Psychological mechanism of over-dependence on safety support system

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Psychological mechanism of over-dependence on safety support system

OUTLINE

- Categories of determinants of driving behavior in view of safety
- Definition of safe driving and direct causes of accidents in Driver's Safety Ability
- Two functions in Driver's Safety Ability (DSA)
- Effect of Safety Support System (SSS) on Driver's Safety Ability (DSA) – "Risk compensation" and "Safety dependence"
- "Risk over-compensation" and "Safety over-dependence"

OUTLINE

- Safety system should work only around the ultimate criterion of hazards.
- The word “Safety (system)” had better be replaced by “Damage reduction (system)” in order to reduce “Safety dependence” .
- The “Safety system” had better not be informed in order “Safety dependence” does not occur.

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Categories of determinants of driving behavior in view of safety

- Road Environment Safety (RES)
- Safety Support System (SSS)
- Driver’s Safety Ability (DSA)

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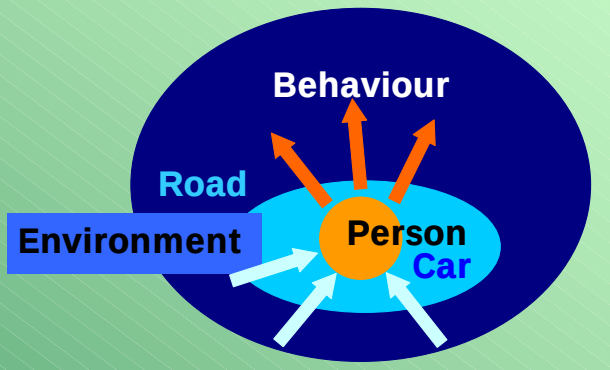

$$B = f(P, E\ (road, car))$$

- Figure 1 Illustration of general structure of the mechanism of driving behaviour based on Lewin's scheme.
- Note: B: Behaviour, f: function, P: Person, E: Environment. The environment consists of two dimensions, a road and a car. The white arrows reveal stimulus flow from road environment to a person through a car. Orange arrows reveal responses to environment as driving a car on a road.

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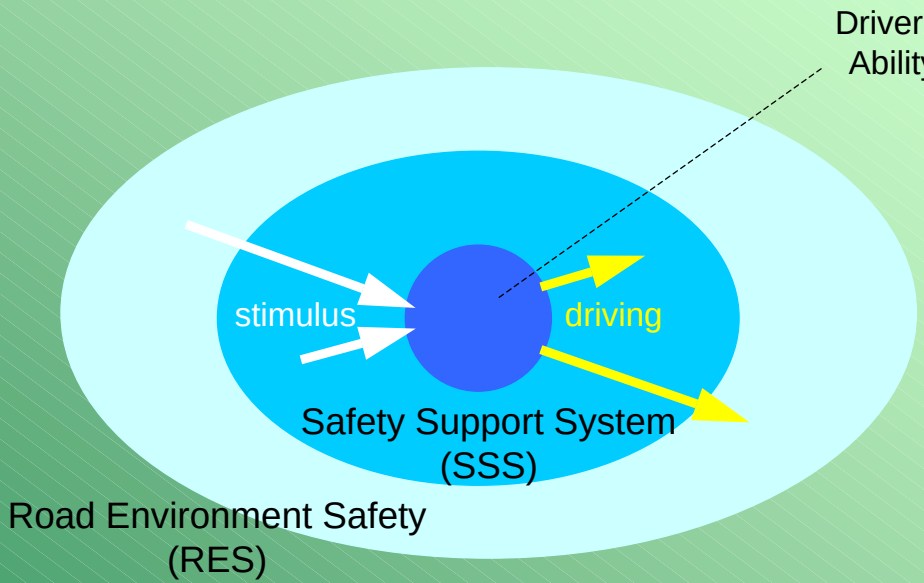

$$SAFETY = f(DSA, RES, SSS)$$

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$$B = f(P, E(road, car))$$

$$SAFETY = f(DSA, RES, SSS)$$

RES: Road Environmental Safety
SSS: Safety Support System
DSA: Driver's Safety Ability

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Definition of safe driving and direct causes of accidents in Driver's Safety Ability

Safe driving

- avoiding collision with objects
- maintaining adequate position on a road.

