TRAFFIC SAFETY WITH A FOCUS ON TRANSPORT PSYCHOLOGY AND DRIVER TRAINING

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Preface

The following report is an excerpt from the book ”*Trafiksäkerhet – Samspelet mellan människor, fordon och trafikmiljö*”[1], second edition (2024), ISBN 978-91-39-02765-2. Published by Norstedts Juridik, Stockholm, Sweden.

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[1] Road safety – the interaction between people, vehicles and the traffic environment

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Special areas of road safety and the human factor

The area of road safety can be structured in several different ways. It is usually based on different pillars such as safe roads, safe vehicles and safe road users. In this chapter, the focus is on safe road users and the human factor. It is not surprising that most crashes are caused by the human factor in, for example, drivers, pedestrians or cyclists. To understand the importance of the human factor, it is usually stated that 95 percent of all crashes are partly due to this and 65 percent entirely. The exact percentage may not be correct, but it still shows that the human factor is crucial in many contexts. Despite this, this knowledge is not enough if we want to develop effective measures to increase road safety. In the early 1990s, researchers therefore developed a questionnaire called the "Driver Behaviour Questionnaire" (DBQ). This questionnaire includes 50 questions that describe a range of different traffic-related situations, with answers given on a scale from never to almost always. The questions in the questionnaire have been tested on several occasions using a factor analysis, where the results present three different factors: Error, lapses and violations.

- Errors – Driving past a traffic sign because you did not see the sign.
- Lapses – Changing into the wrong gear while driving.
- Violations – Deliberately driving too fast.

Errors can, for example, involve failing to judge the speed of others or failing to see, i.e. mistakes that are due to a lack of attention, not an intention to break the rules. Lapses on the other hand can be due to carelessness, forgetfulness or lack of experience in handling the vehicle. This may mean that the lapses happen when the driver is in a complicated traffic situation that requires all attention and as a consequence the driver might forget how to drive the car. Violations are defined as a deliberate deviation from routines that are normally intended to protect the individual from danger. They are thus different from the other two categories and can involve breaking speed limits, staying too close to the car in front, or starting to overtake when visibility is poor. This is then a matter of general negligence in traffic and not just violations that involve breaking traffic rules.

Later studies have divided violations into two groups. In the first group, rule violations are linked to habits. This means that violations have become part of the drivers own driving style. In the second group, the behaviour can be linked to strong emotions such as aggression and involves expressing feelings verbally or using the vehicle to express this, for example by pushing another vehicle out of the way. Since violators' behaviour can be described as aberrant or deviant, it is not so surprising that they are the main cause of traffic crashes.

Knowledge of the different types of human factors linked is important because this so clearly shows that different methods are needed to deal with them. It is therefore not enough to state that the human factor is behind a large proportion of the crashes that occur, we also need to know what types of factors are involved. A driver who makes errors may need additional training to improve his/her ability to make better decisions. Clear and unambiguous information can also reduce errors. A driver who makes lapses needs, like the one who makes mistakes, increased driving training, but in this case the focus needs to be on handling the vehicle itself and getting used to handling different traffic situations so that driving can be done more automatically and even under stress. See also the section on traffic education and experience. The same does not apply to the group that commits violations because increased driving training can instead be linked to more, rather than fewer, violations.

To address traffic violations effectively, it is necessary to focus on the motives underlying the behaviour and the functions that it serves. This means that measures aimed at reducing violations should be grounded in behavioural science research. In particular, research in traffic psychology and traffic education provides an essential foundation for the development of effective interventions.

Transport psychology

Transport psychology is an established field within applied psychology. Transport psychology mainly deals with human behaviour in traffic and the various psychological processes that govern it. These can include personality, emotions, attitudes social psychological processes such as group affiliation, peer pressure and norms, or cognitive processes such as learning, motivation, perception, distraction, memory and workload. Interest in better understanding transport psychology has increased as its importance for people's abilities, conscious choices and decision-making has been recognized. With good knowledge of transport psychology, traffic safety work can be conducted with significantly greater efficiency.

Extensive research has been done over the years to try to understand the connections between different psychological aspects, how they affect our behaviour and what needs to be done to change incorrect and sometimes destructive behaviour. For example, there is extensive theory building around the connections between knowledge, attitudes and behaviour, where various approaches have been used to try to understand how people's behaviour in traffic can be influenced. A presentation of two such theories is given in the section on attitudes and behaviour below.

Another important area within transport psychology is human-machine interaction (HMI), that is, the interaction between humans and technology. For example, how is information conveyed by vehicles and road infrastructure perceived and processed cognitively, and how can this knowledge be used to optimize the design of interfaces such as road signs and technical support systems?

There is currently extensive research on self-driving vehicles. This research may examine issues such as what information a system should provide when requesting a driver to take over control, how this information should be presented, and how automated vehicles can interact safely and effectively with vulnerable road users.

In general, it could be argued that transport psychology focuses on mental capacity and performance. It examines how factors such as visual and cognitive workload, fatigue, stress, and distraction affect an individual's ability to operate safely within the transport system. It also explores the relationship between mental workload and experience in specific traffic control tasks or traffic situations, and how these factors influence attention, visual scanning, reaction times, hazard perception, and other abilities that are critical for safety.

In recent years, the field of neuropsychology has also become important within transport psychology. This includes, among other things, relatively new knowledge about brain development in childhood and adolescence and its importance for the ability to control emotions and impulses, make sensible choices and reflect on the

consequences of different behaviours. This area also includes increased knowledge about how the functions of an aging brain change and affect different abilities.

In some countries, specialized training programmes are available for those wishing to become transport psychologists. These professionals are often employed by government agencies, where they monitor and support drivers who have committed specific traffic violations as defined by national regulations. Follow-up measures may include individual counselling sessions, assessments, or participation in specialized educational and training programmes.

Psychological factors that influence traffic violations

In essence, Vision Zero assumes that road users behave reasonably, make use of appropriate safety measures, and generally adhere to traffic regulations, even if occasional errors occur. It does not, however, assume deliberate rule violations.

As previously described, crashes can result from road users making mistakes, such as errors or lapses. However, it is clear that many of the more serious risky behaviours in traffic are intentional and are committed by individuals who deliberately choose to violate society's formal system of rules and norms. Research on traffic violations from countries such as Australia, Denmark, England, and Sweden consistently shows a strong association between traffic violations and being involved in a crash, whereas the relationship between mistakes and crashes is considerably weaker.

Research has also demonstrated that negative attitudes and incorrect beliefs about the consequences of one's actions increase the likelihood of committing violations. Such behaviours may include excessive speeding, driving under the influence of alcohol or drugs, failing to wear a seat belt or helmet, and driving without a valid licence.

Since violations are influenced by various psychological and social driving forces, these are the ones that should be focused on. To succeed, sound understanding of the factors and phenomena that govern and influence motivation and decision-making is required. Such knowledge is well established through contemporary psychological research and can be applied to promote safer driving behaviour.

Traffic violations linked to personality

Traffic violations can be linked to the driver's personality. In short, personality is described as a set of characteristics that predict a person's behaviour and how the person relates to their environment. These characteristics can be hereditary but also influenced by the environment.

Although personality can change over time, one's core characteristics tend to remain stable throughout one's lifetime. A common way to describe what is meant by personality is to divide it into five basic groups (the so-called five-factor model). Each trait exists on a spectrum, with people varying in how strongly they express each one.

