

Technical University of Denmark



Road user model and persuasion technique

Final version

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ROAD USER MODEL AND PERSUASION TECHNIQUES

Final version

Public

CAMPAIGNS AND AWARENESS RAISING STRATEGIES IN TRAFFIC SAFETY

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EXECUTIVE SUMMARY

This report is CAST deliverable D1.4 output as part of Work Package 1. The deliverable aims to answer the following questions; which kinds of road user behaviour should campaigns target, what influences the behaviour we want to change and how can we influence such behaviour?

In chapter 1, an overview of Social Marketing and the implication this has for road safety communication campaigns is presented. Chapter 2 identifies types of road user behaviour empirically linked to accidents/injuries. We identified the following types of behaviour that fulfilled this criterion:

- Speeding
- Driving under the influence of alcohol and/or drugs
- Deliberately failing to yield for other motorists, pedestrians and cyclists
- Close following (tail-gating)
- Dangerous overtaking
- Red-light running
- Aggressive driving
- Lack of seat-belt wearing and lack of use of child restraints
- Lack of wearing helmet and protective clothing for motorcyclists and moped riders
- Fatigue among drivers of private cars and violation of driving and resting-time regulations for heavy vehicles
- Use of mobile phones while driving

Each type of road user behaviour can be proposed as a theme for road safety campaigns, as supported by studies indicating that European drivers have the potential to improve both their way of behaving in traffic and their beliefs about that behaviour. Each of the above behaviours is effectively a rule violation. A central question is whether these types of behaviour really are open to change through the use of road safety campaigns alone.

What influences the behaviour we aim to change?

Chapter 3 reviews and discusses models aimed at predicting/explaining road user behaviour. Both general behavioural models and models specifically aimed at understanding driving behaviour/road user behaviour are considered. The ultimate aim is a synthesis of factors believed to influence road user behaviour, which together make up an eclectic road user model.

A review of five general models of behaviour demonstrates that they share very similar characteristics. These include:

- Attitudinal beliefs
- Self-efficacy and behavioural control beliefs
- Normative beliefs/social norm
- Risk-related beliefs and emotional responses

- Intention, commitment and planning
- Habit/past behaviour

A comparison of these general behavioural models suggests that the (extended version of the) Theory of Planned Behaviour (TPB) is the most comprehensive model of these five models. The model also has most empirical support for its ability to explain variance in road user behavioural intentions and to some degree road user behaviour. Although there is extensive evidence that the different components in the model are related to road user behavioural intentions and behaviour (when these components are measured at the same point in time), evidence that a *change* in these beliefs will give a change in road user behaviour is limited. This may partly be because few of the intervention studies applying these theoretical frameworks/components evaluate the effect of the key variables included in the models. An alternative explanation is that the model is not suited for the use in behavioural interventions.

One major limitation of the above mentioned models is that the role of emotions and affect are not emphasised to a high extent. Although the general behavioural models incorporate emotions, they often regard them as a part of the more rational “cost-benefit analysis of the mind”, and this emphasis on rational decision processes seems to be central in most of the models. Furthermore, the role of automated/unconscious processes is not emphasised, with the exception of the Theory of Interpersonal Behaviour (TIB). The TIB makes a clear and interesting division between behaviour seen as a result of intention and behaviour seen as a result of unconscious/automatic processes (also called habits). Many types of rule violations in traffic can be regarded as a habitual (like speeding, not wearing a seat belt) and this separation between habits/non habits has important implications for how road safety campaigns should be conducted. A habit is believed to be difficult to influence through addressing e.g. attitudinal beliefs, whereas non-habits are believed to be more easily changed by addressing such behavioural beliefs.

Models specifically developed to understand road user behaviour also emphasise the role of both highly conscious and highly unconscious (automatic) processes as determinants of road user behaviour. Feelings of risk, perception of task difficulty, and emotions are some of important determinants of behaviour according these models. The role of emotions is very central within the Risk Monitoring Model. The main implication of this model is that “The account of feelings” is a mechanism that has to be addressed and utilized in campaigns. Emotions have an important role: no emotions, no evaluation of choice. Thus, if a road user does not experience behaviour increasing accident/injury risk as dangerous (e.g. speeding or not using a helmet while cycling) it is difficult to influence the road user to adopt more safe behaviour. This is mainly because the message may not be felt as personally relevant (because one e.g. thinks that violating certain traffic rules it is quite safe) – or alternatively that the emotion experienced, the best feeling, is in conflict with the message (such as experiencing unpleasantness/boredom when keeping within the speed limit).

The most important implication for road safety campaigns that follows from this is perhaps to **influence the road user in that context in which the behaviour actually occurs**. This may, for instance, be achieved through applying the principles

of learning theory. In general this means giving the road user a sort of feedback or cues to action (stimuli) in the relevant context. Examples of such “in-context” measures can be Intelligent Speed Adaptation (ISA), enforcement, variable message signs giving drivers feedback upon their speed, billboards at the roadside, radio spots broadcasted at times of day when the risk of certain kinds of accidents are high (e.g. broadcasting radio spots at night time encouraging the driver to stop and sleep) etc.

The most common strategy in road safety campaigns is persuading the road user to adopt the desired behaviour through changing the beliefs believed to underpin the behaviour in question. This is mainly done outside the context in which the behaviour takes place, e.g. through advertisements in mass media (such measures are hereafter called “Off-context” measures). Based upon the above mentioned (assumed) advantage of applying “In-context” measures, the strategy of mainly applying “Off-context” measures is expected to have limited success in changing road user behaviour. This does, however, not mean that influencing beliefs believed to underpin behaviour “Off-context” is useless. This strategy can be very relevant if the behaviour in question is not a habit or automatic. Furthermore, “In-context” measures like enforcement usually have only a temporary effect in changing behaviour. However, in the (temporary) period behaviour has changed, the road user is believed to be more open to changing his or her behavioural beliefs due to the experience of cognitive dissonance between existing behavioural beliefs and the temporary change in behaviour. In this case it can be advantageous to combine “In-context” measures with “Off-context” measures in order to obtain a more stable change in the beliefs underpinning behaviour and thereby a stable change in behaviour. “Off-context” measures can also help the road user to elaborate the message more thoroughly, a process believed to crucial in order to obtain a permanent change the beliefs believed to influence to behaviour. The main conclusion is therefore that road safety campaigns should include both “In-context” and “Off-context” measures in order to be effective. This conclusion is also supported from the findings from the CAST meta-analysis of campaign effects presented in deliverable 1.3.

A conclusion drawn from review presented in chapter 4 is that it is very important to understand the interests and needs of the target group of the campaign, and also understand what drives them towards the behaviour we aim to promote or change. Such knowledge is believed to be crucial for tailoring the campaign message and deciding upon how it is going to be delivered to the target group. That is, how to make sure that the target group pays attention to the message, feels that it is personally relevant to them, understands the message and has the ability to process the message. Such thorough mental processing (elaboration) of the campaign message seems to be beneficial if a permanent change in the beliefs underpinning behaviour is to occur.

To facilitate this kind of processing, it is concluded that it is especially important that the receiver perceives the message as being personally relevant to him or her. This represents a challenge for road safety campaigns, as many types of rule violations campaigns aim to influence are often experienced as quite safe to conduct by the individual road user. Some methods that can enhance the probability of the message being processed by the receiver are the use of mental heuristics, focusing upon

cognitive dissonance and the actor-observer bias, using personal communication and including emotional appeals in the message. Recent studies indicate that fear-arousing appeals may be more effective for females and humoristic appeals more effective for males. However, the effects of using emotional appeals are far from clear and unequivocal. A general recommendation is to carry out a thorough pre-testing of the message before deciding whether to use emotional appeals or not.

Conclusion

Based upon the review of general behavioural models and the development of an eclectic road user model, a general recommendation is that **road safety campaigns should aim to influence the road users both inside and outside the context in which the target behaviour occurs**. This is especially true if the behaviour one tries to influence can be regarded as a habit.

It should be noted that this suggestion needs to be further tested before any firm recommendation can be given. However, the relevance of applying “In-context” measures is also supported by the results of the meta-analysis of campaign effects, which suggests that measures like feedback upon drivers’ speed, billboards along the roadside etc. are effective in reducing accidents and increasing seatbelt wearing rate among drivers and passengers.

1 INTRODUCTION

1.1 NOTES ON THE STRUCTURE OF THE DELIVERABLE

We have divided this deliverable into three main sections.

1. **Which** kinds of road user behaviour should campaigns target?
2. **What** influences the behaviour we want to change? (road user models)
3. **How** can we influence such behaviour? (persuasion techniques)

In chapter 1 we present an overview of Social Marketing, which is a sort of general framework for this deliverable. The aim of chapter 2 is to define the problem; which kinds of road user behaviour are empirically linked to accidents/injuries? When one wants to reduce the number of road accidents (and injuries), it is an advantage to know which behaviours are statistically associated with accidents. If one then reduces the frequency of a certain kind of associated behaviour, one should experience a reduction in the frequency of accidents¹.

After establishing which types of road user behaviour campaigns can target, the next question is why road users behave the way they do. The aim of chapter 3 is to review and discuss a selection of relevant theories aimed at predicting/explaining both road user behaviour and behaviour in general. The intention is to end up with a synthesis of factors believed to influence road user behaviour. This synthesis can serve as a guide to what campaigns could address in order to effect a change in road user behaviour.

This synthesis is closely related to the next aim, which is to present some more specific strategies of how to influence the behaviour of the target group of the campaign. Should one for instance emphasise personal communication and emotional appeals or is it beneficial to emphasise more rational arguments distributed through e.g. mass media? This will be the focus of chapter 4. In chapter 5, we will summarise the findings and their implications for road safety campaigns. This will also be discussed in relation to the findings of the CAST meta-analysis.

¹ We would like to clarify that the use of road safety communication campaigns is not the only way of reducing the number of traffic accidents and/or injuries. Enforcement, education, legalisation, improvements of the road infrastructure (engineering), passive and active vehicle safety systems are other effective ways of enhancing road safety. Road safety communication campaigns can also support these measures. For instance, it is quite common to combine traffic police enforcement with campaigning, to use campaigns to inform about new legalisation etc.

1.2 THE USE OF SOCIAL MARKETING

Traffic education: If only they knew more about this, we could change their behaviour". Social Marketing: "If only we knew more about them, we could reach them." (Smart Risk 2007)

Kotler and Zaltmann (1973) used the term Social Marketing first in the 1970s. Social Marketing can be defined as the planning, organisation, implementation and control of marketing strategies and activities of non-commercial organisations, which directly or indirectly aim at finding solutions for social questions. In contrast to commercial marketing that targets purchase or product choice behaviour, Social Marketing targets complex, often socially controversial behaviours with delayed and distant benefits to audiences. The audiences often do not recognise they have a problem, much less are looking for a solution. This can be especially relevant for road users, as we will see later in the report.

According to Stead et al. (2006), the following seven key stages comprise a marketing process:

1. **Defining a problem**

At the beginning of every marketing process a problem will be defined. With respect to Social Marketing the focus is often on a particular behaviour, for instance speeding. In the first step the marketer not only defines the problem, but also tries to get an insight of the cultural, economic, societal and other forces which are influencing the problematic behaviour, i.e. the reasons for speeding.

2. **Defining objectives**

A detailed problem analysis enables the marketer to pinpoint the precise behavioural change which the marketer wants to be achieved. Clear objectives are formulated, which ensure a common understanding and consensus about the intent of the intervention by all those involved. A clear objective also makes it possible to monitor the progress and to measure the success of an intervention.

3. **Understanding the customer**

The core of the marketing process is the customer (or in our case: the road user). For that reason it is important to understand the complexity of a special behaviour, the reasons why people behave in a certain way.

4. **Segmentation and targeting**

It is impossible to make a unique offer to each individual need. For that reason it is usually better to divide the consumers (i.e. road users) into sub-groups according to the similarity of their needs and their common characteristics (e.g. demographics, risk factors, perceptions, wants, and readiness to change).

5. **Understanding and addressing competition**

This stage asks what behaviour competes with the desired behaviour and how such competitive behaviour or other related influences can be minimised or removed by Social Marketing activities. If you e.g. make a campaign against speeding, the competition may for instance be in the form of other messages in movies, where speeding heroes are connected with the attributes cool, masculine, powerful etc. A more problematic competitive message is that speeding may be experienced as safe by the individual road user

6. **The exchange**

Customers are in many ways thought not to buy products, but solutions to

problems (Houston & Gassenheimer 1987). For that reason the key mechanism of every marketing process is exchange. The marketer has to know what the customers really want and he has to provide ways to satisfy their needs. The marketer should offer something beneficial (rewards, personal satisfaction) in return for the performance of a wished for behaviour. People are thought to change behaviour not only because they are well informed or forced into action, but also because they get something they value in exchange. *“Social Marketing is a way of thinking that places emphasis on an “exchange of value” with the audience rather than social control or education alone.” (Smith 2006, p 6).* However, this may be problematic in relation to promoting safe road user behaviour. At the Congress on Enforcement & Rewarding (Copenhagen 1992) it was shown that there is no easy way to give incentives for safe road user behaviour. This signifies that prompting safe behaviour faces more challenges than selling a product.

7. Developing the marketing mix

“...Marketing is essentially about getting the right product, at the right time, in the right place, with the right price and presented in the right way that succeeds in satisfying buyer needs” (Cannon 1992, p 46). In other words the marketing mix consists of the four Ps: product, price, place and promotion. These four Ps are not only relevant for commercial marketing but for Social Marketing, too. The *product* in the traffic safety area may be tangible (e.g. installation of telematic devices in the car) or intangible (e.g. a considerate driving style). The *price* refers not only to monetary costs but also to psychological or emotional costs (e.g. reduction of comfort when using seat belts). The price also refers to social (e.g. loss of image in the peer group when driving slowly) and temporal costs etc. (e.g. losing time from a subjective perspective when sticking to the speed limits). The *place* is the channel by which the change is promoted (e.g. the place where leaflets are distributed) and the *promotion* refers to the messages which are communicated (advertising, information materials, direct mail, etc.).

Professional marketing implies that it is important to stick to these key stages. Often only the promotion P is considered in a marketing concept. In this case one can only talk about social advertising, not about Social Marketing. Especially with respect to campaigns it is necessary not only to advertise a “safe traffic behaviour”, but to know why people behave in a certain way, what kind of motives are relevant for their behaviour and under which circumstances people would accept a change of behaviour. *“Not the objective technical quality of a product or service which matters, but the customer’s perception of a product’s quality” (Stead et al. 2006, p 20).* Some kind of relationship has to be built with the target group. In many cases, however, one should not only engage with the general public but also with “upstream” target groups: policymakers, traffic safety experts, stakeholders, etc. In addition, the marketing process has to be monitored continually with respect to the target groups’ needs. A practical consequence is that changing behaviour is believed to be a long term process. Thus, road safety campaigns following the principles of marketing should be allowed to continue over some time according to this point of view.

Kotler et al. (1996) described the marketing process similar to Stead. They differentiate six different aspects of marketing (Table 1.1):

Table 1.1: The marketing model described by Kotler et al. (1996)

<p>Aspect 1 You have something you want to sell, let us call it a "product"</p>	<p>Marketing content: Define what is going to be marketed, e.g., one very clear type of behaviour that would enhance traffic safety.²</p>
<p>Aspect 2 Find out if there are persons who would be interested in the product, we can call them "customers", and what they want. If you think that there are too few customers (which is almost always the case), it is advantageous to widen the target group</p>	<p>Information measures: Learn about the customers (subgroups); Who should change their traffic behaviour, into what subgroups can they be split up, what are their characteristics?</p>
<p>Aspect 3 Analyse what wishes regarding the product the customers have</p>	<p>Product policy: Provide clear laws etc. that are accepted by the addressees</p>
<p>Aspect 4 Find out what instructions and information must be provided and what kind of advertising you should use for it, whereby all three measures must be directed towards the actual, as well as the potential, customers. You want to keep customers you already have and win new ones</p>	<p>Communication policy: Inform about the product, and advertise it, in a way that will be appreciated by the customer subgroups. „Traffic safety communication“ has to be adapted to the groups that are addressed</p>
<p>Aspect 5 Consider what incentives you will give in order to keep and to win customers. Incentives are an immediate, effective form of making clear that one can profit from using, or buying, the product; even if they have nothing to do with the characteristics of the product. They depict, in psychological terms, a contingent reinforcement and should later be replaced by internalisation or the effects of good product quality</p>	<p>Incentive policy: Provide incentives that will be perceived as such by the customer subgroups that have been identified and that will make them adopt the wished-for behaviour</p>
<p>Aspect 6 Decide how to distribute and place your product to address customers as efficiently as possible and to offer the possibility for them to find out about the product and to have it demonstrated</p>	<p>Distribution policy: See to it that road users see the product as frequently as possible; e.g., make "contracts" with taxi drivers, public transport companies, etc., that force them to behave or make their drivers behave in the wished-for sense</p>

The measures listed in the table above have the following goals, or functions:

Information measures: It is important to develop argumentation strategies, which are based on detailed information about the customer. Information about customers and potential customers, their attitudes and motives (needs, interests, moral concepts) is collected systematically.

² Traffic safety in itself is no product rather an idea which cannot be sold. A product can be e.g. a special driving style, which can be clearly defined and associated with certain emotions

Product and distribution measures: Arrangement/presentation of "products" with regard to customer's wishes and according to the possibilities. Compromises have to be found between the work of experts and the wishes of the customer.

Communication measures: Information, instructions, PR measures and advertising, etc. have to be provided in a way that they will attract the addressed persons' interest and that will appeal to them

Incentives measures: These measures provide possibilities to provide direct (contingent) reinforcement for the customer by if they "use the product" (in our case: if they behave in a wished-for way). We would like to add that this is challenging in the context of road safety, where the opposite often is easier. That is, to introduce disincentives, like enforcement. However, making road users feel that they do the right thing when they behave in a certain manner (e.g. drivers giving way for pedestrians) without introducing any incentives or disincentives is an alternative strategy.

Also Kotler et al. (1996) emphasise that a combination of all the mentioned aspects steps is necessary for a successful marketing process. Figure 1.1 shows the marketing process in a simplified way.

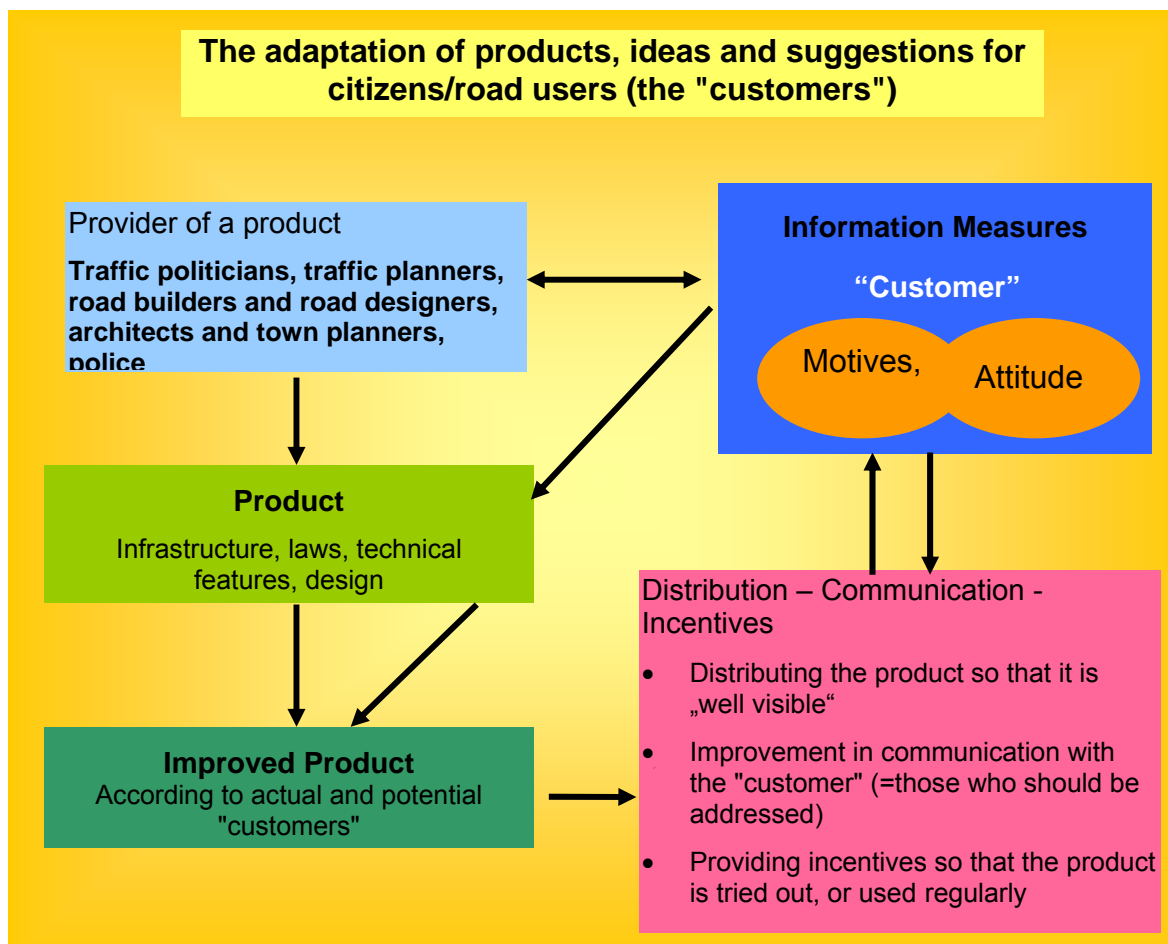


Figure 1.1 Illustration of the marketing process

1.3 SOCIAL MARKETING AND ROAD SAFETY CAMPAIGNS

The use of marketing principles in the traffic safety area has only recently become commonplace. In the OECD report *Marketing of Traffic Safety* (OECD 1993) it was mentioned that the authors were unable to find a single documented case study where marketing principles or a complete marketing approach had been applied to traffic safety.

However, there are some later examples. The Social Marketing model was the theory behind the “Click It or Ticket” programme³. The aim of the program was to increase seat belt usage and child safety across the state of North Carolina by means of a publicised enforcement campaign. In the first run the *product* benefits were re-defined. A new law was enacted in North Carolina, which made the use of seat belt mandatory (using seat belts not only made you safer, but kept you from getting a ticket from the police). The *price* was now a financial fine if people did not obey the law with respect to the seat belt use. Checkpoints - *places* – were established to stop and check motorists for seat belt use. The new law and its consequences were *promoted* by advertising

The results of an evaluation showed that seat belt usage increased from 65% to 80% in the first six months. At the same time fatal and serious highway injuries decreased by 14%. 76% of the citizens were aware of stepped up enforcement of belt use and child restraint laws and 86% appreciated the programme. There are, however, no results available about the long term effect of this campaign.

There are too few campaigns explicitly based upon Social Marketing to conclude that this is an effective strategy in road safety. Smith (2006) mentions that the use of Social Marketing is especially problematic when competing messages are presented at the same time. This is especially relevant for road safety campaigns, where a message promoting safe behaviour often has competition from other sources, such as other drivers displaying unsafe behaviour; movies or adverts portraying unsafe behaviour like speeding as cool; or simply that the road user’s own experience tells him or her that it is not unsafe to engage in the behaviour portrayed as unsafe by the campaign. Such challenges will be addressed more closely in this report.

Summarising, the use of Social Marketing is no guarantee for the effectiveness of a road safety campaign, but the marketing concept offers nevertheless some general guidelines for influencing behaviour on a massive scale. The principles described are thus very relevant for campaigning and will be addressed more closely in the rest of this report, especially in part 4.1. First we will start with defining what is going to be marketed, i.e. the behaviour that is expected to enhance road safety.

³ See <http://www.social-marketing.org/success/cs-clickit.html>

2 WHICH KINDS OF ROAD USER BEHAVIOUR TO INFLUENCE

One of the main aims of road safety communication campaigns is usually to reduce the number of accidents and injuries among road users by means of a change in behaviour. In order to reach this goal, one must know what kinds of behaviours are associated with accidents, i.e., in the statistical sense: If one reduces the frequency of a certain kind of behaviour, one should experience a reduction in the frequency of accidents.

Today, associations between a wide range of behaviours and accidents have been documented empirically. We present here a selection of the most relevant types of behaviour. This is not meant as a complete list of road user behaviour relevant to target for campaigns, other types of behaviour can also be included given that they fulfil the criteria mentioned above. We have focused upon types of behaviours that can be described as intentional, that is, types of acts that the road user deliberately performs (such acts are usually referred to as violations). The reason for doing this is that road safety campaigns are believed to be a suitable measure for influencing unintentional acts that can cause accidents (usually referred to as errors).

We have also tried to find out how common these types of intentional behaviour are among European road users and whether the road users themselves believe that these types of behaviour are dangerous. This can give an indication of the potential campaigns have as a tool for influencing behaviour.

2.1 SPEEDING

Speeding is commonly understood as excessive speed (i.e. driving above the speed limits), but it should also be noted that speeding also can refer to inappropriate speed, meaning driving too fast for the conditions, but within the limits (OECD, 2006). Speed has been found to have a very large effect on road safety, probably larger than any other known risk factor. Because speed at the time of collision is the key determinant for the kinetic energy the human body is exposed to in a crash, speed is a risk factor for absolutely all injury accidents. The effect of speed is found to be greater for serious injury accidents and fatal accidents than for minor injuries accidents and property damage (Elvik, Cristensen & Amundsen, 2004). Based upon a meta-analysis of 98 studies (containing in total 460 results) estimating the effect of changes in speed upon injuries, Elvik, Cristensen and Amundsen concluded that there is a law-like and causal relationship between speed and road safety. The findings support the so-called Power-model of speed, stating that the effects of changes in speed on the number of accidents and the severity of injuries can be estimated by means of a set of power functions. An exponent of 4 is proposed for fatal accidents, an exponent of 3 for accidents involving fatal or serious injury, and an exponent of 2 for all injury, meaning that changes in the speed level is expected to have the greatest effect upon fatal and serious accidents⁴. This means that even

⁴ If speed is increased from 100 km/h to 110 km/h, the ratio speed after/speed before equals 110/100 = 1.1 (i.e. a 10 % increase in speed). Raising 1.1 to a power of 4 gives $(1.1 * 1.1 * 1.1 * 1.1)$ 1.46. This means that the number of fatal accidents is estimated to go up 1.46 times the initial number,

minor reductions in the speed level after a campaign is implemented can have a large effect on injury accidents, especially severe injury accidents.

Results from the SARTRE 3 study suggests that there is a potential for improving European drivers' respect for and their attitudes towards speeding; nearly one-fifth of drivers in European Union countries reported that they drove faster than average (and average means driving above the speed limit). At the same time, less than one in twenty (4%) reported that they were more dangerous than other drivers (SARTRE 3, 2004). The report based upon the SARTRE 3 survey concluded that in general drivers do not acknowledge that speed is associated with risk when their driving is concerned.

2.2 DRIVING UNDER THE INFLUENCE OF ALCOHOL OR DRUGS

In a recent meta-analysis, Vaa (2003) estimated the relative risk of drivers under the influence of drugs and medical products in general to be 1.58 (hence a 58 % increase in accident risk), 1.96 for drugs assumed to be abused and 2.00 for alcohol. Relating accident risk to Blood Alcohol Concentration (BAC), the risk function indicates an exponential increase of accident risk as BAC increases above 0.05 g/dl (see e.g. Zador, Krawchuk & Voas, 2000, Glad, 1985). Driving under the influence of alcohol is estimated to contribute annually to at least 10,000 deaths on EU roads. In the EU as a whole, it is estimated that around 2-3% of journeys are associated with an illegal BAC, resulting in 30-40% of driver deaths (ESCAPE 2002, ETSC 2008). Thus, even a minor reduction of the number of drivers driving under the influence of alcohol is expected to have a large effect on road safety.

The SARTRE 3 report demonstrated that driving under the influence of alcohol is quite common among European drivers; especially in the southern part of Europe where 43% of the drivers drive one day or more per week after having drunk alcohol⁵. Still, driving above the legal BAC limit is a less frequent behaviour according to the drivers themselves (13 % reporting doing this one day or more a week in southern European countries⁶).

It should also be noted that the combination of alcohol and drug abuse is expected to be associated with a very high increase in accident risk. Estimates of both the relative risk as well as the prevalence of driving under the influence of both alcohol and drugs are however not known at the present moment.

corresponding to a increase of 46 percent. The increase of all injuries is expected to be $(1.1 * 1.1) 1.21$, hence an increase of 21 %.

⁵ In western European countries the corresponding number is 19%, in northern and eastern European countries respectively 8% and 11% percent.

⁶ Northern European countries = 0.2%, Eastern European countries = 4% Western European countries = 4%

2.3 LACK OF SEAT-BELT WEARING AND LACK OF USE OF CHILD RESTRAINS

It is estimated that use of seat belt reduces car occupants' probability of being killed in an accident by 50% (See Elvik & Vaa, 2004). A moderate assumption is that seat belt use could prevent 6,000 deaths and 380,000 injuries every year in Europe (EC Recommendation 2004). According to ETSC estimates, current seat belt wearing rates among European countries vary between 59% and 96% for front seat occupants and between 21% and 90% for rear seat passengers (ETSC, 2006). The wearing rate is found to be lowest in urban areas,

Results from the SARTRE 3 project show that drivers had in general positive attitudes towards wearing seat belts (SARTRE 3, 2004). However, many drivers still believe that if they drive carefully they do not need to wear a seat belt (between 5% and 34% with an average of 19% across European countries) and also many held the misbelief of being trapped by the belt in emergency situations. This suggests that campaigns might be a suitable measure for changing such beliefs and thus have a potential for increasing the seat belt wearing rate.

Lack of the use of child restraints as well as incorrect use of child restraint (e.g. placing children in front of an active airbag, use of front facing seats for children under 3 years of age etc.) increases the probability of severe injuries. Within the European countries the self-reported child restraints usage rate ranges from 49% to 97% (SARTRE 3, 2004). This number does not say anything about incorrect use of child restraint system. A Norwegian study based upon observation data found that although the total child restraints usage rate was 93 %, incorrect use was found in 20,6 % of the cases (Amundsen, 2004). One probable explanation is lack of knowledge among parents suggesting that information campaigns might be suitable for promoting both the use of and correct use of child restraints⁷.

2.4 DELIBERATELY FAILING TO YIELD FOR OTHER MOTORISTS, PEDESTRIANS AND CYCLISTS

Junctions are the most frequent crash sites in urban areas. Typically, the proportion of casualty crashes ranges from 40 per cent to 50 per cent in European cities (ETSC, 1999). In addition to rear-end crashes, many other types of crashes occur at junctions such as collisions with intersecting traffic including non-compliance of right hand rule, yield sign, stop sign and traffic signals and crashes involving unprotected road users.

It is difficult to determine whether the failure to yield for other motorists and/or unprotected road users is intentional or unintentional (e.g. failure to perceive other motorists or unprotected road users). Nevertheless, self-reports studies suggest that there is substantial variation among European countries concerning the proportion of drivers giving way to pedestrians. According to the SARTRE 3 study, the proportion "often", "very often" or "always" giving way to pedestrians was highest in the United

⁷ The percentage of incorrect use dropped to 13 % after implementing a campaign combining information with enforcement (Amundsen, 2004). 82% was found to use child restraints correctly, while the remaining 5 % did not use any child restraints.

Kingdom (97%), Estonia (96%), and Ireland (95%), and lowest in Cyprus (80%) and Spain (69%).