Direct causes of accidents in Driver's Safety Ability

- the error
- the delay

(perception, judgment, operation)

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Two functions in Driver's Safety Ability (DSA)

- easily → Workload efficiency → error
  - Subjective image: Safety > Risk
  - finding colliding object: attention, perception, cognition
  - within target **"safety"**
- shortly → Time efficiency → delay
  - Subjective image: Safety < Risk
  - increasing collision possibility: driving motion
  - within target **"risk"**
- (happily, …)

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1. "Workload efficient driving" around target safety is essentially different mechanism from Risk Homeostasis.

Keywords: workload reducing, attention, object finding, stopping, slow motion, long headway, mistake or error in information processing

Main effect: cognitive process

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2. "Time efficient driving" around target risk is regulated by Risk Homeostasis.

Keywords: time reducing, speeding, risk taking driving (overtaking, quick motion, narrow headway…)

Main effect: driving manner

$$t = \frac{d}{v}$$

t: time d: distance v: velocity

$$E = \frac{1}{2}mv^2$$

E: energy m: mass v: velocity

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Effect of Safety Support System (SSS) on Driver's Safety Ability (DSA) – "Risk compensation" and "Safety dependence"

- Risk compensation
  More actions occur in order to reach the target risk.
  SSS: ABS, SRS-Airbag,…

- Safety dependence
  Mental workload is saved, but the target safety is maintained.
  SSS: ISA, DSSS,…

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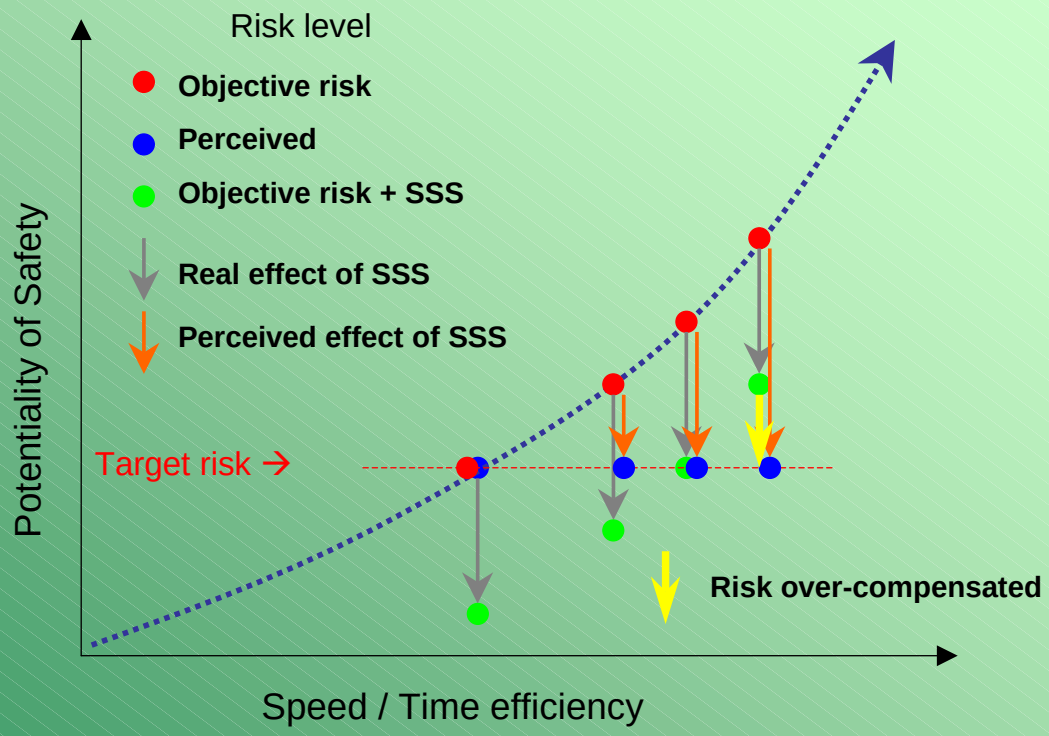

