Is it worth the risk?

A critical approach to the risk homeostasis theory

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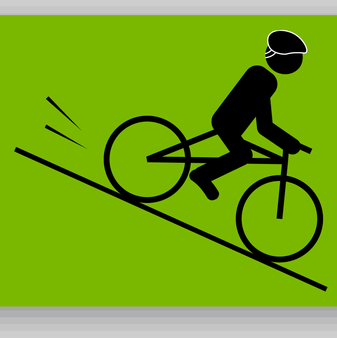


Initiation

Technical progress, organizational or personal measures contribute to occupational safety and health (OSH). This can reduce the *objective risk* which combines the probability of occurrence and the extent of damage caused by an event.

Despite or because of the higher level of protection it can be observed that individuals behave in a more risky manner, which again partially compensates the reduction of risk. This is called *risk homeostasis*.[1] To understand this process the additional terms *subjective risk* and *risk paradox* need to be specified.

Perhaps you know this theory from your everyday life: Wouldn't you ride a bike downhill faster wearing a helmet than without one?[2] How does this theory occur in OSH?

Terms & Definitions

Subjective risk

While the objective risk is predominantly used in legislation and standards, like ISO 31000:2018[3], sociology in particular uses the term subjective risk. It means "that risk and technology are social processes rather than physical entities […]" [4].

Risk homeostasis

Risk homeostasis theory describes the self-regulating process of human behaviour being adapted to the trade-off between perceived risk and the individual target level of risk. In this process, discrepancies between the subjectively perceived risk and the acceptance level are avoided.[5,6]

Risk paradox

The paradox in relation to risk refers to the fact that the alternatives to risky actions, in particular the alternative of refraining from action, are generally also risky. [7]
Especially in complex situations and contexts, people therefore often rely on intuition. [8]

Objective risk[3] =
probability of occurrence *x* the extent of damage

Possible Implication for OSH

Substitution → Implementation of artificial intelligence (AI)

The influencing factor of safety concerns represents an important component in the use of AI, because users feel a higher sense of risk here than when using it without AI.[9]

Due to the complexity of AI, there may be a misperception of risk
→ *Risk paradox*

Technical → Collision prevention

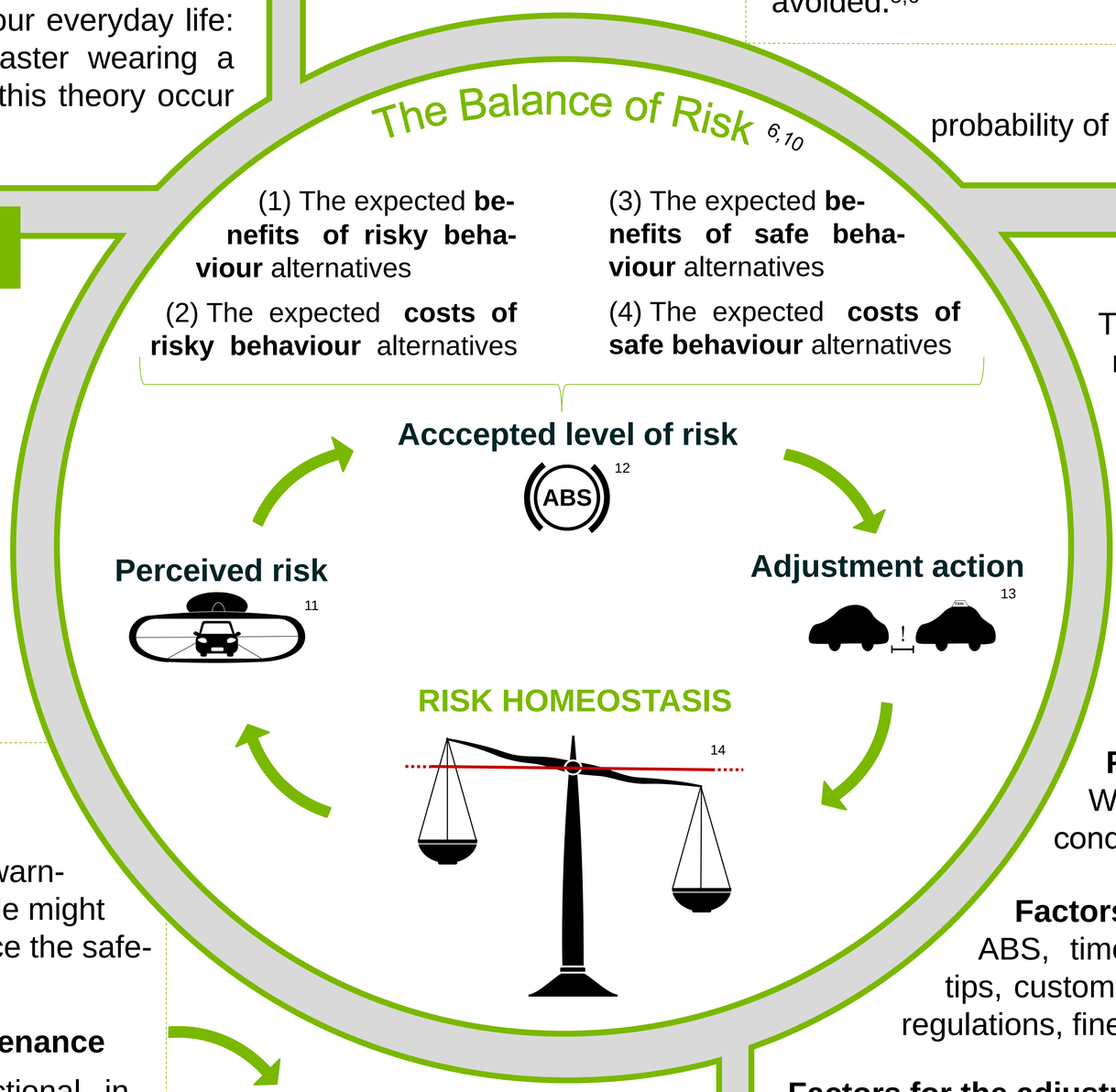
e.g. for forklifts
When vehicles or people approach a warning or automatic braking occurs. People might rely on the technical system and reduce the safety distances.