2.5 CLOSE FOLLOWING (TAILGATING)

Rear-end collisions make up a substantial proportion of all accidents resulting in personal injuries, this proportion ranging from 10-20% within the European countries (Statistics of Road Traffic Accidents in Europe and North America, 2005). It is difficult to estimate how large the proportion of these accidents is being caused by close following. However, simulator studies and in-depth accident studies have concluded that about 50% of all rear-end collisions could be avoided if all vehicles were equipped with an Autonomous Intelligent Cruise Control (AICC) forcing the driver to keep a minimum distance at least 1.5 seconds to the car in front, given that the system worked perfectly (see Elvik & Vaa, 2004 for an overview). As only a small proportion of the vehicles are equipped with AICC, influencing drivers' motivation to keep a safe distance to the vehicle in front might be an appropriate target for road safety campaigns.

According to the results from the SARTRE 3 survey, the proportion of drivers stating that they follow the vehicle in front too closely "often", "very often" or "always" was the highest in Greece (35%), Cyprus (25%) and Belgium (17%), and the lowest (less than 4%) in Austria, United Kingdom, Ireland and Poland (SARTRE 3, 2004).

2.6 DANGEROUS OVERTAKING

As the name implies "dangerous overtaking" is thought to increase accident risk. It is, however, difficult to estimate how large the increase in risk a dangerous overtaking will give. Dangerous overtaking usually involves speeding, and of course driving in the lane of oncoming cars, both activities found to increase accident risk. In-depth road accident studies carried out by Swedish, Israeli and UK police forces have estimated that dangerous overtaking is the most probable cause of 2-5% of all traffic accidents investigated by the police (Anderson, 1999; Israeli police, 2000; Broughton & Quimby, 1999; all cited in Zaidel, 2001).

The SARTRE 3 survey found that within most European countries, less than 5 % of the drivers reported "often", "very often" and "always" "overtaking when they think they can just make it. The exceptions were Slovakia (19%), the Czech Republic (16%), Greece (15%) and Cyprus (14%).

2.7 RED-LIGHT RUNNING

Retting et al. (1999) found that red-light-running crashes accounted for 5 percent of all injury crashes. The study also concluded that red-light-running crashes are typically more severe than other crashes. Brittany et al. (2004) found that about half of the deaths in red light running crashes are pedestrians and occupants in other vehicles who are hit by the red light runners.

Data on the prevalence of red-light running in Europe is not available. In a study based upon US drivers, Porter and Berry (2001) found that every fifth driver reported red-light running, even though the majority of the drivers thought such a violation was very dangerous. On the other hand, a Dutch study found that red-light runners were more likely to believe that this was not a serious violation (cited in Forward & Lewin, 2006).

2.8 LACK OF HELMET WEARING AND PROTECTIVE CLOTHING FOR MOTORCYCLISTS AND MOPED RIDERS

Head injuries often require extensive treatment and may result in lifelong disability if the rider survives the crash. Helmets are found to decrease the severity of head/brain injury and the likelihood of death. On the basis of a meta-analysis, Elvik and Vaa (2004) concluded that wearing a helmet reduces the likelihood of moped riders and motorcyclists getting a head injury by an estimated 45 %.

The helmet wearing rate for moped riders and motorcyclists vary to a substantial degree among the European countries. It has been registered to be as low as 20 % in Greece, even though helmet usage is required by law (Skalikidou et al., 1999). The low usage rate has commonly been explained by a combination of hot weather and low enforcement. Even though the helmet use rate is close to 100% in most European countries, it is important to mention that the protective effect is dependent upon correct use of the helmet (i.e. fastening chin straps, not fastening the strap loosely, wearing a helmet without damaged surface, helmet fit to head size of the rider etc.). Studies from the Netherlands have shown that although the helmet wearing rate is high among moped riders and motorcyclist, many wear helmets incorrectly (Noordzij et al., 2001, Huijbers, 1988, SWOV, 2007). This rate is found to be particularly high among moped riders.

Not only correct use of helmets can reduce injury severity among motorcyclists and moped riders. Studies demonstrate that the use of protective clothing reduces the severity of injuries on hands, feet, legs and arms by 33-50 % (Elvik & Vaa, 2004). The proportion of riders and passengers wearing protective clothing while riding is, however, unknown. Studies indicate that there is a large potential for increasing the rate of wearing protective clothing among motorcyclists (Ulleberg, 2003). Measures (including road safety campaigns) aimed at increasing the rate of wearing protective clothing can therefore be expected to have a potential for injury reduction⁸.

2.9 FATIGUE/DROWSINESS AMONG DRIVERS OF PRIVATE CARS AND VIOLATION OF DRIVING AND RESTING-TIME REGULATIONS FOR HEAVY VEHICLES

It has been documented repeatedly that a considerable proportion of car drivers have fallen asleep while driving (Gårder & Alexander, 1995, McCartt et al., 1996,

⁸ It is not known whether wearing protective clothing can cause the rider to feel safer while riding, and thus be more likely to take more risk while riding.

Nordbakke, 2004 and Sagberg, 1999) and that this kind of driver impairment makes up one of the major causes of serious car crashes (Arnold et al., 1997, Fell, 1994, Horne & Reyner, 1995, Maycock, 1997, Reyner & Horne, 2002, Sagberg, 1999, Summala & Mikkola, 1994 and UK Department of Transport, 2002). Some investigators (for example, O'Hanlon, 1978) conclude that around 10 per cent of road crashes may be attributable to falling asleep at the wheel, and that fatigue contributes to an even larger proportion of single vehicle and commercial vehicle crashes (Harris & Mackie, 1972).

Although drivers are not expected to fall asleep behind the wheel deliberately, the maladaptive behaviour preceding falling asleep is often a result of poor fatigue management, i.e. continuing to drive despite being sleepy. Reyner and Horne (1998) have shown that almost all incidents of falling asleep at the wheel are preceded by subjective symptoms of sleepiness. In other words, there are subjective warning signals that should ideally be sufficient for the driver to take adequate countermeasures. Therefore, assuming that the driver is aware of her/his sleepiness, continued driving can be supposed to result from either inadequate knowledge about the risk of falling asleep while driving, or a failure to act according to the knowledge. Thus, fatigue management can be a target of road safety campaigns, simply by giving the driver concrete advises of how to act when feeling sleepy, e.g. to stop and sleep for 15 minutes.

2.10 USE OF MOBILE PHONES WHILE DRIVING

Driver distraction is thought to be an important cause of crash involvement (Lam, 2002, Sagberg, 2001), with mobile phones being a device known to distract drivers. This distraction arises not only from dialling numbers and holding the phone, but also from the conversation itself (Alm & Nilsson, 1995 and Patten et al., 2004). Research has shown that using a mobile phone while driving greatly increases the risk of being involved in a crash (Laberge-Nadeau et al., 2003, Redelmeier & Tibshirani, 1997 and Violanti & Marshall, 1996).

According to the SARTRE 3 study, European drivers themselves do not regard using the mobile phone while driving as very dangerous, especially if the hand-free phone is used. 21% of the drivers stated that using a hands-free mobile phone is believed to be frequent cause of road accident. The corresponding percentage for hand held mobile phone it was 54%. Within the European countries, the percentage making at least one call on an average day while driving ranges from 20 to 40 percent. The percentage answering the phone while driving is even higher. Although these numbers compromise both the use of hand-held and hands-free mobile phone, this suggests that there is room for improvement in both attitudes and behaviour related to the use of mobile phones while driving.

2.11 AGGRESSIVE DRIVING

Aggression in traffic, aggressive driver behaviour and its association with road accidents has definitely been put on the agenda in the recent years. One of the major problems concerning aggressive driving behaviour, and the possible

association with accidents in traffic, is to define in a clear way, what '*aggressive driving behaviour*' actually is. This difficulty may be a reflection of the variation in definitions of aggression proposed by experts in this field. Based upon a review of the literature, Ulleberg (2004) suggests that three main types of definitions exist. The first defines aggressive driving as direct physical assaults on other road users. The second focus on any form of driving behaviour with the intention to injure, harm or frighten other road users physically or psychologically. The third put emphasis on deliberate and wilful driving behaviour that while not intended to harm/frighten other road users show disregard for their safety and wellbeing.

In general, the last definition can be regarded as the most functional one since it describes acts of behaviour rather than the intention behind the behaviour. This means, however, that aggressive driving behaviour will include acts that commonly are referred to as "reckless driving" (e.g. excessive speeding, dangerous overtaking, red-light running, fail to give right of way, tailgating) and more explicit aggressive acts like rude gesturing, flashing headlights, sustained horn-honking and yelling.

As already shown, behaviour like excessive speeding, tailgating, dangerous overtaking, failure to yield the right of way for other road users and red-light running are all linked to an increase in accident risk. Explicit aggressive acts like rude gesturing, flashing headlights, sustained horn-honking and yelling does not seem to increase the accident risk (Ulleberg, 2004). However, the review of Ulleberg (2004) concluded that drivers who behave in such ways are also more likely to conduct other types of aggressive driving behaviour that increases the risk of accidents.

2.12 CAMPAIGNS ADDRESSING TRAFFIC VIOLATIONS: POTENTIAL FOR BEHAVIOURAL CHANGE

We have presented different types of road user behaviour that are empirically linked to accidents/injuries. This is not meant to be a comprehensive list, there can of course be other types of behaviour that a campaign could address – like the use of pedestrian safety reflector. However, all the types of behaviour presented here can be proposed as themes of road safety campaigns. As shown, European drivers seem to have a potential for improvement in their way of behaving in traffic as well as in their beliefs related to these kinds of behaviour. These findings suggest that road safety campaigns can be suitable for improving road safety. However, a central question is whether these types of behaviour really are open to change through the use of road safety campaigns. This will be discussed in the next chapters.

It is important to mention that all these behaviours are regulated by law. Hence, non-compliance with traffic law and regulation is defined as a violation, which can be enforced by the police. Police enforcement is confirmed to be a potentially effective accompanying measure to road safety campaigns (Delhomme et al.1999, see also Elvik & Vaa, 2004 for an overview). Thus, we will later discuss how campaigns can be integrated with other measures like e.g. enforcement.

3 MODELS THAT CAN EXPLAIN ROAD USER BEHAVIOUR

In this chapter we will review some of the most common models aimed at explaining behaviour in general, but also models specifically developed for explaining road user behaviour. We will discuss the relevance these models/theories have for road safety campaigns and show how they have been or can be applied in this context. Finally, we aim to propose an eclectic model of road user behaviour.

3.1 PROTECTION MOTIVATION THEORY (PMT)

This theory was originally developed as a means of understanding the concept of fear appeals (Rogers, 1975; 1983). However, in 1983 Rogers expanded the theory so it became a general theory of persuasive communication emphasising the cognitive processes mediating behavioural change.

Protection Motivation Theory proposes that a person's motivation to engage in adaptive behaviour (in order to protect him-/herself from danger) is a positive linear function of four beliefs:

- 1) That the threat is severe (it has serious consequences)
- 2) That he/she is vulnerable to the threat (it could happen to me)
- 3) That he/she can perform the coping response (I am capable of carrying out the recommended preventative behaviours)
- 4) That the recommended coping response is in fact effective (the recommended behaviour will prevent the threat from happening)

Also, a person's motivation to engage in adaptive behaviour is a negative linear function of two factors:

- 1) The reinforcements associated with the maladaptive response
- 2) The response cost

The above mentioned beliefs are included in the threat appraisal and the coping appraisal which then again determines the level of protection motivation (Rogers, 1983). This is presented in Figure 3.1.

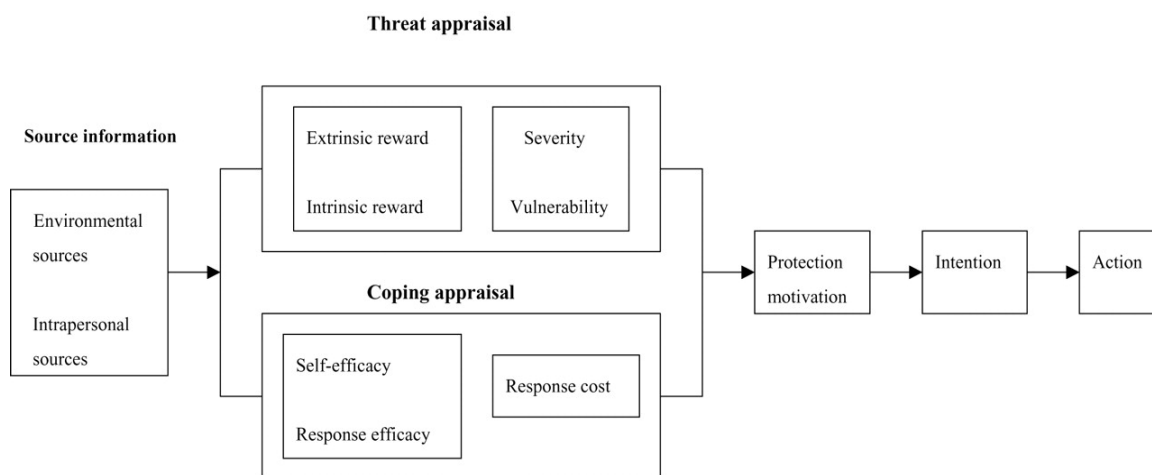


Figure 3.1: Protection Motivation Theory

As can be seen from the overview of the theory in Figure 3.1, the source of information about the threat can be either intrapersonal, for example prior experience with a similar threat, or environmental, such as campaigns or observational learning.

During the threat appraisal the person takes into account the reward of the maladaptive behaviour/response e.g. drink driving. As mentioned in Figure 1 the reward can be either extrinsic or intrinsic. Perhaps there is a subculture in which it is viewed as cool to drive when drunk and thus one can earn social respect from the peer group by doing so, which is a very strong extrinsic reward. In such cases it is more difficult to make the person stop driving when drunk. In such a case a campaign aiming to change the attitude towards drink driving could be effective as it would reduce the reward associated with drink driving.

Another part of the threat appraisal is considerations regarding the severity of the threat and the likelihood of it happening to oneself. To use the above example of drink driving a person might think that it really is not that dangerous especially if you are only a little drunk. Or a middle aged person might believe that it is only young inexperienced drivers who have serious accidents when driving drunk. Thus this person is not going to consider him/herself as vulnerable to the threat and therefore not very likely to stop drink driving. A campaign should therefore stress that the threat for e.g. having an accident while driving drunk is relevant to everybody – even experienced drivers have prolonged reaction time which increases the risk of an accident. Also, the campaign has to illustrate that the consequences of drink driving are indeed severe.

As shown in Figure 3.1 coping appraisal is also a determining factor for the level of protection motivation. Parts of the coping appraisal are considerations regarding self-efficacy and response efficacy. Self-efficacy refers to the person's belief that he/she is capable of performing the adaptive behaviour and response efficacy the belief that the recommended behaviour will in fact prevent the threat from happening (Rogers, 1983). For example, a person might not see how he/she can avoid drink driving as there are no other means of transportation available and is not prepared to stay sober as he/she enjoys drinking. Or if the person thinks that being sober is not going

to prevent an accident he/she is not very likely to stop drink driving either. Again in order for a campaign to be effective it must illustrate that the recommended behaviour does in fact reduce the threat. Also, it could improve the effect of a campaign if the campaign offers an alternative to the undesired behaviour which does not require too much effort. Perhaps a campaign could target parents and encourage them to arrange common transportation for their youngsters and thereby reduce the risk of them driving while drunk because they feel they have no alternative. In other words increase the youngsters feeling of self efficacy.

According to Bandura (1977) it is the cognitive appraisal of self-efficacy which determines if and which coping behaviour(s) will be initiated, how much effort will be exercised and for how long it will persist.

In addition, there is an interaction between self-efficacy and threat appraisal. If self-efficacy is low (I do not believe that I am capable of performing the coping response) it affects the influence of threat severity on the behaviour outcome. If the threat severity is high (while self-efficacy is low) it can at worst have a boomerang effect so that the person gives up and does not even try (Rogers, 1983). In other words a feeling of high self-efficacy is important in order to achieve adaptive behaviour.

Finally response cost is part of the coping appraisal and thus affects the level of protection motivation (see Figure 3.1). If the cost of performing the adaptive behaviour is considerable higher than the perceived benefit of preventing the threat the person is not very likely to engage in the adaptive behaviour. If the only alternative means of transport is Taxi which can be very expensive, particularly in the countryside, the person might choose to drive while drunk. Or if the peer group makes fun of the person because he/she does not want to drive while drunk, he/she might choose to drive to preserve his/her self-esteem. How a campaign should take into account the response cost of course depends on the nature of the response cost. If it is an economic expense like in the first example the campaign somehow has to convince the target group that the money is well spent. If however the response cost is loss of self esteem due to peer pressure like in the latter example, the campaign should aim at changing the negative attitudes towards not wanting to drive while drunk and thereby eliminate the response cost.

All in all if a campaign is to be successful it must:

- Convince the target group that the threat is severe and has serious consequences – E.g. “Speeding is dangerous and can have severe consequences”
- Convince the target group that the threat is relevant to them – that it can happen to them
- Consider possible rewards achieved from the maladaptive behaviour and take these into account in order to outweigh them
- Offer an alternative to the maladaptive behaviour which is surmountable so that it leaves the target group with a feeling of high self-efficacy

- Show evidence that the coping response is in fact effective to ensure a belief of high response efficacy
- Take into account the response cost and where possible reduce it or outweigh it.

Implications for road safety campaigns

Based on a review of mass media campaigns in road safety, Delaney et al. (2004) recommend the use of PMT in these types of campaigns. This is mainly due to the concepts of threat appraisal coping responses and self-efficacy in this theory as campaigns using fear appeals is believed to be more effective. The effectiveness of fear-based campaigns is however debated and will be discussed further in chapter 4.8.

Flyan et al. (2006) are however a bit more reserved to the use of the PMT in relation to road user behaviour, in particular speeding. The authors reviewed the use of the model in attempts to change different forms of health promoting behaviour and risky behaviour (none of these were related to road safety, though) and concluded that threat (perceived severity and vulnerability) and coping appraisal variables (i.e. perceived response efficacy, self-efficacy and response costs) can predict protective motivation, but to a lesser extend behaviour. In relation to using the PMT as the basis for interventions to reduce speeding, they concluded that:

“Interventions based on PMT have been somewhat successful in changing intentions, and when these changes do occur they appear to be due to changes in the relevant cognitions. However, evidence that PMT is a successful model for behaviour change is still weak and further studies of these relationships and, specifically, for risk behaviours are needed before any strong claims can be made about the efficacy of PMT as a basis for reducing speeding”. Flyan et al. (2006) pp.39.

3.2 THE HEALTH-BELIEF MODEL (HBM)

The HBM is a psychological model that attempts to explain and predict health behaviours by focussing on the attitudes and beliefs of individuals as well as sociodemographic variables (McArthur, Holbert, & Forsythe, 2006). The theory was developed in the USA in the 1950s in response to the failure of a free tuberculosis health screening program, and has since then been adapted to explore a wide range of short- and long-term health (and other) behaviours. In essence, it seeks to explain why some individuals adopt health-protecting behaviours, whereas others are unwilling to do so (Rosenstock, 1966, 1974).

As stated above, the HBM grew out of a failed free tuberculosis health screening program in the USA in the 1950s. The program utilised mobile units conveniently located in various neighbourhoods providing free screening X-rays. Whereas organisers of the program began to investigate why the expected number of adults

did not visit such units, Godfrey Hochbaum (1956) was more interested in what motivated the few individuals that did visit the screening units. The ultimate result of this initial work was the HBM, which is based on the idea that an individual will take a health-related action (e.g., mammogram screenings, condom usage, vaccination) if that individual:

- believes that a negative health condition (e.g., HIV/AIDS) is possible to avoid
- expects and believes that following a certain recommended or prescribed action s/he is able to avoid the negative condition (i.e., condom usage is effective at preventing HIV contraction)
- feel that s/he can successfully follow the recommended or prescribed action (i.e., is able to use condoms)

What is apparent from the above is that the HBM is based on the idea that the desire to avoid a negative health consequence is the key motivator for taking a positive health action. While people may take positive actions for other reasons (e.g., exercising to look good or driving slowly to enjoy a scenic route or minimise fuel consumption), such cases fall outside the explanatory realm of the HBM in which avoiding a negative health outcome is paramount. In other words, condoms are used to avoid catching sexually transmitted diseases, mammogram screenings for preventing breast cancer, vaccinations for preventing certain contagious diseases, and cardiovascular exercise to avoid a heart attack. As already alluded to, it is not too difficult to extend the HBM to the traffic-safety domain: not speeding, not drinking and driving, and wearing a seat belt can all be construed as actions for avoiding negative consequences (i.e., injury or death).

3.2.1 Key variables and concepts

The HBM is founded on six key concepts: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy (Dutta-Bergman, 2005; McArthur et al., 2006):

Perceived susceptibility is one's belief of the chances that s/he will contract condition or suffer some negative consequence (e.g., contracting HIV; having a motor vehicle accident due to speeding).

- *Perceived severity* refers to a person's belief of how serious a condition and its consequences are.
- *Perceived benefits* refer to the beliefs an individual has regarding how effective an advised action is in reducing the risk or seriousness of the condition should it occur (i.e., believing that condom usage will reduce the risk of contracting HIV; believing that reducing motor vehicle speeds will both reduce the risk of an accident and its severity should it occur).
- *Perceived barriers* refer to an individual's opinion of the costs (both tangible and psychological) of the advised action (e.g., embarrassment in talking to a partner about condom usage; perceived losses in freedom and sensation seeking as a result of not speeding).
- *Cues to action* are strategies or factors that motivate readiness or behaviour change. These can either be internal (e.g., unpleasant memories of how HIV

or a speeding-related accident affected close friends or family) or external (e.g., advice from others or information in the media).

- *Self-efficacy* refers to the confidence one has in his/her own ability to take actions (e.g., in how to use a condom comfortably and correctly; in how to resist pressures encouraging one to speed).

Perceived susceptibility and *perceived threat* can be seen as providing a measure of the degree of perceived threat associated with a current behaviour or a condition and both components need to be high if an individual is to even consider altering his or her behaviour. *Perceived benefits* and *barriers* can be seen as gauging the effectiveness and attractiveness of altering one's behaviour, as well as the negative consequences of altering one's behaviour (Mattson, 1999; Rosenstock, 1974). As such, they can be seen as a kind of cost-benefit analysis of a proposed alternative. Taken together, these first four components can be seen as accounting for a person's readiness to act. The last two components, *cues to action* and *self-efficacy*, capture the specific stimuli need to trigger the appropriate behaviour and one's confidence in his or her ability to perform the behaviour.

3.2.2 Empirical support and its application to traffic safety

The HBM has been applied to a broad range of behaviours and subject populations such as preventive health behaviours (e.g., diet, exercise, smoking, vaccination), compliance behaviours to medical care regimes, and clinic usage and physician visits (e.g., Aspinwall et al., 1991; Connor & Norman, 1996; Gillibrand & Stevenson, 2006). Recent work has expanded the application of the HBM away from traditional health-related domains, most notably areas having to do with safety (e.g., household, traffic).

Nelson and Moffit (1988) showed how the HBM could potentially be applied to seat-belt usage. They argued that drivers needed to feel sufficiently threatened to use a seat-belt, either by feeling susceptible to the negative outcomes associated with not wearing a seat-belt and by believing that the consequences of non-usage were sufficiently severe (e.g., damage to physical health, financial well-being of the individual and of his/her family). Arnold and Quine (1994) found that the components of the HBM accounted for 53% of variance in bicycle helmet use. More recently, Lajunen and Räsänen (2004), although finding a poorer fit of the HBM to helmet usage, showed that *perceived barriers* (e.g., social unpleasantness) and *cues to action* were of greater importance than the other components when predicting school children's intentions to use a bicycle helmet. Stalvey and Owsley (2000) examined driving behaviour amongst older adults and found that, while drivers' *self-efficacy* for engaging in self-regulatory and preventive actions so as to minimise collision risks was high, they did not perform such actions. The reason for this was the fact that they did not perceive themselves as susceptible to crash involvement (despite being able to perceive the seriousness of crash involvement) and that they perceived several barriers to performing such actions despite recognition of the benefits.

3.2.3 Implications for campaign design

Without knowing the exact specifics of the problem at hand or the target group it is impossible to go into exact detail on to how the HBM can be used in a specific campaign. It is nevertheless possible to provide some guidelines and general examples. The main guideline is to influence the supposed cost-benefit analysis of the mind of the behaviour in question. The aforementioned findings of Lajunen and Räsänen (2004) suggest, for example, that a campaign should focus on reducing barriers to helmet use than on emphasising benefits. The benefits of wearing a helmet are well-known but peer attitudes should be targeted so that it is seen as desirable and as having the same status as a moped helmet. Similarly, Stalvey and Owsley's (2000) work on older drivers suggest that there is no need to target *perceived severity* of a crash. Rather older drivers' *perceived susceptibility* needs to be increased. As already mentioned *perceived severity* and *perceived susceptibility* provide a measure of the perceived threat of a current behaviour. Perceived threat needs to be high if an individual is to change his or her behaviour. Thus, a campaign addressing susceptibility and barriers should be successful given the self-efficacy of older drivers in performing the targeted behaviour.

As seen above, the HBM suggests what needs to be done in a campaign on the basis of which of its six key components a practitioner wishes or needs to target. If the aim of a campaign is to get a target group to increase its perception of susceptibility, then the HBM suggests presenting the target group with images, statistics or data concerning their true susceptibility or risk level. If a target group downplays the severity of negative behaviour (e.g., driver fatigue, drink driving, speeding), then campaigns should seek to clearly demonstrate these consequences. For example, the Transport Accident Commission in Victoria, Australia, is renowned for its hard-hitting, graphic visualisations about the consequences of driver fatigue, speeding, and other dangerous behaviours. Campaigns targeting susceptibility or severity seek to communicate the threat associated with a particular behaviour.

Campaigns may also try to encourage a preventative, positive behaviour. One way to do this, according to the HBM is to emphasise this behaviour's benefits so that the target group can better perceive them. Campaigns encouraging seat-belt usage may compare and contrast the consequences of being involved in accidents with or without wearing a seat belt. Similarly, the difference between hitting a pedestrian at 60 km/hr or 50 km/hr is often one of life and death for that pedestrian (according to a recent TAC campaign in Australia), something which may encourage less speeding amongst drivers. Another way to encourage positive health behaviour is to remove any barriers preventing its performance, as described in the case of helmet usage among school children in Lajunen and Räsänen's (2004) study, where the barriers were peer attitudes.

Finally, to encourage the actual performance of a behaviour, a campaign should target *cues to action* and *self-efficacy*. Lajunen and Räsänen (2004) suggested that one cue to action for helmet usage was improving the visibility of the helmet by having cycles designed with in-built helmet stands and locks. Variable electronic signs are often used in many parts of the world to remind drivers about speeding, speed limits, or taking breaks after long drives.

3.2.4 Conclusion

Although there are few road safety campaigns being explicitly based upon the HBM, attempts to focus upon some of the central elements in the model is quite common in practice— like focusing upon benefits and barriers and/or perceived threat though fear-based communication. The effects of fear-based communication is however uncertain, a topic further explored in chapter 4.8. The HBM is in many ways quite similar to the PMT, and the same conclusion we made for the PMT is therefore equally valid for the HBM, meaning that the evidence for its effectiveness in road safety campaigns is limited. One reason is that relatively few studies have examined the effect of HBM traffic safety interventions.

3.3 THE PROBLEM-BEHAVIOUR THEORY (PBT)

This theory was especially developed to explain problem behaviour in adolescence (Jessor, 1991; Jessor & Jessor, 1977). It takes into account both the person in question and the environment and it differentiates between risk factors and protective factors.

According to Problem-behaviour theory adolescent risk behaviour is the result of an interaction between various risk factors arising from the biological, psychological, environmental, family, economic and behavioural domains of interpersonal interaction.

PBT consists of three major systems of explanatory variables: the perceived-environment system, the personality system and the behaviour system. The variables in each of the systems can either serve as instigations for engaging in problem behaviour (risk factors) or as controls against involvement in problem behaviour (protective factors). It is the balance between those that determines the adolescent's degree of proneness for problem behaviour.

The perceived-environment system includes social controls, models and support. It is called the *perceived*-environmental system because the adolescent actually has to perceive the variables that belong to this system in order to be influenced by them. The variables are divided into distal and proximal variables. Where distal variables are covert and exercise a more indirect influence, the proximal variables are more overtly linked to the behaviour and therefore exercise a more direct influence on the behaviour. Examples of distal variables in this system are perceived general support from parents and friends and perceived control by parents and friends. Examples of proximal variables are friends and parents approval or disapproval of the behaviour in question, and models for behaviour (Forward, 1994).

As proximal variables have the most direct influence on behaviour campaigns should aim at influencing these. If a campaign manages to promote a culture in the peer group of young drivers where risky driving is disapproved off and this disapproval can be expressed openly, it should have a fair chance of reducing risky driving among the very young drivers. To give a more concrete example a campaign could aim at making it uncool to speed as it puts the lives of friends at risk

and maybe this way achieve that the young drivers discourage each other from speed driving rather than encourage this behaviour. This way the friends will function as protective factors decreasing the likelihood of the young drivers engaging in problem behaviour rather than function as risk factors promoting problem behaviour.

The personality system includes a patterned and interrelated set of relatively enduring, sociocognitive variables such as attitudes, values, beliefs, expectations, and orientations towards self and society. These reflect social learning and developmental experience. Examples of variables in this system are value on academic achievement, value on independence, social criticism, alienation, self-esteem, and attitudinal tolerance of deviance.

As mentioned above the personality system reflects social learning. If in a family the parents from time to time exceed the speed limit the children might indirectly learn that speed driving is ok. Thus when the children start driving themselves, they are more likely to engage in speed driving as they have developed the attitude that it is ok. Therefore a campaign could aim at making parents aware of this effect and make the parents aware of the importance of expressing negative attitudes of risky driving and to refrain from engaging in risky driving when the children are in the car. In other words “don’t drive in a way you don’t want your children to”. This way the social learning from the parent serves as protective factors rather than risk factors.

The behaviour system describes two types of behaviour; conventional behaviour and problem behaviour. Conventional behaviours are behaviours that are socially approved, normatively expected, and codified and institutionalized as appropriate. Problem behaviours are behaviours that generally are socially unacceptable, and behaviours that are not accepted by society. Once the adolescent engages in one kind of problem behaviour, it increases his or hers proneness to engage in other problem behaviours as these tend to be linked.

The variables within the behaviour system reveal to which extent the adolescent’s proneness for problem behaviour has reached the point of being problem behaviour. This means that young drivers who engage in risky driving are likely to engage in other types of problem behaviour as well. It could therefore be an advantage to explore if certain types of problem behaviours are more often linked to risky driving than others. If this is the case a campaign could target the entire group of problem behaviours and perhaps thereby achieve a larger effect.

Empirical findings provide support for the moderating influence of protective factors on the impact of risk factors (http://www.colorado.edu/ibs/jessor/pb_theory.html). Thus if campaigns manage to enhance the protective factors it may be successful in reducing problem behaviours such as risky driving.

The literature search did not reveal any cases of the PBT applied to campaigns as such – road safety or other topics. It appears that the theory has commonly been used to and is still used to explain problem behaviour rather than changing problem behaviour. However, some campaigns target peer groups and thus recognise the advantage of for example reaching young people through young people – which is an element of problem behaviour theory. This will be further explored in chapter 4.7.2.

3.4 THE THEORY OF PLANNED BEHAVIOUR (TPB)

The historical background of the TPB lies in the Theory of Reasoned Action (Fishbein & Ajzen, 1975) which in turn is an adaptation of Dulany's (1961, 1964) theory of propositional control (in Fishbein, 1967).