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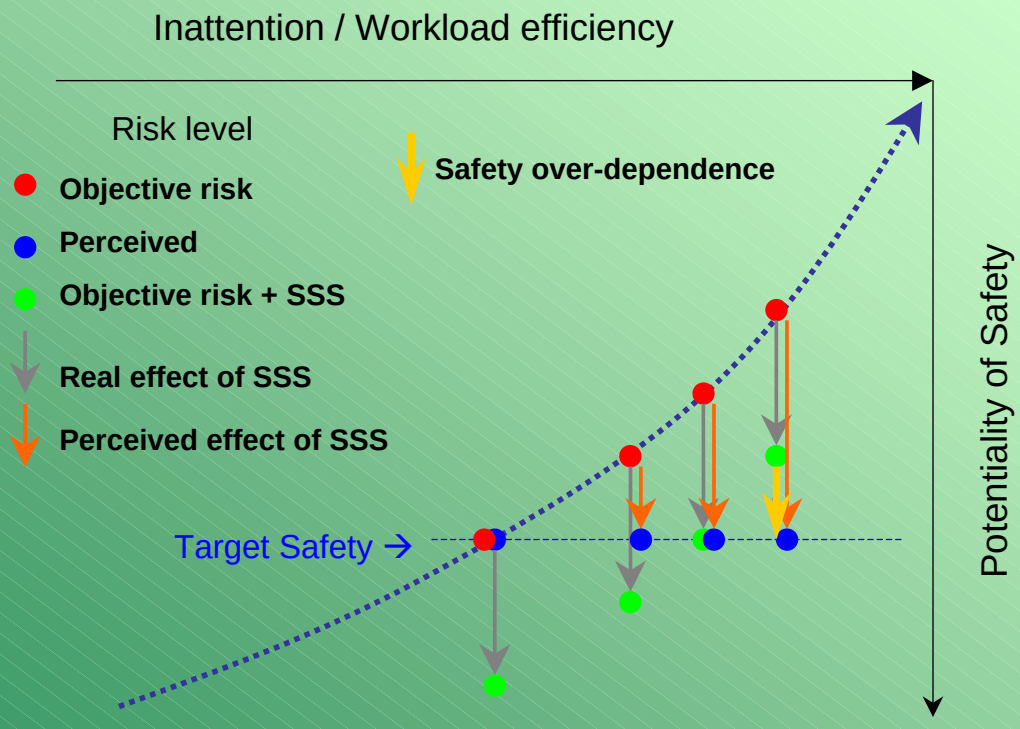

"Risk over-compensation" and "Safety over-dependence"

- Risk over-compensation

  Driving manner becomes more active by a driver's over estimation of the effect of SSS than the objective.

- Safety over-dependence

  Cognitive activity is reduced by a driver's over estimation of the effect of SSS than the objective.

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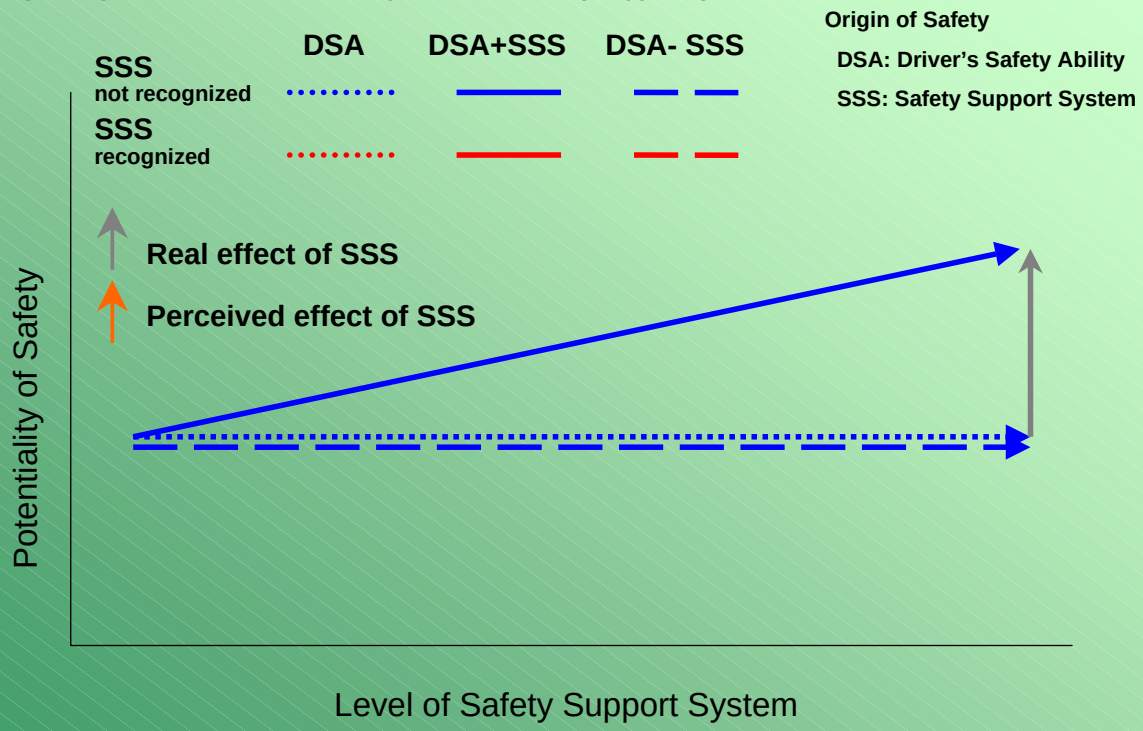