- Openness to experience (prefers routine, practical vs. imaginative, spontaneous)
- Conscientiousness (impulsive, disorganized vs. disciplined careful)
- Extroversion (reserved, thoughtful vs. sociable, fun-loving)
- Agreeableness (suspicious, uncooperative vs. trusting, helpful)
- Neuroticism (calm, confident vs. anxious, pessimistic).

The five-factor model has been included in several studies that have found a connection with crashes. The research shows, among other things, that individuals who are extroverted are more risk-averse than others. Some forms of risk-taking can also be described as sensation seeking, which is also described as a personality trait. To measure this, the "Sensation Seeking Scale SSS" was developed, which includes four different types of sensation seeking:

1. Thrill and adventure seeking, e.g. "I have often wished I could be a mountaineer."
2. Experience seeking, e.g. "I have smoked hashish or would like to do so."
3. Boredom Susceptibility, e.g. "I can't stand watching a movie twice."
4. Disinhibition, e.g. "I like wild and uninhibited parties."

Those who scored high on this test engaged in many risky activities. It is assumed that sensation seeking has a biological cause because such a person needs higher levels of stimulation to react compared to others. Most studies indicate that the group most at risk of being involved in a crash is the first, thrill and adventure seeking, although the others can also be linked to crashes.

Violations linked to strong emotions

As previously described, violations are divided into two groups, for the first group traffic violations have become a habit and for the second group the action can be linked to strong emotions and aggressiveness.

It is important to emphasize that feeling angry does not always result in aggressive behaviour. It is therefore necessary to distinguish between strong emotions and how they are expressed. If anger is the emotional state, aggression describe how it is expressed towards the outside world (verbally or physically). The expression of anger can serve various functions such as reducing tension, increasing self-esteem and escaping boredom. Strong emotions are not always expressed verbally or physically but can instead be repressed. This is especially true when one expects that such an expression may lead to some form of punishment.

Aggressive behaviour can also be divided into two groups. The first behavioural category can be described as instrumental, i.e. using one's anger to get something one wants. The

second can be described as more emotional, which means expressing one's anger verbally with the intention of hurting someone else or, in more extreme cases, causing physical suffering.

Aggressive driving may well be perceived as unacceptable, but some argue that aggressive behaviour behind the wheel is tolerated and, in some cases, even encouraged. The reason for experiencing anger in traffic may be that the person feels hindered by others, for example due to traffic jams. It may also be that they become irritated by the behaviour of others in traffic. Several such incidents can result in strong feelings of anger.

The reason why these feelings lead to some form of aggressive action when driving is that the car provides a certain protection (anonymity) which makes drivers less restrained. This may also explain why anger is more often expressed in traffic than in other places. Another explanation is the lack of communication. The driver who is perceived as provocative cannot explain his/her behaviour hence the action can be interpreted as a hostile act even if this was not the case.

Several studies have found that road rage also leads to both risky and reckless driving. It is therefore not surprising that there is a link between aggression and crashes.

In addition to personality and strong emotions, attitudes, norms and perceived driving ability can also be linked to violations. These factors are included in the psychological theories presented below.

Theoretical models in psychology with relevance to road safety

Much of road safety work is aimed at influencing people's behaviour so that they act safely in traffic. There are several ways to achieve this, including educational interventions, the design of safe and intuitive traffic environments and enforcement measures such as monitoring and sanctions. Regardless of the approach used, it is advantageous to draw on the knowledge and theories developed within the fields of behaviour change and transport psychology. Applying such evidence-based insights can increase the effectiveness of road safety measures and contribute to safer road user behaviour.

A well-designed theory not only describes behaviour but also provides increased knowledge about what influences it. A theoretical model helps us to understand what to focus on and how to deal with the problem. It should also form the basis when designing a road safety campaign. Some wise person expressed this as “there is nothing more practical than a good theory”. In this section, three different theories are described: Theory of Planned Behaviour, Health Belief Model and Trans-theoretical Model of Change.

Theory of Planned Behaviour (TPB)

TPB is developed to predict why people behave the way they do, for example to explain why people don't wear bicycle helmets or why they drive too fast.

The model describes the individual's intention to perform an action, which in turn is based on the attitude towards the behaviour, the subjective norm and the perceived behavioural control. The *attitude* describes the individual's assessment of the consequences of a particular action. For the behaviour of speeding, it may be that one does not experience any negative consequences if they believe that the risk of being involved in a crash or being fined is very unlikely. There is an element of cost-benefit evaluation in these beliefs. The *subjective norm* measures a form of peer pressure and describes how others would react if the behaviour were performed. These could be friends, parents, coworkers or other close relatives. These are therefore the individual's beliefs about these norms, which may be true or false. *Perceived behavioural control* is the subjective experience of one's own ability to master the situation and not the actual one. This can be about one 's own competence, but also about external factors such as weather and road conditions, car performance, speed limits, etc. Attitude, subjective norm and perceived behavioural control are defined as three independent concepts, each of which affects the intention to a different extent. The dotted line between perceived control of the behaviour and behaviour shows that the relationship can be either direct or indirect depending on the degree of control. An example of a direct relationship could be a person who does not use a seat belt because he or she cannot fasten it.

The theory also assumes that an individual can have several different beliefs about a particular action, but relatively few of them control the behaviour, so-called "salient beliefs". According to the model, three different salient beliefs are included: belief about the behaviour, belief about the norm and belief about control, which affect the intention indirectly via attitude, subjective norm and perceived behavioural control. Other factors such as age, gender, previous experience etc. may in some cases be important for understanding the behaviour, but according to the theory they then affect the behaviour indirectly via the variables that are already included in the model.

To strengthen the connection between the factors included in the model and the behaviour, researchers typically refer to four elements: object, action, context, and time. Deficiencies in this regard can arise when, for example, an attitude question concerns speeding violations in general, while the behaviour subsequently observed is speeding on a specific stretch of road. In the first case, the question is broad and may apply to any context or point in time; in the latter, the behaviour is much more specific. Studies that fail to achieve this correspondence often find no relationship between attitude and behaviour. However, this does not necessarily mean that attitudes are unimportant;

rather, it suggests that they have not been measured in a manner that corresponds appropriately to the behaviour being studied.