3.4.1 Key variables and concepts

The Theory of Planned Behaviour (TPB) predicts that overt behaviour is a function of behavioural intention which in turn is a function of attitudes, subjective norms and perceived behavioural control. Intention has a central role within the model and is regarded as a sufficient immediate cause of behaviour. The combination of attitude, subjective norm and perceived behavioural control determines intention. These constructs, also described as global or direct measures, are determined by salient beliefs namely; behavioural beliefs, normative beliefs and control beliefs. All other variables not included in the model, affect behaviour but only as they are related to attitude, subjective norm and/or perceived behavioural control. A schematic representation of the model is presented in Figure 3.2.

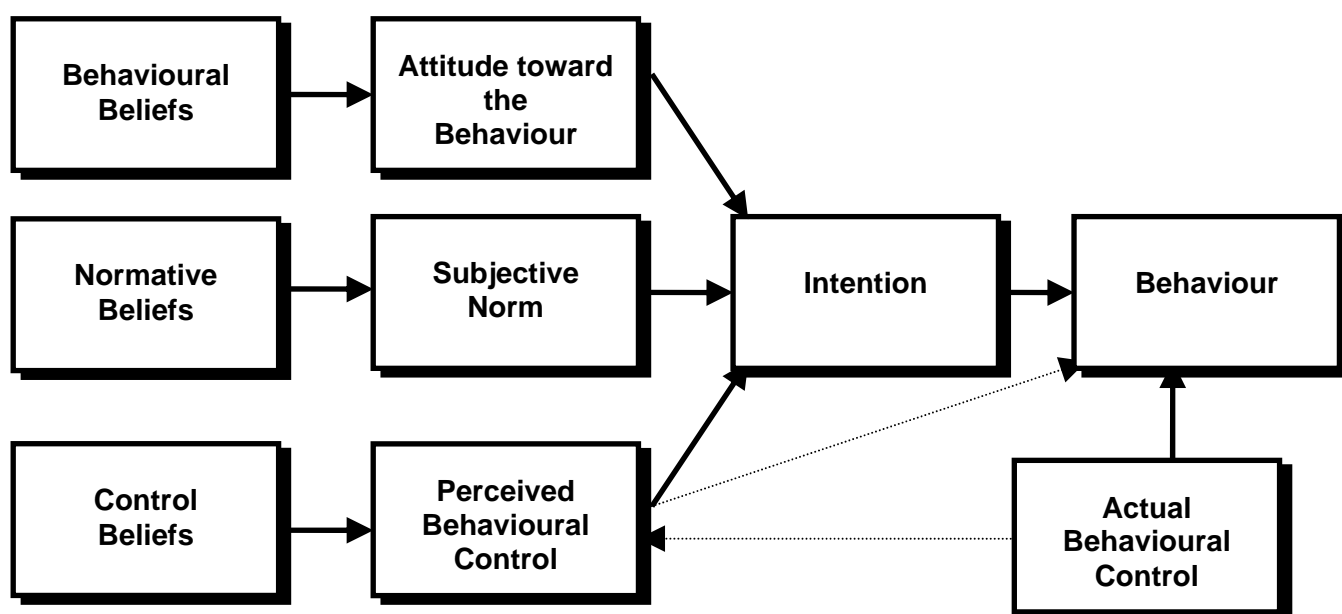


Figure 3.2. *Theory of Planned Behaviour (Ajzen, 2005)*

The figure shows that attitude, subjective norm and perceived behavioural control are antecedents of intention. The figure also shows that perceived behavioural control can have a direct effect on behaviour. However, the broken arrow in the figure implies that this is not always crucial but that it can act on behalf of actual control. Perceived behavioural control is a significant predictor of behaviour when it is not under complete volitional control and when this perceived notion of control truly reflects reality (Madden, Scholder-Ellan & Ajzen, 1992). In situations with high actual control the variable is expected to be less significant. The figure also shows that three different beliefs determine attitude, subjective norm and perceived behavioural control. Hence, the model distinguishes between so called global measures and belief based measures. The difference between the two has been

described as follows: “the global measure focuses directly on the concept in question, the belief-based measure focus on the presumed determinants from which the concept can be inferred” (Ajzen & Driver, 1991, p. 188). As previously mentioned the theory recognizes the importance of background factors such as: personality, mood, emotions, education, age, gender and past experience. However, they are not included in the model and if they affect behaviour it would be via beliefs. Ajzen and Fishbein (2005) stated:

“Whether a given belief is or is not affected by a particular background factor is an empirical question. In light of the vast number of potentially relevant background factors, it is difficult to know which should be considered without a theory to guide selection in the behavioural domain of interest” (Ajzen & Fishbein, 2005, p197).

They are therefore seen as a complement in so far as they could deepen our understanding of what determine behaviour, but should not be part of, the reasoned action approach (Ajzen & Fishbein, 2005).

In the description below each factor within the variable will be presented in some more depth.

3.4.1.1 Behaviour and intention

Behaviour refers to an observable act and intention refers to the respondents' willingness to perform the behaviour. The theory states that the stronger the intention to perform the behaviour, the more likely it is that it will be performed (Ajzen, 1991). However, the model also postulates that a number of factors help to strengthen this relationship. First of all it is important that both are measured at the same level of specificity i.e. very specific or at a more general level. This is also described as the principle of compatibility which means that both intention and behaviour should correspond with regard to Target, Action, Context and Time (TACT). For example if a study of speeding should be conducted then the target is driving, the action speeding, the context might be speeding in an urban area and time could be around noon. If the research is carried out with a high level of specificity then the correspondence between attitude and behaviour should be high (Ajzen & Fishbein, 2005). Secondly intention needs to be stable and thirdly the behaviour must be under volitional control (Fishbein & Ajzen, 1976). For instance, new information presented before the behaviour is emitted can reduce the relationship. The principle of compatibility does not only apply to intention and behaviour, instead it is permeating the use of the whole model.

3.4.1.2 Global measures

The model includes three global measures of intention; attitude, subjective norm and perceived behavioural control. Attitude describes the respondents' positive or negative evaluation of the behaviour. Initially the TPB did not provide a clear distinction between affective and cognitive responses to a behaviour. However, as empirical findings started to accumulate, suggesting that a distinction was needed,

Ajzen (1991) made some adaptations. In an article from 2005 Ajzen and Fishbein concluded: "It is now generally recognized that attitude toward a behaviour contains instrumental // as well as experiential // aspects, and that attitude measures should contain items representing these two sub-components" (Ajzen & Fishbein, 2005). Nevertheless, and in agreement with Ajzen (1991), it is not suggested that attitude should be treated as a multi-dimensional construct. Hence, a measure of attitude is typically obtained by asking the respondent to rate both an instrumental and an affective component although Ajzen (2006) prefers the word experiential rather than affective. For instance the statement "For me to walk on a treadmill for at least 30 minutes each day in the forthcoming month" is rated on two instrumental scales: *worthless-valuable*, *harmful-beneficial* and two evaluative scales; *pleasant-unpleasant* and *enjoyable-unenjoyable*. Furthermore, a measure of an overall evaluation is also included and measured on a scale from *good to bad* (Ajzen, 2006). The sum of these responses form a direct measure of attitude.

Subjective norm deals with the impact of the social environment on behaviour. It is described as the individuals' perception about other people's reaction to them while performing or not performing a certain behaviour. This reaction is sometimes described as a form of social pressure (Ajzen & Fishbein, 2005; Albarracín, Fishbein, Johnson & Muellerleile, 2001; Fishbein & Stasson, 1990). This would then be followed by compliance if the individual accept their influence. A measure of subjective norm is obtained by asking the respondent to judge peoples' approval or disapproval "Most people who are important to me think that I should walk on a treadmill for at least 30 minutes each day in the forthcoming month" (*I should-I should not*). In some more recent versions of the TPB it is also recommended that a measure of descriptive norm is included and in that case the question about subjective norm might be reformulated as follows: "Most people who are important to me walk on a treadmill for at least 30 minutes each day" (*completely true-completely false*).

Perceived behavioural control refers to a persons' perception about their own capability to perform an act. This perception can be based on past experience with the behaviour, the experience of others, and/or by second hand information. In general it should capture if the respondent feels confident about his/her ability to perform the behaviour. This factor has therefore been described as most compatible with (Ajzen, 1991) or quite similar to Banduras' notion of self-efficacy (in Ajzen, 2002). In hindsight Ajzen argued that it might have been wrong to call this variable perceived behavioural control. This could suggest that it refers to control of the outcome of the behaviour, rather than, as the case is, the degree of control "over performance of the behaviour itself" (Ajzen, 2002, p 4).

A direct measure of perceived behavioural control includes two different types of control; capability, previously known as self-efficacy, and controllability. These two items are assessed by different questions but theoretically they are dealt with as a unitary factor and should be correlated (Ajzen, 2006). Capability deals with the ease or difficulty of performing the behaviour. This is then measured by two statements: "For me to walk on a treadmill for at least 30 minutes each day in the forthcoming month would be" (*impossible-possible*) and "If I wanted to I could walk on a treadmill for at least 30 minutes each day in the forthcoming month" (*definitely true-definitely false*). Controllability refers to perceived control over its performance and is assessed

by the following statements: “How much control do you believe you have over walking on a treadmill for at least 30 minutes each day in the forthcoming month” (*no control-complete control*), “It is mostly up to me whether or not I walk on a treadmill for at least 30 minutes each day in the forthcoming month” (*strongly agree-strongly disagree*) (Ajzen, 2006). These items are then averaged to provide a measure of perceived behavioural control. Although Ajzen appears to be in favour of a unitary factor he would still argue that it is up to the investigator to decide if the items should be separated or not (Ajzen, 2002).

Attitudes, subjective norm and perceived behavioural control are described as different constructs and should correlate more strongly with intentions than with each other. The relative importance of each variable has to be established empirically. The most frequently used method is an interpretation of beta weights derived from a multiple regression analysis. The factor with the greatest beta weight is interpreted as being of greatest importance (Trafimow & Fishbein, 1994).

3.4.1.3 Belief based measure

People can hold a great many beliefs about any given object, but they can attend to only a relatively small number, perhaps eight or nine, at any given moment. The model makes no prior assumption about the nature of these beliefs. Instead, pilot studies asking the respondent to list their beliefs about behaviour and the believed consequences of the behaviour, are used on each occasion to elicit relevant beliefs. These beliefs, may be directly related to intention and therefore the theory can be tested using either direct or belief based measures (Ajzen & Driver, 1991).

A persons' overall attitude is determined by the respondents' beliefs about the attitude object (Ajzen & Fishbein, 2000). Theoretically this is described as a combination of behavioural beliefs and outcome evaluation, the first describes the consequences of performing the act and the latter how these consequences are evaluated. In accordance with the Expectancy Value Model (EV) an attitude is the outcome of a number of beliefs regarding the expected value of the attitude object. Thus a belief in positive outcomes generally suggests a positive attitude (Albarrcín et al., 2001). The expectancy component describes the probability that the attitude object possesses the anticipated attributes. The value component refers to the evaluation of the same attributes (Eagly & Chaiken, 1993). The terms “object” and “attribute” should be understood in its broadest sense. For example a person may believe that walking (the attitude object) increase well being (the attribute). According to the EV Model behaviour is engaged in if the sum total of these beliefs suggests that it will have positive outcomes. Hence, attitudes towards the behaviour (A_B) include all salient beliefs about the consequences of the act (b) multiplied by an evaluation of those outcomes (e), the resulting product is then summed across the number n of salient beliefs using the following equation:

$$A_B = \sum b_i e_i$$

Behavioural beliefs can be assessed using the following statement: “My walking on a treadmill for at least 30 minutes each day in the forthcoming month will lower my blood pressure”. This is then rated on a 7-point bipolar scale from *extremely unlikely* – *extremely likely*. Outcome evaluation is assessed asking: “Lowering my blood

pressure is” followed by a 7-point bipolar scale *extremely bad – extremely good* (Ajzen, 1991).

The decision to act is regarded as reasoned although this is not to say that they always are reasonable, or as Ajzen and Fishbein (2005) stated: “they may be inaccurate, biased, or even irrational” (p. 193). The implication of a reasoned action is that once formed all the variables within the model are assumed, “to follow in a reasonable and consistent fashion” (Ajzen & Fishbein, 2005, p. 194). Furthermore, it is not suggested that people carry out these elaborate computations before an attitude is established. It only suggests that the formation of attitude may be *modelled* in this manner (Ajzen & Fishbein, 2005).

It is also quite possible for an attitude to be activated automatically, that is without conscious intent or cognitive effort (Bamberg, et al., 2003). For instance, an attitude can be activated automatically when it is discovered that a new object can be linked to other objects to which a judgement already has been formed. Thus, by a process of association, attitudes towards new objects are being established (Fishbein & Ajzen, 1975). This would then imply that attitudes, rather than behaviour, could influence the formation of new beliefs (Ajzen & Fishbein, 2005). The perceived outcome of a behaviour is then interpreted and evaluated in the same light as similar behaviours encountered in the past. Indeed, not only attitudes but also subjective norm can work backwards in the manner just described.

Normative beliefs describe social norms and stands for the person's belief that significant others’ think that the individual should or should not perform the behaviour. Examples of significant others depend on the behaviour being investigated but could be friends, family, partners and so forth. In the guide presented by Ajzen (2006) the following statement is used to measure normative beliefs: “my family thinks that I should walk on a treadmill for at least 30 minutes each day in the forthcoming month” this is then rated on a scale from *I should* to *I should not*. The main difference between subjective norm and normative beliefs is that the first ask about “most others” whereas the latter are more specific assessing each referent separately.

Normative beliefs are then related to motivation to comply in so far as the latter modifies the first. Motivation to comply refers to the individual's general motivation to comply with the expectations of particular referents and is independent of the behaviour in question. Motivation to comply is assessed by asking; “When it comes to exercising, how much do you want to do what your family thinks you should do?”. This is then scored on a scale from *not at all* to *very much*. Subjective norms (SN) are the summed products of normative beliefs (n) multiplied by the motivation to comply (m) the resulting product is then summed across the number n of salient beliefs using the following equation:

$$SN = \sum n_i m_i$$

The relative importance of normative beliefs and motivation to comply may vary between individuals, situations and behaviours.

Perceived behavioural control refers to the person's belief about how easy or difficult the performance of an act is likely to be. This is then assessed indirectly using control beliefs strength and control belief power. Control beliefs strength indicates the perceived likelihood (or frequency) of a given factor being present. Control belief power assess if these factors have the power to facilitate or impede the performance. These factors could be internal (e.g. self-efficacy and skills) or external (e.g. opportunities and constraints). External facilitators can also be other people but here Ajzen (2002) clearly states that it only deals with a persons' own power to secure help from others. The items used to capture these factors should be carefully selected by some form of pilot study. For example, the results from a pilot study might indicate that being in a hurry makes speeding more likely. In the survey respondents are then asked to indicate on a seven point scale if being in a hurry would make speeding more or less likely. In the guide provided by Ajzen (2006) control belief strength can be assessed by a question about demand "I expect that my work will place high demands on my time in the forthcoming month" followed by a rating scale from *strongly disagree* to *strongly agree*. Control belief power is assessed by a question about ease or difficulty "My work placing high demands on my time in the forthcoming month would make it" followed by *much more difficult* to *much easier*. To form an aggregate measure of perceived behavioural control the two control beliefs are multiplied and then summed across the number of salient beliefs using the following equation:

$$PBC = \sum c_i p_i$$

Extensions of the TPB

Richard and co-workers (cf. Richard, van der Pligt & de Vries, 1995; see also Parker, Manstead & Stradling, 1995) were among the first to initiate research addressing the role of **affect** in the context of the TPB. Since the TPB primarily deals with future behaviour, they suggested that it would be appropriate to investigate the impact of *anticipated affective reactions* (e.g., Richard et al., 1995). They demonstrated that anticipated affective reactions of a particular behaviour, i.e., feelings about having performed the target behaviour, predicted intentions beyond the TPB components (Richard et al., 1995, 1996a, 1996b; see also Abraham & Sheeran, 2003; Abraham & Sheeran, 2004; Conner & Flesch, 2001; Richard, de Vries & van der Pligt, 1998; Parker et al., 1995; Sheeran & Orbell, 1999). One example of a measure of anticipated regret related to speeding is "Driving 20 km/h over the speed limit on a rural road would make me feel" ...very bad-very good etc.

Moral norms or obligations are defined as perceptions of the moral correctness of the behaviour in question, and has been suggested as additional variables in the TPB (Ajzen, 1991). This usually is measured as personal feelings of the responsibility to perform or refuse to perform a certain behaviour, e.g. "it would be wrong for me to drive 20 km/h over the speed limit".

Finally, the importance of including past behaviour in the TPB has been emphasised (Ajzen, 1991, see also Eagly & Chaiken, 1993 for a further discussion and review). Not surprisingly, this has been found to be a very important predictor of future behaviour, including driving behaviour (see e.g. Connor, Smith & McMillan, 2003)

3.4.2 Empirical support and its application to traffic safety

The results from a number of meta-analysis based upon different kinds of behaviour have given further support to the model. For instance, it has been shown that attitude and subjective norm explain 33 to 50 % of the variance (Ajzen, 1991; Armitage & Conner, 2001; Sherran & Taylor, 1997). When the model adds perceived behavioural control, a further improvement of 5 to 12 % is noted (Armitage & Conner, 2001; Sherran & Taylor, 1997).

Theory of Planned Behaviour (TPB) and its predecessor Theory of Reasoned Action (TRA) have been used extensively, and successfully, to predict a range of different traffic safety related behaviour such as; drink and driving (Parker, Manstead, Stradling, Reason & Baxter, 1992; Åberg 1993), speeding in rural areas (e.g. Letirand & Delhomme, 2005), speeding in an urban areas (e.g. Elliott, Armitage & Baughan, 2003; Parker, et al., 1992), dangerous overtaking (Parker et al., 1992), close following (Parker et al., 1992), seat-belt use (Budd, North & Spencer, 1984; Stasson & Fishbein, 1990; Trafimow & Fishbein, 1994), and lane discipline (Parker, et al., 1995b). In the study by Parker et al. (1992), assessing speeding in an urban area, the model explained 47 percent of the variance with the most important variable being perceived behavioural control.

Moan and Ulleberg (manuscript in preparation) conducted a meta-analysis of 15 studies having applied TPB to predict different kinds of road user intentions and behaviour. Some of the studies also included additional explanatory variables, like moral norm, anticipated regret and past behaviour. The results of the meta-analysis are presented in Table 3.1 and Table 3.2.

Table 3.1. Impact of attitude (ATT), subjective norm (SN), perceived behavioural control (PBC), anticipated regret (AR), moral norm (MN) and self-identity (SID) on road safety intentions.

No.	Authors	Intentions to...	N	Impact of the TPB components				Impact of extension variables, beyond the TPB components				
				ATT	SN	PBC	R ²	AR	MN	SID	PB	R _{change}
1.	Newman et al. (2004)	...speed in a work vehicle	204	.09ns	.02ns	.15ns	.10	.24*	-	-	-	.03
2.	Newman et al. (2004)	...speed in a private vehicle	204	.19*	.08ns	.17*	.16	.26***	-	-	-	.06
3.	Parker et al. (1998)	...commit aggressive driving violations (A)	270	.31***	.14**	.26***	.35	.19**	-	-	-	.02
4.	Parker et al. (1992)	...drink and drive (A&G)	881	.08*	.26**	.48***	.42	-	-	-	-	-
5.	Parker et al. (1992)	...speed (A&G)	881	.13*	.30*	.39*	.47	-	-	-	-	-
6.	Parker et al. (1992)	...follow closely (A&G)	881	.06*	.40**	.18**	.23	-	-	-	-	-
7.	Parker et al. (1992)	...overtake on the inside (A&G)	881	.15*	.33*	.27*	.32	-	-	-	-	-
8.	Diaz (2002)	...cross the road in risky situations	146	.34*	-.25*	.23*	-	-	-	-	-	-
9.	Elliot et al. (2003)	...comply with speed limits	598	.11***	.25***	.53***	.48	-	-	-	.52***	.11
10.	Parker et al. (1995)	...cut across traffic	598	.16**	.11**	.16**	.35	.18***	.27***	-	-	.11
11.	Parker et al. (1995)	...reckless weaving	598	.12**	.07*	.19**	.37	.15***	.33***	-	-	.11
12.	Parker et al. (1995)	...overtake on the inside	598	.06*	.20**	.07*	.34	.22***	.34***	-	-	.15
13.	Conner et al. (2003)	...break speed limits	162	.17**	.19**	.19**	.45	.12ns	-.14ns	-	.36***	NR
14.	Marcil et al. (2001)	...drink and drive	113	.51***	.16*	.24**	.64	-	-	-	-	-
15.	Evans & Norman (1998a)	...cross dual carriageway (A&G)	210	.22***	.15*	.36***	.38	-	-	.10ns	-	-
16.	Evans & Norman (1998b)	...cross pelican crossing (A&G)	210	.20***	.26***	.38***	.49	-	-	.16***	-	.03
17.	Evans & Norman (1998c)	...cross residential road (A&G)	210	.09ns	.10ns	.44***	.37	-	-	.19***	-	.03
18.	Evans & Norman (2003)	...cross the road in risky situations (A&G)	1833	.15***	.26***	.30***	.25	.15***	.01ns	.22***	-	.06
19.	Quine et al. (1998)	...wear a safety helmet (bicycle)	162	.00ns	.45***	.22**	.54	-	-	-	.51***	NR
20.	Stead et al. (2005, T1)	...speed	511	.24***	.16***	.43***	.47	-	-	-	-	-
21.	Stead et al. (2005, T2)	...speed	377	.23***	.06ns	.60***	.53	-	-	-	-	-
22.	Stead et al. (2005, T3)	...speed	360	.15**	.13**	.54***	.49	-	-	-	-	-
23.	Stead et al. (2005, T4)	...speed	278	.23***	.14**	.46***	.49	-	-	-	-	-
Average (weighed by N)			10842	.15**	.23***	.32***	.36	.18***	.16***	.20***		.07
								N = 4467	N = 3789	N = 2463		

Note. ***p < .001, **p < .01, *p < .05, N = number of respondents in each study, NR = not reported, A = controlled for age, A&G = controlled for age and gender.

Table3.2. *Impact of intention (INT), perceived behavioural control (PBC), and past behaviour (PB) on subsequent road behaviour.*

No.	Authors	Subsequent behaviour	N	Impact of the TPB components				R ²	Impact of extension variables		
				ATT	SN	INT	PBC		PB	PB X PBC	R _{change}
1.	Elliot et al. (2003)	...Self-reported speed while driving (A&G)	598	-.02ns	-.05ns	.46***	.23***	.32	.35***	-.15**	.05
2.	Quine et al. (1998)	...Safety helmet use (bicycle)	162	.00ns	.00ns	.57***	.17*	.73	.75***	-	NR
3.	Stead et al. (2005, T1)	...self-reported speeding	526	-	-	.41***	.23***	.33	-	-	-
4.	Stead et al. (2005, T2)	...self-reported speeding	381	-	-	.36***	.29***	.36	-	-	-
5.	Stead et al. (2005, T3)	...self-reported speeding	362	-	-	.45***	.24***	.40	-	-	-
6.	Stead et al. (2005, T4)	...self-reported speeding	281	-	-	.42***	.23***	.35	-	-	-
Average (weighed by N)			2310	.00ns	.00ns	.43***	.24***	.42	.44***		.05

Note. ***p < .001, **p<.01, p<.05, N = number of respondents in each study, NR = not reported, A = controlled for age, A&G = controlled for age and gender.

As shown in Table 3.1, perceived behavioural control is on overall the most important predictor of road user behavioural intentions followed by subjective norm and attitudes. Anticipated regret, moral norm and past behaviour also explain additional variance in intentions.

However, when road user behaviour is the dependent variable (Table 3.2), only intentions, perceived behavioural control and past behaviour are significant predictors. This suggests that attitudes and social norm are indirectly related to road user behaviour through their influence on behavioural intentions.

3.4.3 Implications for campaign design

The Theory of Planned Behaviour posits that behaviours are maintained by attitudes, subjective norms and perceived behavioural control. The theory therefore posits that before a new behaviour will be executed it would be necessary to convince the person that it will result in a valued outcome and that significant others agree with the performance of the act and that they themselves are capable of carrying it out. Perceived behavioural control is very important since change can only occur if the person believes that s/he have both the skills and resources needed to carry out the new behaviour. A useful strategy to enhance skills could be to present information which clearly shows how to perform the desired behaviour but also opportunities to execute the same behaviour.

Despite the fact that both Ajzen and Fishbein discuss behavioural change, very few attempts have been made to use the Theory of Planned Behaviour as a conceptual framework for changing behaviour in e.g. a campaign (Armitage & Connor, 2002; Bamberg et al., 2003; Hardeman et al., 2002). However, there is some evidence which suggests that when the constructs are changed behavioural change will follow.

Subjective norms, or to be more precise group support, especially among young people, is an important factor in maintaining and changing attitudes and can be seen as a tool through which one's own attitudes are realised. An old behaviour which is rejected by in-group members is easier to resist than if it is accepted. Yates and Dowrick (1991), who introduced a preventive program, focused on peers of high-risk teenage drivers and social modelling. The program was evaluated over a 3 year period and the conclusion was that subjects were less likely to drive while intoxicated and more willing to stop a friend from drinking and driving after the implementation than before.

The social aspects of driving were also included in a driving whilst intoxicated (DWI) program for driving schools. The results indicated that participation in this program lead to improved knowledge about DWI. In general the already negative attitude towards DWI remained and people in the experimental condition planned to drink less alcohol as compared to the control group. However, the actual DWI behaviour was more difficult to change, although in a follow-up fewer people in the experimental group would drive after drinking if other people were telling them not to drink. (Kayser, Schippers & van der Staak, 1995).

Sheehan, Najman, Schofield, Siskind and Smithurst (1990) used the TPB in their National Campaign Against Drug Abuse and produced major changes among a group of young drivers. The immediate impact of the program was assessed one month after implementation and the trend was in the intended direction. In a follow up three years later the same positive effect remained.

Parker (2002) conducted an experimental study examining the effect of viewing different videos on speeding intention and attitudes towards speeding. Four of the videos addressed different components of the TPB; a) perceived behavioural control, b) normative beliefs, c) behavioural beliefs, d) anticipated regret. A fifth video not addressing speeding was also included. Drivers were randomly assigned to view one of these videos and effect on speeding intention was measured afterwards. The result showed that drivers who viewed the video addressing anticipated regret expressed the most negative attitudes towards speeding. However, drivers who viewed the control video expressed least intention to speed. Thus, addressing the different components of the TPB through persuasive video messages did not seem to be effective in order to influence speeding intentions.

An example with more ecological validity is the Scottish “Foolspeed” campaign (1999-2001), intending to reduce speeding on Scottish roads. The campaign was based upon the TPB and aimed to influence the psychological variables believed to underpin speeding behaviour; attitudes, social norm and perceived behavioural control. Stead, Tagg, MacKintosh, and Eadie (2005) conducted a thorough evaluation of the campaign, using a 4-year cohort study consisting of 550 drivers (one baseline measurement and three annual follow-up measurements). The results showed that there were significant changes in attitudes and affective beliefs in the desired direction after the campaign was implemented. However, no changes in either subjective norms or perceived behavioural control could be detected. Most important; no changes in either behavioural intention to speed or speeding behaviour was found.

The “Foolspeed” campaign thus seemed to have limited success. Although attitudes and affective beliefs were changed, this did not seem to have any effect upon the target outcome of the campaign, i.e. speeding behaviour. One possibility is that attitudes are not an important predictor of behaviour. Although attitudes and behaviour were associated (the relationship is mediated through behavioural intentions) when measured at the same time, they were not when prospective measurement was used. The relationship between attitudes measured at baseline and speeding behaviour four year later was almost non-existing - the indirect standardized effect of attitudes upon reported speeding four year later was .04. The same conclusion was reached in the meta-analysis presented in table 2. In the evaluation report from the “Foolspeed” campaign, perceived behavioural control at baseline was significantly related to speeding behaviour four year later. This could indicate that it is more efficient to focus more upon changing perceived behavioural control than attitudes towards speeding. The value of focusing upon perceived behavioural control (and behavioural intentions) is also supported in table 2.

3.4.4 Conclusion

The TPB has been found to be able to explain variance in speeding behaviour and in particular speeding intentions, especially when the measures of the different components in the model are collected at the same time. However, the effectiveness for using the model as the basis of road safety interventions seems to be limited. It is important to note that few evaluated road safety campaigns has used the TPB as the basis for the intervention, meaning that it is difficult to reach a firm conclusion whether or not it is effective to use this model in road safety promotion. The use of TPB will be further discussed in chapter 3.6 and especially in chapter 5.

3.5 THE THEORY OF INTERPERSONAL BEHAVIOUR (TIB)

The TIB was initially proposed — and modified — by Triandis (1977, 1980, 1982). It is similar to the Theory of Planned Behaviour (Ajzen, 1988; Ajzen & Fishbein, 1980) in that both include expectancy-value and normative beliefs constructs and that both seek to explain the intention to perform a behaviour and the actual performance of the behaviour. The main difference between the two theories is that the TIB attributes more importance to the level of consciousness in explaining and predicting behaviour. The central tenet in the TIB is that as the level of consciousness decreases (i.e., the degree to which intention plays a role), the level of habit in performing the behaviour increases. The weight that intention or habit plays in the performance of a behaviour is a function of three different factors: the person, the act, and the situation. For example, behaviour for an individual learning to drive a car is initially under the control of intention. However, with time and experience, driving comes to be more and more under the control of habit.

3.5.1 Key variables and concepts

In essence, the TIB consists of two important relationships comprised of several variables. The first relationship provides an explanation of the *formation of intentions*, while the second relationship is an account of the *probability to act*.

According to the TIB, intentions are a function of personal attitudes and social factors. Personal attitudes include both affective and evaluative components. The former involves the emotional response (i.e., feelings) one has towards an act, whereas the latter is a cognitive evaluation (i.e., pleasant, unpleasant, good, bad) of the probable consequences of an act. These components are defined separately as they are argued to have distinct influences on intention formation. For example, in sexuality research, where the TIB has been readily applied, Maticka-Tyndale, Herold, and Mewhinney (1998) argue that young adults on spring break may anticipate positive feelings at the thought of casual sex while at the same time judging the consequences to be undesirable. Social factors refer to what an individual believes to be morally, ethically, and normatively correct to do. The conceptualisation of social factors has varied from study to study. For example, Boyd and Wandersman (1991) include three different constructs under the rubric of social factors:

- personal normative beliefs (i.e., internalised personal codes, moral standards, or social norms)

- role beliefs (i.e., what is seen to be appropriate with regard to one's perceived social role or status)
- social norms (i.e., the perceived norms and expectations of close friends, parents, and others included in one's reference group).

Maticka-Tyndale et al. (1998) had a similar conceptualisation but also included a fourth construct, capturing the fact that agreements and promises are made between individual, which they referred to as pacts to act or not act in a certain manner. Irrespective of the exact conceptualisation of social factors, what is apparent is that they capture the social group's function as a reference point (e.g., social norms or pacts/agreements) and an individual's transformation of social norms into standards and self-expectations with him-/herself as the point of reference (e.g., role beliefs and personal normative beliefs).

