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Road Safety Advice, Research and Strategy

Human Impact: What In-Depth Analysis of Crashes Tells Us



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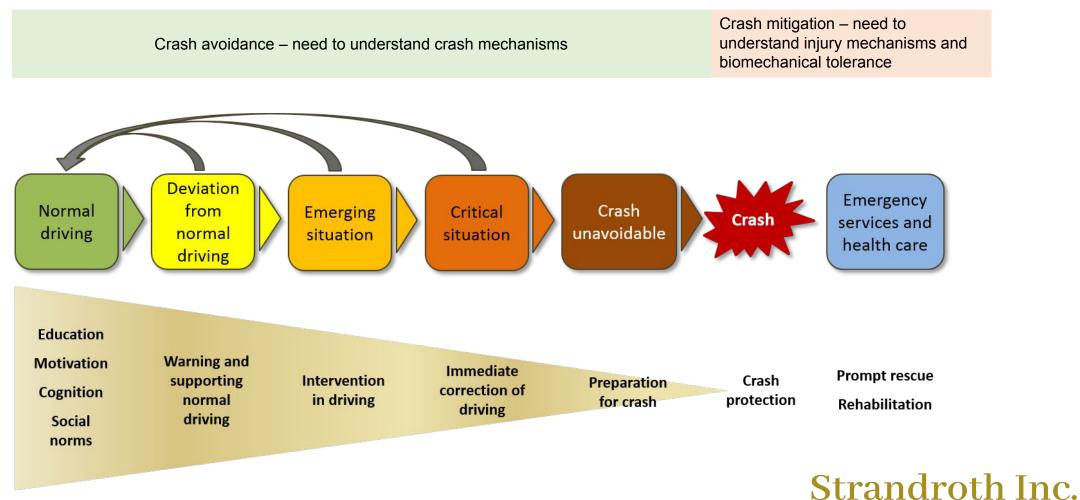
Dr Johan Strandroth

Content

- First principle crash avoidance and injury mitigation
- Counterfactual analysis
- Local validation of Safe System boundaries and end states

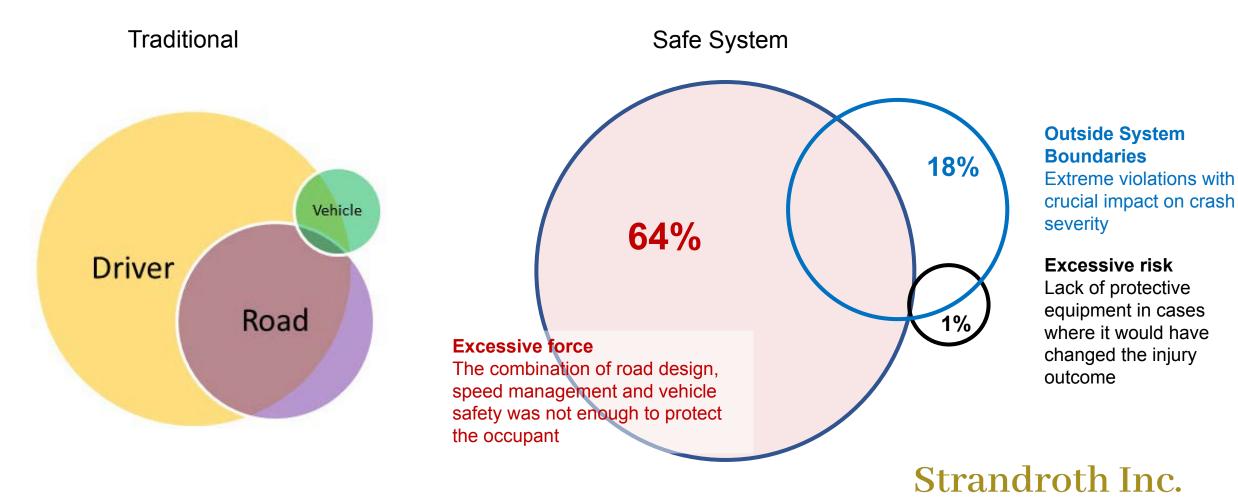


First principle crash avoidance and injury mitigation



Rizzi M. (2016) Towards a Safe System Approach to Prevent Health Loss among Motorcyclists - The Importance of Motorcycle Stability as a Condition for Integrated Safety