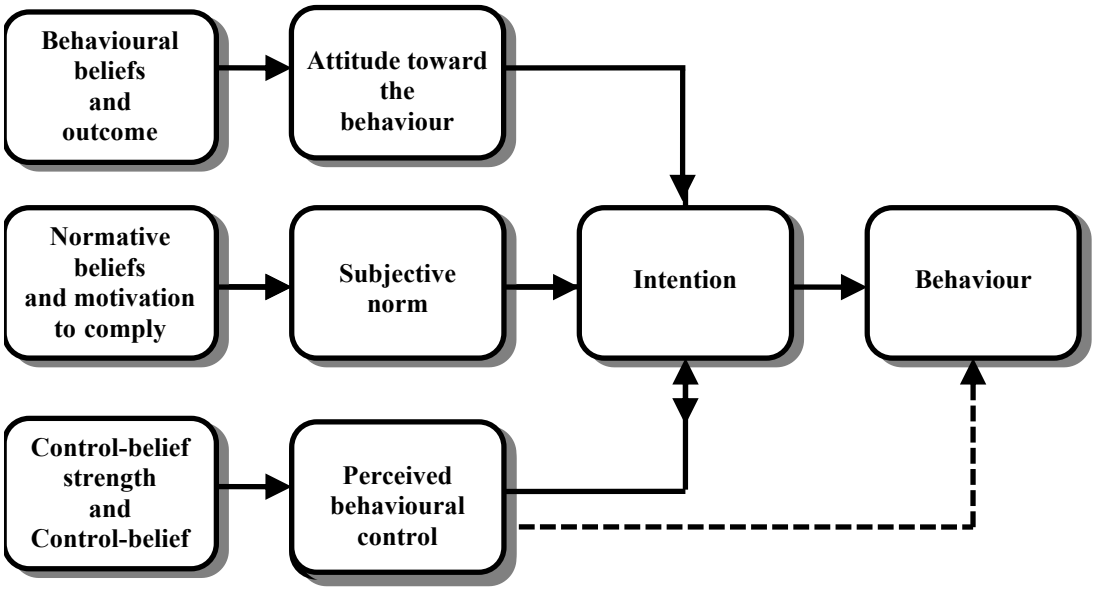

Figure 1. Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB) has been applied in numerous studies, many of which are related to road safety. With regard to attitudes towards a particular behaviour, such as speeding, research has shown that drivers who frequently exceed speed limits often do not regard speeding as a serious offence. Although they may be aware of the general relationship between higher speeds and an increased risk of a crash, they often do not perceive themselves as being personally at risk. Instead, the consequences of speeding may be viewed as positive, such as making the driving experience more enjoyable or reducing travel time by allowing them to reach their destination more quickly.

Attitudes are also influenced by context, meaning that behaviour is not always consistent across situations. In some circumstances, drivers may perceive a particular behaviour as risky, whereas in others they may not. For example, speeding is often perceived as less risky on rural roads than in urban areas. Drivers may also be willing to accept a higher level of risk in environments that are familiar to them. This can be explained by the fact that risk perception is largely shaped by previous experiences and expectations. For instance, drivers who have rarely encountered obstacles on a familiar route may come to expect the road to remain clear, which can lead to complacency and risky behaviours such as checking a mobile phone or reading a text message while driving.

The second variable in the theory is the subjective norm. Studies have found that those who violate expect that people close to them accept their behaviour. This is especially true for speeding violations, while it is not as true for drunk driving.

The third variable is perceived behavioural control, which can be linked to perceived driving ability, that is, a driver's assessment of their ability to control the vehicle and avoid being involved in a crash. Drivers' self-perceptions can be described in terms of two components: their ability to handle the vehicle (that is, maintaining control of both the vehicle and the traffic situation) and their ability to drive safely (that is, avoiding crashes and hazardous situations).

Drivers who perceive their ability to handle the vehicle as superior to that of other drivers are more likely to engage in traffic violations. One explanation for this tendency is driving experience. Experienced drivers may believe that they are better able to interpret the traffic environment and that their history of not being involved in a crash reflects a higher level of skill.

As a result, some drivers may develop an inflated sense of competence and perceive traffic rules as less relevant to them. Consequently, they may justify behaviours such as speeding by believing that their superior skills enable them to drive safely even while exceeding the limits that apply to other drivers.

However, there is some evidence to suggest that being involved in a crash does not necessarily affect a person's perception of themselves, they can still view themselves as very skilled. This can be explained by a phenomenon often referred to as the "Superman complex". In this context, drivers engage in self-deception and continue to view themselves as safe and competent drivers, even when their behaviour may pose a danger to themselves or others.

This self-perception serves an important psychological function by helping individuals protect their self-image and maintain high self-esteem. For some people, seeing themselves as a competent driver is particularly important, and as a result, information or experiences that challenge this belief are often rationalized, minimized, or dismissed.

The Health Belief Model (HBM)

The Health Belief Model is often used in healthcare to understand people's health behaviours, but it is also suitable for understanding road users' behaviour. To some extent, the model resembles the TPB, but it is more closely related to risk perception and how individuals believe they may be affected by risks. The outcome of the model is the likelihood that a person will engage in a particular behaviour. The magnitude of this likelihood depends on four factors: first, the *perceived benefits and barriers*; second, the *perceived threat,* third, *self-efficacy* and fourth *cues to action*.

If the outcome is considering to be of benefit to the individual is based on a cost-benefit calculation which varies between individuals and may include different considerations depending on the person and the situation. For example, to reduce the speed in rural areas may be associated with perceived benefits such as reducing the risk of crashes,

injuries, and fines. Perceived costs, on the other hand, may include longer travel times, reduced driving enjoyment and a potential loss of social status or image.

Perceived threat consists partly of the perceived likelihood of experiencing an outcome that the individual wishes to avoid, such as being injured in traffic and partly of the perceived severity of that outcome and its consequences. The perceived likelihood may be based on an objective estimate of the probability that a person could be involved in a crash. It may also reflect an individual's assessment of their own risk, taking into account factors such as their driving skill, the type of vehicle they drive, and their previous involvement in crashes. For example, a driver might reason: *"I have been driving for 30 years and frequently speed, but I have never been involved in an accident."* Consequently, their perceived level of risk may be relatively low.

The *perceived seriousness* can be purely physical injuries, economic, social, etc. How individuals assess the threat, and the consequences depends on a number of *modifying variables* such as gender, age, ethnicity, education, personality, social class, group affiliation, habits, knowledge about behaviour and its consequences, etc. If the threat is perceived as serious, the likelihood that one will do everything possible to avoid it increases.

The third component, *self-efficacy*, is about how individuals view their own competence, physical ability, and other abilities needed to perform a behaviour. It also involves how they judge their own ability to resist peer pressure and perhaps violate certain cultural or social norms, e.g. in the workplace, in the family, or among friends.

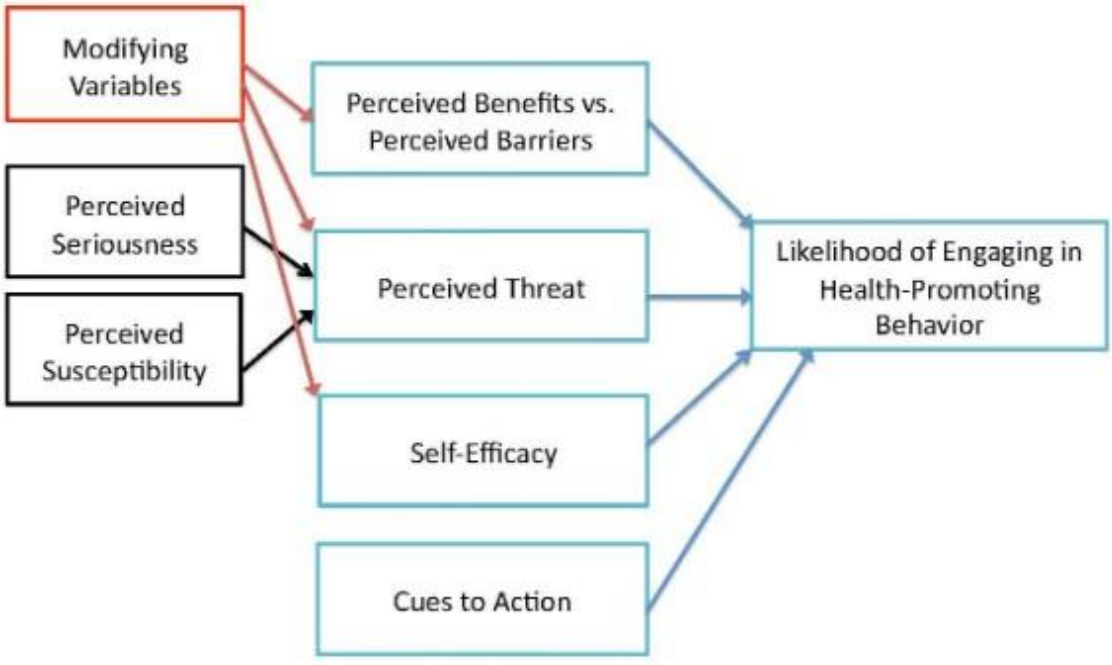

Figure 2. ***Health Belief Model***

A central component of the theory is the fourth one, *cues to action* which can been described as a triggering mechanism, which can influence the likelihood that an individual will act. A trigger may help a person take the final step from intention to action. Such triggers can take various forms. For example, an individual might have been involved in a crash, or somebody close to themselves, or perhaps received a traffic fine.

