safer with engineering innovations are useless in the long run? Are vehicle safety belts and air bags responsible for increases in vehicle speeds? Does this mean that laws and policy to enforce safe behavior in one situation will actually provoke off-setting at-risk behavior in another situation? Do we compensate for safety perception?

Theory and Common Sense

In recent years, the issue of compensating for safety has been given several different labels (including risk homeostasis, danger compensation, risk-offsetting behavior, and perverse compensation) and has caused quite a stir in the world of injury control. Whatever the label, the basic idea of risk compensation is quite simple and straightforward. People are presumed to adjust their behavior to compensate for changes in perceived risk. Thus, if a job is made safer with machine guards or the use of personal protective equipment, people might reduce their perception of risk and thus perform more at-risk behaviors.

The notion of taking more risks to compensate for increased protection from injury certainly seems intuitive. In fact, I bet every reader has experienced the phenomenon. I can clearly remember the increased risks I took after donning a standard high-school football uniform. With the protective helmet and shoulder pads, I'd willingly throw my body in the path of another player or leap into midair to catch a pass. I did not perform these behaviors until perceiving security from the personal protective equipment. (PPE).

Today I experience risk compensation of a different kind on the tennis court. If I get ahead of my opponent by a few games, I increase my risk tolerance and take more chances (e.g., by hitting out for a winner or going to the net for a volley). On the other hand, when I get behind my opponent by two or more games, I play more conservatively from the base line. Thus, I adjust the risk level of my tennis game depending on my opponent's skills and the score of the match. I'm sure you can apply my personal experience on the tennis court to a number of competitive or recreational activities in your life. So, how can the phenomenon or risk compensation (or risk homeostasis) be denied?

What About Research?

There is, in fact, scientific evidence that risk compensation (or risk homeostasis) is real; as our intuition or common sense tells us. However, the off-setting or compensating behavior does not negate the benefits of the protection from engineering intervention. Although football players increase risky behaviors when suited up, for example, they sustain far fewer injuries than they would without the PPE, even if the lack of protection reduced their risk taking substantially. More importantly, if people change the level or risk they are willing to accept (as when safety becomes a value), then risk compensation or risk homeostasis is irrelevant. I'll explain this "good news" further, but first let's look more closely at research evidence for the phenomenon.

Comparisons Between People

The notion of risk compensation made its debut among safety professionals following the theorizing and archival research of a University of Chicago economist -- Dr. Sam Peltzman. Peltzman systematically compared vehicle crash statistics before (1947-1956) versus after (1966-1972) the regulated installation of safety engineering innovations in vehicles (including seat belts, energy absorbing steering columns, padded instrument panels, penetration-resistant windshields, and dual braking systems). As predicted by risk compensation theory, Peltzman found that the vehicle-manufacturing safety standards had not led to a reduction in the frequency of crash fatalities per miles driven. Perhaps the most convincing evidence of risk compensation

was that the cars equipped with safety devices were involved in a disproportionately high number of crashes.

Peltzman's article has been criticized on a number of counts, primarily statistical; but it did stimulate a number of follow-up investigations. Dr. John Adams of University College, London, UK, for example, compared traffic fatality rates between countries with versus without safety-belt use laws. His annual comparisons (from 1970 to 1978) showed dramatic reductions in fatal vehicle crash rates after countries introduced seat-belt use laws. Taken alone this data would lend strong support to the seat belt legislation. However, the drop in fatality rates was even greater in countries without safety-belt use laws. Apparently, the large-scale impact of increased use of vehicle safety belts has not been nearly as beneficial as expected from laboratory crash tests. Risk compensation has been proposed to explain this discrepancy.

There are obviously numerous possible explanations for the fluctuations in large data bases compiled and analyzed by Drs. Peltzman and Adams, including changes in the economy, improvements in vehicle performance, and media promotion of particular life styles. Regarding safety-belt legislation, for example, it's generally believed that the safest drivers are the first to comply with a belt-use law. Therefore, the most prominent decrease in injuries from vehicle crashes won't occur until the remaining 30% buckle up -- those currently resisting belt-use mandates. In fact, research has demonstrated reduced compliance with safety rules and policy among individuals more apt to practice at-risk behaviors.

Finding different characteristics among people who comply with a safety policy versus those who do not, certainly weakens the case for risk compensation in studies that compared people's risk behaviors across large data sets. Behavioral scientists call this a between-group design, and it can only indirectly test the occurrence of risk compensation. Given that risk compensation theory predicts that individual increase their risky behavior after perceiving an increase in safety or security, the theory can only be tested by comparing the same group of individuals under different conditions. Behavioral science researchers call this a within-subject design.

Within-Subject Comparisons

Most within-subject tests of risk compensation theory have been restricted to simulated laboratory investigations. This is obviously the case because within-subject observations under different risk conditions are time consuming and quite difficult to pull off in a real-world situation. One such study was conducted by Dr. Fredrick Streff and me in 1987. To conduct this research we built an oval clay go-kart track (about 100 meters in circumference) and equipped a 5-hp go-kart with an inertia reel type combination shoulder-lap safety harness.

Subjects were instructed to drive the go-kart around the track quickly, but at a "comfortable" speed. The 56 subjects were either buckled or unbuckled in the first of two phases of 15 driving trials. After the first phase, the safety condition was switched for half the subjects. That is, the safety belt was unbuckled from subjects previously buckled up, or the belt was used by subjects who previously did not use it. The speed and accuracy of each subject's driving trial were systematically measured. Following the first and second phases (of 15 trials each), the subjects completed a brief questionnaire which assessed their perceived risk while driving the go-kart.

The between-subject comparisons showed no risk compensation. That is, the subjects who used the safety belt for all trials did not drive faster than subjects who never used the safety belt. And, the perceptions of risk were not different across these groups of subjects. On the other hand, the within-subject differences did show the predicted changes in risk perception and behavior. That is, subjects reported feeling safer when they buckled up, and subsequently drove the go-kart significantly faster than subjects who used the safety belt during both phases. The subjects who took off their safety belts reported a significant decrease in perceived safety, but this change in risk perception was not reflected in slower driving speeds (compared to drivers who never buckled up in the go-kart).

Our go-kart study was later followed up in the Netherlands using a real car on real roads. Specifically, habitual, "hard-core" non-users of safety belts buckled up at the request of the experimenter. Compared to measures taken when not using a safety belt, these buckled-up

drivers drove faster, followed more closely behind vehicles in front of them, changed lanes at higher speeds, and braked later when approaching an obstacle.

In Conclusion

I'm convinced from personal experience and from reading the research literature that risk compensation is a real phenomenon. What does this mean for injury prevention? Professor Gerald Wilde, the leader in risk homeostasis theory and research, says it means safety excellence cannot be achieved through top-down rules and mandates. Under these conditions, some people only follow the rules when they are supervised and might take greater risks when they feel "free." Such behavior is predicted by risk compensation theory.

As the title of his 1994 book "Target Risk" indicates, Wilde advocates that safety interventions need to reduce the level of risk people are willing to tolerate and this requires a change in values. Wilde claims that improvements in safety cannot be achieved through training, engineering or enforcement. In his words, "the extent of risk taking with respect to safety and health in a given society, therefore, ultimately depends on values that prevail in that society, and not on the available technology" (Wilde, 1994, p.223). This means, of course, our vision should be to make safety value, not a priority. When safety becomes a value, tolerance for risk will not change as a function of protective equipment.

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Note: Dr. Geller will be teaching these and other influence techniques for safety at three two-day seminars in 1996. Contact Safety Performance Solutions at (540) 951-7233 for more information.