The second important relationship in the TIB is the probability of action being performed, which is a function of habit, intentions, physical arousal, and facilitating (situational) conditions. Intentions, whose determinants according to the TIB have been presented above, can be defined as the instructions or plans an individual gives to him-/herself for behaving in a certain manner. Habits can be described as automatic associations between a stimulus situation and a chosen option. According to the TIB, habits and intentions are inversely related, with the relationship varying according to the individual, the act to be performed and the situation. So, for example, a novice, a new act, or an unfamiliar situation will tend to result in a larger weight for intentions (and a consequent smaller weight for habits). Conversely, an expert, an oft-repeated act, or a familiar situation will result in a greater weight for the habit component. Physical arousal refers to the arousal level of the individual and magnifies the probability of a response, while situational conditions refer to the objective conditions of the external environment that influence the probability that an act is performed. If the situation prevents or impedes the act from being performed then neither habitual processes nor intentions (or some combination thereof) will result in the behaviour. If the situation is conducive to the performance of the behaviour then habitual processes and/or intention will lead to its performance provided there is a sufficient level of physical arousal.

3.5.2 Empirical support and its application to traffic safety

The empirical evidence for the TIB has been inconsistent and ambivalent. Studies both supporting and disconfirming it can be found. One reason — and criticism — for this is the lack of standardisation of measurements for many of the model's constructs meaning the model is not very clearly defined (e.g., Sheth, 1982). An example of this was seen above when describing the relationships behind the formation of intentions (cf., Boyd & Wandersman, 1991; Maticka-Tyndale et al., 1998).

Nevertheless, research has demonstrated some support for the TIB. For example, Bagozzi (1981) showed that past behaviour (habit) reduced the impact of intentions on behaviour, while Boyd and Wandersman (1991) found that past behaviour greatly increased the ability to predict condom use. The use of past behaviour as a predictor of behaviour has also been successful additions to other models attempting to explain behaviour, like the TPB. With respect to the determinants of intentions, Hom

and Hulin (1981) found support for the role of social factors and the perceived consequences of the behaviour. A more recent study by Bamberg and Schmidt (2003) found that *role beliefs* (e.g., “using the car for university routes is (not) fitting for my position as a student”) improved the prediction of car use intentions, suggesting social factors are important for the prediction of intention. The same study also found support for the role of car use habit on behaviour. The authors concluded that car use was habitual in nature and involved routine-shaped automatic associations between situations and habitually chosen options but that it was once rooted in conscious evaluations of advantages and disadvantages (Bamberg & Schmidt, 2003). This is wholly consistent with Triandis’ proposition of an inverse relationship between habits and intentions.

3.5.3 Implications for campaign design

The first key issue a campaign based on the TIB needs to address is the extent to which the targeted behaviour (i.e., the behaviour the campaign designer is trying to influence or change) is habitual. Habitualised behaviours are beyond an individual’s conscious control and less reliant on an individual’s intentions. Thus, according to the TIB, habitualised behaviours can only be affected by altering one’s level of physical arousal, which is not an option available to planners, or changing the situational conditions in which the habitualised behaviour occurs. One way to bring a behaviour back under conscious, intentional control is to provide an independent reminder to individuals (e.g., reminders to use a seat-belt once ignition occurs in an automobile, reminders to keep within the speed limit like speed cameras, visible traffic police control, intelligent speed adaptation technology (ISA)). Another is to change the very situation in which the behaviour occurs. As an example, consider a campaign to encourage car user to use a new improved public transport service. Habits have been shown to be important determinants of automobile use. Indeed, habitual driving is arguably a much more important determinant of car use in the long run, because a general finding is that attitudes and intentions are not enacted if they are interfered with by habits (Verplanken & Faes, 1999). So, returning to our example, should the situation in which the habit was formed change (e.g., better, quicker public transport), then there is no guarantee that car use will decrease. As habit strength increases, depth of predecisional information search decreases and people will continue to drive despite the fact that driving is no longer the optimal, or most rewarding, mode of transport. What is needed, therefore, is a package of measures consisting of coercive measures that break a habit (by, for example, making car use no longer possible or making it prohibitively expensive) and non-coercive measures (such as increased public transport services or new routes) encouraging the use of other modes (e.g., Gärling, Eek et al., 2002; Meyer, 1999). This is consistent with the TIB.

If, on the other hand, a type of behaviour is intentional (either from the outset or after having first altered its habitual nature) then the TIB suggests that campaign design should focus either on personal attitudes or social factors, or both. If it is decided by campaigners that personal attitudes need to be targeted, the issue as to whether or not cognitive or affective elements should be influenced or if they can be influenced. If we take the example of speeding, it may be easier to influence the cognitive aspects of the behaviour (i.e., it is dangerous, risky, bad) rather than the affective components (i.e., it is fun, sense of freedom, carefree). Alternatively, repeated

campaigns of speeding accidents and negative consequences may also influence affective components by means of association (i.e., feeling unsafe, scared). It is also possible to target social factors through campaigns. For example, a recent anti-speeding advertisement in Australia showed onlookers making fun of a speeding young adult male by waving their small finger (suggesting that speeders have a small penis). The VTI's policy regarding driving by its employees is based on the assumption that its target group (i.e., VTI employees) will accept their role as model citizens with respect to driving behaviour.

Conclusion

The TIP has to our knowledge not been empirically tested to explain variance in road user behaviour (except from the use of car). Still, several of the central variables in the model are also included in the other models presented. In addition, the TIB presents an interesting division between behaviour as a result of habits and behaviour being a result of intentions that the other models seemed to have missed. This could give a valuable prediction of whether a campaign addressing e.g. attitudes would work or not. If the behaviour is a result of habits, then it is difficult to change behaviour through a campaign targeting attitudes and social norms. It could be more effective to force the driver to change his or her behaviour through e.g. enforcement measures. If the behaviour on the other hand is a result of intentions, then a campaign targeting such beliefs might be effective. Thus will be a very central topic of discussion in later sections of the report (see chapter 3.8.12 and chapter 5).

3.6 COMPARISON BETWEEN THE GENERAL BEHAVIOURAL MODELS

The different behavioural models presented so far contain a variety of constructs/components thought to influence behaviour. Although some of these are unique to certain models, the majority of the components/constructs share very similar characteristics. This has previously been noted by Weinstein (1993) and more recently by Noar and Zimmerman (2005). The latter authors analysed the components of different (health) behaviour models in terms of their use of attitudinal beliefs, self-efficacy and behavioural control beliefs, normative beliefs, risk related beliefs and emotional responses, intention, commitment and planning, and finally past behaviour. Although the TIF, PMT and PBT were not included in Noar and Zimmerman's overview from 2005, a similar overview is presented in Table 3.3. The table demonstrates that the models are very similar.

Table 3.3. *Similar elements within five behavioural theories. Partly adopted from Noar and Zimmerman (2005, p 278-79)*

Concept	Description	HBM	TIF	TPB	PMT	PBT
<i>Attitudes</i>	The perceived benefits/positive aspects of the behaviour exceeds the perceived costs/negative aspects of the behaviour	Benefits, barriers and health motivation	Behavioural beliefs and derived attitudes	Behavioural beliefs and derived attitudes	Perceived rewards and costs of behaviour	The personality system
<i>Self-efficacy</i>	Belief in one's ability to perform the behaviour	Self-efficacy		Perceived behavioural control	Self-efficacy and response efficacy	
<i>Normative beliefs</i>	Beliefs that others (e.g. peers) wants you to engage in a behaviour Beliefs that others (e.g. peers) are engaging in the behaviour	Cues to action from others (media, friends)	Personal normative beliefs Role beliefs Social norms	Normative beliefs and motivation to comply Descriptive norm	Anticipated rewards or costs received from others when engaging in a behaviour	Perceived environmental system (influence from friends , family etc.), social learning
<i>Risk related beliefs and emotional responses</i>	Belief that the unsafe behaviour can give (severe) consequences outcome and that oneself is vulnerable	Perceived severity and susceptibility	Emotional response towards an act, cognitive evaluation of consequences of an act. Physiological arousal	Anticipated emotional responses	Perceived severity and susceptibility	
<i>Intention/planning</i>	Intention or planning of conducting a specific behaviour		Behavioural intentions	Behavioural intentions	Behavioural intentions (Protective motivation)	
<i>Habit/past behaviour</i>	Whether the specific behaviour is established, and how strongly established it		Habits (believed to be automatized)	Past behaviour	Prior experience with a similar threat	One type of problem behaviour is linked to other problem behaviours

The main difference is perhaps in how thorough the different concepts are defined and operationalized. For instance, emotional responses and threat appraisal is some of the key concepts in the HBM and PMT, and are therefore most defined in detail in these models.

The results from the comparison suggest that the (extended version of the) TPB is the most comprehensive model. The meta-analyses presented in table 1 and 2 also support the “predictive” power of the TPB in terms of its ability to explain variance in road users’ behavioural intentions and behaviour (about 40%). Thus, the TPB might be a good summary model with good ability to explain variance in road user behaviour. This does not necessary mean that the model is suitable for promoting behavioural change, a topic that will be discussed soon.

Another similarity between the different models is that they have the assumption that certain beliefs (attitude, social norm etc.) influence behaviour, i.e. that the behaviour in question is partly a result of these beliefs. In many ways, the individual is believed to make a sort of cognitive cost-benefit analysis of the mind when deciding upon whether to perform the behaviour in question or not. The models can therefore been said to emphasise rational thinking to a high extend.

Although the models incorporate emotions, one main impression is that emotions is a part of the more cognitive “cost-benefit analysis of the mind” that seems to be central in most of the models. Thus, automated/unconscious processes are not emphasised in the models. One exemption is, however, the Theory of Interpersonal Behaviour (TIB). The TIB makes a clear and interesting division between behaviour that can be seen as a result of intention and behaviour that can be seen as a result of habit. The latter is believed to be partly unconscious and automatic and hence difficult to influence through e.g. a campaign addressing attitudes and other beliefs. This particularly is interesting, since many of the types of road user behaviour can be regarded as a habit and thereby not as a result of intentions. If the predictions made from the TIB are valid, this questions the utility of influencing beliefs as proposed by the other models.

Interventions based upon the other models (primarily the PMT, HMB and TPB) suggest on the other hand to first influence the beliefs thought to influence behaviour. If one is able to change the beliefs that underpin the behaviour in question, then a change in behaviour is likely to occur. Although there is extensive evidence that the different components in the model are related to behaviour (when measured at the same point in time), the evidence that a *change* in these beliefs will give a change in road user behaviour is as previously mentioned limited. This is mainly due to that few road safety campaigns being based upon the models have been evaluated⁹. One exemption was the Foolspeed campaign, where a change in

⁹ This is also true for interventions aimed at changing other types of behaviour. For instance, Armitage and Connor (2002) note that although the TPB is the prime model for explaining health behaviour, surprisingly few attempts to use the model as the basis of health (and safety) behaviour campaigns have been made. Most of the few interventions based upon the TPB, does not evaluate the impact of the intervention upon the behavioural predictors either (Hardeman, et al., 2002). This is in line with the conclusion reached from the data material collected for the meta-analysis of road-

attitudes was not followed by a change in either intentions to speed or speeding behaviour (Stead et al., 2005).

One reason may be that many types of road user behaviour (in this case speeding) is a results of habits and automatically processed, and attempts to change behaviour through changing beliefs and intentions will therefore be difficult. But how can we change habits and automatic processes? These are central components in specific models of driver behaviour, like the hierarchical driving behaviour model and in particular the Risk Monitoring Model. These two models will be elaborated more in detail in the next sections and can give alternative recommendations for changing behaviour.

3.7 HIERARCHICAL DRIVING BEHAVIOUR MODELS

In this chapter an overview is given over several models developed for understanding driving behaviour specifically. Models simplify reality to such a degree that understanding and predicting certain phenomena (e.g. speeding) will be possible, by describing the mechanisms which produce the phenomena. All models mentioned in this chapter refer to different task hierarchies and performance levels. Most of the hierarchical driving behaviour models were developed in the 1970s. At the beginning of 1980 they were used as a starting point for planning training for car drivers (Keskinen, 2007).

3.7.1 Driving Behaviour models

In order to describe road user behaviour, it is advisable to divide it into different levels, or areas. This does not only make structured description easier, but it is also of advantage when identifying, discussing, and/or implementing measures to influence behaviour. Models help to identify types of behaviour and behaviour aspects that can be accessed with the help of, e.g., campaigning measures. E.g., any campaign that aims at influencing traffic behaviour in such a way that it becomes safer will have to be based on "intelligent" assumptions concerning the question what levels, or areas, of behaviour one wants to address with different communication contents, and how changes on these levels, or in these areas, can be achieved. A good model should allow, or even support the generation of such intelligent assumptions, thus guiding any traffic safety measure, including campaigns, in the wished-for direction. In the following, three models will be discussed: The one by Michon, the model of Rasmussen, and the model of Keskinen & Hatakka.

3.7.1.1 Michon

The description of different hierarchical levels according to Michon is the most general one and can be applied to most of the models: He speaks of the strategic

safety campaigns; relatively few of the evaluated campaign are explicitly based upon a theory or a model (see CAST report 1.2).

(planning), the tactical (manoeuvring) and the operational (control) level (see Michon 1985). It can also be seen as a continuum from highly conscious processes (strategic level) to automated processes (operational level).

- *Strategic Level:* This level describes the general planning stage of a trip. Plans usually derive from general considerations about transport and mobility e.g. route to be chosen, modal choice, time planning like when to start a trip and when one should arrive and from attendant factors such as aesthetic satisfaction and comfort.
- *Tactical Level:* At this level the driver negotiates prevailing circumstances e.g., how one approaches an intersection, a pedestrian crossing, when one changes lane before obstacles, etc.
- *Operational Level:* This level is concerned with the “real” handling of the vehicle e.g., steering, changing of gears, speed control, braking or accelerating when traffic light changes to yellow, etc.

3.7.1.2 Rasmussen

According to Rasmussen, acts taken by drivers can be knowledge-based, rule based, or skill based. In theory these task performance types can be applied to all of Michon's level, but it may be assumed that on the strategic level the portion of knowledge based performances is higher, while on the operational level skill based performances will prevail (see e.g. Rasmussen, 1986).

- *Knowledge-based activities:* e.g., find your way through the city, choose the correct road out of a roundabout, etc.
- *Rule-based activities:* e.g., yielding at an intersection, stopping when the traffic light is red, respecting the speed limit, etc.
- *Skill-based activities:* e.g., changing gears, adapting speed to different traffic situations, driving on a mountain road with the appropriate gear, etc.

3.7.1.3 Keskinen & Hatakka

The model by Keskinen and Hatakka (that in the frame of the EU-project GADGET has been transformed into the Gadget model) is in principle similar to the Michon model, but adds one “highest” task hierarchy: the “Goals for life and skills for living” (see e.g. Keskinen 1996, Hatakka 1998). The assumption of the hierarchical approach is that abilities and preconditions in a high level influence the demand and preconditions on a lower level. The model includes the following levels (also presented in Figure 3.3):

- Goals for life and skills for living (importance of cars and driving to personal development, skills and self-control, physical and mental preconditions)
- Goals and context of driving (purpose of driving and in which environment, company it is made)
- Mastery of traffic situations (adjustment to demands of traffic situations)
- Vehicle manoeuvring (control of speed, braking, understanding the impact of seat belts, etc.)

The lowest three levels are directly associated with driving task. The third one is already in close connection with motivational aspects affecting also the lower levels. The fourth level refers to personal attributes that guide person's decisions in everyday situations. This level covers not only driving but personality and motives, a person's relation to life and the present life situation and lifestyle (e.g. the importance of cars and driving to personal development). A very important aspect with respect to traffic safety campaigns as a wished for behaviour has to be seen in relation to the consequences for someone's life style and life quality. Good manoeuvring skills alone are not enough to drive safely. A driver must also have the will to behave correctly. He must understand that the social context affects what a person can do and is permitted to do as a driver.

In the frame of the EU-project GADGET the model by Keskinen & Hatakka was elaborated somewhat more by splitting up behaviour on all levels into knowledge about one's own behaviour, types of possible risk tendencies and one's own problem awareness concerning one's own behaviour on that specific level.

Figure 3.3: *The GADGET matrix*

<p>Goals for life and skills for living (general)</p>	<p>Knowledge about/control over life-goals and personal tendencies affect driving behaviour</p> <ul style="list-style-type: none"> lifestyle/life situation group norms motives self-control, other characteristics personal values 	<p>Risk tendencies</p> <ul style="list-style-type: none"> acceptance of risk self-enhancement through driving high level of sensation seeking complying to social pressure use of alcohol/drugs values, attitudes towards society 	<p>Self-evaluation / awareness of</p> <ul style="list-style-type: none"> personal skills of impulse control risk tendency safety-negative motives personal risky habits ...
<p>Goals and context of driving (trip related)</p>	<p>Knowledge and skills concerning</p> <ul style="list-style-type: none"> effects of trip goals on driving planning and choosing routes evaluation of requested driving time effects of social pressure in car evaluation of necessity of trip 	<p>Risk connected with</p> <ul style="list-style-type: none"> driver's condition (moods, BAC etc) purpose of driving driving environment (rural/urban) social context and company extra motives (competing etc) being caught by the police 	<p>Self-evaluation / awareness of</p> <ul style="list-style-type: none"> personal planning skills typical goals of driving typical risky driving motives ...
<p>Mastery of traffic situations</p>	<p>Knowledge and skills concerning</p> <ul style="list-style-type: none"> traffic rules anticipation of course of situation speed adjustment communication driving path driving order distance to others / safety margins ... 	<p>Risk caused by wrong expectations</p> <ul style="list-style-type: none"> risk-increasing driving style (e.g. aggressive) unsuitable speed adjustment vulnerable road users not obeying rules/unpredictable behaviour information overload difficult conditions insufficient automatism/skills 	<p>Self-evaluation / awareness of</p> <ul style="list-style-type: none"> strong and weak points of basic traffic skills personal driving style personal safety margins strong and weak points for hazard situations realistic self-evaluation ...
<p>Vehicle manoeuvring</p>	<p>Knowledge and skills concerning</p> <ul style="list-style-type: none"> control of direction and position tyre grip and friction vehicle properties physical phenomena ... 	<p>Risk connected with</p> <ul style="list-style-type: none"> insufficient automatism / skills unsuitable speed adjustment difficult conditions (low friction etc) ... 	<p>Awareness of</p> <ul style="list-style-type: none"> strong and weak points of basic manoeuvring skills strong and weak points of skills for hazard situations realistic self-evaluation

Source: Hatakka et al. 1999

3.7.2 Implications for campaigns

Hierarchical driver behaviour models concern, as the name implies, driving behaviour. The following implications are therefore most relevant for campaigns addressing driving behaviour, but might also be relevant for other types of road user behaviour.

The aim of road safety campaigns is usually to change or promote behaviour that occurs in the two lowest level of the GADGET matrix, especially if violations are the target. However, the usual campaign strategy is to influence through information forwarded to the road user, and not by introducing direct impact on behaviour in the context the behaviour occurs. This information has to go through the cognitive channels first. They have to understand the meaning of information and take decisions. Thus, road users are usually influenced through the highest levels in the hierarchy. Transference of this information to lower levels in the hierarchy will probably occur much later, if at all. A central question is whether one should influence the road user more directly in the relevant context, i.e. in the lower level in the hierarchy if a change in behaviour is the aim. For instance, the use of Intelligent Speed Adaptation (ISA) can give direct feedback to the driver when the violation occurs.

However, it can be difficult to influence the driver directly all of the time. Thus, a more stable change in the higher levels of the hierarchy is needed. Given these preconditions, it seems especially important to include Keskinen and Hatakka's highest level, the goals for life and skills for living, in any model that wants to systematically interconnect traffic-safety-campaign activities and their effects on behaviour.

This means that it is necessary to operationalize what notions, i.e. what aspects of behaviour will, or should, change due to any campaign, on the "goals for life and skills for living", the strategic/knowledge based, and the tactical/rule based level. In practice, this can mean a combination of measures to influence the road user both in the relevant context and outside the context – the latter meaning the higher levels in the hierarchy. This will be further discussed in part 3.8.12.

3.8 AN ECLECTIC ROAD USER MODEL BASED ON RISK MONITORING AND EMOTIONS

Implicit in the CAST proposal of developing a Road User Model for explaining and predicting behaviour in the road traffic system, is "the necessity of being eclectic". The reason why this is a necessity is the lack of a comprehensive theory of behaviour in road traffic, there is no such thing as an applicable, all-inclusive road user model with predictive power. One way out is to build a road user model from existing theories and models by identifying relevant building blocks and propose a model which takes into account all aspects that are significant in terms of contributing to explaining violations and accidents in road traffic.

In this perspective, the following aspects are considered as core building blocks and problem statements:

- **Risk monitoring:** The prime task of road user behaviour is the perception and handling of risks, identifying dangers and avoid accidents. This is the basic core and a road user model must acknowledge this by integrating and applying risk monitoring as its base
- **Risk compensation:** Road users adapt to whatever measure that is applied in the road system or integrated in the vehicle. The difficulties do not arise so much concerning how, as behaviour can be observed and described, but rather concerning why: Why is it that drivers so often seem to compensate by changing their behaviour as a function of new safety measures?
- **Motivation:** All behaviour is motivated, but what motivates violations in traffic? Inherent in motivation is a component of emotion, the two concepts are interrelated. Motivation is also mediated through personality traits and can hardly be understood or separated from these.
- **Emotions:** Emotions and feelings have to a large extent been neglected in existing road user models, although there are exceptions as with Taylor (1964) and Näätänen and Summala (1974). However, through achievements in neuroscience, the significance of emotions and feelings are again brought back on the agenda.
- **Learning theory:** In road safety research the mechanisms of learning and learning theory is surprisingly seldom addressed. It is surprising because one often aims at influencing and changing behaviour from violations to compliance with traffic law. In principle, one cannot understand these processes of retainment and change of behaviour without referring to reinforcement, i.e. the stimuli that increase or reduce the frequency of a given road user behaviour.
- **Personality traits:** Likewise as with learning theory, the significance of personality traits has to a large extent been neglected. One might think that sensation seekers are the only driver group being different from “normal, average driver”, but as Ulleberg has shown (2002), the picture of driver subgroups with differering personality traits is much more complex than the seemingly ruling dichotomy “normals/sensation seekers”. The necessity of describing driver subgroups according to traits is also evident because a given personality trait constitution must be taken heavily into account as personality mediates motivation, behavioural reinforces may differ, and because a campaign must consider characteristics of a given target group is in its design and application of accompanying measures.

Even if there is a considerable amount of driver behaviour models in the field of traffic safety research, an integration of different aspects under one common, overall frame of understanding has not yet been accomplished. The considerable number of models displays first of all a lack of consensus, especially regarding theories on driver speed choice which is a core issue in traffic safety work and road safety campaigns.

3.8.1 The significance of motivation

Motives can be defined as “*Factors, which give behaviour energy and direction*” (Atkinson et al. 1996). Then, motives are factors, which initiate and govern behaviour. The energy component of the definition shows that a motive basically also is a drive. The direction component implicitly presupposes repulsion or attraction, i.e. a movement away from something or attraction to something, which again implies that the repulsive or attractive object has to be loaded with some emotional quality. Otherwise, there would be no energy, and no direction (Overskeid, 2000). A neutral object is neither repulsive nor attractive. Hence, the emotional dimension of motives is then a core aspect of motivation.

A second feature of the definition is that it does not say anything about cognition, i.e. whether motives are rooted in consciousness or in the unconscious. This is a significant point, for two reasons (Vaa, 2007a):

- 1) The role of the unconscious has seldom been made explicit in prevailing driver behaviour models,
- 2) The phenomenon of risk compensation cannot reach any satisfactory explanation, without including and addressing unconscious processes

A central concept in biological psychology is the principle of homeostasis, i.e. when basic physiological needs are regulated by a homeostatic mechanism. When deviances become larger than the body can regulate internally, tension may arise and the organism will be motivated for a given (external) behaviour resulting in a restored (internal) homeostatic state. This might lead to specific, purposeful acts when the state of tension exceeds a given threshold. The behavioural goal is then to satisfy the need in order to reduce tension.

3.8.2 Motivational aspects in selected driver behaviour models

The listing below includes some of the most predominant theories and models that have been applied to explain driver behaviour, and each of them has a motivational aspect as a key dimension. The history of models starts in 1938 when Gibson and Crooks' presented their theoretical field-analysis of automobile driving:

- “*Field of safe travel*” (Gibson & Crooks, 1938)
- “*Driving as a self-paced task governed by tension/anxiety*” (Taylor, 1964)
- “*Zero-Risk Model*” (Näätänen & Summala, 1974)
- “*Target level of risk*” (Risk Homeostasis Theory (RHT), Wilde, 1982)
- “*The Threat-Avoidance Model*” (Fuller, 1984)
- “*Theory of Planned Behaviour*” (Ajzen, 1985)
- “*The role of pleasure*” (Rothengatter, 1988).
- “*Sensation seeking*” (Zuckerman, 1994)
- “*Task difficulty*”/ “*Task interface model*” (Fuller, 2005).

The purpose of presenting such a listing is to focus on main motivational aspects which have been proposed and discussed in traffic safety research. It can be argued that a common denomination for most of the models is emotion because concepts such as “safe travel” (Gibson & Crooks, 1938), “tension/anxiety” (Taylor, 1964), “zero risk” (Näätänen & Summala, 1974), “target risk” (Wilde, 1982), “threat-avoidance” (Fuller, 1984), “pleasure” (Rothengatter, 1988), “task difficulty” (Fuller, 2005) are the key concepts. Wilde’s RHT, which has been heavily debated since it was launched, represents something different, because the target level of risk is understood and defined as a number > 0 (Vaa, 2001a), not as an emotion or a feeling. On the other hand Wilde’s RHT is inescapable because of its reliance on central concepts as homeostasis and risk compensation.

One may get the impression that models have been too focused on cognitive aspects as determinants of driver behaviour, as in Theory of Reasoned Action (TRA) (Ajzen & Fishbein 1980) and Theory of Planned Behaviour (TPB) (Ajzen, 1985). One could even say that the focus on cognitive models has been predominant to such an extent that the role of the unconscious has more or less been neglected (Vaa, 2007a). Extending this assertion, one can argue that there is no common understanding of driver behaviour that is based on recent achievements in cognitive psychology and neuroscience. In fact, Taylor’s early work of 1964 may be more in line with recent achievements in neuroscience than any other of the models listed above (Damasio, 1994; Bechara et al., 1997). The hypothesis which is proposed is that the role of the unconscious is significant as a motivating force also when it comes to driver behaviour. Hence, there is a need for a deeper and more considerate elaboration of the role of the unconscious. This is made a predominant point in the present discussion, which aims at a deeper understanding of the phenomenon of risk compensation.

3.8.3 Risk compensation and behavioural adaptation

Behavioural adaptation and risk compensation are concepts which sometimes are used interchangeably, but a distinction between them is proposed (Vaa, 2007a). Behavioural adaptation is naturally the widely used generic concept, and this meaning remains. However, a limitation of *behavioural adaptation* to *strategic* decisions, i.e. to conscious decision-making is suggested. Strategic decision-making may take place outside as well as inside the road traffic system. One example is driving in darkness, when the number of elderly drivers, and women (all ages), increases as a function of road lighting on a given stretch of road, because these specific driver groups feel more secure when a road is lit up by road lighting (Assum et al., 1999). A second example is when you decide to drive faster because you are out of time, or you decide to take an alternative route because you are stuck in traffic, these are, likewise, also strategic decisions.

Risk compensation also represents behavioural adaptation, but it is regarded as a special case of adaptation, i.e. adaptations which occur without necessarily involving consciousness. Hence, this concept is used mainly for decisions made on an unconscious, automated level, as when the driving speeds are increased (Aschenbrenner et al., 1987), or when time headways are reduced (Sagberg et al., 1997), for drivers driving cars equipped with ABS compared to a control group of

drivers with cars without ABS. This distinction is deliberately made because these kinds of decisions origin in bodily reactions, that is the hypothesis, which drivers do not necessarily experience at a conscious level. This type of process is named risk compensation, because, when a given, supposed risk-reducing measure is introduced in the road traffic system, as for example with cars with ABS, the risk-reducing effects, which are expected, are compensated by certain behaviour changes, most predominantly by increased driving speeds or by changes of levels of attention (Elvik & Vaa, 2004).

It should be added that the “hierarchical” categorisation strategic-tactic-operational introduced by Michon (1985), is not adopted here, behaviour is rather seen as belonging to a continuum ranging from highly conscious to highly unconscious as end points, i.e. not as separate categories in itself (Vaa, 2003a). The degree of conscious/unconscious information processing and decision-making is going back and forth along the continuum, thus illustrating the dynamics and integration of cognitive processes, bodily reactions and emotions and feelings.

3.8.4 Risk homeostasis or risk compensation?

One of the basic starting points of Wilde’s RHT is in control theory/cybernetics. Wilde states very clearly that his RHT-model may be compared to a heating system that regulates the in-door temperature of a house (Wilde, 2001). The homeostatic model relates house temperature to heating system activity and vice versa: Relating heating system activity to house temperature, with the set-point (target) temperature as the controlling variable (Wilde, 2001; Wilde, 1988). Wilde converts his model of regulating the house temperature “box-by-box” in developing his model of how the RHT works (Wilde, 2001), presented in Figure 3.4:

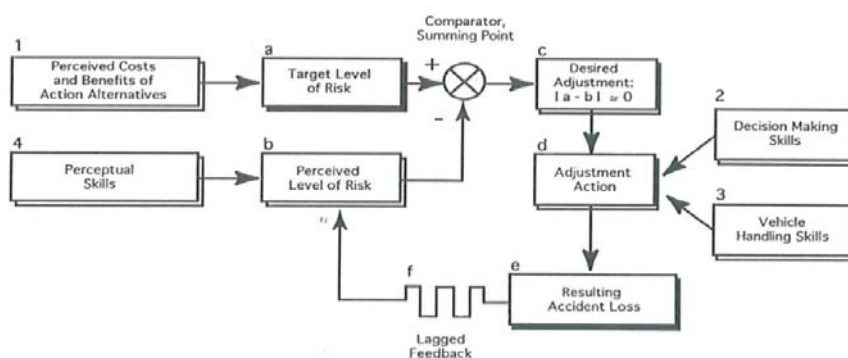


Figure 3.4: Wilde’s Model of Risk Homeostasis (Wilde, 1982).

Wilde describes it as a

“...homeostatic model relating the accident rate per head of population in a jurisdiction to the level of caution in road-user behaviour and vice versa, with the average target level of risk as the controlling variable” (Wilde, 2001 – page 33)

Wilde’s RHT has been central for years and it has been at the core of heavy debates since it was first published. It addresses risk compensation which does exist, but it

remains as an unsolved and not fully understood problem in traffic safety work. However, by its postulate of *homeostasis*, it represents a deadlock theoretically speaking, as it is not suitable for testing, but the RHT is nevertheless inescapable as it addresses a core problem in driver decision-making.

While Näätänen and Summala (1974) postulate that drivers try to avoid risk by regulating their behaviour according to a perception of zero risk, Wilde postulates the opposite by stating that drivers **seek** a certain risk level – “a target risk level” - a risk level that must be perceived as a number > 0 presumed to be defined by a measure of exposure, i.e. as number of accidents per kilometre driven, per a certain unit of time, or accident rate per head of population in a jurisdiction” (Vaa, 2001a; Wilde, 2001; Vaa, 2007b). This target risk number varies between drivers, it seems partly to have idiosyncratic origins, partly to be a regulator in a homeostatic system: When the driver is confronted with certain changes in the road environment, he/she will meet these changes with adaptations that secure that the level of target risk is sustained. Wilde postulates further that the target level of risk can be increased when expected benefits from risky behaviour, or expected costs from cautious behaviour, increases. Finally, it can be reduced when expected benefit from cautious behaviour, or expected costs from risky behaviour, increases.