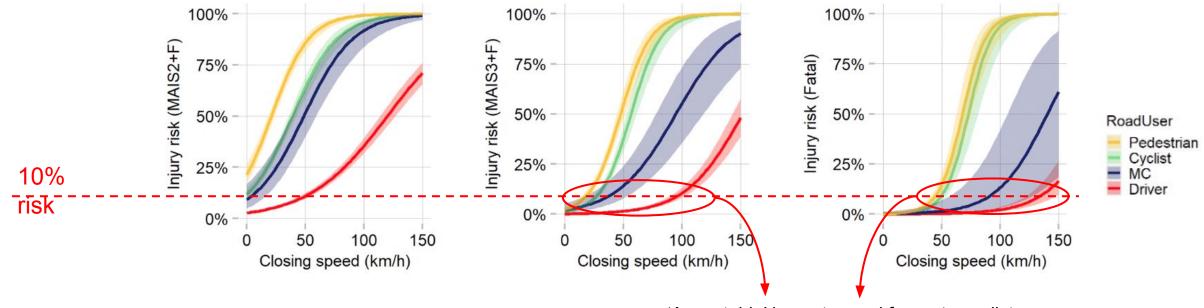
First principle crash avoidance and injury mitigation Classification of all fatal motorcycle crashes in Sweden 2016-2018 (n = 163)



Adapted from Kimber (2003)

Source: Swedish Transport Administration

First principle crash avoidance and injury mitigation Human biomechanical tolerance

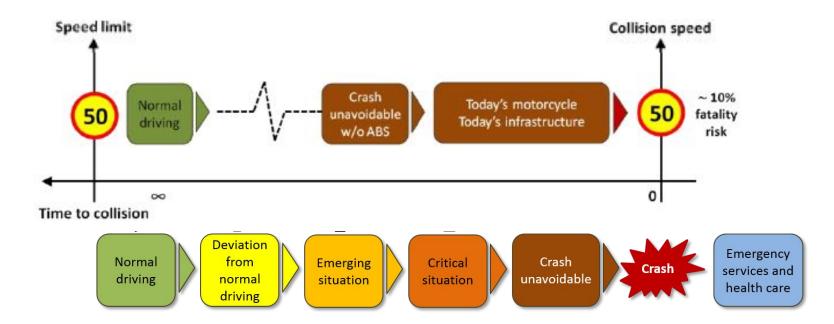


'Acceptable' impact speed for motorcyclists: Max 30 km/h (MAIS3+) to 50 km/h (fatalities)

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Adapted from: Lubbe, N., Wu, Y., & Jeppsson, H. (2022). Safe speeds: fatality and injury risks of pedestrians, cyclists, motorcyclists, and car drivers impacting the front of another passenger car as a function of closing speed and age. *Traffic Safety Research*, 2, 000006-000006.

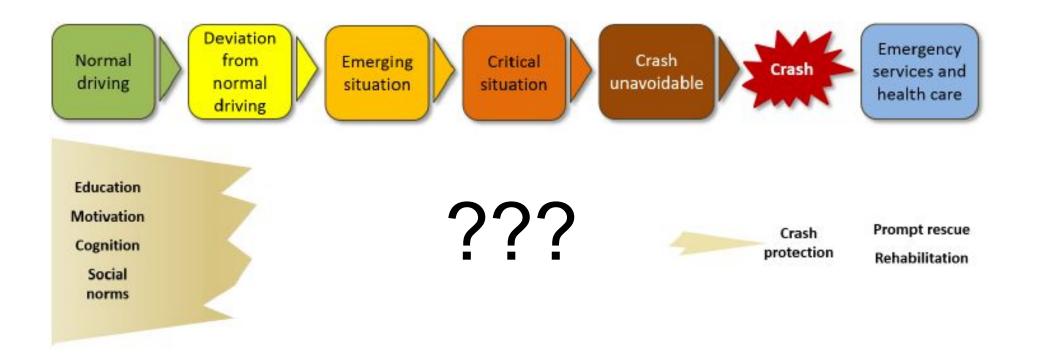
First principle crash avoidance and injury mitigation



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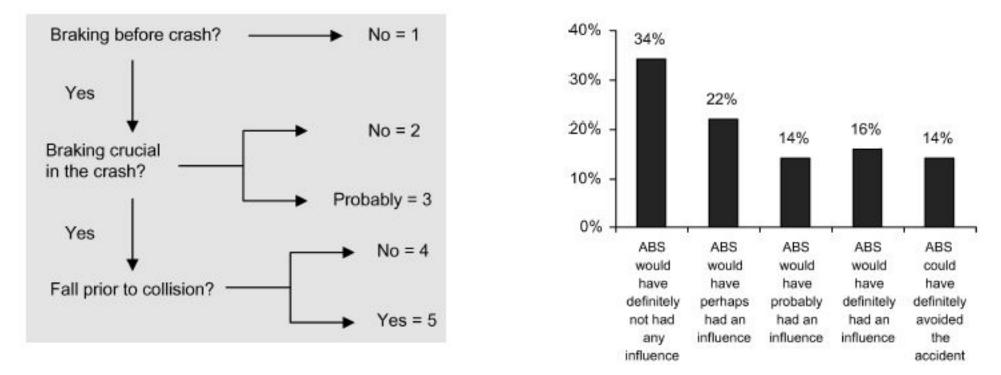
First principle crash avoidance and injury mitigation