These events can serve as catalysts that motivate behavioural change.

With the help of these and other similar theories, one can get a real picture of which factors influence each other and which factors should be targeted if we want to change the behaviour. With the help of TPB, one can, for example, state that if one wants to change people's intentions to carry out a certain behaviour, one can focus on the subjective norm and perhaps explain that their beliefs does not match the actual norm among friends. One can also focus on attitudes by changing people's basic beliefs about a behaviour and its consequences.

In the same way, HBM can be used to increase the likelihood of behavioural change by clarifying the actual costs and benefits or by using different triggers.

Both models aim to explain what influences behaviour, but there are also theories that aim to explain the processes an individual goes through before a new behaviour is established. One such model is the transtheoretical model of change (TTM).

Transtheoretical model of change (TTM)

The Transtheoretical Model of Change provides valuable insight into the process of behavioural change. It emphasizes that change is a gradual, stage-based process and that an individual's current stage influences the types of messages and interventions to which they are most receptive. Research has shown that different strategies are required at different stages of change. According to the model, individuals typically progress through six stages before a new behaviour becomes established. These six stages are:

1. Precontemplation – has not considered changing
2. Contemplation – has considered changing
3. Preparation – has prepared for change
4. Action
5. Maintenance
6. Termination – ending, which means that the new behaviour is established.

The steps do not only go in one direction since a person who is at step 4 (action) can go back to step 3 (preparation) if the action was not carried out to their satisfaction.

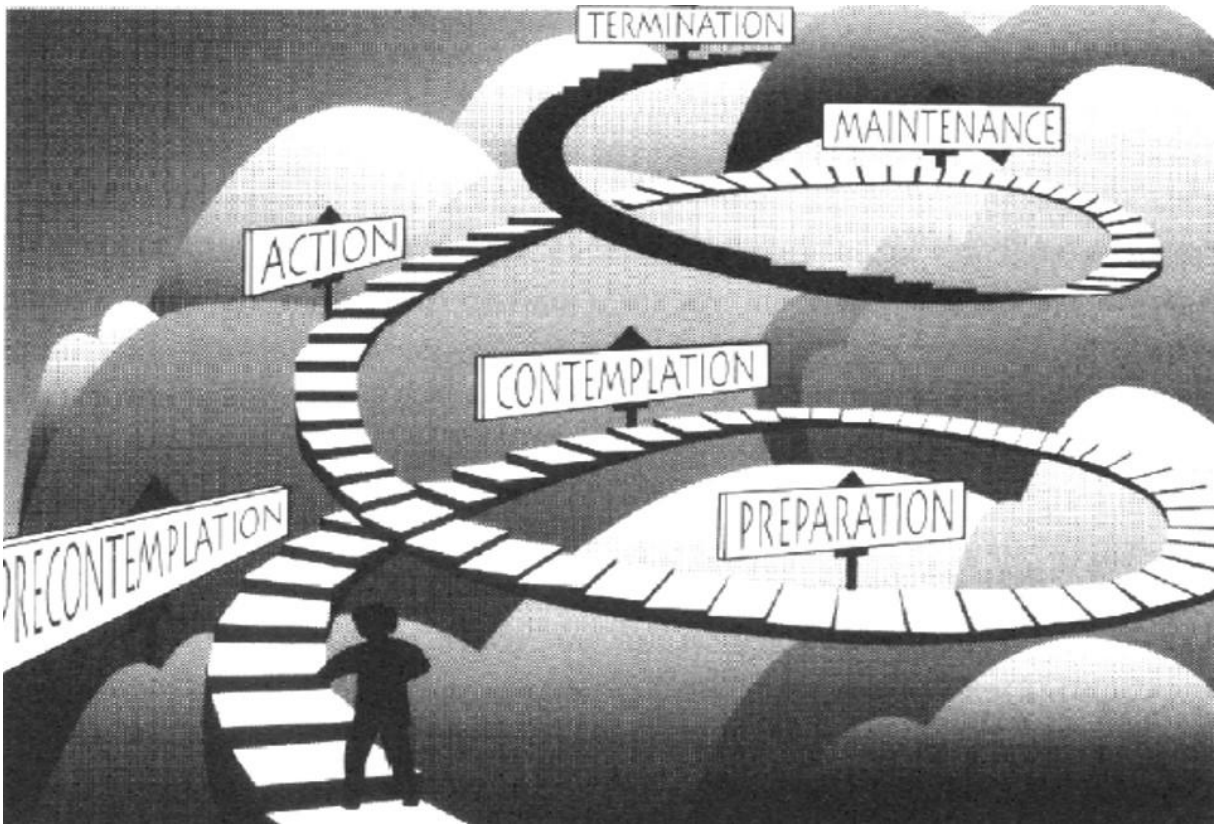

Figure 3. Trans-theoretical model of change

If we consider drivers who engage in traffic violations, the process may unfold as follows. In the first stage, *precontemplatio*n, there is no intention to change behaviour. This stage is also referred to as denial, as individuals do not perceive their behaviour as problematic. For example, a driver may regularly exceed the speed limit. If this behaviour produces the desired outcomes, there is little motivation to change it.

Reaching drivers at this stage typically requires substantial effort, as they tend to disregard messages that challenge or contradict their existing behaviour. Approaches that have proven more effective include direct, informal interactions with the target group, allowing individuals to begin reflecting on their behaviour through dialogue with others. Another approach is to allow drivers, in a controlled and safe environment, to experience situations involving relatively risk situations. Such experiences may generate an "aha" moment, leading drivers to realise that they may be overconfident in their driving abilities

In the second stage *contemplation*, the drivers begin to become aware that their own behaviour may be a problem. At this stage, a form of disharmony often arises because the drivers behave in a way that they cannot fully defend. The easiest way to deal with this discomfort is to seek information that supports their current behaviour. Access to such information can cause the drivers to go back to stage 1 and thereby try to forget what they have been told. If, on the other hand, the drivers realize that their own behaviour need to change, they move on to the third stage *preparation*. Now the drivers

are preparing themselves for change and is therefore much more open to information that can help them to act differently. At the fourth stage they move from preparation to *action*, for example, the drivers begin to follow the posted speed limits. Since the behaviour is new, the drivers are very sensitive to criticism and how the new behaviour is perceived by others. In cases where the driver's friends do not appreciate a change in behaviour, there is a high risk that they will go back to stage 1. This means that drivers at stage 4 still need support, help and encouragement. It does not always have to be about encouragement from people around the drivers, but it could be that it has become cheaper to refuel the car or that driving can be carried out in a more relaxed way. If it works well, the drivers move on to stage 5 *maintenance*. Now the behaviour is more established but has not yet become a real habit. It is only at the last stage, stage 6, *termination* that the drivers reach the goal, which means that their previous behaviour is no longer an attraction.