Wilde’s RHT model contains one explicit element called a *comparator*. This is a place, a function, or a process where three input factors are put together and compared: b , c and d (Figure 1) resulting in one output factor e . According to Wilde, the three input factors are “weighed together” in the comparator, which is then a *bound* weighing because RHT predicts that the end result should be **zero**. Translated into words it means that the output from the comparator, the result of the weighing procedure, must be chosen in such a way that requirement $b - c - d = 0$ is fulfilled. Translated to behaviour it means that the output factor must be regarded as *the desired adaptation of the individual driver*, which is such that the risk homeostasis is sustained on an individual basis.

A central issue is then the question of how risk is appraised and how processes linked to risk appraisal should be modelled. The concept of a *comparator* produces an image of something being compared (consciously) and that behaviour are triggered by differences between images or ‘inner scenarios’ (Vaa & Bjørnskau, 2002). The appraisal of images/inner scenarios means that specific comparisons between these scenarios are made, especially in contexts which demand (conscious) choices between alternatives.

Monitor, however, implies something being monitored more or less continuously. The main task of a monitor is, as the word says, to monitor the organism and the situation in which it operates, identify unpleasantness and danger in order to avoid it, and/or to achieve a better condition among those scenarios that are available as alternatives. The basic objective of the monitor is to secure or increase the probability of survival. In monitoring there is not necessarily anything being compared and no position is taken towards whether consciousness is involved (Vaa, 2007b). A monitor functions universally rather than specific and would not be viewed as a focal point as with risk comparing. The concept of risk monitoring was introduced by Näätänen and Summala and is a key concept of their “Zero-Risk Model” (1974). Note that target risk in this context is zero.

More recent contributions from neuroscience support Näätänen and Summala’s zero-risk model (Damasio, 1994; Bechara et al., 1997). These contributions may

serve as inputs to the development of a driver behaviour model based on risk monitoring. While Bechara et al. confirm Taylor (1964) and the role of Skin Conductance Response as a guide in monitoring risk, Damasio simply states axiomatically that

- *Man's deepest motive is survival*

It follows from this axiom:

- *We must have an organ, a risk monitor for detecting dangers that threaten survival*

Assertion (1):

- *the body is the risk monitor*

Assertion (2):

- *Emotions and feelings are the tools enabling the organism to monitor the risks of the environment in which the organism operates*

Damasio introduces what he labels an “unorthodox definition” of *emotions* and *feelings* by limiting emotions to *unconscious/automated* processes – as with the *schemes* - and *feelings* to *conscious* processes – as with conscious appraisals of *inner scenarios/images* (Damasio, 1994).

3.8.5 Target risk > 0 or target risk = 0 ?

One basic disagreement with Wilde RHT, concerns the value of the target risk as imagined by the individual human being: Do we imagine it as zero or greater than zero? Consider the following statement:

“..... all behaviour is risk-taking behaviour, regardless of whether this is consciously realized by the acting person or not. It is obvious, too, that the challenge of life is not to eliminate risks. “Zero risk” is not a meaningful option, since it can only exist in the absence of behaviour – after death, in other words” (Wilde 2001, page 151)

This statement illustrates very concretely the difference between Wilde’s conception of risk and the conception of risk in other models. If one contrasts the above statement with Wilde’s previous statement (Wilde 2001, page 33) confusion is brought about by not being clear about at which level one operates. Is it on the individual level or on an aggregated level of a population? It is obvious that a society encounters and will encounter accidents within its jurisdiction within a given time span but that is of course not the same as saying that an *individual* will encounter an accident within the same time span. In fact, it is more normal that a driver will not experience an accident with personal injury in his/her lifetime than he or she will. A calculation based on Norwegian accident statistics estimates the individual involvement in an accident with personal injuries to, on the average, once in 390 years, that means that you must have a group of some 6 drivers driving ca. 14.000 km a year for 65 years, i.e. from they are 18 to they are 83 years of age, before one of them, on the average, will experience one personal injury accident (Vaa, 2003b). And in this single accident, the probability that it will result only in some minor injuries

is 70-80%. In fact, this is a very good empirical illustration of how skilled the individual driver is in monitoring risk and avoids dangers in traffic. Wilde illustrates his conception of risk by utility functions as in Figure 3.5:

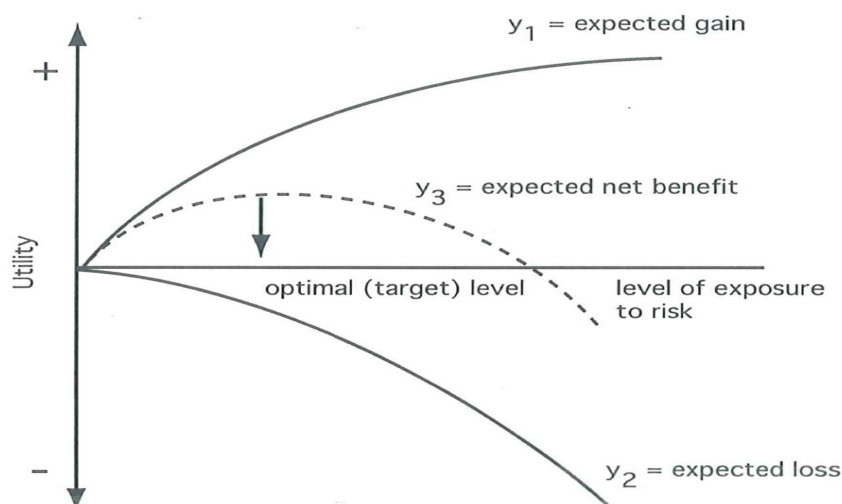


Figure 3.5: Theoretical representation of road users as net benefit maximizers (Wilde, 2001)

In the above graph $y_3 = y_1 - y_2$. Through this theoretical representation of benefits, Wilde characterizes road users as “risk optimizers” because they:

“..... choose an amount and manner of mobility such that the associated level of subjective risk corresponds with the point at which the expected net benefit is maximal.” (Wilde 2001, page 35).

The target – as understood and defined by Wilde – may be chosen so that the value of “level of exposure to risk” result in an optimum where the utility is at its maximum. Concepts which Wilde applies here are taken from economy and it is a question whether these concepts of “utility”, “expected loss/gain” and “optimal target level” on the whole are applicable when it comes to how drivers deal – i.e. psychologically speaking– with risks in the road system. The utility theory and adherent concepts are not applicable in this context as it rules out fundamental issues as information processing and unconscious and conscious routes to decision-making in dealing with the risks and dangers of everyday road traffic (Vaa, 2007b). One cannot simply just rule them out and leave them uncommented and pretending they do not exist. The alternative is of course to go deep into the subject matter as for example Reason has managed to do (1990), by modelling what he calls “a fallible machine” of information processing and decision-making (Figure 3.6):

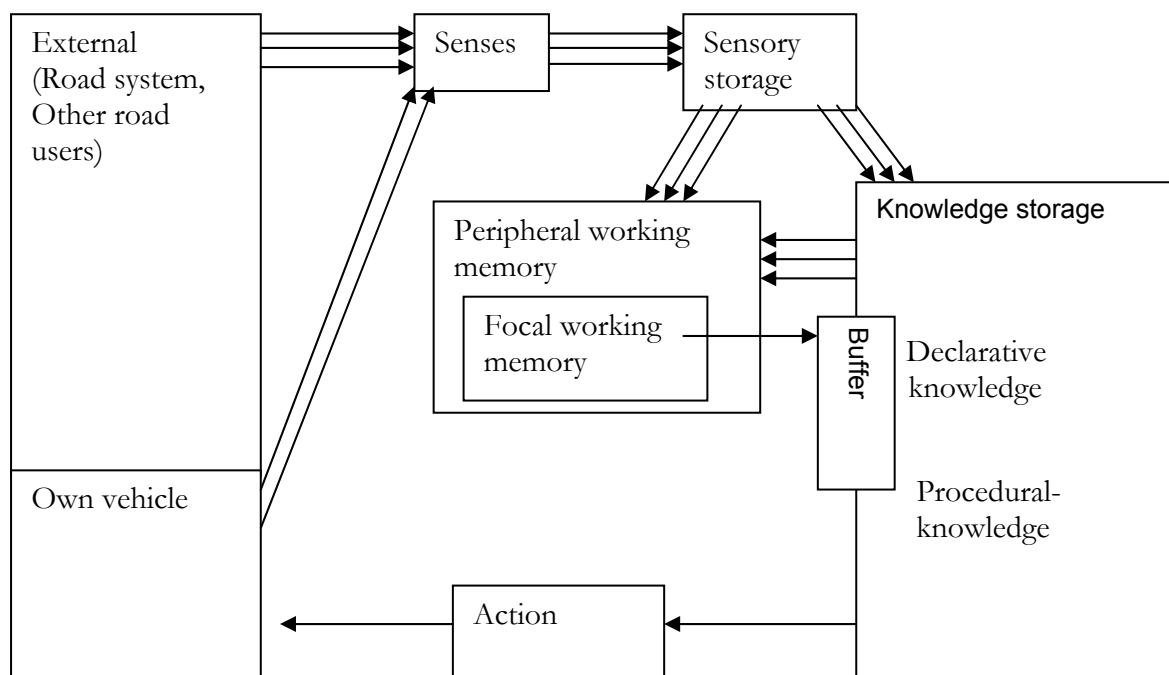


Figure 3.6: Reason's model of information processing and decision-making (Reason, 1990)

Reason's "fallible machine"-model illustrates the complexity of interrelationships between entities of memory, storages of information and types of knowledge. Inherent in Reason's model is the building of experience through schemes – i.e. the encounters with myriads of different scenarios of everyday life, in road traffic and elsewhere, that we have to face and deal with as they come. One important point here is the process of automation, probably initially starting as a conscious process regarding how to solve a problem, appraise it, try it out, fail perhaps, before the "best solution" is found, and as time goes on, transfer the conscious appraisals to automated schemes and acts without thinking consciously about the problem any more, the experience is "in the body" – it is there when needed, also in terms of dealing with risks and handling dangers (Vaa, 2007a).

As a conclusion, a target level of risk cannot be a number, a thought, or an imagination that I bring with me consciously and which I put into some weighing procedure when I decide what speed I should choose or what kind of acts I should perform as was it a constant, predominant thought or imagination in the dynamics of my thinking. And that is exactly my critique against Wilde: The RHT model does not grasp or mimic the varied dynamics of thinking and feeling, "the streams of consciousness", the fluctuations of automated states mixed with thoughts coming and going so characteristic of everyday driving. The RHT model somehow assumes a powerful, hidden, unconscious force that forces us to act in such a way that the target level of risk is sustained individually for everyone as well as for everybody else. Such a powerful force somehow resembles the cosmological anti-gravity force,

“dark matter”, “dark energy” or whatever: The force is there, it makes the universe accelerate in its expansion, but we cannot observe it (Vaa, 2001a)

3.8.6 Target risk or target feeling?

Finally then, to complete the discussion of the value of the target risk, a completely different type of understanding is suggested as opposed to Wilde’s utility model. Consider the following simple model presented in Figure 3.7:

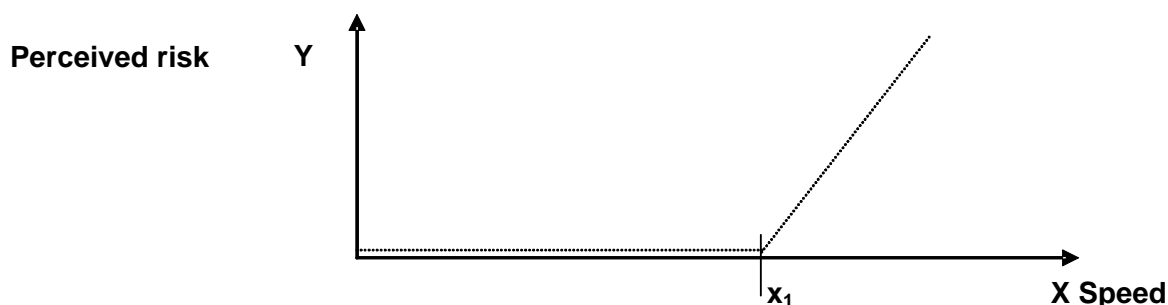


Figure 3.7: Hypothetical distribution of perceived risk according to driving speed.

The graph of Figure 3.7 is a deduction from Näätänen and Summala’s “Zero-Risk Model” (1974) and it is put forward to illustrate the following:

- (1) *The perceived (subjective) risk of an accident = 0, for all values of $x < x_1$.*
- (2) *For all values of $x > x_1$ the perceived/subjective accident risk > 0 .*

Again: For all values of $x < x_1$ the perceived/subjective accident risk is zero. Every $x < x_1$ realises the feeling of a subjective accident risk which is zero. Why then do drivers stop at x_1 as the chosen driving speed? Why not choose any other of the speeds $< x_1$? Why exactly x_1 ?

Näätänen and Summala do not state or answer this question directly. But let us see what happens if we loosen Wilde’s rigid presupposition about estimating the target risk level as a certain number > 0 that the driver seeks to achieve. Let us suppose that this target is of another nature. Let us suppose instead that drivers are searching a certain feeling, a certain way of driving that suits him or her well - “*a best feeling*” - which is realised in the organism by his or her choice of x_1 . Then the target should not be regarded as a number, but rather as a certain kind of feeling – a target feeling. A mere fulfilment of a “zero-risk” is then not enough, there has to be added another dimension to it. A dimension, or an experience, that is achieved at the “exact speed of x_1 ”, but not at speeds lower than x_1 . Then, the following assertion can be stated:

Assertion: *In addition to avoid accidents, drivers seek a certain “target feeling”. This feeling is not the same in all drivers - all drivers have his or her unique target, which is not necessarily experienced consciously. Targets that drivers seek are defined and characterised by an emotional dimension. (Vaa, 2001a)*

This is exactly what one should characterise as Wilde’s contribution by his RHT, the introduction of *the target* – but the RHT has to be rephrased: It is not to be understood as a number or some probability fraction of a risk of accidents, but as a *feeling* – a *best feeling* which drivers are seeking and which is possible to realise in a given context in road traffic.

There is “a best feeling” also inherent in Wilde’s RHT, - which is phrased in economic/utility terms as:

- *Benefits/costs expected from risky/cautious behaviour (+/-)*

Applying utility terms is, however, not sufficient because it does not fully grasp the psychological dimension of emotions – emotions are not stated explicitly in Wilde’s utility terminology. This can be illustrated by stating several “*emotional candidates*” that would correspond better to the variety of personality traits that drivers exhibit. Other candidates of best feelings that drivers may seek are then:

- *“Arousal” and being vigilant, attentive, aware, focused*
- *Sensation (seeking)*
- *Pleasure*
- *Security, minimizing workload*
- *Avoid violations (always behaving correctly)*
- *Non-compliance*

It is worth noting that several of the driver behaviour models mentioned previously do have inherent emotional aspects, but, with the exception of the zero-risk model and its inclusion of risk monitoring, none of the models view emotions and feelings as a governing principle in a general way, i.e. they somehow isolate single feeling dimensions as their key variable as with threat-avoidance (Fuller, 1984), joy/pleasure (Rothengatter, 1988), and sensation seeking (Zuckerman, 1994). Three other feeling dimensions as motivating forces are also suggested: “Arousal” (being vigilant, attentive), compliance/rule-based driving, and non-compliant driving. Not all drivers enjoy driving, so the “best feeling” that can be achieved or sustained may be negatively defined, as an optimal choice where unpleasantness, difficulties etc, are reduced to their minimum in any given situation. It is proposed that such choices are at least two-dimensional. Avoiding accidents, “zero risk”, is not the full answer. A certain emotional experience has to be added. Car driving is characterised by constantly solving problems, problems that involve thinking, choosing and deciding between different alternatives. All alternatives, scenarios, acts, can be characterised by an outcome that has an emotional dimension attached to it. In fact, that emotional dimension is the very variable that enables drivers, or any other in any other situation, to evaluate and choose between alternatives. If there is no feeling, there is no possibility for evaluating the outcomes (Damasio, 1994; Overskeid, 2000). There is no such thing as thinking and reasoning without an emotional dimension.

3.8.7 The role of learning theory

Car driving is a highly automated activity governed by schemes established predominantly by implicit learning. These concepts are defined as follows:

"... schema (or schemata) are cognitive, mental plans that are abstract and [...] serve as guides for action, as structures for interpreting information, as organised frameworks for solving problems, etc"

"Implicit learning is a term [...] for learning that takes place largely independent of awareness of both the process of acquisition and the content of the knowledge so acquired" (Reber and Reber 2001).

Schemes can be regarded as a successful recipe of how a previous problem has been solved by a given act (Vaa, 2003). The act may at the same time realise a certain best feeling – or more relativistic: What is being realised by a certain act is a state of less unpleasantness than the one one is escaping from. Automated driving may be described as a continuous sampling of schemes that are relevant for the present context, i.e. a context which is highly dynamic and more or less in constant change by the emergence of new time windows. The dynamics of the change and sampling of schemes can be formally described as follows (Atkinson et al., 1996):

$$S^D \rightarrow R \rightarrow S^R$$

where:

S^D = *Preceding or discriminative stimulus* - i.e. the stimulus which in a given context precedes a response and which indicates that certain responses lead to certain consequences.

R = *(Operant) response*: Acts which are previously learned and which are applicable in a given context. Previous experiences with similar contexts mean that one knows that a certain act is expected to result in a given consequence.

S^R = *Consequence or reinforcing stimulus*: Increases or decreases the probability that a response will be elicited.

What we have called target feelings may, generally speaking, be classified as reinforcing stimuli. All the above-mentioned emotional 'candidates' may, hence, be classified as reinforcing stimuli – or S^R - in operant conditioning terminology. Considering speeding for example, there must be a reason why speeding is so prevalent and stable and so difficult to combat with enforcement and other measures. Stating it very simply, it must be associated with the realisation of certain gratifying stimuli that is not counteracted with the feeling of danger or perceived risk of accidents.

3.8.8 Rephrasing Wilde's RHT

As indicated in the previous discussion the following concluding statements are suggested:

- One main obstacle for a wide acceptance is the strict maintenance of the *homeostasis* concept which is not considered as a fruitful position to uphold. In this respect, the much more adequate concepts of *risk compensation* and *behavioural adaptation* are suggested as alternatives of rephrasing the RHT.
- By focussing less on utility concepts and more on compensatory mechanisms involved in information processing and decision-making and how behaviour is adapted to the variety of conditions in the road traffic system, it is believed that research will benefit considerably from taking into account the achievements of neuroscience.
- Wilde's proposition of a **target** is a unique contribution from the Risk Homeostasis Theory, but also this concept needs to be rephrased from target **risk** to target **feeling** which seems more appropriate regarding what drivers actually are seeking in road traffic.
- Finally, RHT's insisting of a target level of risk > 0 should be abandoned and replaced by a target risk = 0 which definitely is more in line with what the majority of drivers actually accomplish: It is more normal to drive a whole lifetime without personal injury accidents than the opposite.

3.8.9 The significance of personality traits

Drivers are different, some feelings might be more predominant than others, motivational aspects may be labelled 'deep motivation' because it is rooted deep in a personality as predominant traits, personality constitution and identity. The proposed model (section 3.8.10) integrates recent research regarding personality traits and how these may influence driver behaviour. Personality traits can be defined as dimensions of individual differences in the tendency to display consistent patterns in ways of thinking, feeling, and in behaviour. A central goal regarding research on personality traits has been to identify basic building blocks which constitute personality. Today, it seems to be a consensus in the perception of personality as composed of five main components known as the "Big Five": *Extraversion*, *Neuroticism*, *Conscientiousness*, *Agreeableness* and *Openness*. Each of these main components is represented by six more specific components – *facets* – or *lower-order personality traits*. Empirical studies give clear indications that these traits are relatively stable over time and also across different cultures and countries. In short, the "BIG-5" test-battery consists of the basic traits as follows:

- **Extraversion:** *social, active, seeking adventures and thrills, dominating*
- **Neuroticism:** *Anxious, hostile, depressed, variable mood, impulsive, vulnerable*
- **Conscientiousness:** *Conscientious, self-discipline, organized*

- **Agreeableness:** Empathy, relying on others, helping others, conform, pleasing
- **Openness:** Imaginative, creative, open for new ideas

What Ulleberg manages to do is to link attitudes, motives, behaviours and accidents with personality traits. By cluster analysis he discerns between six subgroups of drivers by also indicatively labelling them by a “key characteristic” (2002).

1. “Considerates” (15%): Balanced, calm, low on anxiety/aggression: considerate and caretaking, smooth interaction, avoiding conflicts, respecting law, low on anxiety and aggression, slightly more women than men, accident risk below average
2. “Socially deviants” (15%): Normless, irresponsible, low on altruism, egoistic, (very) self-confident, low on anxiety, sensation-seekers, non-compliant, low on consideration, create conflicts, low on understanding the risks of behaviour. 80 % men, accident risk above average
3. “Anxious” (15%): High on anxiety, high on altruism, low on stimuli-seeking, insecure, avoiding conflicts and workload, 84% women, accident risk below average
4. “Considerate sensation-seekers” (22%): High on sensation-seeking, high on altruism, moderate on normlessness, average accident risk
5. “Aggressive” (15%): High on aggression, anxiety and driving anger, irritable, low on altruism, low on skills, low on consideration, lower on self-confidence than the “social deviants”, high on sensation-seeking, hostile, making conflicts, unsolved conflicts. 57% men, accident risk above average
6. “Adaptable, but egoistic” (18%): Moderate all-over, low on sensation-seeking, altruism, and consideration, strategic, selfish, self-control, avoiding conflicts. (“economic man”?), 57 % men, average accident risk

By this description and characterisation of driver subgroups it becomes clear that the frequency of accidents must be associated with personality traits and probably also explained by personality constitution and emotional problems as might be seen in the driver subgroups labelled “Socially deviant” and “Aggressive” (Vaa, 2007b).

3.8.10 Proposing a Risk Monitor Model based on emotions

Antonio R. Damasio and the neurobiological perspective he elaborates in his book, “*Descartes’ Error: Emotion, Reason and the Human Brain*” (1994), gives in our view a more basic understanding of man than alternative models and theories do. The basis for what we will name as the Risk Monitor Model is three simple statements:

Axiom 1: Man’s deepest and most fundamental motive is **survival**.

Deductions: Man must possess a specialized ability to detect and avoid dangers that threatens his/her survival. Hence, man must possess an organ that takes care of the necessary monitoring of potential threats.

Assertion: Evolution has developed and designed the human organism to be this monitor whose prime objective is detection of dangers and securing survival. **The body is the monitor.**

Damasio discusses rationality in decision-making processes by contrasting (ideal) reasoning and proper evaluation of alternatives with what he states as the Somatic-Marker Hypothesis. In an apt and short way, he says, with reference to Plato, Descartes and Kant, that

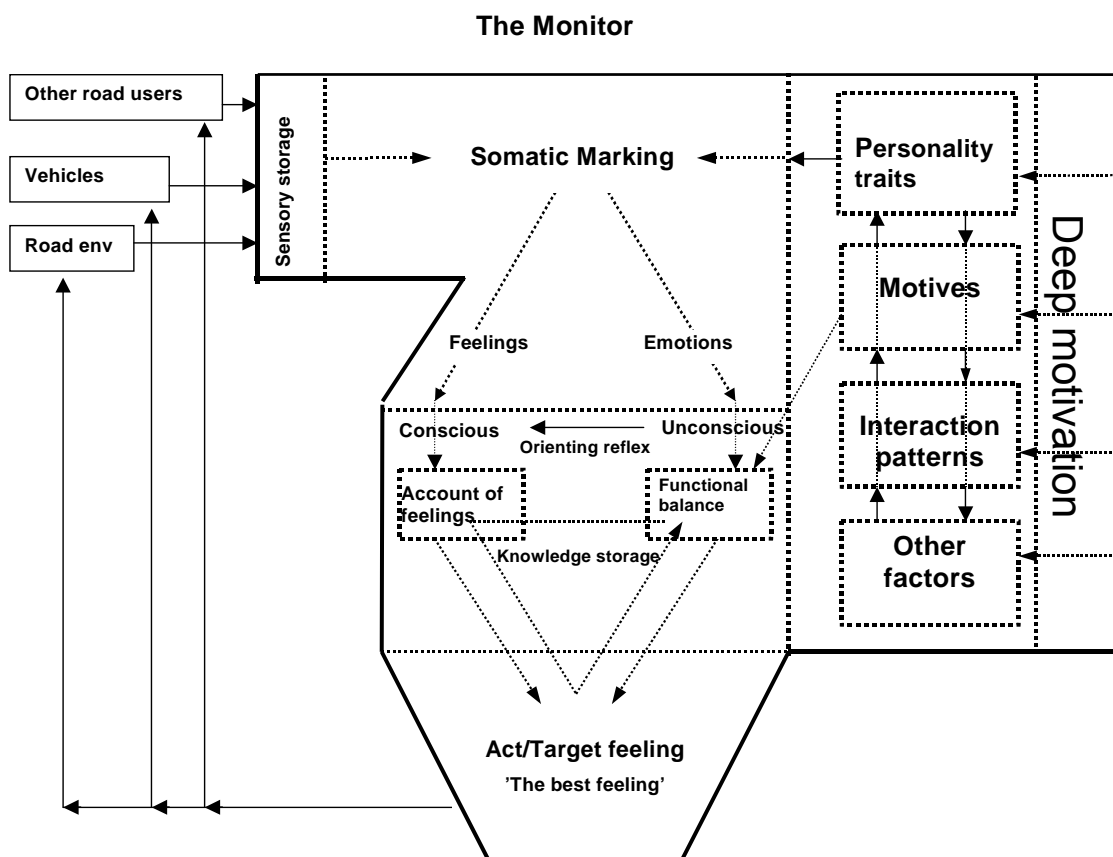
“... formal, logic will, by itself, get us the best available solution of any problem. An important aspect of the rationalist conception is that to obtain the best result, emotions must be kept out. Rational processing must be unencumbered by passion”

The neo classical/economic theory of rational processing and decision-making is that individuals consider and evaluate each of the alternatives that are present in a given context and by means of cost-benefit analysis of each of them and then makes a decision (like presented in the behavioural models in section 3.1 to 3.5). To maximise the subjective utility, positive and negative outcomes of each of the alternatives are considered. Rational decision-making can, however, be mentally demanding and time-consuming if one is to consider the subjective utility and costs of every alternative that can be imagined. If every aspect and labyrinths of the mind are to be examined one would in the end get lost and lose the overview. Damasio says, quite frankly, that such a strategy will not function, the span of consciousness, i.e. the working memory, just is not wide enough to maintain an overview. The initial assessments will have disappeared from memory when new enters the internal scene (Vaa, 2003).

On this background, Damasio states his alternative by saying that something important happens before reasoning, before the application of a cost-benefit analysis of the inner scenarios. If, for example, a situation seems to develop into something threatening or dangerous, a feeling of unpleasantness will enter the body, an unpleasant ‘gut feeling’ may be under way. Because this feeling is knit to the body, Damasio labels it **somatic** (‘soma’ is Greek for ‘body’) and **marker** because the feeling marks the picture or the scenario. Damasio describes the consequence of this **somatic-marker** in the following way:

[A somatic marker.]...“forces attention on the negative outcome to which a given action may lead, and functions as an automated alarm signal which says: Beware of danger ahead if you choose the option which leads to this outcome....

.... The automated signal protects you against future losses, without further ado, and then allows you **to choose from among fewer alternatives** (Damasio 1994, page 173).



Source: TØI report 666/2003

Figure 3.8: *The Risk Monitor Model: Basic structure*

There will still be room for a cost-benefit analysis and for proper deductions on the basis of the analysis, but now after the emotional response has reduced the number of alternatives drastically. Thus, somatic marking will increase the precision and the efficiency of the decision-making process. Without somatic marking, less precision, less expenditure and efficiency will follow. Emotions and feelings are now, by learning mechanisms, associated with specific scenarios in a way that makes predictions more accurate.

The introduction of a monitor is justified by the Damasio model and his assertion that emotions and feelings are fundamental mechanisms which are involved in the organism's perception and evaluation of dangers. Hence, the monitor is then both a concept and a principle, as well as a model for organising processes that influence sensing, processing of information and decision-making that will affect factors outside the organism. Figure 3.8 presents the basic structure of the Risk Monitor Model (RMM) (Vaa, 2003).

The monitor is nothing less than the whole of the body, the whole organism. The boundaries of the monitor (solid line) correspond to the boundary of the body. The internal components are all elements and processes enclosed by the solid line:

Somatic marking, information processing, personality traits, motives, interaction patterns, a residual of 'other factors', and deep motivation. All these elements represent potentials of influencing other components through personality traits, motives, and interaction. Personality traits influence motives and dispose for interaction patterns that are idiosyncratic for each driver. The interaction pattern of the individual driver can in turn elicit new, latent motives as a consequence of other road users' responses on the initial act(s) of the driver.

One superior motive is to establish or maintain (unconsciously) the functional balance of the organism. During automated behaviour, there is identity between target feeling and functional balance. Hence, there is a direct impact from motives to functional balance and to target feeling. The target feeling can also be a product of a concrete account of feelings, which is regarded as conscious and also as an ability of and a part of working memory. The motive will then influence the target feeling indirectly through the account of feelings to the best feeling that can be achieved in a given situation. The functional balance, and the consciously quested best feeling, should normally be regarded as the top motives in a hierarchy of subordinate motives. In addition, personality traits, motives, interaction patterns and other factors will interact with stimuli selected from sensory storage, somatic marking takes place, before a distribution along the unconscious or conscious route and subsequent information processing and decision-making. External components are grouped in the categories other road users, vehicles and road environment. All these three components are separated from the monitor.

3.8.11 The significance of emotions and feelings

The body, the human organism, is on occasions exposed to strain and emotional stress from which it will try to establish a functional balance, which Damasio defines in this way:

"... a set of alterations [which] defines a profile of departures from a range of average states corresponding to a functional balance, or homeostasis, within which the organism's economy probably operates at its best, with lesser expenditure and simpler and faster adjustments " (Damasio 1994).

This functional balance is also be defined as the **target feeling**, or **the best feeling**. These concepts can well be applied within learning theory where the best feeling corresponds to S^R – *reinforcing stimulus* – in operant conditioning. Nevertheless it is the **functional balance** which is retained as one of the two central principles in the model. The drive to achieve functional balance is regarded as a central, unconscious knowledge, which the organism possesses about itself, and which the organism is actively seeking to restore or to maintain. Further, it is our assertion that this unconscious quest for functional balance becomes the steering principle in the RMM, and this also may constitute the basis for a deeper understanding of risk compensation (Vaa, 2003).

The second central concept is **account of feelings**. This is used to describe a conscious process and is defined as a cognitive 'weighting' of conscious, internal

scenarios against each other. The scenarios can for example be different alternatives in a concrete choice situation which the individual faces and which requires an action. A choice implies alternatives with different expectations about future events that potentially can be realized. Every scenario is coloured by a specific feeling that also may be realized if this alternative is chosen, i.e. every scenario represents a potential amount of 'feeling capital'. In that way the scenarios can be evaluated by this feeling dimension, scenarios can be contrasted by an internal 'cost-benefit analysis'. On such a basis, a decision can be made that realizes the best feeling in the given situation, and it is this feeling dimension that on the whole enables the organism to evaluate, to do the cost-benefit analysis, to make a choice. In short: No feeling, no evaluation, no choice.