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Counterfactual analysis using in-depth crash investigations



In-depth analysis: 2/3 fatal crashes with motorcycles involve braking where ABS could have made a difference

Statistical study: The overall effectiveness of ABS in Sweden was 48 percent on severe and fatal crashes.

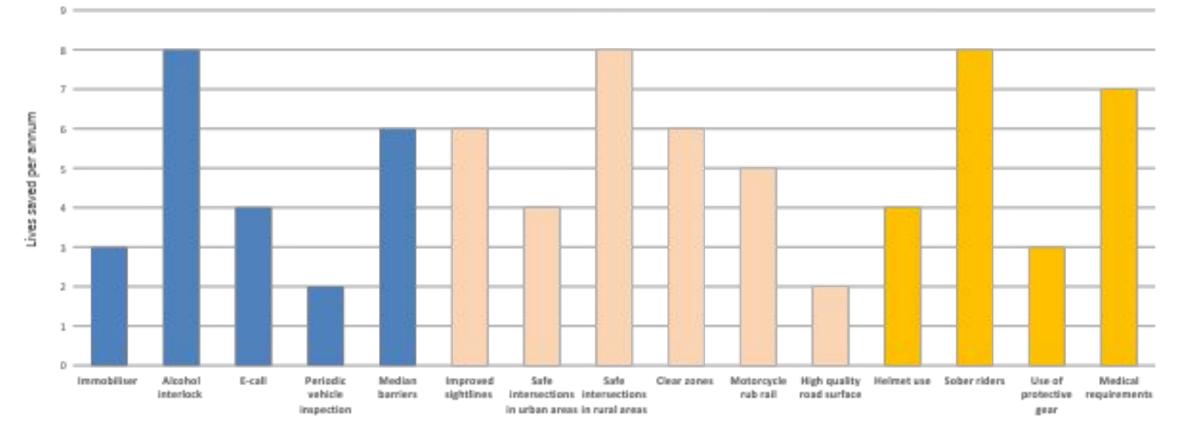
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Rizzi, Matteo, Strandroth, Johan and Tingvall, Claes(2009)'The Effectiveness of Antilock Brake Systems on Motorcycles in Reducing Real-Life Crashes and Injuries', Traffic Injury Prevention, 10:5,479 — 487

Counterfactual analysis using in-depth crash investigations

Potential benefits of motorcycle safety measures in Sweden

Treatment effectiveness (lives saved per annum)



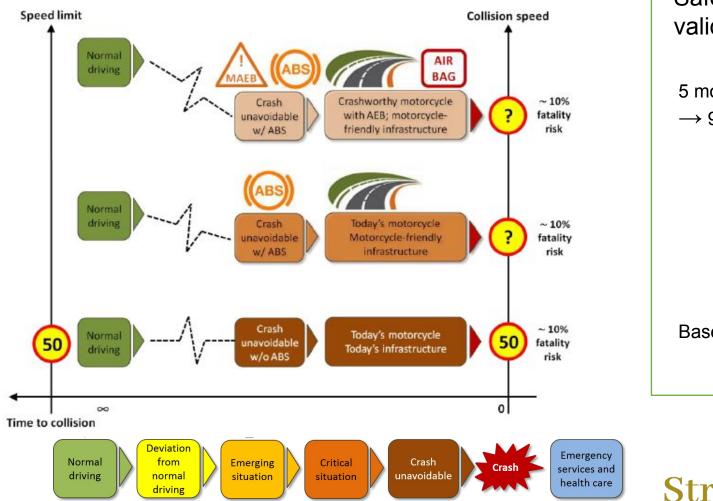
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Counterfactual analysis using in-depth crash investigations Performance Indicators to achieve interim targets

| Performance Indicators | Lives saved at 100% | Current | Target | Effect |
|--|---------------------|---------|--------|--------|
| Share of new motorcycles sold with ABS | 21 | 30% | 98% | 15 |
| Motorcyclists speed compliance on arterial roads | 11 | ? | 80% | 6 |
| Motorcyclists speed compliance on municipality roads | 4 | ? | 80% | 2,5 |
| Share of safe intersections on the arterial road network | 4 | ? | 50% | 2 |
| Share of motorcycle friendly barriers on the arterial road network | 5 | 0% | 50% | 2,5 |
| Share of guard rails in curves fitted with motorcycle run rail | 2 | 0% | 50% | 1 |
| Total (number of lives saved) | 47 | | | 29 |
| Corrected for double counting | 28 | | | 17 |
| Target 50% reduction | | | | 26 |