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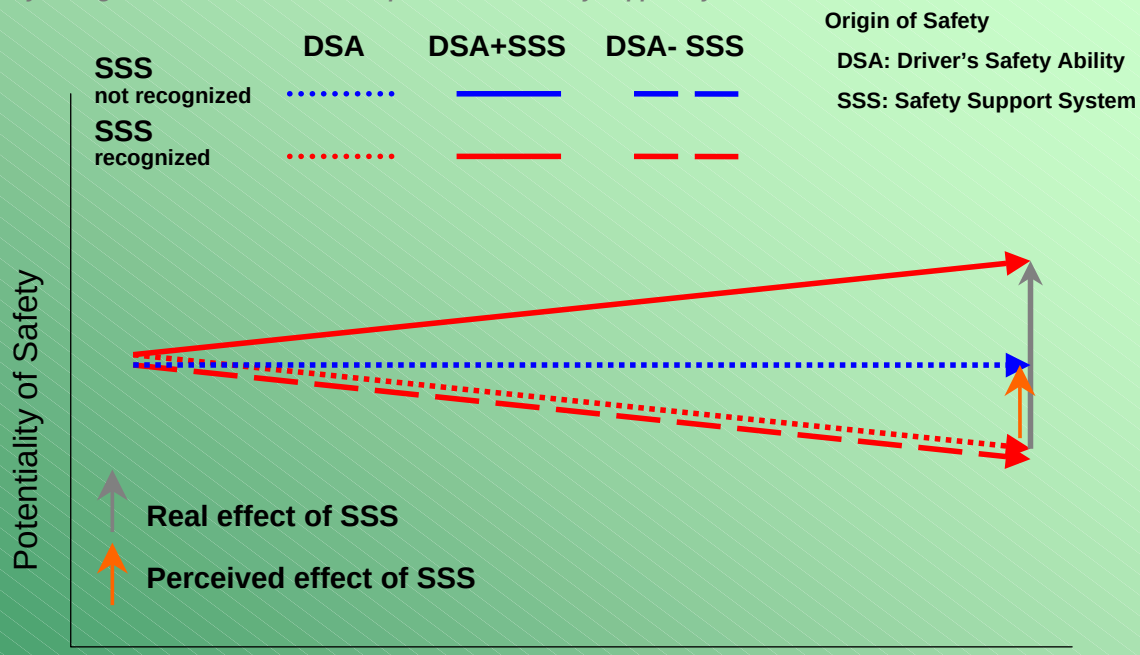