The monitor is not an infallible machine, it has weaknesses regarding monitoring of dangers, even if some of its functions can be modified and improved by driver training and driving experience. Underestimation of the dangers of speeding in curves is a habit that is quite rapidly improved by training, drivers seem quite poor in the ability to identify speed changes in the vehicle which a driver follows, a situation that is supposed to be a more stable weakness and less modifiable property of the monitor. Drivers accept distractions and their ability to stay awake while driving is overestimated, again examples of monitoring weaknesses that may call for ITS-solutions as Intelligent Speed Adaptation, electronic monitoring of falling asleep, etc.

The present driver behaviour model also includes 'other factors' which encompasses factors that contribute to increased accident risk, i.e. age (young and elderly drivers), use of intoxicants, diseases and other medicinal and psychological conditions that influence accident risk, interaction conflicts regarding differences in driving styles and driving cultures, and suicides by car collisions. The monitor also exhibits certain limitations and inferiorities that are categorized as 'other factors'.

3.8.12 Implications for campaign design

In the Risk Monitoring Model, the motivation behind road user behaviour is moving from highly conscious to highly unconscious (automatic) processes. The main implication is that "The account of feelings" is a mechanism that has to be addressed and utilized in campaigns.

Emotions have an important role in the model – no emotions – no evaluation of choice. Thus, if a road user does not feel that behaviour that increases accident/injury risk is dangerous (e.g. speeding or not using a helmet while cycling) it is difficult to influence the driver to adopt more safe behaviour because the message does not feel relevant – or alternatively that the emotions experienced (the best feeling) is in conflict with the message. For instance, driving above the speed limit might give the driver the best feeling (it is not experienced to be dangerous to speed at this amount) and thereby a (rational) message saying that speeding is dangerous is not perceived as credible. This may explain why many speeding campaigns fail to reduce speeding.

The most important implication that follows from this is perhaps to **influence the road user in the context where the behaviour actually occurs** – for instance through applying the principles of **learning theory**. In general this means giving the

road user a sort of feedback or cues to action (stimuli) in the relevant context. Such “in-context” measures may give cues to action and thereby facilitate the account of feelings, that is, the cognitive weighting of scenarios that is believed to take place. Examples of “in-context” measures can be:

- Intelligent Speed Adaptation (ISA), meaning that drivers are given feedback when exceeding the speed limit through either one or a combination of the following: sound, light, heavy accelerator pedal or not being allowed to exceed the speed limit
- Enforcement – this is stimuli signifying that violations will not be tolerated and sanctioned. Speed cameras can also be such a stimulus
- Variable message signs giving drivers feedback upon their speed or whether he/she drives too close to the vehicle in front
- Seat-belt reminders
- Information given at the fixed (urban) sites, billboards at the roadside and moving pictures presented at the roadside. This may provide information and “thoughts” that may be provoked or elicited when people are driving by. Such information may also be distributed in relevant contexts before driving (e.g. at bars, discotheques, parking spaces)
- Making the road seem narrower than it actually is through e.g. introducing broad road shoulder marking. This can give a feeling of discomfort when speeding (Vaa and Ulleberg, 2007)
- Passengers influencing the driver. A passenger might be encouraged to ask the driver to drive more carefully when feeling discomfort
- Personal communication of campaign message delivered at roadside rest stops, gas stations etc.
- Broadcasting radio spots at night time encouraging the driver to stop and sleep

The principle of influencing the road user within the context in which the behaviour occurs is also mentioned in some of the other models for explaining behaviour, like the “cues to action” proposed by the Health Belief Model and in particular the Theory of Interpersonal Behaviour, which explicitly recommends this if the behaviour in question can be regarded as a habit. This is also an implication taken from other driver behaviour models the Hierarchical Driver Behaviour Model and Fuller’s (2005) Task Interface model. Although these two models do not use the term “feelings”, the implication for road safety campaigns is in many ways the same as for the Risk Monitoring Model. That is, road user behaviour is to a high extend influenced by what goes on “there and then”, i.e. stimuli in the context in which the relevant behaviour occurs. This suggests that it is advantageous to influence road users within this specific context and not “outside” the specific context like e.g. using of advertisements presented in mass media channels in order to influence behaviour.

This does not mean that influencing beliefs believed to underpin behaviour outside the context in which the relevant behaviour occurs is useless. Influencing beliefs can be very relevant if the behaviour in question is not a habit. For instance, maladaptive measures taken to cope with fatigue, like singing, drinking coffee etc. is probably a result of lack of knowledge (Nordbakke, 2004) and informing about the ineffectiveness of these measures “off-context” can be effective. Furthermore, “In-

context measures” like enforcement can have a temporary effect and in order to obtain a more stable change in motivation/beliefs underpinning behaviour, it can be advantageous to combine “In-context” measures with “Off-context” measures. “Off-context” measures can also help the road user to elaborate the message more thoroughly, a process described more in detail in chapter 4.2 and 4.3. Thus, the general behaviour models presented in section 3.1-3.5 is not believed to be worthless. This topic will be further discussed in chapter 5, but a main conclusion is that both “In-context” and “Off-context” measures can be combined. Thus, the principles of all of the presented theories can be put together in one eclectic model, the Risk Monitoring Model.

Finally, given that there exist road user sub-groups (that among other things differ in their composition of personality traits and levels of accident risk), campaigns must take these differences into account in design and application of accompanying measures. One prediction is for example that the application of fear appeals might be counterproductive in the subgroup of “anxious drivers”. To frighten a group of drivers who already are anxious, and whose accident risk probably is below the average, may be detrimental to traffic safety. The principle of how to fit the message to the needs, motives and interests of the road users will be further explored in section 4.1.

4 HOW TO INFLUENCE

In this chapter, we will look more closely to both general and specific persuasion techniques. We will first start with the more general principles of understanding and communicating with road users, general theories behind of persuasion and attitude change, theory of cognitive dissonance and prospect theory. The relevance of these models for road safety campaigns will be discussed.

Next, we will look in depth into more specific techniques applied in road safety campaigns, like personal communication and peer influence. We will pay particular attention to the use of fear appeals. Within the CAST project an experiment was carried out testing the effects of different kinds of fear appeals.

4.1 GENERAL PRINCIPLES FOR COMMUNICATING WITH ROAD USERS

In order to understand, what role campaign work plays when trying to influence behaviour, one can have a look at the figure below that is called the diamond (Risser 2000). This diamond reflects all areas from which behaviour-steering effects originate, and it mirrors also the fact that effects, or areas, are interrelated.

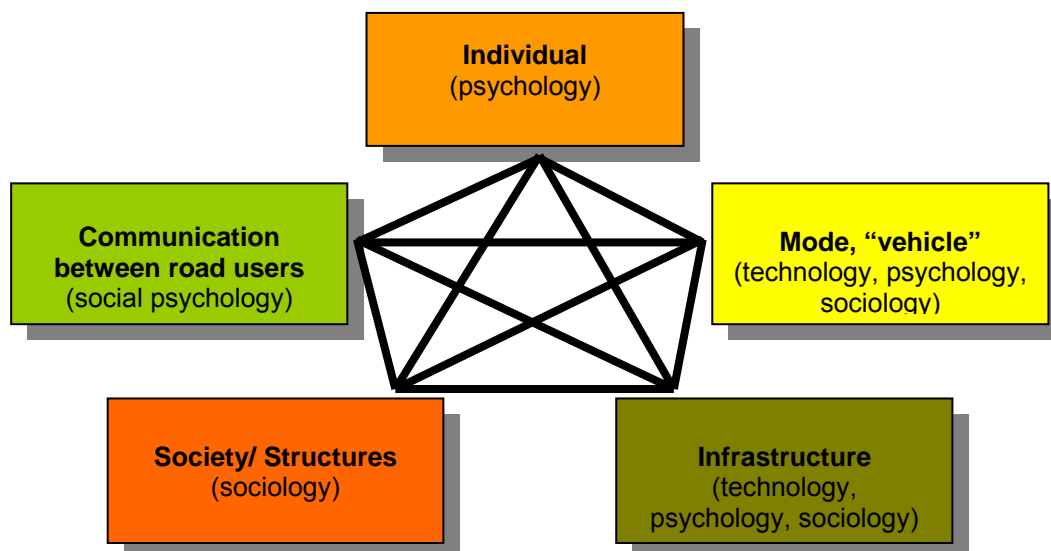


Figure 4.1: *The Diamond*

As said, measures to influence behaviour can be derived from all areas, but for the campaigns one can mainly envisage the psychology-sociology related ones: Individual, communication between road users, and society, or structures.

4.1.1 How is a change of behaviour achieved?

One purpose of the project CAST is to identify ways of influencing road user behaviours that are experienced as problematic with the help of campaigns. However, to a large extent the public experiences different things as problematic from what the experts do. Thus, there is a need to translate safety risks according to experts' knowledge or assumptions into everyday language; because, in order to change the safety situation, the citizens have to include the results of these translations in their decision processes and their behaviour. "What is important is the way in which the experts and the public communicate with each other about health risks and their consequences in everyday life" (Leiss 1990).

It may be assumed that the road users, or some of them, feel safe or undisturbed in some situations where accidents do actually happen at a frequency which reflects objective safety deficiencies. In these cases/situations information that tells road users how to improve the safety situation will not easily fall on fertile ground. On the other hand, road users, or some of them, experience safety deficiencies in situations or at places, where accidents actually do occur (which indicates an overlap between subjective and objective safety deficiency). In these cases, support given in the frame of a campaign will be welcome.

4.1.2 Some basic concepts

In the following, communication with road users is going to be discussed. The basic concept in this discussion is that everything that is done by official institutions or by those who represent them in public, or in the public space, in order to improve traffic safety or to influence mode choice, is in principle a communication process. Narrowing roads in the hope to reduce car speeds is as much an action addressed to the road users, to which they hopefully react in a wished-for way, as is the information in the media that a new law is implemented on, e.g., the maximum BAC (blood alcohol concentration) still allowed when one drives a car. Often, the word „customers“ will be used, and this word is sometimes used synonymously with the word „users“, or road users. In some cases, „customers“ include also residents, or passively involved citizens, i.e. those who are effected of any measure to influence traffic safety, but who in their role (e.g., as residents) do not in the first place "use" whatever is provided in connection with these measures. „Target groups“ is also used in some cases and refers to all groups mentioned above, but also to politicians, decision makers, experts, researchers, and so on.

The basic assumption is that in order to achieve better road user behaviour, the communication with the road users has to be improved. Especially, the motives underlying certain behaviour, and functioning as barriers for behaviour changes have to be made transparent and to be considered in the frame of this communication. The best proof that the world of motives is not considered well in traffic safety work is the traffic safety expert, or researcher, who does not respect traffic rules him- or herself.

4.1.3 Problem awareness

There is a common agreement that severe traffic safety problems are connected to car use (see Sachs, 1984; Risser, 1988; Brög, 1990; Praschl et al., 1992, 1993, or add all national and EU traffic safety programs). In Europe, the authorities invest

billions in work on traffic safety year after year. This reflects the fact that traffic safety problems are officially recognised within society. However, as said above, the main question is whether the population is aware of safety problems. This is an important prerequisite for all further considerations. Like mentioned previously, driving a car may feel very safe for the driver although traffic accidents is a major problem in the EU. Another indication is that car drivers do not address the problem of lack of traffic safety, when they are asked to list spontaneously problems connected to the car use (shown, among others, by Praschl et al. 1993).

However, a tendency to consider lack of traffic safety as a real problem can be detected if one differentiates between different population and road user groups (Risser & Lehner 1998). For example, old car drivers or beginners do experience a lack of safety. Also, the so-called “unprotected road users”, or “vulnerable road users” (pedestrians, cyclists) feel different than the “average car driver”. In Risser et al. (1997) it is shown, that in the frame of qualitative interviews safety is not mentioned directly by pedestrians and cyclists, but that recklessness of car drivers and their inadequate and high speeds are regularly criticised and perceived as a barrier for walking and cycling. Such a differentiation is also a stimulus for sociological research which deals with the social situation, power and influence of different groups in society (see, for example, Flyvbjerg 1992/1996). Applying paradigms of this scientific branch helps one to understand why car drivers are the best researched group, why they are regularly equated with “the population” and why they do not see the lack of traffic safety as a problem: The car stands in the centre of public life, it sets the scene.

4.1.4 In which directions should traffic change

This observation and the knowledge linked to it that too little attention has been paid to pedestrians and cyclists, so far, made many human and social scientists interested to concentrate more on these other groups than on “the average car driver“, when discussing safety issues during the last twenty years (Ahrens, 1987; Bläsigt, 1983; Henderson, 1991; Laroche-Reeff, 1986; Risser et al., 1990a; Risser et al., 1990b; Risser et al. 1988; Rosenbloom, 1991; Tränkle et al. 1994). The interesting thing is that risk emanates from the cars mainly, that those who produce risk do not perceive it appropriately, and that at the same time road users who do not produce much physical risk, are very much aware of a lack of safety. Children are aware of it (Laroche-Reeff, 1986) and senior citizens are aware of it under certain conditions (for example, Risser 2000, Risser et al. 1988; Tränkle et al. 1994, Kaiser & Myllymäki-Neuhoff 1996).

Much of this research also shows that people often are afraid for other people: Their children, their partners, etc. They worry that car drivers themselves are not aware of any lack of safety, and thus do not watch out. Anxiety of car drivers focuses, if it is there at all, on other cars, especially on lorries, but not on unprotected road users – “car drivers are not afraid of vulnerable road users” (Pasanen 1997). In the surveys mentioned above, it was totally clear that the need for safety in traffic is an element of the quality of life. Whether safety needs become virulent or not depends, however, on the question, whether lacks in their respect are perceived.

This all provides interesting perspectives in connection with work to change traffic in the direction of more safety: The change must be effected in some direction, and in accordance with whose point of view the direction of these changes is going to be

made requires clarification. Somewhat apodictic and emphasising a "customer-centred" viewpoint (see, for example, Kotler et al., 1996) it could be said, that it will not be enough that car driving people are satisfied in this respect: More people's and groups' needs and interests (N&I) are to be brought in as a basis for the discussion of safety work.

There will not be any "absolutely right" decisions concerning safety work that are based purely on "facts". The determination of "absolutely right" with regard to societal decisions is to be referred to the area of metaphysics. Instead, N&I of different groups have to be analysed, and compromises will have to be found. Then, societal decisions have to be taken, and the goals of safety work have to be decided upon (e.g., see Tingvall 1996), connected to operational descriptions of what changes one wants to achieve

When looking for possible directions for such changes in traffic based on, among other things, the meaningful and suitable use of psychological methods, one will have to discuss several aspects:

1. Into which groupings should one really divide the very heterogeneous population of "road users"?
2. What interest groups are there in society who are not in the strictest sense of the word road users, or are not primarily to be dealt with in their role as road users (residents, politicians, decision-makers, journalists, etc.)?
3. How does one identify the interests and needs of the different groups? What methods have to be applied?
4. How does one deal with the resulting conflicts of interest? Are there good methods to solve conflicts of interests? (see, e.g., Risser 1994)

With regard to these aspects 1 to 4, the following must be considered: Whether road users, even if they are aware of the problem, will contribute to a certain change depends on circumstances which are difficult to identify and to influence in advance. It can, however, be expected that the readiness to change behaviour increases if the alternatives are adapted, as far as possible, to suit the wishes and needs of the potential user. E.g., to make that safe behaviour also gives contingent positive reinforcement by satisfying certain needs and interests (N&I) will reinforce safe behaviour. To do this, however, one must know the users and one must know what is perceived as a relevant contingent positive reinforcement by them.

4.1.5 Needs, interests, motives

The satisfaction of N&I is conceptually related to motives: A motive is a reason for setting, viz. for avoiding a certain behaviour, or situation, in order to satisfy certain needs, or in order to see to it that the preconditions for the satisfaction of relevant needs are fulfilled. Every kind of behaviour is steered by some motive. Mostly, several motives are relevant in connection with any behaviour¹⁰, and in many cases these motives are even to some degree contradictory to each other¹¹. An example

¹⁰ Smoking, or rather trying to stop smoking, is a good example for this: On the one hand, there is the motive to satisfy a physical need (to have the special contingent feeling connected to smoking a cigarette) which makes one who knows that feeling long for a cigarette, and on the other hand there is the motive to remain healthy which makes one want to stop smoking. Reinforcement lies in the future, though, and is not contingent.

¹¹ Having a need fulfilled, or avoiding frustration of a need has of course to be considered as a reinforcement. Often, contradictory motives are connected to different types of reinforcement. In the case of the smoker who

for this is that car drivers sometimes criticise inadequate speeds of car traffic (see Risser & Lehner 1998), though they usually have a good explanation for those cases when they themselves drive too fast. Most often by such explanations they transform a speed that would look inappropriate from outside into something that looks reasonable, at least to themselves ("I should drive more slowly according to law, but here it is safe to drive faster, and I am in a hurry"). The reasons that make it difficult to adapt speed better, or the motives for choosing an inappropriate speed, have to be studied as a precondition for influencing behaviour in a wished-for way. Parallel, it is necessary to find out, what motives could be activated in the frame of the communication with road users, in order to make it more attractive for them to choose appropriate speeds.

4.1.6 For identifying N&I a qualitative approach is advantageous

Methods for combining qualitative and quantitative research is advantageous in order to provide a deeper insight into the needs of people (see for example, Patton 1991, Lamnek 1989; Reason & Rowan 1981). Interview instruments do not only have to be short, fully structured, and standardised. When communicating about motives, one has to talk about the „why“ of certain judgements, perspectives, and types of behaviour, which takes time and calls for explanations. To produce the premises for answering that „why“ requires correspondingly flexible methods, including the possibility for the interviewer to ask for further information and for the interviewee to elaborate on his own answers (see also Schmidt 1995).

An appropriate part of the communication with the interviewees has to be dedicated to the context of actual behaviour, to the „yes but“ (e.g., „yes I see the safety problem connected to driving too fast ... but one has to follow the crowd“). The feelings provided by driving fast (being faster than others, physical sensations, etc.), for example, reflect a contingent reinforcement that makes that one uses the car in a certain way even if one could easily behave in a different way. Contingent reinforcement provided by the context of a certain behaviour „ruins“ many good intentions resulting in the usual discrepancies between good intentions and the actual behaviour (Praschl et al. 1993).

There are theoretically an infinite number of different context aspects in real life. By using standardised questioning methods only, it is, for example, very difficult to find out how you actual can change dangerous car driving habits of questioned persons. Amongst other things, lifestyle analysis also explores the above mentioned aspects of the complexity of the behaviour context (Kellner 1997). Here, as well, the subject-centred investigation into motives is done in such a way that the opinion of the interviewer does not colour the interviewee's statements. Attempts are made to take into consideration the personal relevance of specific formulations of questions and the context-dependence of specific behaviours (it is, among other things, tried „to speak the subjects' language“ in the interviews; Berge 1996; Rothe 1987; Schulze 1993 and many more).

does not succeed to stop smoking, the difference of the reinforcement lies primarily in the contingency of the reinforcement: Smoking the cigarette leads immediate = contingent reinforcement, which usually has strong impact on behaviour, whereas the reinforcement of „good health in the future“ is rather abstract and not contingent.

Further work must also be done on the possibilities of clear and convincing presentation of results gained from the use of complex, qualitative methods (Kotler et al. 1996; Bell et al. 1996).

In the frame of CAST, there will not be done much empirical work. For discussing different ways of campaigning, and for developing campaigning strategies and plans, it will however, be necessary to at least summarise what can be found in literature with respect to motives that steer behaviour and that have an influence on the safety of behaviour and interaction in traffic.

4.1.7 N&I and Conflicts of Interest

There is a conflict of interests well-known to practitioners and researchers, between people who want to drive cars in different ways or between those who drive cars and those who do not (Amann et al. 2006 SIZE). In the EU project WALCYNG¹² (Hyden et al. 1998), strategies for the transfer of short car trips to walking and cycling were developed. Surveys showed, among other things that, throughout Europe, some 50% of all car journeys are shorter than 5km and could be carried out by bike and partly on foot (shorter than 1km). To achieve a change in this direction, however, one must take car user needs into consideration; the needs of those that one wants to motivate to walk or ride a bike instead of using the car on short trips. The same is necessary when trying to influence car drivers to use their car in a different way. What kinds of motives are relevant, if people behave in an unsafe manner and what motives "feed" an interest in a safe traffic system? Among others, the following N&I are important:

- *"Objective" Safety* (commonly equated with "safety"): to know facts concerning numbers of accidents connected to a certain behaviour
- *Security* ("subjective" safety): lacks of which are often felt, according to literature, by older persons, by cyclists, by women at night, by parents when their children are on the road alone, by pedestrians, etc., but not by those who produce risks
- *Mobility* at the micro level: A certain speed and communication behaviour of car drivers produces barriers for pedestrians who want to cross the road, thus causing comfort and time losses, it makes it difficult for other road users to merge, etc. etc.
- *Comfort*: In the EU-project SIZE it was shown that, e.g., the comfort of older road users is reduced considerable by an inconsiderate use of the car (parking, speeds generally, speeds at intersections, etc.; see Risser 2000)
- *Aesthetics and environmental quality*: Cars that are driven in a certain way have negative impact on the perception of the public space by those outside the cars – even if this aspect is not directly related to safety,
- *Social Communication*: The possibility to be with, or at least amongst, other people under safe and comfortable conditions is very much influenced by car drivers' behaviour

¹² WALKing and CycliNG instead of shorter car trips

If one includes possible „extra motives“ connected to driving a car, the list above could become even much longer¹³.

Even if some of the motives discussed above are not directly related to safety, it seems clear that a change of behaviour that allows to satisfy some of these needs would increase safety, at the same time. Moreover, the concepts can be used for the discussion of conflicting needs and interests in such a way that, e.g., comfort aspects that steer the behaviour of one group may well result in safety problems for another group.

4.1.8 Conflicts between Individuals or Groups and Society

One can share the point of view that, when it is declared policy to force a change in the behaviour of car drivers then people who use cars must accept things that they perceive as disadvantages: The individual car driver has sometimes interests that go directly against those of the community, and also, and particularly so, against the law. To adjust behaviour in this connection is by many car drivers experienced as a disadvantage. Many statements of motorist associations concerning various traffic safety measures make this totally clear. One can, therefore, see this conflict as one between the individual, or certain groups of individuals, and society.

One reason for such conflicts is that the individual citizen does not always agree that the official position, represented in law-making and policy, and representing the society, is the right one. What is required from the society's side, among other things, is detailed explanations as to what values will be protected by the official position. The explanations given are often, in practice, inadequate. A good (or "bad") example of this is the tradition of "one-sided"¹⁴ information; this means that only advantages of wanted behaviour or disadvantages of an unwanted behaviour are named and no dialectic aspects are discussed. This is in Social psychology seen as disadvantageous for good persuasive work (see, for example, O'Keefe, 1990, Sammer 1986; Brög 1997).

4.1.9 Conflicts between Individuals or Groups

Conflicts of interests also manifest themselves as those between different individuals or between different groups of individuals (inter-individual conflicts of interest).

The following overview (Table 4.1) illustrates such a conflict. In no way does it deal with a particularly important conflict, but it gives a clear and easily-followed example. Pajunen (1994) showed that bus journeys (in Finland) are for the passenger a safe way of getting about. At the same time, she showed that busses are also involved in fewer accidents where other road users (outside the bus) are injured. Simultaneously, in group discussions with pedestrians in Austria, buses (respectively their drivers) were described as inconsiderate, dangerous and "intimidating" (Risser et al. 1988; Risser 2000). Even when they are objectively safe, buses are seen as a threat, at least by some other road users. In Table 4.1, the conflict between bus

¹³ The concept of extra motives has been produced by the Finnish traffic researcher Sauli Häkkinen in the Fifties and refers to all N&I that are satisfied by driving a car (e.g. feeling powerful), but that are not (directly) related to the transport function of the car.

¹⁴ In contrast to "two-sided", one-sided information focuses only on the advantages of a wanted behaviour, or the disadvantages of an unwanted behaviour, and thereby automatically relieves the information of its credibility as there are hardly any types of behaviour which have only advantages

drivers and pedestrians with regard to the aspects objective and subjective safety is illustrated:

Table 4.1: *Conflict Bus Driver/Passenger – Pedestrian (objective and subjective safety)*

	Bus driver, passenger	Pedestrian (pd)	Bus driver, passenger	Pedestrian (pd)
	Objective Safety		Subjective Safety	
Explicit recognition as a value	Recognised by this group	Recognised by this group	Recognised by this group	Recognised by this group
How is the value operationalized?	No accidents	No accidents	Mobility without fear	Mobility without fear
Situation	Interaction with pedestrians	Interaction with buses	Interaction with pedestrians	Interaction with buses
Evaluation: Is the value protected?	Yes	yes	yes	No

In the interaction between these groups, the bus drivers do not feel that they cause safety problems to other road users, whereas the pedestrians very strongly experience such problems. Those people who walk have, however, like all citizens, a legally guaranteed right to safety. In the Austrian constitution like in most other industrialised countries, the protection of the physical and psychological integrity of the individual has top priority. Measures which enhance the perceived safety of the pedestrian (by definition included in the concept of „integrity“) and mean occasionally a certain decrease of comfort for car drivers (in this case: bus drivers) have to be accepted by those whose comfort is disturbed (see, e.g. Risser 1994, Ballabio & Moran 1998).

A solution of the conflict displayed in Table 4.1 to the advantage of pedestrians improves the attractiveness of walking as a possible alternative to driving a car on short trips. At the same time, nothing indicates that public transport would lose passengers by a reduction of speeds of busses at intersections and by more considerate communication of bus drivers with pedestrians¹⁵. But if this was the case, ways to communicate with the passengers would have to be found, in order not to loose them. Such communication for example has to deal with arguments why certain changes in the behaviour of bus drivers are necessary.

Improvements in attractiveness for certain groups which could mean disadvantages for other groups (e.g. for car drivers: lower speeds, higher fines for infringement of traffic laws) must in practice be accompanied by notice that through this improvement, socially relevant interests, which the majority of people are in principle in agreement with, are being simultaneously protected¹⁶. The latter, as well as making it clear that a certain behaviour change could be an attractive choice for everybody, including the addressed individuals, is a basic requirement to persuade individuals to change their behaviour (for example, to use the car in a less dangerous way, in order to achieve better traffic safety). One probably agrees with new solutions which are suggested, such as those which bring advantages for

¹⁵ However, if there are any doubts concerning the last statement, it is the passenger who should be asked about what kind of driving style they prefer and which one would make their use of public transport more or less probable.

¹⁶ We have discovered that disputes generally arise when this principle is being finalised in detail. This in particular when it does not become sufficiently clear that specific values will be protected, or when one gets the impression that oneself must contribute more to the protection of these values than others.

others, in form of passive acceptance, but also in form of changing one's own behaviour if one may accept certain advantages by doing so. This leads us directly to the next chapter:

4.1.10 Intra-individual Conflicts of Interest

Politicians who support traffic change in order to improve traffic safety can be assured that part of the car drivers will accept measures which reduce their own comfort but protect values which they stand for, at the same time. This reflects the existence of different, sometimes opposing, interests within the same individual: intra-individual conflicts.

Individuals have different and sometimes conflicting interests. Intra-individual conflicts are among others distinguished by their context-dependency. Under certain conditions one agrees to a certain solution, whereas one rejects the same solution under other conditions; when other N&I are virulent. E.g., contingent reinforcement of the behaviour that one actually wanted to change or to replace by another behaviour, may prevent such change or replacement.

To summarise, it can be assumed that if one wants to enhance the change of a person's behaviour, for example, the choice of transport mode, the following arguments should be considered:

- ⇒ **Accuracy** is necessary in the portrayal of the political, economical and ecological reasons for specific measures
- ⇒ **The situation of different groups** within the population **must be portrayed** in public discussions. Very often only the situation of the car drivers is discussed. Politicians and groups representing specific interests seem to assume that citizens are not interested in the situation of other groups than car drivers¹⁷. In pilot projects, however, it was possible to clarify some measures so that the vital interests of specific population groups were protected while car drivers accepted these measures (for example, traffic-calming measures and their advantages for unprotected road users and residents; e.g. Patel et al. 1994).
- ⇒ It must be emphasised that even those car drivers who strongly resist a change have varying interests. The **interest situation is never totally homogeneous and one-dimensional**, and there is a potential that one may find things attractive at the end of the day which one initially rejected. In a study by Burwitz et al. (1991), for instance, car drivers tried for one month to live without a car. The positive aspects that such a way of life can have were for several of those involved sufficiently noticeable that, despite the well-known advantages of the car, they maintained their new lifestyle for the time being.

It is not always certain which arguments will be individually seen as plausible. But the prospect of reaching understanding amongst the population if one has justified matters of concern is there. Among others, Sammer (1986) and Brög (1990) have shown that car drivers show much more readiness to accept restrictive measures than politicians believe. Accordingly, Praschl et al. (1993) discovered in a sample survey of 300 Viennese car drivers that this is particularly the case if the solution is seen as fair, that is when others also have to accept certain disadvantages.

¹⁷ With "car drivers" those people are meant who use the car for most of their trips and who hardly ever consider to use any other mode

However, on a more general level, this survey also provided much evidence that the awareness of a problem does not necessarily co-vary with a change in behaviour. The majority of people agree that the general public should change their behaviour. Already less people share the attitude that they themselves should change their behaviour and the lowest affirmation is achieved, if you ask people if the actual will change their behaviour:

- ⇒ One should drive (the car) less 90%
- ⇒ I should drive less 52%
- ⇒ I will drive less 33%

In the case of restrictive measures where one cannot choose whether one, e.g., should use the car in a different way or not, the following is taken to be valid: If all car drivers are equally affected by a restrictive measure, viz. if there are no exceptions without clear and provable reasons, then restrictive measures have a higher possibility to be accepted. An example of this is the parking management in Vienna since the beginning of the 90's. The present solution provides relatively fair conditions and is, in general, accepted.

In psychological terms, one can finish this chapter with the following statement: The more positive the consequences linked to a certain behaviour are, or the more positive consequences are promised from it, the more this type of behaviour will be aimed for. Those who have still not considered a certain behaviour different from the one displayed so far must be offered stimuli which allow them to imagine how attractive this alternative behaviour could be.

As a formula, this can be expressed as

$$A_{ab} > A_{ub}$$

where A = attractiveness, ab = alternative behaviour, ub = usual behaviour and > = "has to be higher than"

And thereby it should be remembered that „attractiveness“ is hardly ever defined by the presence of one single need that is satisfied, but it is the outcome of several N&I being more or less satisfied at the same time.

4.1.11 The wishes of the Citizens

N&I of different groups of citizens in connection with transport could, among other things, be analysed by asking people in what direction they would wish the traffic system to change. Surprisingly, there are hardly any comprehensive inquiries into the wishes and ideas of the citizens in this respect. There are also only rather few studies which allow indirect conclusions to be made as to how specific groups in society view traffic, traffic policy, day-to-day traffic and how they view other people, or other road users (Socialdata 1992; Uniroyal 1996).

In connection with projects for the increased use of information technology in traffic, experts were questioned about the supposed needs of citizens with respect to safety (Risser & Chaloupka 1993). In the course of this, although most of the interviewees were engineers from car industry, it was clearly emphasised that in traffic planning and management, the unprotected road users are, especially, to be taken into consideration or to be consulted as a reference group. For those experts questioned

by Risser & Chaloupka traffic should, in any case, guarantee the following subjective aspects and interests which go far beyond the objective safety aspect:

- ⇒ An optimal relationship between risk and advantages of use
- ⇒ Protection of human life and the environment
- ⇒ No unwanted incidents
- ⇒ No surprises
- ⇒ Guarantees that everyone will abide by the rules and that these rules will be such that all can abide by them
- ⇒ No stress and no psychological strain

If these expert statements reflect the attitudes of the population is not certain, but it is possible. We just have to learn more about the wishes of different groups of citizens.