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A conseptual Safe System for motorcycles



Safe System end state validation in Sweden:

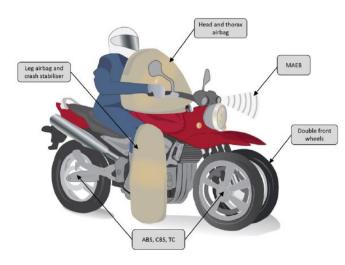
5 motorcycle fatalities per annum \rightarrow 90% reduction

Baseline: 40 fatalities per annum

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A conceptual Safe System for motorcycles





Safe System end state validation in Sweden:

5 motorcycle fatalities per annum \rightarrow 90% reduction

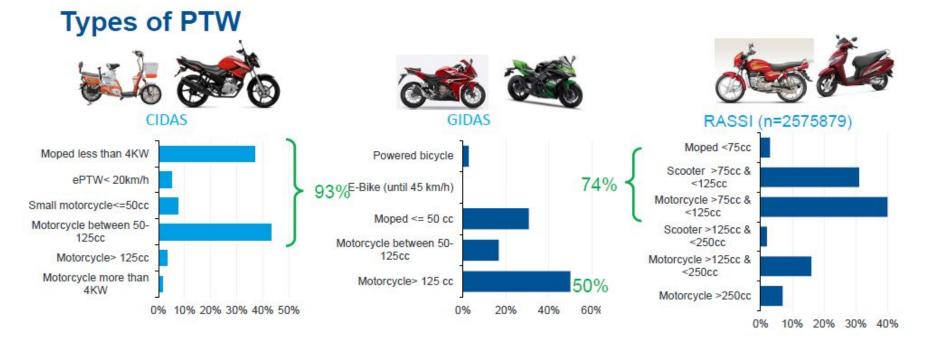
Baseline: 40 fatalities per annum

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Context sensitive implementation

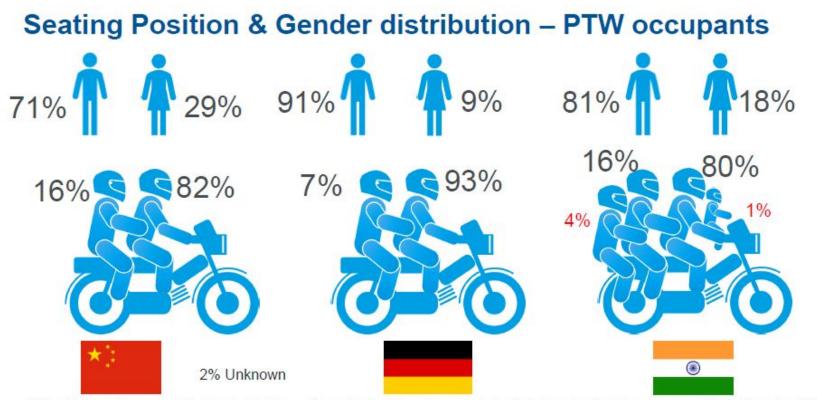


- India & China → Less powered PTW → Daily commute for transport/daily needs
- Germany → More of high powered PTW → Recreational use

Puthan Pisharam, P., Lübbe, N., Shaikh, J. et al (2021). Defining crash configurations for Powered Two-Wheelers: Comparing ISO 13232 to recent in-depth crash data from Germany, India and China. Accident Analysis and Prevention, 151. http://dx.doi.org/10.1016/j.aap.2020.105957

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Context sensitive implementation



Mostly males as riders, In India, often try to accommodate full family (not necessarily helmeted!!)

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Puthan Pisharam, P., Lübbe, N., Shaikh, J. et al (2021). Defining crash configurations for Powered Two-Wheelers: Comparing ISO 13232 to recent in-depth crash data from Germany, India and China. Accident Analysis and Prevention, 151. http://dx.doi.org/10.1016/j.aap.2020.105957

Recommendations

- Develop an evidence based Safe System end state for motorcycles that takes regional mobility needs into account
- Validate the Safe System end state for local conditions using in-depth analysis of fatal and serious motorcycle crashes