This theory highlights the importance of long-term planning of behavioural interventions and that an evaluation also considers psychological factors. In connection with a campaign, the primary goal may be to change behaviour. Since change is a process, it cannot be expected that a target group that is at stage 1 or 2 will change its behaviour only after one campaign. For this reason, it is of great importance to also measure secondary factors (e.g. knowledge, attitudes, norms) and where in the change process the group is, both before and after the campaign. Based on the model, it can therefore be argued that a campaign that succeeds in getting the target group to move from one stage to another should be seen as successful, but it should be followed up with other campaigns (see also the section on information campaigns).

Traffic education

This section discusses some fundamental educational issues that can be applied in in driver's license training for various qualifications or in other educational efforts with a focus on road safety.

The section also deals with behavioural interventions (such as campaigns) that are applicable to many different road user and target groups.

Road user education and information are needed in all user groups such as; children, young people, the elderly, pedestrians, cyclists, moped riders, motorcyclists, car drivers and professional drivers. For some groups, there are given arenas where information can be disseminated, such as driver's license training, continuing education, television and social media. For some groups, however, natural arenas for learning and engagement are lacking, making initiatives by voluntary organizations and committed schoolteachers particularly important. This section presents broader perspectives on education and information within the field of road safety.

Driver training

Something that research has taught us over the past decades is that driver training is much more complex than we previously thought. Motivation and decision-making are influenced by several phenomena that have nothing to do with the road user role itself. Things like personality, lifestyle, attitudes, gender roles, group affiliation, etc. are very important for the motivation to behave safely. It can also be described as a backpack with different compartments, which the person carries with them into the role as a driver. This also means that the drivers, during their lifetime have acquired several beliefs, attitudes and norms before they even start learning to drive a car.

One of these compartments is particularly relevant for children and adolescents and contains the brain's maturation process. Neurophysiological research has accumulated a great deal of knowledge about how different brain functions develop. It has been shown that the development of functions that are crucial for road safety takes longer than we previously thought. Functions such as controlling impulses and emotions, reflecting on the consequences of one's actions, or resisting peer pressure are not fully developed among young people. All such abilities are extremely important for road safety.

Experience

In addition to the conscious choices that underlie many behaviours, many crashes among car drivers can be explained by the fact that they are beginners and lack experience behind the wheel. Lack of experience and routine means increased mental strain, which in turn means that the driver's performance is not always at its peak. This in turn leads to beginners more easily missing or misinterpreting traffic events, making mistakes and therefore more easily ending up in critical situations.

The mechanisms underlying the benefits of experience and routine are relatively easy to understand. By repeatedly performing a behaviour and spending sufficient time in a particular environment, individuals learn how that environment functions and how to respond to its demands more effectively. Initially, decisions require active cognitive processing. Gradually, however, decision-making becomes easier as behaviours become more or less automatic, thereby freeing up mental capacity.

This available mental capacity is particularly important in a complex system such as road traffic, where drivers must control their vehicle, follow traffic rules, interact with other road users, and anticipate potential risks. At the same time, they may need to converse with passengers, navigate to an unfamiliar destination, or attend to aspects of the environment that are not directly related to driving. A lack of experience can result in poorer visual scanning, slower reaction times, and a reduced ability to perform multiple tasks simultaneously.

Automation develops gradually as one becomes more and more experienced behind the wheel. There are different theories about how this happens, for example one developed by Rasmussen describes how skills develop in a technical system. Rasmussen describes three different stages that one goes through when learning, for example, to drive a car.

The first, K*nowledge-based stage,* describes a novice driver for whom all subtasks must be performed consciously and deliberately. Initially, a task such as starting a car is not a coordinated action but rather a sequence of separate actions involving the clutch pedal, accelerator, gear lever, turn signals, mirrors, and other vehicle controls. Each of these actions requires mental attention. As a result, a large proportion of the driver's cognitive capacity is occupied, leading to longer reaction times and increased vulnerability to distraction.

Gradually, however, the driver learns how different elements of the traffic system are interconnected and, according to Rasmussen, develops mental models or rules for more complex behaviours, such as starting the vehicle, overtaking, or navigating a roundabout. These mental rules characterize the second, *Rule-based stage*, in which the driver is able to cope with more demanding situations, including driving in complex traffic environments, at higher speeds, and with greater anticipation of future events. As a result, the mental workload is reduced, and more cognitive capacity becomes available to deal with factors that might otherwise distract or overwhelm a novice driver.

Gradually, with increased routine and experience, much of driving occurs without the need to think or make conscious decisions. Behaviours that can be performed without increasing mental load are automated, such as shifting a gear, maintaining a certain speed, or driving through an intersection. In this third, *Skill-based stage*, reaction times have shortened and the driving becomes smoother. A better visual scan has also developed, where the gaze is raised and peripheral vision is used better. The visual capacity to take in information that is not directly related to the driving task is also developed. With increased experience, the driver looks more at, for example, people outside the car, nature, houses and other objects.

This three-stage developmental process does not end once a driver becomes experienced. Throughout their driving career, drivers encounter new situations and tasks that may require them to move back through the stages and repeat parts of the learning process. Examples include driving an unfamiliar vehicle, driving in a country with left-hand traffic, or navigating a busy city with which they are unfamiliar to. In addition, some tasks never become fully automated, such as navigating to a new destination. These tasks are often unique and therefore require conscious attention each time they are performed.

Visual scanning changes in several ways with increasing experience. A novice driver does not use peripheral vision as effectively as an experienced driver. The novice driver

fixes on objects and moves his/her gaze more often and has difficulty lifting the gaze and looking far ahead on the road. The novice driver looks more often at the road directly in front of the car and on the right edge of the road.

Safe road user – the GDE matrix as a tool in driver training

The objectives of driver training, both internationally and nationally, have shifted from a traditional focus on vehicle manoeuvring and control to a greater emphasis on cognitive skills and risk awareness (OECD/ECMT, 2006). This shift is based on research demonstrating that proficiency in vehicle manoeuvring and control alone is insufficient for safe driving. An excessive focus on these skills may even lead drivers to overestimate their own abilities, which in turn can encourage greater risk-taking.

Risk-taking can be understood as a balancing act between drivers' perceptions of their own skills and their perceptions of risk. An overestimation of one's abilities is often accompanied by an underestimation of risk. Consequently, increased attention has been given to the individual's personal goals, motives, and circumstances, as these factors have been shown to play a crucial role in shaping driving style and influencing the risk of involvement in a crash.

Based on these research findings on the importance of self-assessment and insights into personal motivations for driving, a matrix of educational goals has been developed, the so-called GDE matrix (Goals for Driver Education).

The GDE matrix was originally developed as a model to define competencies a safe driver needs to have, but also as a tool for what goals should be set in driver training. It is for this purpose that it has been most widely used, as the basis for national curricula for driver training in several countries, including Norway, Finland and Sweden. The matrix can also be used in several other contexts and other road users, e.g. for older people in traffic and for children and young people.

The basic idea of the GDE matrix is that the road user's task can be described hierarchically. Here, such an approach means that abilities and conditions at higher levels in the matrix have an impact on requirements, decisions and behaviours at lower levels. The following four levels are included in the GDE matrix:

- The individual
- The journey
- Traffic
- The vehicle.

The first level, t*he Individual* refers to personal circumstances and aspirations in life from a general perspective. This level is based on knowledge that lifestyle, social background, age, personality, group affiliation and other individual circumstances influence attitudes, motives, strategic choices, behaviour and involvement in crashes. It

highlights that the decisions we make and the motivation that guides our choices and behaviours are largely a result of the personal circumstances we bring with us into the role as a road user.