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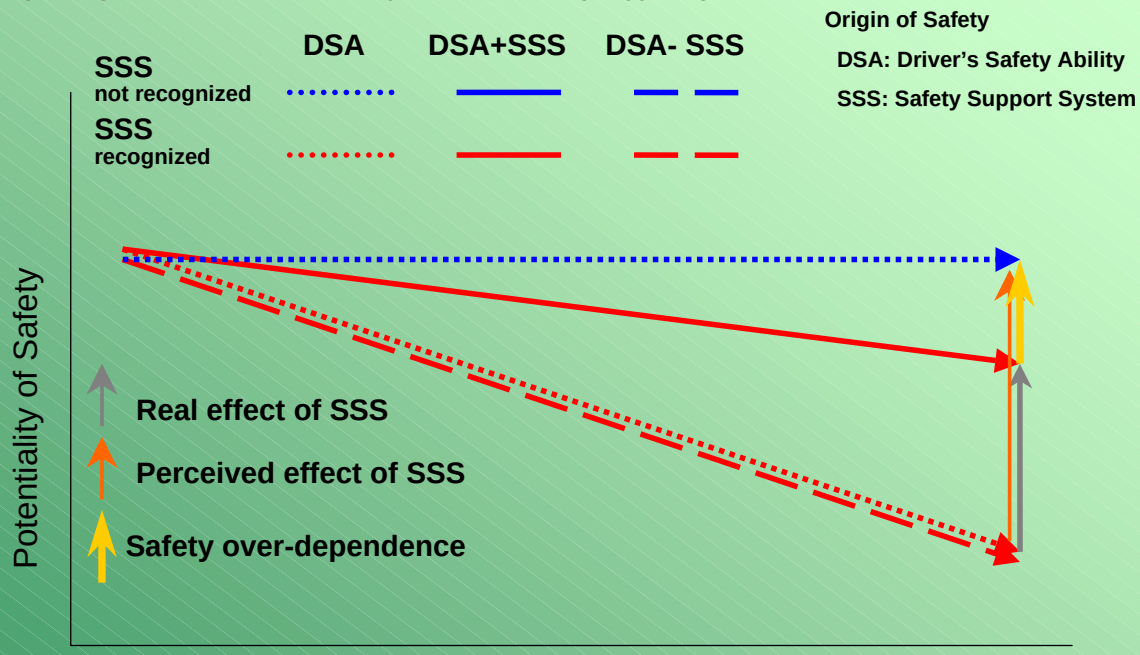

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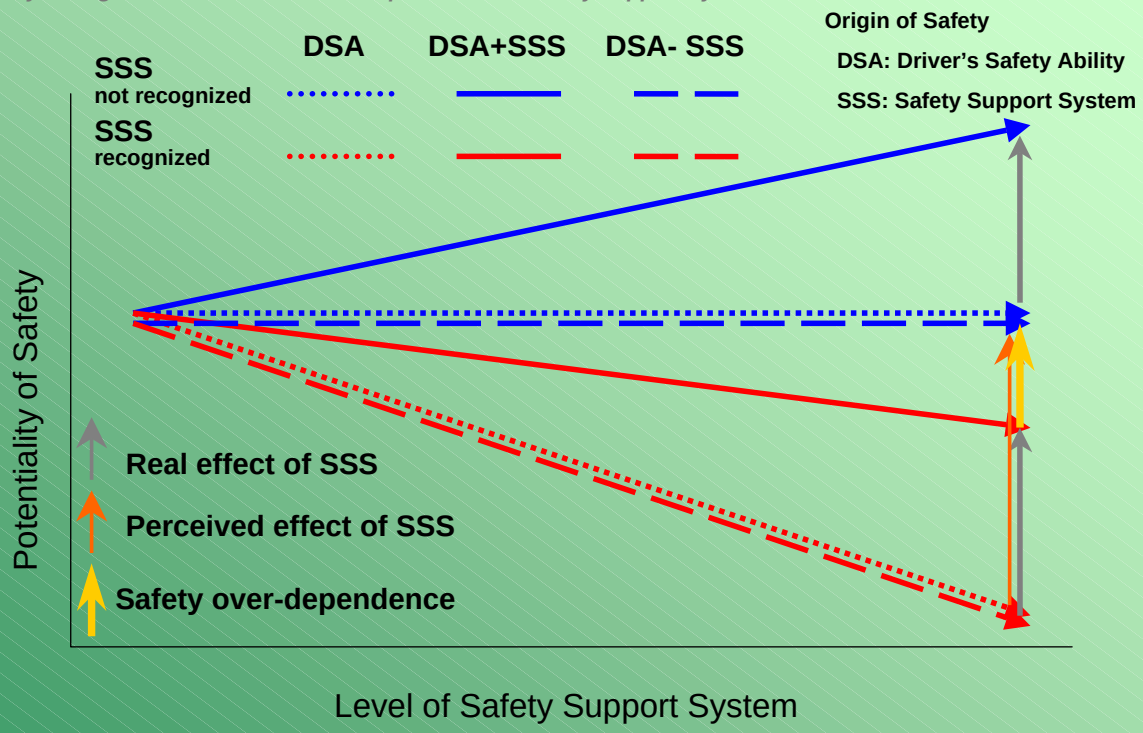

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Thank you for your attention.