4.1.12 Acceptance

The question of the citizens' wishes is directly linked with the concept of acceptance. "Acceptance" reflects how people stand towards projects. In practice, the concept also includes those people who never would be the users, or customers themselves e.g., residents near motorways. Just to repeat the thoughts from above: People will accept, e.g., traffic safety measures if they do not have to suffer disadvantages compared to other people or groups, if the reasons given for the measures are credible and comprehensible, and/or if new advantages arise that bring about an attractiveness of the new situation that exceeds the attractiveness of the status quo. But there is still another important aspect: One wants to be considered and listened to. Acceptance is linked, among other things, to the extent a person feels involved in the process of the implementation of measures. This is reflected by the principle of Participation. The possibility to be involved and listened to with regard to one's own wishes is a very important need per se. It expresses that one is taken seriously, which reflects a central social motive (e.g., see Weiner 1988). Furthermore, being listened to is a precondition for being able to express one's N&I, and to have them fulfilled. For the authorities viz. for those who take decisions this means that communication with different target groups is necessary.

The conclusion of this for the project CAST: The addressees (i.e. those who should change their behaviour) have to be made participants of the communication in some way. An acceptance model that was developed in connection with the implementation of a railway project in Austria (Praschl & Risser 1996) includes a list of aspects which should be taken into account when one wants to introduce the concept of participation in order to increase acceptance of measures. According to this model, the following aspects have to be considered in the communication with target groups:

- a) People's own history and experiences (for example, as a person living alongside the railway)
- b) The expected consequences of the project for people (e.g., predicted noise pollution)
- c) The subjective evaluation of these consequences
- d) Arguments have to consider facts **and** their evaluation (= what do they mean for the addressees)

It was shown in the above mentioned study that people who had a generally positive attitude towards the railway and its representatives were more likely to accept special projects (in the above mentioned case: a tunnel) or the necessity of these projects. This underlines the relationship between the acceptance (the image¹⁸) of someone offering a service, and the acceptance of the service. As suppliers of infrastructure and as "deliverers" of ideas, concepts, legal preconditions and physical preconditions for safe behaviour, the representatives of public institutions and researchers assisting them should keep this in mind: *The image of the one's who lead a campaign is most important!*

4.1.13 How to fit the wishes of the citizens

Communication of public institutions with the road users has the practical function of providing the prerequisites for adapting all possible public measures, at least in their fine-tuning, to fit the wishes of those involved¹⁹. Such a procedure also generally strives to take appropriate notice of the relationship aspects of communication (see Watzlawik et al. 1974). Thus, the target is not to let decisions be made over the heads of those involved as this would not sufficiently allow the feeling to rise that they are being listened to and considered. Whether communication happens in a fair or in a manipulative way: e.g., that the feeling of being listened to and considered does not correspond to the facts, ultimately lies with the decision-makers and with the carrying out of the decisions.

4.1.14 Summary

One basic assumption in part 4.1 is that in order to influence road user behaviour, the communication with road users has to be improved. Motives steering the behaviour, the need & interests of people have to be made transparent and have to be considered in the frame of this communication. Possible conflicts of interests (between individuals and society, between individuals and groups, intra-individual conflicts) have to be taken into account. Participation is a key issue with respect to behaviour change and acceptance of measures, as the need to be involved and listened to with regard to one's own wishes is a very important need per se.

To include road users in a more systematic communication process needs application of communication theories, more specifically theories of persuasion. This is the topic for the next section.

¹⁸ „Image“ and „acceptance“ are equalled here because it seems that in our example both concepts reflect the same construct. However, further analysis is necessary in order to establish to which degree both concepts mean the same thing.

¹⁹ Remember: „those involved“ consist of actively involved, therefore potential customers, and of passively involved. The latter do not come into question as customers but the measures under discussion have effects on their everyday life.

4.2 MCGUIRE'S INFORMATION PROCESSING THEORY OF PERSUASIVE COMMUNICATION

In order to understand why persuasive communication may or may not work, McGuire (1972) proposed an information processing model consisting of 12 different steps. In general, these steps represent different forms of attention, comprehension and acceptance of the message. The 12 steps are presented in Figure 4.2.

The 12 different steps consist of the following: (1) being exposed to the message, (2) attending to it, (3) being interest in processing/elaborating the message further (feeling personal relevance to the message), (4) understanding the message, (5) acquire taught skills (learning how to act), (6) accepting the message (i.e. attitude change if the message is in conflict with existing attitudes), (7) storing the message content and/or the new attitudinal position in memory, (8) retrieving that information at later times, (9) making decisions based on the retrieved information, (10) behaving in accordance with the decision, (11) receiving positive reinforcement for behaving so, and finally (12) making the new position a part of the self by integrating it into personal cognitive structures and habit patterns.

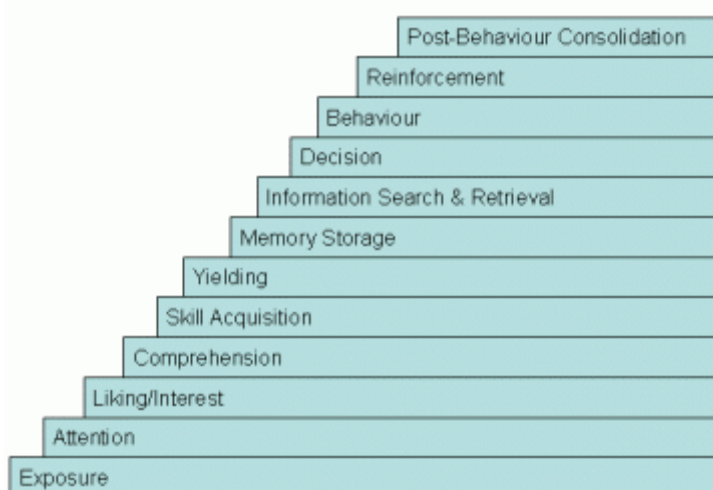


Figure 4.2: *The 12 steps in McGuire's Information Processing Theory of Persuasive Communication. Adapted from <http://www.comminit.com/en/node/27099/36>*

The model is analogous to climbing a staircase; reaching one step is dependent upon success in reaching *all* the previous steps. If the aim of a road safety communication campaign is to change behaviour (permanently), the model predicts that the campaign will fail if one of the steps is not completed.

The model thus illustrates why it might be difficult for a campaign to have a strong persuasion effect upon its target group. It pinpoints that creating attention/interest is no guarantee for successful persuasion to occur, the campaign must also pay attention to a range of other aspects such as making it easy to comprehend the message, retrieving the message and reinforcing the receiver when conducting the wished for behaviour.

As an example, a campaign aimed at reducing fatigue among drivers may for instance try to create attention, liking and interest of the message by using rational and emotional appeals (for instance by providing new facts and attractive posters). Not all receivers will find the message appealing/interesting and will thus not proceed to the next step. The success of persuading the remaining receivers will be contingent upon them comprehending the message (that fatigue is dangerous), knowing how to behave (e.g. stop and sleep for 15 minutes) and accepting this. The new information needs to be stored and retrieved when relevant (e.g. driving when tired). Billboards, “pit-stops” (special areas designated for stopping and sleeping in the car) etc. along the roadside may be one example of measures taken to help the receiver to retrieve the message and thereby be in a better position to reach the next step: the decision to behave in accordance with the campaign message (i.e. to stop and sleep). To reinforce this behaviour is a bit more difficult, but the positive experiences of feeling more awake after actually sleeping for 15 minutes, passengers to telling the driver that this was the right thing to do etc. may be examples of reinforcements.

In road safety campaigns, the benefits of avoiding negative consequences (crash, receiving a ticket, losing the driver license etc.) by behaving in a certain manner is traditionally more emphasised than reinforcing the desired behaviour, and it may therefore be problematic to use incentives for engaging in the desired behaviour.

Although McGuire’s theory can be regarded as a quite practical model that may help campaigns to be more successful, a central question is whether all these steps really has to be completed before persuasion occurs. For instance, a forced behavioural change like e.g. a change in legalisation may result in a stable change in attitudes in order for them to be in correspondence with the behaviour in question – without having completed the preceding steps in McGuire’s model. An example of this is presented in chapter 5, where the effects of the introduction of mandatory seat belt usage on behaviour and attitudes are described.

There are other theories of persuasion that are related, but not identical to McGuire’s model. These have also been quite influential as explanations of why persuasive communication may succeed or fail, and these will be described in the next section.

4.3 DUAL-PROCESS THEORIES OF PERSUASION

In this section, we will present two influential models of persuasion; the Elaboration Likelihood Model of Persuasion (ELM) and the Heuristic Systematic Processing of Information Model (HSM). The two models are quite similar, so we will focus most upon the first.

The ELM was developed by Petty and Cacioppo in 1980 to explain how a persuasive message worked to change the attitude of the receiver. The core of the model is the elaboration continuum- i.e. how much the receiver thinks through (elaborates) the message. At one end of this continuum is the central processing involving high mental elaboration of the message/attitude object. At the other end is the peripheral processing involving low mental elaboration. Based upon this distinction, Petty and

Cacioppo proposed that a message was transmitted and received through two routes, either the central route or the peripheral route of persuasion.

4.3.1 The central route of persuasion- the cognitive approach

The central route involves a high degree of elaboration, and the model predicts that a person is more likely to be persuaded/change attitudes if he or she is able to elaborate on a message thoroughly. In order to do this, several barriers have to be crossed. First, the receiver needs to be motivated to think about the message. To do this, the message must be felt as **personally relevant** and the receiver must have a “**need for cognition**”, meaning that the person has a desire to think about topics. If not, the elaboration process ends. In relation to road safety campaigns, it is important that the receiver feels that e.g. “this can happen to me or someone I care for” or “this concerns me”.

Next, the receiver must be **able** to think about (elaborate) the message, that is, not to be distracted by an incomprehensive message, other cues or competing messages. For instance, an anti-speeding TV can be followed by an advert for a new car portraying speeding as fun thereby distracting the original message. Or the person may simply not have the time to process the message at the moment. If, however, the person is able to elaborate the message, it will then be evaluated in relation to existing attitudes. If the message is in accordance with the receiver’s previous attitudes, there is likely to be lasting, positive persuasion. Thus, that particular attitude is reinforced for the future. If the message is not in correspondence with the receiver’s initial attitude, the message needs **strong arguments** in order to be convincing. Furthermore, the use of two-sided argumentation is usually advantageous, that is, not only showing advantages, but also disadvantages. If the quality of the arguments is perceived as weak, false and/or non-convincing, the receiver will reject the message and easily form negative thoughts and feelings about the message.

To sum up, persuasion through the central route is believed to be a result of extensive cognitive elaboration, that is, a quite rational and thorough process.

4.3.2 The peripheral route of persuasion – the emotional approach

Even though the person is unable or not motivated to elaborate on a message extensively, then he or she may still be drawn to the message persuaded by factors having nothing to do with the actual content of the message itself. Cialdini (1993) has suggested several main types of peripheral cues:

Reciprocation is that the receiver agrees with the message because it corresponds to past experience or information. **Consistency** means that the receiver prefers to stick to already established thought (“I felt like this before and I feel like this now”). **Social proof** is similar to peer pressure, meaning that what others think about the message is likely to influence the receiver. **Liking** means that the speaker or the “wrapping” of the message is likeable. The sender may be physically attractive, charismatic, or charming. Similarly, the message may contain music and pictures the receiver finds appealing. Vice versa, the receiver may also dislike the sender and or

message based upon the same cues. **Authority** is the sense that the sender has some power over the receiver, for instance being an expert in the subject matter.

Such cues can persuade the receiver toward the message, albeit weakly and temporarily. This is called the peripheral route, naturally involving a low degree of elaboration. In this route, feelings play a more important role than cognition.

The two routes to persuasion seem to exist as separate entities but Petty and Cacioppo note that they should be considered as poles on a “cognitive processing continuum that shows the degree of mental effort a person exerts when evaluating a message” (McClish 2001). The ELM has, however, been criticised separating too much between the two routes and not opening up for the possibility that both may operate at the same time.

A similar dual-process model opens up for this possibility. The heuristic-systematic information processing model (HSM) was developed by Chaiken (1980) is also a dual-processing theory like the ELM. Similarly to the ELM, HSM holds that individuals will use one or two modes of information processing when attempting to evaluate a persuasive message. Systematic processing is defined by effortful evaluation of information, whereas heuristic processing is defined by the use of heuristic cues to arrive more easily at a judgment. Heuristic cues refer to the use of simple rules in order to make a judgement, for instance “experts are right”, thus similar to peripheral cues (another example is presented more thoroughly in section 4.4 describing prospect theory). Heuristic processing in line with peripheral processing believed to result in less stable and temporary attitude change – systematic processing the opposite. One of the main differences between the HSM and ELM is that the former states that both processes may occur simultaneously. There are some more differences between the two models, but we will not go more into depth about these here. The point made here is that the two models can be regarded as complementary to each other and that both models have been very influential in understanding the process of persuasion.

The ELM has been criticised for mainly being tested through the use of persuasive messages within a rather limited area such as attitudes towards “senior comprehensive exams” and “college fees” (see e.g. O’Keefe, 1990). Still, there is a great deal of empirical support for the similar theory of HSM (see Eagly and Chaiken, 1993 for an overview). The main message is that both models emphasise the central role of cognitive evaluation in persuasion and attitude change. Through this process, the receiver actively persuades him/herself through the mental elaboration elicited by the message, rather than passively accepting the message. Attitude shift may occur without central/systematic processing, but central/systematic processing will lead to more stable attitudes, being resistant to change, and also being predictive of behaviour. Thus, the latter signify that both the ELM and the HSM assumes that attitudes predict behaviour, an assumption in correspondence with the previous presented behavioural (change) models such as the TIB, TPB, HBM and PMT.

4.3.3 Implication for road safety campaigns

Based upon the two dual-process theories, successful persuasion through a road safety campaign will be the one that is able to create a perception of personal

relevance and that provides the necessary “strong” arguments for accepting the message. In addition, the receiver must be able to process the message.

This is a quite demanding process and may explain why many (road safety) campaigns fail to change different kinds of beliefs (attitudinal, control etc.) and behaviour. First, having the time and opportunity to elaborate a message can be difficult since the campaign message has to compete with a lot of different and sometimes conflicting messages at the same time (like ads for cars portraying speeding as attractive). Another cue may be that e.g. speeding is not felt as dangerous (as proposed by the Risk Monitoring Model), and thereby the message is not perceived as credible. Thus, to create personal relevance can be problematic, especially among the road users with the highest need for attitudinal and behavioural change. For instance, Ulleberg (2002) found that high-risk young drivers were the ones who were least motivated to pay attention to messages promoting safe driving. On the other hand, these represent one subgroup and not the majority of road users.

This signifies the importance of understanding the target group’s needs, interests and motives in order to design the campaign message to be felt as personally relevant. For instance, Falk and Montgomery (2007, 2008) and Falk (2008) have in several studies examined the role of mental elaboration in promoting traffic safety among young male drivers. Based upon in-depth interviews of young high-risk male drivers, Falk and Montgomery (2007) concluded that this group did not think that speeding was dangerous and much less that they were vulnerable of being injured when speeding. Instead, speeding seemed to elicit positive feeling, almost like a feeling of “flow”. Thus, messages portraying excessive speeding as dangerous to themselves will most probably not be felt as personally relevant to this group of drivers, and if it is, the initial attitudes are nevertheless strongly opposing the message. On the other hand, the risk of hurting others when speeding was activated when being forced to elaborate about the possible consequences of being involved in accidents. Falk and Montgomery (2007) therefore suggested that intervention built upon imaging the personal emotional aftermath after hurting others in a serious accident could be a method of obtaining personal relevance and mental elaboration among this group of young male drivers.

The authors developed and tested an intervention based upon encouraging young male drivers to mentally elaborate about the consequences of risky driving and hurting others in a serious accident (Falk and Montgomery, 2008). One group of young male drivers was asked to imagine an accident scenario, and another group watched a film where a driver hits a little girl in a pedestrian crossing. Those seeing this film were afterwards asked to imagine that they had been the driver. Both groups were then interviewed and asked to visualize their feelings and the consequences the accident would have for their future lives. The aim of this was to force the drivers to elaborate more thoroughly around this issue. A control group was also included in the study, and these were interviewed about more neutral issues. The results showed that the two experimental groups displayed slightly more ideal attitudes compared to the control group right after the intervention, but that there were no significant differences between the groups four weeks later. Thus, the interventions built upon imaging did not produce any long-term effects.

However, all groups, including the control group reported a significant decrease in risky driving behaviour over time. Answering questions about one's own behaviour is certainly personally relevant, so it might be that this made the driver more aware of own driving behaviour and therefore more willing to evaluate and take stand against/for it. Falk (2008) therefore conducted two additional studies, this time only with a pre and post measurement (4-5 weeks later) and no intervention. The results were the same as on the previous study; a significant reduction in self-reported risk taking behaviour in traffic was reported in both studies. Attitudes did also change in a more ideal direction at the follow-up measurement. Based upon these findings, the authors hypothesized that answering questions about own driving behaviour might elicit the necessary elaboration processes for an attitudinal and behavioural change. However, it is a bit peculiar that just answering questions should produce more effect than a forced mental elaboration of the consequences of risky driving. Thus, these recent findings are too premature to reach any firm conclusion. Nevertheless, these are interesting findings.

There are more examples of techniques that might facilitate mental elaboration of the message. In section 4.4 to 4.8 we will present some specific methods for influencing both mental heuristics and mental elaboration.

4.4 COGNITIVE DISSONANCE THEORY

In many ways, the principle of influencing or changing road users' attitudes and/or behaviour through the use of campaigns is more or less based upon the idea of creating some form of cognitive dissonance among those who are not in favour of the message.

This theory first published in 1957 by Leon Festinger (Festinger, 1957) claims that pairs of cognition can be relevant or irrelevant to one another. If two cognitions are relevant to one another, they are either consonant or dissonant. Two cognitions are consonant if one follow from the other, and they are dissonant if the obverse of one cognition follows from the other. The existence of dissonance, being psychologically uncomfortable, motivates the person to reduce the dissonance and leads to avoidance of information likely to increase the dissonance. The greater the magnitude of the dissonance, the greater is the pressure to reduce dissonance (Harmon-Jones & Mills, 1999).

Formally speaking, the magnitude of dissonance (D) equals the number of dissonant cognitions (C_d) divided by the number of consonant cognitions (C_c) plus the number of dissonant cognitions:

$$D = C_d/C_c + C_d$$

An example used by Festinger (1957) may assist in elucidation the theory. A habitual smoker who learns that smoking is bad for health will experience dissonance, because the knowledge that smoking is bad for health is dissonant with the cognition that he continues to smoke. He can reduce the dissonance by changing his behaviour, that is, he could stop smoking, which would be consonant with the cognition that smoking is bad for health. Alternatively, the smoker could reduce dissonance by changing his cognition about the effect of smoking on health and

believe that smoking does not have a harmful effect. He might look for positive effects of smoking and believe that smoking reduces tension and keeps him from gaining weight (adding consonant cognitions). Or he might believe that the risk to health from smoking is negligible compared with the danger of automobile accidents (reducing the importance of the dissonant cognition). In addition, he might consider the enjoyment he gets from smoking to be a very important part of his life (increasing the importance of consonant cognitions).

Maybe the same reasoning goes for road safety campaigns. The speeding driver learns from campaigns, that speeding not only jeopardizes his (assuming in this example that the driver is a man) own life, but also the lives of others. This causes dissonance if he continues his speeding habits even though he knows that speeding is dangerous to himself and to others. He can reduce dissonance either by changing his behaviour, or he could convince himself, that he is a good driver, who does not end up in car crashes, and/or he could fortify his conviction that speeding is part of the enjoyment of driving.

The result would then depend upon the degree to which being a specific car driver was part of the identity of the person. If being a “wild and furious” driver is part of the self description of a young man, this may influence his susceptibility to road safety campaigns. Being wild and furious does not correspond well to driving carefully and slowly, but on the other hand very few young men would like to think of themselves as reckless or mindless. In such a case a road safety campaign telling the young man, that speeding is reckless behaviour, may cause dissonance, which again may lead to his shrugging off the campaign message as suggested above.

Road safety campaigns could on the other hand be consonant with the cognitions of a young driver, who thinks of him or herself as a daredevil and an outlaw. According to The Self Standards Model (Cooper, Mirabile & Scher 2005) people have a tendency to evaluate their own behaviour according to personal measuring sticks or standards. If a person’s behaviour is consonant, with the way he or she sees him/herself, then no dissonance would be felt. Therefore a road safety campaign telling that reckless driving is wrong and dangerous, would not collide with the self standards of the driver, who thinks of himself as an outlaw. That is, he does not comply with rules, an outlaw does not comply with rules – ergo no dissonance. But the result would then remain the same: the campaign would have no effect on the behaviour of the driver.

If, however, it were part of the driver’s self description to be a law-abiding citizen and a believer in authority, then a road safety campaign stating the importance of these aspects, would give rise to consonant cognitions in the driver’s daily compliance with the rules. In such a case the campaign would probably be very effective, because any transgression of the rules would cause instant cognitive dissonance in the “well behaved” driver, and since behaving within the law would be important to the self concept of such a driver, it would be easier to change the inappropriate behaviour in stead of changing his or her attitude.

Thus the theory of cognitive dissonance may be able to explain, why some drivers are more difficult to reach through campaigns than others. A consequence of dissonance theory may be that we should avoid creating dissonance in campaigns

aiming at subgroups of individuals who identify themselves as outlaws or who are likely to rationalize or justify their non-compliance with the rules. If campaigns insist that speeding drivers are dangerous and mindless, the campaign might result in an unproductive change in the attitude of drivers (maybe even in favour of speeding) and not a change of their behaviour.

It does not appear like the cognitive dissonance theory has been applied explicitly to road safety campaigns. It seems like it is mostly used within marketing and political campaigns. However, one could argue that it is implicit in most campaigns aiming to change the attitudes of the target group.

4.5 PROSPECT THEORY

Prospect theory (Kahneman & Tversky, 1979, 2000) focuses on the intuitive choices people make and the specific information processes underpinning these choices. In many ways, the principles of prospect theory can be used as an example of mental heuristics (as proposed by the Heuristic-Systematic Information processing model) applied when evaluating a message.

Prospect theory originates from the debate initiated by the neoclassical microeconomic assumption that human beings are rational and make rational choices. The microeconomic utility theories recognize that the individual decision-maker ascribe subjective values (henceforth referred to as utilities) to the possible outcomes enlisted in a given choice situation. The utility theories subsequently hypothesizes that the decision-maker chooses between these utilities in a rational and consistent manner, so as to optimize the total amount of subjective utility. Empirical studies of decision-makers' actual choices have shown that this is not the case. Not only are people not rational, but they are biased in a systematic way, which renders the predictions made by the utility theories invalid (see e.g. Ellsberg, 1961; Allais, 1953/1979; Slovic & Lichtenstein, 1973, 1983).

Through an extensive empirical work Kahneman & Tversky (and others) have examined the discrepancy between actual observed behaviour and the predictions made by utility theories. The results of these studies have lead Kahneman & Tversky to the formulation of Prospect theory (Kahneman & Tversky, 2000).

According to Kahneman (2002) the human information processing is divided into three different systems – perception, intuition and reasoning. Choices are mediated either by the intuitive system or by the reasoning system. The reasoning processes are flexible, slow and capacity consuming and therefore put an extensive demand on the cognitive system. The processes in the intuitive system resemble the processes in the perceptual system, and are very efficient in regard to the amount of cognitive capacity these processes consume. In choice situations where fast decisions need to be made, where the cognition is overloaded or where the decision-maker is not able to apply effort in the decision-making process, the decisions will be based on intuitive processes. Since the processes of the intuitive system are automatic and effortless, these processes influence decisions even in situations where it is possible for the decision-maker to use the reasoning system. Thus, this separation of conscious and unconscious/automated processes is similar to the previous presented theory of Damasio (1994) and thus in correspondence with the Eclectic Road user Model.

Table 4.2. *The human information processing systems. Adapted from Kahneman, 2002.*

	Perception	Intuition System 1	Reasoning System 2
Process	Fast Parallel Automatic Effortless Associative Slow-learning		Slow Serial Controlled Effortful Rule-governed Flexible
Content	Percepts Current stimulation Stimulus bound	Conceptual representations Past, Present and Future Can be evoked by language	

To be able to influence individuals' decisions and the judgments these decisions are based on it is necessary to take the processes of the intuitive system into account.

Judgment processes of the intuitive system follow a well specified pattern.

- **Prospects are not evaluated by the absolute values of their outcomes.** The subjective utility of the outcomes is instead dependent on the individual's current situation or expectations – decision-makers are reference dependent. An outcome is perceived as a loss if it reduces the individual's current wealth, and not only if the outcomes reduces the individual's current wealth to a negative amount. The same goes for gains. The subjective utility of an absolute value therefore depends on the reference point. By changing the reference point, it is possible to manipulate the individual's judgment of a given absolute value.
- **The subjective utility shows marginally falling sensitivity.** For example the subjective value of one apple is larger than 1/9 of the subjective value of 9 apples. The utility of a given number of objects in other words *does not* equal the mathematical amount of the given object times the subjective value of that object. Due to this, most decision-makers show extensive risk aversion in gain situations and are risk seeking in loss situations.
- **The subjective weighting of negative prospects is generally twice as large as the weighting of positive prospects.** In general terms this means that if an individual gains \$100 the gain will be ascribed a subjective utility of X, where as a loss of \$100 will result in a subjective utility of $-2X$, resulting in a thorough loss aversion that accentuates the risk seeking behaviour in loss situations. (see Kahneman & Tversky, 1979; 2000)

The utility function in Prospect Theory is named ‘the value function’ and follows the shape shown in Figure 4.3.

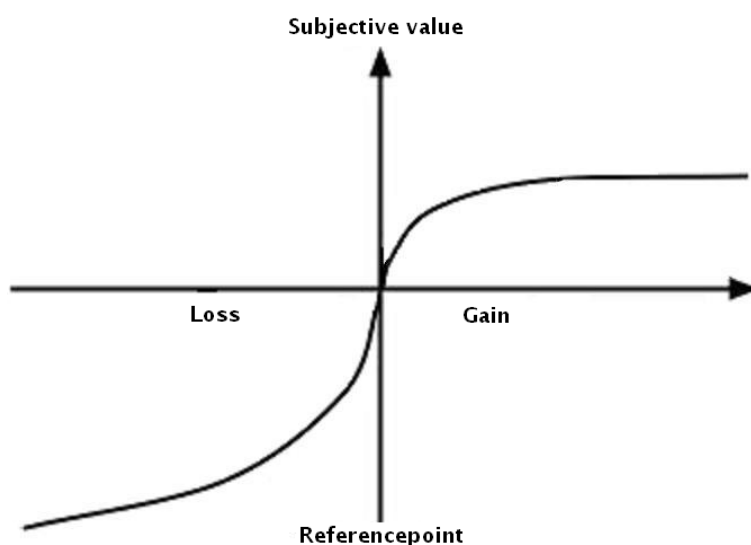


Fig. 4.3: Graphic depicting of the subjective weighting of the outcomes of prospects as according to Prospect Theory. Adapted from Kahneman & Tversky, 1979, p. 279.

The shape of the value function is confirmed by a large body of empirical research. The following two choice situations or “Problems” show how the same absolute values can be represented in different ways by manipulating the reference, and thereby elicit inconsistent preferences. The subjects were either presented with Problem 1 or Problem 2.

”Aisan Disease

Imagine that the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimates are as follows:

Problem 1: If Program A is adopted, 200 people will be saved (72%). If Program B is adopted, there is 1/3 probability that 600 people will be saved and 2/3 probability that no people will be saved (28%).

Problem 2: If Program C is adopted, 400 people will die (22%). If Program D is adopted there is 1/3 probability that nobody will die and 2/3 probability that 600 people will die (78%).”

(Tversky & Kahneman, 1981, p. 453)

In Problem 1 the majority of subjects prefer A, whereas in Problem 2 most subjects prefer D, even though A and C mathematically represent the same options, as do B and D. The “Asian disease” problems clearly demonstrate how judgments are

elicited by the intuitive system, and how the loss aversion, risk aversion and reference dependence of the intuitive system influence the choices decision-makers take. This also suggests that people do not think in terms of probability, but more in terms of gains and losses.

4.5.1 Prospect Theory and Campaigns

The above mentioned choice patterns has been tested thoroughly in a wide number of different situations involving judgments of for example cars, ice cream, ball point pens, chocolate, and more abstract things such as insurances, health plans, and working hours (see Kahneman & Tversky, 2000). The results of these investigations imply that human decision-makers apply the intuitive system in a wide range of decision-making situations.

Several researchers have examined how Prospect Theory can be used in relation to campaigns and how to convey information to the public (Weyland, 1996; Whysall, 2000; Rothman, Bartels, Wlaschin & Salovey, 2006). Especially the framing effect – whether a change is presented as a loss or a gain – has a clear effect on how people judge a possible change. A message is perceived more dramatically if it is presented in a loss frame. If the aim is to capture people’s attention and make them (re)act, the most effective strategy is to present the message as a loss compared to the target group’s current situation.

If the aim on the other hand is to get people to accept a change, then it is necessary to focus the campaign on a gain frame. For example, when it was legislated, that stores in the United States were allowed to charge higher prices to credit card users, the credit card lobby made sure that the difference between cash and credit card consumers was presented as a cash discount rather than as a credit card surcharge. Since loss is perceived more strongly than gains, the formulation of the difference between cash and credit card payments as a cash discount, made people perceive the difference as smaller than if it had been presented as a credit card surcharge (Thaler, 1980).

Prospect Theory clearly explains how people evaluate and choose between different prospects, providing a better understanding of why different wordings of the same message are judged differently. There are examples of campaigns using the gain and loss concepts in traffic safety (like a speeding campaign stating “save 10 seconds and loose your life), but no evaluations have been found. Prospect theory is thus a good example of how the message can use mental heuristics in order to make it seem more appealing. It also demonstrates the importance of intuitive reasoning.

4.6 CAUSAL ATTRIBUTION AND THE ACTOR-OBSERVER BIAS

4.6.1 Causal attribution

Causal attribution theories attempt to describe how people come up with explanations for the human behaviour they see around them. In one of the first theories, by Heider (1958), people were described as ‘naïve scientists’ looking for enduring features in others in order to attribute cause to their behaviour. This theme was developed by Kelley (1973) who added that people seek to identify those causes that co-vary with the effects they are associated with. Subsequent researchers claimed that people are not as systematic as these earlier theories suggested, and that subconscious enquiry to attribute causation actually involves validation based on pre-existing and sometimes inaccurate personal hypotheses (Major, 1980). Modern established theory holds that personal filters that we use to make the causal attribution process efficient can lead to bias and distortion in the way we explain the behaviour of others. Several forms of bias in causal attribution have been specified, and considerable empirical support provided. For example, a *self-serving bias* describes how people can take or deny causal responsibility for success or failure with the goal of enhancing self-image (Weary et al., 1982). One bias with particular relevance for driver behaviour is *actor-observer bias*.

4.6.2 Actor-observer bias

The actor-observer effect is one of several forms of bias in the way people attribute cause to human social activity. The theory on which it is based holds that while people (observers) tend to attribute their own behaviour to their circumstances, they tend to attribute other people’s (actors’) behaviour to stable dispositions (Jones and Nisbett, 1971). The effect has been observed and documented in several different contexts and by several different authors, as reviewed by Watson (1982).