The second level, *the Journey* focuses on the journey itself and the strategic choices that are related to the goal of the journey and the context and conditions in which it takes place. More specifically, it may involve the choice between using a bike, a car or a bus, to travel during the day or at night, in rush hour traffic or not. It may also involve the decision to drive when tired, stressed or under the influence of alcohol. All these factors are related to the purpose or goal of the journey.

The third level, *Traffic*, is about mastering different situations in traffic. A road user must be able to adapt his/her driving behaviour to the constant changes that occur in traffic, e.g. at intersections, at pedestrian crossings, when overtaking or when interacting with vulnerable road users. The ability to identify possible dangers in traffic also lies at this level.

At the lowest level, *the Vehicle* the emphasis is on the function of the vehicle itself and how it is operated. Being able to start and shift gears well enough, to be able to use the moped or car in traffic belongs to this level, as do techniques for more complicated evasive manoeuvres, braking effectively, avoiding skidding on slippery surfaces and understanding how the laws of nature affect vehicle movements. The function and benefits of lights and reflectors, seat belts, child car seats, and airbags also belong here.

It could therefore be stated that it is not enough to be able to handle the vehicle skilfully to be a safe road user. It is also necessary to understand how to plan the journey so that it is safe and to be aware of own limitations and how the individual is affected by the environment. The hierarchical structure is therefore expanded into a matrix to cover all these different dimensions. In addition to the four levels, the matrix contains the following three columns/dimensions:

- knowledge and skills
- risk-increasing aspects
- self-knowledge.

Table 1 The Goals for Driver Education (GDE)

	Knowledge and skill	Risk increasing aspects	Self assessment
Goals for life and skills for living	Lifestyle, age, sex, Personality, Group norms, Company culture	Sensation seeking Risk acceptance Safety ignorance Peer pressure	Introspective competence Own preconditions Impulse control
Goals and context of driving	Time planning Route planning Fitness to drive	Alcohol, Stress, Tiredness Rush hour	Own motives influencing choices Self-critical thinking
Driving in traffic	Traffic rules Co-operation Hazard perception Automatization	Speeding Close-following Low friction Vulnerable r.u.	Calibration of driving skills Own driving style
Vehicle control	Car functioning Protection systems Vehicle control Physical laws	No seatbelts Breakdown of vehicle systems Worn-out tyres	Calibration of car-control skills

The content of the first column *Knowledge and skills* describes what insights, knowledge and skills the road user needs to be able to behave safely under normal conditions. At the two lower levels in the hierarchy, this is equated with being able to manoeuvre the vehicle and use the various safety systems, being able to behave correctly in traffic and knowing which rules must be followed. At the two higher levels, the column relates, for example, to how safe journeys should be planned and an understanding of how personality traits etc. can affect behaviour and safety.

In the second column, *Risk-increasing aspects*, the emphasis is on awareness of factors that may be associated with greater risks. At the two lower levels, this may involve understanding the risks of cycling at intersections, demanding one's right of way at crosswalks as a pedestrian, overtaking in poor visibility, exceeding the speed limit in a residential area, having worn tires or bad brakes, not being familiar with simple manoeuvres, etc. Higher up in the hierarchy, the second column refers to, for example, the risks of driving when tired or drunk, walking or riding in the dark, etc. The top level includes risk-increasing aspects of lifestyle and personality, such as a sensation seeking personality or dangerous peer pressure.

The third column, *Self-awareness* is about the road user's ability to assess and place themselves on the four levels, an ability for self-awareness. At the two lowest levels, it is about "calibrating" one's own ability to handle one's vehicle and to behave safely in traffic. Many studies show that overestimating one's own ability is a problem that can lead to underestimating risks. At the higher levels, "self-awareness" is about becoming

aware of, for example, one's own personality traits and one's own group affiliation and how they can influence individual choices and the risks one exposes oneself to.

All four levels in the matrix should be considered important. They form parts of a whole system of competences and insights. Such an approach means that all levels should be included in road safety education, regardless of whether the focus is on level 1 or 4 in the matrix. It is important to clarify the hierarchical structure and that conditions at the highest level affect strategic choices and behaviour at the lower levels.

The matrix emphasizes above all how personal circumstances influence the choices individuals makes for their travel and how they behave in traffic. The matrix can also be interpreted as a reverse hierarchy where skill, experience and routine at the lowest levels can influence the strategic choices and insights into personal circumstances at the higher levels. It can be said that personal circumstances influence from the top down, while experience and skill influence from the bottom up.

Pedagogical methods in road safety education

Education based on the levels described in the GDE matrix requires methods that are more student-centred. The following section provides some concrete examples of pedagogical approaches with a focus on student-centred learning.

Student-centred learning

A possible historical interpretation of the development of driver training is that it has previously been viewed as quite similar to traditional teaching where the aim is to accumulate knowledge and skills on specific subjects. Such an orientation requires special pedagogical methods that have traditionally been dominated by teacher-centred methods.

Today we know that only some parts of driver training are about accumulating knowledge and skills. To improve road safety, things like insights into risks and one's own limitations as described in the GDE matrix are important. It is not enough to be able to handle the vehicle and know the rules. The ability to control one's own emotions and impulses and the ability to resist peer pressure are crucial and must be given high priority. It is necessary if we want driver training to contribute to preventing serious injuries and death.

But with such an ambition, the pedagogy must also be different. A lot has happened in terms of the development of new pedagogical methods and we are gradually starting to understand and apply these in driver training as well. To be able to work with areas such as the importance of group affiliation and peer pressure, lifestyle, personality and other "compartments in the backpack", it is important to use methods that develop the student's active participation, commitment and ability to reflect on consequences. Just listening to someone lecturing about peer pressure, about how to think or how to

behave, can work in certain contexts, but if the goal is for students to apply it themselves, it is not very effective.

It is necessary to create commitment, reflection and motivation that can withstand the counterforces that await just outside the door of the classroom or driving school, such as youth culture, group norms and peer pressure. This is largely about student-centred learning and student-centred methods such as problem-based learning, inquiry-based working methods, group dynamic methods, small group activities, coaching, etc. Such methods have been used in other types of education for a long time and are also gaining ground in driver's license education. Here we know from general educational research that student-centred methods have many advantages because they:

- Involves active rather than passive learning
- Provides deeper learning and better understanding
- Encourages collaboration
- Strengthens students' motivation
- Creates engagement and reflection
- Strengthens communication between students
- Reduces disruptive behaviour
- Strengthens respect and independence between student and teacher
- Develops investigative and active learning
- Gives the student increased responsibility for their own learning.

There is a great deal of research on the use of learner-centred methods in learning, but very little on how it can be applied to road user education. However, we know that student-centred methods are effective for learning, curiosity, engagement, reflection and motivation, which are crucial for increased insight and understanding of risks in traffic.

A crucial question for learning is what characterizes a good learning situation. Research show that different people have different learning styles and that different pedagogical strategies and methods work differently for different students and student groups. But despite this, research also shows that methods where students are active, investigative and critical knowledge producers get good results because such education can be adapted to groups and to individuals.

An example of a pedagogical model for student-centred learning is the so-called 5E model. It consists of five perspectives on the pedagogical process, all of which support the teacher in planning the learning situation:

- *Engage* - motivate (create curiosity and interest in a phenomenon/theme, create a learning need, demonstrate existing prior knowledge, beliefs and attitudes in the student through active value choices, focus on educational goals).
- *Explore* – investigate (be a supervisor, support students in building bridges between existing knowledge/beliefs/attitudes and new ones that are in line with the goals, facilitate students' investigative information gathering, interpretation and questioning).
- *Explain* – clarify (let students communicate their experiences and results, assist in making connections and drawing conclusions).
- *Elaborate* – develop (help students move on and draw conclusions about themselves and the application of the new in a broader perspective, transfer from the learning situation to reality).
- *Evaluate* – reflect, also with the students, on how and why different activities are engaging and motivating, value and provide feedback to the students on their learning process.