Organisational → Predictive maintenance

Negligence of the visual and functional inspection due to the reliance on the AI system

Personal → Smart PPE

People rely on smart PPE and pay less attention to their own safety.
Example: respiratory protection monitoring for firefighters, health monitoring systems with automatic emergency call, ...



With routine use of technologies, people become reliant on them. As a result, individual judgement could be lost. This raises the question of whether and to what extent risk homeostasis should be taken into account when using AI.
→ *Risk homeostasis*

Description

The theoretical mechanism of the risk homeostasis theory can be explained based on studies in the past using the example of ABS (anti-lock braking system) in taxis: It was observed that taxi drivers with ABS showed riskier driving behaviour than drivers without ABS. The technical measure of ABS did not reduce the number of accidents.[14]

Factor for the perceived risk:
Weather conditions, traffic volume, condition of the vehicle and road, …

Factors for the accepted level of risk:
ABS, time pressure, profit maximization, tips, customer satisfaction, safety, road traffic regulations, fines, ...

Factors for the adjustment action:
Adjust driving behaviour, e.g. safety distance not adapted to speed, …

Individuals who consider their risk to be low may react in a counterproductive way by behaving more riskily. This *licensing effect* has been observed for example in the context of food supplements or sport compensated by smoking.[15]

Discussion

Would you ride down the mountain fast with a helmet? In this case, you might be like the experienced helmet users in a Norwegian study of cyclists riding down a hill. It showed that risk perception decreases and speed increases among routine helmet users when they wear a helmet - in comparison to riding without a helmet. In contrast, there were no measured effects in people who are not used to wearing a helmet.[16] It is therefore necessary to discuss where the risk homeostasis theory reaches its limits: Some researchers declare that this theory is "lacking in empirical support"[17]. Others point out that such risk compensation is not a universal but an individual phenomenon[18]. But when considering long-term adjustments, Wilde's theory receives support[19].
Studies of risk homeostasis in the context of OSH are rare and without high significance (e.g. small sample size[20] or no adaptation on work environment[18]). Therefore, there is a lack of data on the long-term effects of measures, like wearing personal protective equipment[16].
Additional, future research should take theory developments like the risk-adaptation theory[21], which contains the zero-risk, threat-avoidance, and risk-homeostasis theories into account.

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References:
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