Coaching

Coaching involves helping a student achieve their goals by helping to formulate them, encouraging them and asking questions. Coaching also involves encouraging the student to solve problems on their own. A coach helps their student to set up a plan to achieve the goals and motivates the student to complete it. By giving a lot of positive feedback, the teacher ensures that the person they are coaching develops in a positive way. In addition to the positive feedback, they can also try to give constructive criticism to build and develop the person they are coaching. Coaching is characterized by:

- The method creates a more equal relationship between teacher and student.
- individual goals are discussed and formulated together
- the teacher asks instead of telling
- the student's learning is in focus instead of the teacher's teaching
- the teacher tries to draw knowledge out of the student instead of putting it in
- the teacher creates engagement and initiates thought processes
- The teacher helps the student to define the problems themselves and suggest solutions.

Group discussions

Group discussions can create engagement among students if the topic of the discussion is engaging and close to the students' own experiences. For example, road safety topics can be, drink driving, speeding and police surveillance or perhaps analyse real crashes. Using material from an authentic fatal crash involving young people quickly creates emotional engagement among most people. One variant is to start from authentic investigation material where the students in a group are given a certain amount of time to go through descriptions, pictures, police interviews, etc. Another way is to search for

information about a crash on the internet, where many different perspectives can be obtained. The students can then discuss and make suggestions about what they think happened and what causes they believe were behind it.

This can stimulate a discussion about several risk factors if the right type of crash is chosen, e.g. crashes which can be linked to peer pressure, speed, seatbelts, alcohol, darkness, fatigue or lack of experience. Part of the discussion is also how the crash could have been avoided, through efforts from society or from those who were involved in the crash. It is important to have a clear structure for the discussions where the teacher define in advance which elements are to be discussed. Part of the group discussions can also be to search for factual and in-depth information, e.g. on the internet. A model that has worked well in several contexts is to end a group discussion with each person drawing conclusions from the discussion and making a promise to themselves about how to change their behaviour.

Another example of an approach for group discussions is to practice reflecting on the consequences of a behaviour. This can start with the connection between young people's behaviour and crashes and discuss what the consequences are of different types of risk-taking. The discussions can also start with fact-gathering and analysis and then continue with a discussion of the consequences. Examples of risky behaviours that can be used in such group discussions are if they:

- violates speed limits
- not using a seat belt in a car
- drinking and driving
- drive when tired
- gives in to peer pressure
- participates in street races and competitions

Assessment exercise

The purpose of this exercise is to give students the opportunity to take a position on various situations and phenomena that may involve dilemmas. By reflecting on and expressing their views, students are encouraged to consider the consequences of different behaviours and to examine and develop their attitudes. Because the exercise is conducted in groups, students also have the opportunity to discuss similarities and differences in their perspectives. The exercise can lead to more structured group discussions or form part of a broader educational programme that incorporates a variety of activities and teaching methods:

- The exercise encourages engagement and reflection.
- Participants are given the opportunity to make an active and conscious choice.
- They are trained to express their opinions and justify their positions.

- They are trained to listen to others.

Here is an example of an assessment exercise. It is taken directly from a publication belonging to a school project in Gothenburg, "Traffic for Life." The publication contains a long list of examples of how assessment exercises about traffic can be designed for different ages in school.

Example

In a 4-corner exercise, a question is asked and three to four alternative answers are presented. Participants choose the corner where they feel most at home. The fourth corner can be an open corner to provide the opportunity for their own solutions. Anyone who does not feel at home in any of the presented alternatives or has their own alternative also stands there. Let the participants discuss with each other and justify why they have chosen a particular corner. If someone is standing alone in a corner, the teacher can go and stand at the same corner and lead the exercise from there. The lone participant gets to discuss with the teacher and explain why he/she chooses this corner. One from each group then tells what the group has talked about. They can switch to another group if they are more interested in the topic discussed in this group. Make sure that the groups are not too large. 3–5 in each group is just right. The 4-corner exercise is a good introduction to forum games, as it is based on the discussions that have been held. Instead of the group in a corner telling their opinion, they can try to express it. Let the group rehearse for five to ten minutes, while they distribute the roles and determine the sequence of events. They should show the situation without any solution to the problem. Then the situation is played out for the audience, who come up with solutions to the problem by jumping in, when one of the actors is replaced.

insight-based training used in on-track driver training

During the 1980s, a discussion began about which strategy should be used in on-track driver training, especially for so-called skid training, but also for other advanced training courses in controlling the vehicle in critical situations. The discussions concerned whether the ambition to teach drivers to manoeuvre out of a critical situation increased or decreased the risk of being involved in a crash.

Other studies found that the increased skills acquired through on-track training could be used to satisfy motives other than safety, such as arriving more quickly at a destination or competing with other drivers. This, in turn, could lead to driving with reduced safety margins. An important outcome of this discussion was the development of a new approach, known as insight-based training. Over time, this approach has gained acceptance as an effective strategy, both in the Nordic countries where it originated and in many other parts of the world. Today, insight-based training is incorporated into a wide range of road safety education programmes and is no longer limited to on-track driver training.

The primary aim of insight-based training is to reduce overconfidence and encourage drivers to maintain generous safety margins. In contrast to skill-based courses, which focus on developing the ability to manoeuvre a vehicle in critical situations, insight-based training emphasizes the importance of avoiding such situations altogether. Another key objective is to increase awareness of the benefits of using protective systems, such as helmets, seat belts, and child restraints.

Example

During this exercise, the student practises performing a braking-and-evasive manoeuvre on a slippery surface. The exercise is designed to demonstrate that the manoeuvre can be performed successfully at low speeds but becomes considerably more difficult at higher speeds. To reinforce this message, an additional scenario is introduced on the way to the next exercise. The student is driving at 50 km/h when a life-size inflatable car is suddenly deployed onto the roadway in front of the vehicle. The distance is calculated to allow sufficient time for a successful braking-and-evasive manoeuvre, yet students rarely manage to complete it successfully. The purpose of the exercise is to illustrate that drivers cannot rely on their newly acquired evasive manoeuvring skills to be effective in all situations.

Behind this strategy was, among other things, knowledge from education and psychology that the type of skill that a driver needs to manoeuvre out of a critical situation cannot be learned in the traditionally very short courses that are usually involved. The driver cannot trust that their skill will be sufficient in an unexpected situation. It takes quite a lot of training to avoid skidding or for an effective braking evasive manoeuvre to be ingrained in the spinal cord. The amount of training that is needed is almost never received by normal drivers. Learning about risks, anticipating them and thereby being motivated to drive with large safety margins has a significantly greater safety potential, not least because this can be practiced constantly and gradually become automatic.

Many countries have developed practical exercises where drivers experience what happens if they drive too fast, with too short distances, talk on a mobile phone, etc. This thinking can be the starting point for developing various concrete experiences around seat belts, crash violence, speed, bicycle helmets, moped helmets, etc.

Information campaigns

Information campaigns are an important tool for increasing road safety because they are aimed at a wider public, i.e. not only at those who undergo a more structured mandatory training. Today we know quite a lot about what increases the effect of a campaign but also why some fail. For example, it has been seen that campaigns that have tried to change drivers' attitudes by pointing out the risks of crashes have often failed or have had little effect. This is because most people believe that crashes are something that

happens to other people. Another problem with these campaigns is that crashes are relatively few and that drivers often get away with it despite serious violations of the rules. This is of course good from a road safety perspective, but when it comes to education it means that incorrect behaviour is rewarded.

To achieve a greater effect, the language used should be aimed at the individuals in question, something they can identify with. This is where theories can contribute important knowledge. Humans are active beings with a need to understand what is happening. How an individual interprets what is happening is influenced by what has happened in the past but also by what they expect from the future. An individual is thus guided by how something appears to be rather than how something is. Each experience is not an isolated component but is incorporated into a structure, new knowledge is added to old. It can therefore be assumed that the same information will not be interpreted in the same way by different individuals. A driver who drives recklessly in traffic may explain this by saying that he or she can master the situation and that the chance of a crash is almost non-existent. Excessive self-confidence combined with a downgrading of the risks leads to a so-called maladaptive survival strategy.

Another observation is that information campaigns focusing solely on increasing the target group's knowledge are often insufficient. Research has shown that cyclists are generally well aware that bicycle helmets provide protection, yet this knowledge does not necessarily lead to increased helmet use. One reason why such campaigns have often been unsuccessful is that they appeal primarily to reason rather than emotion. However, human behaviour is influenced not only by rational considerations but also by emotional factors. In the case of bicycle helmets, negative attitudes may stem from perceptions that helmets are uncomfortable, inconvenient, or do not substantially increase feelings of safety while cycling.

Getting the message across can also be problematic because people we are constantly bombarded with information that we cannot possibly process. Most of what is presented we spend little or no time on and very rarely does it cause us to reinterpret well-established beliefs.

The prerequisite for change to occur is that the individual is willing to actively process the message, but first the individual must become curious enough to stay. Four different conditions have been identified that need to be met before change can occur:

1) Dissatisfaction with one's own perspective
2) Understanding, the new information must be clear and concise
3) Credibility, the new alternative must be feasible to implement
4) Attraction, the new must be more attractive than the old.

Dissatisfaction can be created by presenting information that conflicts with previously held ideas or when the individual has been successfully convinced that the new

behaviour is better than the old. Increased *understanding* can be achieved if the message is relevant and if it can be connected to something that is already known. The message becomes more *credible* if it is based on knowledge and if the alternative is possible to implement. The message can be experienced as more *attractive* and appealing if it succeeds in convincing the individual that the new, in a better way than the old, fulfils a desired function. Attraction is also increased if the message is experienced as interesting and exciting. The conclusion that can be drawn from this is that successful campaigns or programs are based on results from a well-established theory (see the introduction to this chapter). In addition, it is important to adapt the campaign to the target group. If this is not done, it is a bit like shooting straight into the dark, it is impossible to know where the bullet will end up.

Sometimes messages are used that aim to appeal to the recipient's emotions. This type of message can be based on either intimidation, threats, promises, humour or irony. Messages with threats and intimidation have been the subject of extensive study.

Messages that contain some forms of intimidation do not only have to involve a physical threat of death and injury, but also social, psychological and economic threats. Social threats can involve not being accepted by people who are important in one's life or even being ostracized. Economic threats can involve criminal sanctions, such as fines.

In summary, the research shows that if the message use threat then this should be used with caution and that the campaign must make it clear how the recipient can prevent him or her from finding themselves in the same situation. Unfortunately, there are many campaigns that do not take this into account and therefore fail. There is also a risk that a scaremongering message leads to fatalism and therefore does not affect the recipient's behaviour. Another problem may be that the presentation is so repulsive that the recipient does not process the message.

Humour, on the other hand, is not as well researched as intimidation, but there are results that show that humour can increase the impact of a campaign because it:

- creates a positive mood, people who feel good are less likely to distance themselves from the message
- makes the individual appreciate the message more
- establishes trust in the person conveying the message
- prevents the recipient from finding counterarguments.

A handbook funded by the EU in the CAST project (Campaign and Awareness-Raising Strategies in Traffic Safety) provides advice on how to plan, implement and evaluate a good information campaign.

CAST suggests six steps in designing, implementing and evaluating a road safety communication campaign:

1. Getting started
2. Analyse the situation
3. Design the campaign and evaluation
4. Conduct the feasibility study and launch the campaign
5. Complete the evaluation and draw conclusions
6. Write final report.

The first step, *getting started*, involves identifying and defining the problem to be addressed, gathering background information about the problem and the context in which it occurs. This includes determining partners, establishing a budget, and arranging a creative kick-off meeting.

In the second step, *analysing the situation*, is still in the planning stage. This includes a careful analysis of the problem and how it can be solved, which target groups to address and which messages are most suitable. The advantage of having a primary target group and a secondary one that can set a good example is pointed out. This step also includes the important analysis of what influences the incorrect behaviour, how the goals of the campaign should be set and how best to reach the target group with the message. Here, it is very helpful to base the design of the message on studies that have examined the behaviour. Another important element is to learn from how similar campaigns have been implemented and evaluated, as well as from the results they have achieved. However, previous campaigns should not be copied uncritically, since differences in context, target groups, and objectives may require different approaches. Once a campaign has been implemented and evaluated, it can contribute to the cumulative development of knowledge and provide valuable insights for future road safety initiatives.

In the third stage, campaign *design and evaluation*, attention shifts to planning and testing the more concrete elements of the campaign. Key questions include whether the campaign should be implemented as a standalone intervention or combined with other measures, and which communication channels should be used to reach the target audience. Research has shown that mass media campaigns have the potential to reach large numbers of people. However, people's willingness to engage with campaign messages is often greater when interventions are delivered locally through community-based channels and personalized communication, such as letters, emails, telephone calls, or face-to-face contact, and are supported by local activities.

The third step also includes refining the message, which also includes testing the message on a small group like the target group. Questions to ask:

- Is the message clear and concise?
- Does the message make the recipients reflect on the problem,
- Does the message make them want to change their behaviour?

The third step also includes a detailed design of the evaluation. It consists of a process and an outcome evaluation. The process evaluation take note of what is being done and what happens during the campaign that can affect the result, who notices the campaign, etc. The process evaluation could help to detect errors and shortcomings in the design, making it possible to correct them before it is too late. The outcome evaluation measures, using a pre- and post-study, the degree to which the goals of the campaign itself are met. It is important to formulate goals for the evaluation, determine the evaluation design, and decide which impact measures and which measurement methods to use early on.

The fourth step, *conduct the feasibility study and launch the campaign* means that a feasibility study ensures that data, measurement methods, etc. work as intended. When this is complete and the campaign material has been developed, the campaign itself can be launched.

In the fifth step *complete the evaluation and draw conclusions*, a second outcome evaluation is carried out and the results from the pre- and post-study are analysed. Based on this, clear conclusions are drawn about the campaign. The conclusions are about both how the implementation worked and the extent to which the objectives of the campaign have been met. Sometimes the evaluation also includes a cost-benefit analysis.

The sixth and final step is to *write a final report*. Only by doing so can practitioners communicate their experiences and contribute to the cumulative development of knowledge about campaigns.

According to CAST, the report should be designed to answer the following questions:

- Why was the campaign carried out?
- How was it implemented?
- What effects (if any) did the campaign have?
- What types of evaluations were carried out (process, impact or outcome evaluation and/or economic evaluation)?
- What aspects of the campaign were evaluated?
- Which campaign elements were particularly effective, and which were not effective?
- Were the impact(s) measured in the short, medium and/or long term?

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