Two main reasons for the effect are proposed:

- observers have less knowledge of cross-situational inconsistencies of others’ behaviour compared to that of their own; and
- the salience of the varied actions of others is greater than the salience of the self and the variations in the environment in which one finds oneself.

4.6.3 Implications for road safety campaigns

To our knowledge there have been no major studies investigating specifically the role of actor-observer effect in driver behaviour. However, it is highly relevant if one considers that driving violations can result from incorrect interpretation, over the short- or long-term, of other drivers’ actions.

Violations account for the greatest amount of variance in aberrant behaviour among drivers, which in turn is reported to be the greatest single cause of car accidents (Rumar, 1985). Furthermore, a clear and positive link has been demonstrated

between propensity to engage in violation behaviour and the number of accidents in which the driver is involved (Blockey and Hartley, 1995; Parker et al., 1995).

It is reasonable to exemplify how some important driving violations could be influenced by the actor-observer effect:

- A failure to comprehend the situational causes of an actor-driver's cautious behaviour results in an observer-driver overtaking on a dangerous stretch of road.
- An observer-driver pursues an actor-driver whose dispositionally attributed behaviour has enraged them.
- A routine speeding violation on the part of an observer-driver seems minor compared to the violations of the many actor-drivers around them.
- Actor-drivers' red-light-running might annoy an observer-driver, whose own red-light-running habit has been developed through situational attributions.

The actor-observer effect could be used as the sole-basis for road-safety campaigns, for example, by:

- persuading drivers to attend more to their own driving behaviour (make it more salient);
- encouraging reflection of how their own violation behaviour appears to that of other drivers; or
- in 'road-rage' campaigns persuading drivers to reinterpret other driver's behaviour by putting themselves 'in the driving seat'.

If it is true that such a bias in causal attribution contributes to the violation of driving laws, then such campaigns seem reasonable. A better first step, however, might be to thoroughly explore the importance of attribution in the development of driver violation behaviour. Meanwhile, the effect could be used to help design campaigns on the basis of Social Marketing or other more directly relevant theories.

Causal attribution can be seen as form of mental heuristic applied when making sense of a situation. Directly addressing causal attribution can potentially enhance perceived personal relevance of the message since it directly addresses the fact that the receiver may have a "this does not apply to me" attitude towards the message (i.e. low personal relevance). This may in the next turn motivate for further mental elaboration of the message.

4.7 THE USE OF PERSONAL COMMUNICATION

A campaign can also have a more indirect effect upon mental elaboration through putting the road safety on the agenda in daily social communication. Thus, discussing the campaign message with other persons easily require more mental elaboration of the message than merely reading a campaign slogan or seeing a TV-spot. We will here first present some notions about the two-step flow of communication, then look more into group discussions and the use of peer influence

as means for promoting social communication and thereby mental elaboration of the message.

In 1948, Lazarsfeld, Berelson, and Gaudet published *The People's Choice*, a paper analyzing the voters' decision-making processes during a 1940 presidential election campaign. They found that only some 5% of people changed their voting behaviour as a result of media messages. The study suggested that communication from the mass media first reaches so-called "opinion leaders" who filter the information they gather to their associates, with whom they are influential. An opinion leader is typically a person using mass media more than the average and see themselves and are seen by others as having an influence on others. People tend to be much more affected in their decision making process by face to face encounters with influential peers than by the mass media. This was later the core element of the Two-step Flow of communication theory later proposed by Katz and Lazarsfeld (1955). Thus, the direct impact of mass-media is low according to the model – personal communication around the topic can on the other hand be very influential.

Katz and Lazarsfeld (1955) mention several advantages of personal communication over mass media communication in relation to persuasion. These are also very relevant for road safety campaigning:

- **Non-purposiveness/casualness** One must have a reason for tuning into a political speech on television, but political conversations can just "pop-up". In this situation, the people are less likely to have their defences up in preparation, they are more likely open to the conversation. The same is valid for messages promoting road safety. We would also like to add that personal communication have the potential of allowing the sender to influence the recipient in situations in the most relevant context, e.g. addressing unsafe driving when being a car passenger or influencing the driver to stop and rest when feeling tired. Furthermore, the sender can influence the receiver when he or she has "ability to proceed" with elaborating the message.
- **Flexibility to counter resistance** A conversation means two-way communication, and the sender has opportunity to counter any resistance. This is not so in media. This also means that the sender can adjust the information to the receiver (e.g. adjust the difficulty of language, talk when the receiver is attentive etc), i.e. a sort of interactive Social Marketing. Moreover, the message can be transmitted at times when there are no other conflicting messages or cues present, thereby increasing the possibility of the message being elaborated. Moreover, the receiver cannot ignore the message so easily when being presented to the message face to face
- **Trust** Personal contact carries more trust than media. As people interact, they are better able through observation of body language and vocal cues to judge the honesty of the person in the discussion. Newspaper and radio do not offer these cues.
- **Persuasion without conviction** The formal media is forced to persuade or change different kinds of beliefs (attitudinal, normative, control etc.). Using personal communication, sometimes friendly insistence can cause action without affecting any comprehension of the issues.

The two-step flow of communication model has been criticised for underestimating the impact of direct flow of the mass media, especially when major news events occur (Westley, 1971). According to Lin (1971), it ignores the possibility of a continuum instead of a crude dichotomy between opinion leaders and non-leaders (Lin, 1971). Others have called for a separation between intragroup flow and intergroup flow of communication (Weimann, 1982), and furthermore it is a bit difficult to define what an “opinion leader”. Still, the model remains influential today, 60 years after it was proposed. The advantages of using face-to-face communication cannot be ignored, the use of personal communication have the potential for resulting in deeper cognitive elaboration of the message as compared to mass media communication.

This may be the main reason why the use of personal communication was one of the few characteristics of road safety campaigns being significantly related to accident reduction in the INFOEFFEKT meta-analysis (Vaa et al., 2004). In the CAST meta-analysis the effect is lower, but still present. We will in the next sections present some examples of how personal communication can be used in road safety campaigns.

4.7.1 Group discussions

Group discussions as a part of a road safety campaign is another way of ensuring that the message is elaborated. Some locally directed road safety campaigns have implemented this with a seemingly beneficial effect. For instance, Gregersen et al. (1996) undertook an experimental study in the Swedish company which involved the testing of four different measures to promote traffic safety; driver training, receiving bonus for avoiding crashes and group discussions on how to promote safe driving. The employees were divided into five groups of around 900 drivers each, each group received one of these measures and one group served as a control group. The results showed that there were reductions in accident risk for the driver training, group discussion and bonus groups, with the bonus group showing the least reduction. The authors concluded that group discussion and special form of driver training were the most effective measures, and that group discussions about traffic safety was definitely the cheapest measure.

On the other hand, Goldenbeld, Twisk and Houwing (2008) found a negative effect of group discussions upon the acceptability of anti-speeding policies. In an experimental study, drivers had group discussions upon the topic of 60 km/h zones as opposed to 80 km/h after either being exposed to a leaflet, a fear-evoking TV-spot or neither of the two. After the group discussions, the acceptability of 60 km/h zones tended to shift in a negative direction. A possible explanation is that negative thinking about 60 km/h zones dominated in the group discussion and that the participant adjusted their attitudes and intentions to what was perceived as the norm or standard. However, a neutrally toned, informative written communication leaflet prior to the discussions seemed to counter this effect among the female participants.

Thus, group discussions will most likely guarantee further mental elaboration, but not necessary that persuasion will occur. Arranging group discussion is probably easiest to conduct when the campaign concerns a specific target group at a geographically restricted area – like at a workplace or at a school. However, a campaign can also

have the potential to stimulate more casual “around the coffee table” discussion, and thereby enhance mental elaboration of the message. We have not come across campaigns specifically addressing this.

4.7.2 Peer influence

Another way of promoting social communication about the campaign message (and thereby more elaboration of the message) is peer influence. This is perhaps a measure most suited for reaching out to a young target group, but could also include target groups in all age groups. The research presented below will however focus upon the use of peer influence related to a target group consisting of young people.

Based on the observation that people tend to trust others who are similar to themselves, several researchers emphasise the use of social influence to motivate people to change their attitudes and behaviour (Bandura, 1986; Edwards, Tindale, Heath & Posavac, 1990). According to Tindall (1995, in Posavac, Kattapong & Dew, 1999), peers are particularly suited for reaching young people since they usually regard peers as more credible, to have a better understanding of the thoughts of other young people, and tend to model the peers’ behaviour more easily as compared to adults (and authorities in general). The latter notion is also supported by social cognitive theory, which states that people more easily tend to imitate behaviour if the model performing the behaviour in question appears to be a realistic figure for self comparison (Pervin, 1989).

The belief that peer-based programs are advantageous as means for preventing health problems has been commonly accepted. Based on a meta-analysis of 47 peer-based intervention programs, Posavac, Kattapong and Dew (1999) found a consistent positive effect of such programs on various health behaviours. None of these studies did, however, concern driving behaviour. Campaigns focusing on peer influence may be of particular relevance for adolescent drivers and their passengers. Clark (1976) found that a group of young drivers who had been involved in traffic accidents were more open to the influence from peers who encourage them to take risks than young drivers who had not been involved in traffic accidents. On this basis, he suggested that safety campaigns should focus the driver’s peer group rather than the driver himself.

The potential positive effect of peer influence is also supported in other studies. Brown (1998) found that drivers believing that their friends would disapprove of drinking and driving, were less likely to drive under the influence of alcohol themselves. Similar results have been found in a study of Swedish male drivers (Åberg, 1993). Furthermore, Parker, Manstead, Stradling et al. (1992) concluded that normative beliefs play a key role in drivers’ intention to commit driving violations such as speeding, dangerous overtaking, close following, and driving under the influence of alcohol. They found that drivers who believed that significant others would disapprove of them committing these violations and at the same time felt motivated to comply to these referents, reported less intentions to commit the violations. They also found that younger drivers perceived less pressure from others to abstain from committing the violations. However, younger drivers were at the same time more motivated to comply with the perceived wishes of their referents. The authors

concluded that publicity campaigns aiming to reduce the risky driving of young drivers should highlight the disapproval of their peers and their referents.

Thus, highlighting the role of other socially influential persons involved in the driving situation may be beneficial in order to promote safe driving. Some traffic safety campaigns have focused on this type of positive peer pressure. For instance, the “Peer Intervention Program” (McKnight & McPerson, 1985) aimed at motivating and enabling US high school youth through role-playing to intervene in the drinking and driving of their peers. An evaluation of the program concluded that it had led to a significant increase in self-reported intervention behaviour (McKnight & McPerson, 1985).

Another example is the “Speak Out!” (Norwegian: “Si i fra!”) campaign carried out among Norwegian adolescents. The primary aim of the campaign was to encourage teenage car passengers to let the driver know that they felt unsafe in the car, that is, verbally tried to prevent unsafe driving. Alternatively, they were encouraged to choose other means of transportation. An evaluation of the campaign carried out five years after its implementation, concluded that it had resulted in a 30 % reduction of adolescent passengers injured or killed in car accidents (Elvik, 2000). However, the number of young car drivers injured or killed was not reduced. Apparently, the campaign did not succeed in reducing risky driving among young drivers, although it did reduce young passengers putting themselves at risk. A possible explanation is that the campaign had not helped the teenage passengers to prevent unsafe driving by voicing their opinion in a driving situation, but rather choosing the alternative strategy. From this one campaign may draw the conclusion that future campaigns need to address this flaw.

The “Speak out!” campaign was extended to other areas in the year 2000. The campaign was then carried out in roughly two different versions in different areas. One version used mainly information appeals, school visits and role playing encouraging adolescents to speak out against unsafe driving, while the other version combined information with extensive roadside control directed towards young drivers. Ulleberg and Christensen (2007) compared the effect of these two versions of the campaign after it had been active for a five-year period. After controlling for various confounding variables (including changes in injured and killed road users older than 24 years of age), they concluded that there had been a significant reduction of 25 % in the number of seriously injured and killed car occupants in the age group 16-24 years in areas combining information and roadside control. In areas that did not combine the campaign with control activity, there was no significant reduction in this number. This indicates that promoting peer influence is not enough in itself, it needs to be combined with some kind of enforcement.

4.8 THE USE OF EMOTIONS

In campaigns you can choose to give a rational description and explanation of the subject of the campaign. Research has shown, however, that the effect can be larger if you use an emotional message (Elliott, 1993; Weber et.al., 2006; Lewis, Watson, White & Tay, 2007). According to Monahan (1995) “affective reactions to stimuli are assumed to be primary, occurring before and influencing subsequent cognitive processing” (p.84). This is also in line with Damasio (1994) and the previous presented Risk Monitoring Model/Eclectic model.

According to the Elaboration Likelihood Model (ELM) and Heuristic Processing of Information model, persuasive messages can be processed differently depending on the degree of involvement of the audience with the issue in question. If the message is perceived as personally relevant (i.e. high involvement), and if one has the ability to process the message, this is believed to increase the probability of evaluating the message, primarily on the basis of the quality of the arguments presented (i.e. the central route to persuasion). If the issue either not perceived as personally relevant or the receiver does not have the ability to elaborate the message, the receiver still may find the message appealing due to factors not necessarily related to the actual content of the message itself (peripheral cues). In the peripheral route to persuasion, emotions play a more important role than cognition. Thus, adding an emotional component to the message can be an aid for persuading receivers who are not motivated to pay attention to the quality of the arguments in the message.

Campaigns can evoke different emotions – negative as well as positive. This chapter will report on the present state of knowledge concerning the effect of campaigns using fear appeals – representing the negative emotions – and humorous appeals – representing positive emotions.

4.8.1 Fear appeals

The use of fear appeals is widespread in public health campaigns as well as in road safety campaigns. There is a kind of basic logic in the argument that if people will not listen, when we tell them rationally to do things differently, then we will have to show them, how disastrously it can end, if they don't. Then they will learn. The use of fear appeals implies an assumption that when emotional tension (fear) is aroused, people will become more highly motivated to accept the message and recommendations presented in the campaign, especially if the perception of personal relevance to the message is low (Tay, Watson, Radbourne & DeYoung, 2001).

4.8.1.1 Theories behind fear appeals

The following overview of theories is based on reviews by Witte (1992), Witte & Allen (2000) and Ruiter (2000), and concerns fear appeals in general. Theories on the effect of fear appeals have generally reflected the psychological theories of their time. In the 50'ies and 60'es drive models were prevalent, using a learning theory approach: Fear aroused tension and the individual would use either adaptive (e.g.

behaviour changes) or maladaptive actions (e.g. denial of the problem) to reduce the tension. If the action was successful in reducing the fear, it would be reinforced and used again in similar situations.

Research did not fully support these theories and more elaborate theories containing more variables of importance for the effect of fear appeals were brought forward. Around 1970 Leventhal (1970, after Witte, 1992) made an important distinction between cognitive (danger control) and emotional (fear control) reactions to fear appeals (the parallel response model). Attempts to control the danger – the presented threat – would lead to protective adaptive behaviour whereas attempts to control the fear – the emotions brought about by the threat – could lead to maladaptive behaviour e.g. denial or reactance.

The cognitive aspect was further stressed in theories by Sutton (1982, after Witte, 1992) and in the Protection Motivation Theory (described in chapter 3.1). Sutton applied subjective expected utility (SUV) theory to fear appeals and stressed the importance of three variables: The perceived utility of the threat, the subjective probability that the threat will occur and the subjective probability that the threat will occur if the person makes the recommended change.

The Protection Motivation Theory (PMT) has been the main theoretical framework for most research on fear appeals. It has been further elaborated by Witte, who combined PMT with the parallel response model, reintroducing the emotional reaction into the otherwise cognitive model: the Extended Parallel Process Model (EPPM) (1992). The danger control side of the model is the PMT: When perceived threat is high and perceived efficacy of the recommended action is also high, people will be motivated to control the danger. “When danger control processes are dominating, *individuals respond to the danger, not to their fear*. Conversely, when perceived threat is high, but perceived efficacy is low, fear control processes are initiated. The fear originally evoked by the personality relevant and significant threat becomes intensified when individuals believe they are unable to effectively deter the threat. Thus, they become motivated to cope with their fear (defensive motivation) by engaging in maladaptive responses (e.g., denial). When fear control processes are dominating, *individuals respond to their fear, not to the danger*.” (Witte, 1992).

4.8.1.2 Effects of fear appeals

Witte & Allen (2000) made a meta-analysis of the research on fear appeals in public health campaigns. They found that rising levels of

- fear
- perceived severity of the threat
- perceived susceptibility to the threat
- response efficacy (how well does the recommended action avert the threat)
- and self-efficacy (to what degree does the person feel able to perform the recommended action)

in the fear appeal message resulted in greater positive levels of attitude, intention and behaviour change. The effects were relatively weak but significant. However, most of the results were very heterogenic.

One possible explanation of this heterogeneity of results can be that different studies apply different measures of message acceptance, as well as measuring message acceptance at different points in time after exposure to the fear appeal. Taubman Ben-Ari, Florian & Mikulincer (2000) found contradicting results of the same fear-appealing video film when they applied different measures of message acceptance: Whereas actual driving speed in a simulator increased among participants after seeing a fear-appealing video film (negative result), the outspoken intent of the participants not to commit dangerous actions in the future also increased (positive result). Similar results have been found in an early study by Evans, Rozelle, Lasater, Dembroski & Allen (1970) on dental hygiene, where high fear appeals resulted in higher intention to behave and reported behaviour, than a positive message, while the positive message resulted in better actual behaviour.

Another explanation if the heterogeneity of effects, is that significant moderator variables may explain why some fear appeals work better than others Lewis, Watson, Tay & White (2007b) have made a review of research in the effect of fear appeals specifically in the road safety area. They found, that two factors were of decisive importance for a positive effect:

- the susceptibility factor – that the threat is perceived as relevant for the person and
- the response efficacy factor – that coping actions are presented, which are perceived as effective as well as possible for the person to carry out.

The actual level of threat communicated in the campaigns seemed to be of less importance.

4.8.1.2.1 Susceptibility to the threat

Fear appeals are believed to be most efficient if a person feels vulnerable to the threat – i.e. the threat must have personal relevance for him/her. The topic of the campaign is of importance here as the definition of the target group can be more or less clear. The latter is often the case in the road safety area. Walton & McKeown (2001) found, that a considerable number of drivers (around $\frac{1}{4}$ of his sample) thought that others usually drove faster than they did themselves, while it was in fact the other way around. Although these drivers in reality were part of the target group for the campaign messages presented to them, they felt that the messages were directed more towards other drivers than towards themselves. No doubt this can make it difficult to reach specific target groups, as drivers can feel that the “bad drivers” addressed in campaigns are not themselves.

In a study of the effects of different anti drink driving adverts, including fear appeal adverts, Lewis, Watson and White (2008) found that attitudes and behaviour changed most for drivers reporting high involvement with the issue (i.e. those who felt that the message was personally relevant). This group also showed the most enduring change in attitudes and behaviour, measured 2-4 week after being exposed to the advert. This was believed to be due to more central processing of the message among those reporting high involvement in the issue (as expected from the ELM).

Furthermore there can be a tendency to expect campaign messages to be more effective for other drivers than for oneself (third-person effect). Lewis, Watson, & Tay (2007) found strong third-person effects in relation to a drink driving as well as a speeding fear appeal. The effect was gender specific, though: Whereas men showed a third person effect and thought, that others would benefit more from the messages, than they themselves would, women generally showed a reversed effect and thought more often, that they would benefit more than others. Furthermore they found that this variable was significantly associated with later intent to commit to the recommended actions: The stronger the third-person effect, the weaker the intent to avoid drink driving/speeding. The results suggest, that it is more difficult to reach men than women with the fear appeals, which is a problem as men generally more often will be the target group of road safety appeals. The same gender differences in third-person effect were also found in the previously mentioned study conducted by Lewis, Watson and White (2008).

4.8.1.2.2 Response efficacy

In their meta-analysis Witte & Allen (2000) tested the relationship between level of threat and level of response efficacy and came to the following result: When both factors were high the effect of the appeal was also high. If both were low the effect was also low. If one factor was high and the other low (irrespective of which was which) the effect was lying in the middle. On the basis of a meta-analysis of the effect of Protective Motivation theory, Floyd et al. (2000) concluded that response efficacy was the strongest predictor of message effectiveness.

Research within the field of road safety also stresses the importance of the response efficacy factor and argues that the strength of the response efficacy factor is in fact more important than the strength of the fear appeal (Tay, Watson, Radbourne & DeYoung, 2001; Lewis, Watson, Tay & White, 2007). Tay (2005) found, that Australian drink driving campaigns had been more effective in terms of crash reduction than speeding campaigns. He points out that this – among other things – could be caused by the differences in efficacy associated with the recommendations in the two cases: Drink driving can be avoided by adopting an alternative mode of transport besides being the driver in the particular situation, where the person wants to drink. Speeding, however, is avoided only by not speeding, which can contradict the desire of many drivers to do just that, and it should be applied in all situations, where you drive, which makes it a more difficult task to handle.

Results from the meta-analysis of seatbelt campaigns presented in CAST Deliverable 1.3 suggested addressing risk of harm/injury was related to increased seat belt wearing rate. One possible explanation is that wearing a seat belt is a behaviour that is relatively easy to perform and has high response efficacy (avoiding injury).

4.8.1.3 Defensive responses to fear appeals – fear control

The presence of defensive reactions to fear appeals has been shown in general research on fear appeals as well as in research in the road safety area. The feeling of fear can lead to a variety of reactions like e.g. denial of the threat, derogation of the message or reactance (acting contrary to the recommendations). These defence actions are considered maladaptive, because they do not avert the real threat

(Ruiter, 2000). They only serve to alleviate the feeling of fear. Witte and Allen (2000) concluded the following on defensive responses in their meta-analysis of fear appeals in health campaigns:

- the stronger the fear appeal, the greater the fear control response/defensive avoidance
- the weaker the response efficacy in message was perceived to be, the greater the fear control response
- Defensive responses are negatively correlated with danger control responses; that is, the stronger the fear control response the weaker the danger control responses.

Ruiter (2000) argues on the basis of his studies on breast cancer prevention that “fear control processes are less influenced by efficacy perceptions because they are automatic in nature, but that the more deliberate action planning involved in danger control is more dependent on efficacy perceptions” (p. 33).

Tay, Watson, Radbourne & DeYoung (2001) found, that rising levels of fear evoked by a fear appeal on driver fatigue did not significantly enhance message acceptance. In contrast, the level of fear had a highly significant effect on message rejection. An example of defensive responses in the road safety area is seen in a study by Taubman Ben-Ari, Florian & Mikulincer (2000). After having seen a scary video film displaying the consequences of a traffic accident some of the subjects drove even faster in a simulator than they had done before the film. This reaction was found in a specific group of the subjects, namely those who perceived driving as relevant to their self-esteem. The authors explain these results in a terror management perspective: as a reaction to threat people will try to strengthen their self-esteem by living up to the standards of value put by others in their own culture. In this case speeding was considered important for the self-esteem of this particular group of drivers and was therefore increased.

As pointed out above (section on efficacy) the kind of action needed to avoid the danger/feeling of fear is of importance to the effect of the campaign. This will differ between situations where the recommended action is mostly an inconvenience (e.g. seat belt wearing) and situations where the recommended action means giving up something that is very important to you (e.g. the thrill of speeding). Defence mechanisms will probably be evoked more easily in the latter than in the former situation.

4.8.1.4 Age, gender and other personal characteristics

Age and gender are important variables in the road safety campaign area, as young males have a higher accident rate than others and therefore will be a natural target group for campaigns.

Witte and Allen (2000) could see no consistent age and gender differences in their meta-analysis of fear appeals in health campaigns generally. Biener found, that women remembered fear appeals better than men, and found them more effective (Biener, Ming, Gilpin & Albers, 2004). For road safety campaigns, gender differences seem to be more prominent. Lewis, Watson, Tay and White (2007) concluded in their review of fear appeal campaigns in the road safety area that men are not as affected

by fear appeals as women. Lewis, Watson and Tay. (2007) found that apart from the third person effect mentioned above, fear appeal films generally had a stronger effect on women's intent to speed/drink-and-drive than on men's. They did not find age related differences. Goldenbeld, Twisk and Houwing (2008) found a tendency for females displaying more positive attitudes towards anti-speeding zones than males after being exposed to a fear-evoking TV-spot. Moreover, Tay & Ozanne (2002) found after a fear-evoking drink driving campaign a reduction in fatal crashes in the group of women 15-34 years old and in men 35-54 years old, but interestingly no reduction in the group of young men of 18-24, who was actually the direct target group of the campaign.

Other personal characteristics have been suggested as factors important for message acceptance. Witte & Allen (2000) looked at research studying the possible effect of a person's characteristic level of anxiety on persuasive outcome, but found no such effect. They did find some effects of a persons need for cognition and uncertainty orientation.

4.8.1.5 Feeling of fear and an optimum level of fear

The basis for the possible influence from a fear appeal is that it evokes fear in the audience. It is important to be aware, that the level of fear evoked does not necessarily have a close correlation with the level of threat displayed in the message, and a threat displayed in bloody pictures may not be as fear-provoking as a threat expressed in more psychological terms (see e.g. Rise, 2006). Appelton (2007) found in focus group interviews, that young people agreed that killing or injuring your friend/s would be more devastating than any harm caused to them selves. Reardon (1991, after Mayfield 2007) states that people handle fear differently and also handle fear differently in different situations. What causes fear in one person may be ignored by another.

Furthermore research has shown, that the fear appeal can evoke other feelings than just fear e.g. anger, guilt, annoyance, uneasiness, sadness etc. (Kohn, Goodstadt & Cook, 1982; Rise, 2006; Dillard & Nabi, 2006) and too little is known about the connection between all these emotions and message acceptance.

Lewis, Watson, White & Tay (2007) found in focus group interviews that some people are getting numbed to shock/tired of shock, because presentation of shocking and bloody scenes is getting more commonplace. These are problems that it is important to be aware of when designing a campaign. Interestingly, a review of the use of fear appeals in road safety advertisements concluded that whether fear actually was aroused was rarely studied when the effects of such advertisements have been evaluated (Lewis, Watson, Tay & White, 2007).

Finding the optimum level of fear in a fear appeal is a much debated subject, and it is difficult – if at all possible – to establish general guidelines. Although Witte & Allen (2000) found a rising effect with rising strength of the fear appeal, it is also clear from other research mentioned above that other factors such as efficacy and susceptibility may be of even higher importance. Furthermore Witte and Allen (2000) found that the risk of defensive responses rose with rising strength of fear appeal. This has also been found by Tay, Watson, Radbourne & DeYoung (2001) in relation to road safety campaigns, and they argue that “the level of fear arousal could be lowered without a

significant effect on the message acceptance rates but could result in a lower rate of message reduction” (p. 1). Furthermore high levels of fear evoking content in a message has also been criticised as being unethical, for instance because it can put unreasonable stress on people outside the target group e.g. children.

The question of how strong feeling of fear that needs to be evoked and if such a feeling of fear can be evoked by not portraying strong physical threats/injuries was the background for a pilot study carried out within the CAST-project.

4.8.1.5.1 CAST-experiment on the use of fear appeals

The present review has shown that the effect of fear appeals as well as how strong the appeal needs to be is uncertain. In general, messages creating emotional arousal seem to be more effective than others. On the other hand, some studies suggests that an optimal level of fear is preferable, i.e. that one should arouse some fear, but not too much to avoid that defensive reactions occur (message rejection).

In road safety campaigns, showing the strong physical threats (e.g. showing explicit a personal injury or crash) is the most common method to create fear arousal. Even though this might be effective, the use of such strong physical threats is problematic due to ethical concerns, especially if “horror effects” is used. Such appeals might therefore not be broadcasted on e.g. national television. A central question is whether it is necessary to portray strong physical treats explicit in order to create fear arousal, or whether it is enough to let the receiver of the message themselves imagine the consequences of e.g. a road accident themselves without showing this explicitly.

One of the main principles within Gestalt psychology is the “The principle of closure”. This principle applies when we tend to see complete figures even when part of the information is missing. In the two examples presented in Figure 4.4 we see respectively one circle and one triangle instead of three lines joined together.



Figure 4.4. *Illustration of the principle of closure*

Thus, we complete the form, even though we often receive incomplete information. A central question is whether this principle also might apply to the use of threat appeals. If we e.g. portray a story resulting in an accident, but avoid showing the most shocking consequences, will then the receiver fulfil this gap by imagining themselves what consequences might have been? If so, this may be a technique for facilitating mental elaboration of the message.

We might thus have a potential “win-win situation” where the advert not portraying strong physical threats might result in a level of fear arousal being strong enough to have beneficial effects upon message acceptance. Such adverts might also be less

problematic to show on e.g. national television. Another possible advantage is that when the receivers themselves can imagine what happened, it is up to the receivers to decide the level of physical treats and thus the possibility of reaching optimum level of fear arousal could be more easily fulfilled. A possible drawback is that when the receiver is not forced to see strong physical treats, he or she might to a lesser degree or not at all be willing to imagine the consequences.

This was the starting point of an experiment carried out within the CAST project in 2008. In order to test whether it is necessary to show strong physical threats explicit, two existing TV-adverts of one to two minutes duration were applied:

Seat belt usage: “Damage”

This is an Irish seat belt campaign. ‘Damage’ portray in slow motion the horror of what happens inside a car when one of the four occupants in a car chooses not to wear a seat belt. The car is involved in a crash and the person not using a seatbelt is thrown around in the car, thereby causing the death or injury of the other car occupants, including the person’s girlfriend. The advert ends with a police officer informing over radio “three persons killed and one critically injured. The guy without the seatbelt did the damage” and the text “No seatbelt, no excuse!”.

In the cut version, the scenes showing “horror effects” like blood, crushing noises, heads smashing each other etc. were excluded. The end of the advert is the same as in the original version.

Driver fatigue: “John”

The UK TV-advert "John" is about driver fatigue, filmed in night vision. The advert shows a sleeping man, and the voiceover informs us that "Tonight, John will die in his sleep. He's comfortable, warm, and has his family by his side." It then zooms out to show us that he is driving along a motorway, with his family as passengers. The car crashes into a side barrier and overturns, accompanied with high noises from the crash. The scene focuses upon how the car is smashed, but personal injuries are not shown. The advert ends with the caption "THINK: Don't drive tired". In addition, we included the slogan “Stop and sleep for 15 minutes if you are tired” at the end of the advert. This was done to present a clear response recommendation.

In the cut version, the scene showing how the car overturns was excluded. The car is only shown overturned on the motorway. The cut version contains the same response recommendation as the original version.

The aim of the experiment was to examine how these different adverts and versions of them relates to emotional arousal, severity, susceptibility, danger control (adaptive responses) and fear control (defensive responses). In addition, other effect variables were also included, including other emotions evoked than fear.

Sample

The sample consisted of 88 students at the Department of Psychology, University of Oslo, Norway. Of these, 71 were females and 17 were males. The students were invited to participate in the study and after accepting to participate randomly assigned two four conditions; 1: the seatbelt advert, original version, 2: the seatbelt advert, cut version (consequences not shown explicit), 3: the fatigue advert, original

version, 4: the fatigue advert, cut version (consequences not shown explicit). This means that the participants only saw one of the four versions of the adverts each. The students were informed that the advert they were about to see could portray strong physical scenes.

Measures

Evaluation of the characteristics of the advert was measured by asking the respondents how they would characterise the TV-advert on five 7-point bipolar scales; bad-good, boring-interesting, exaggerated-realistic, manipulating-convincing and weak-strong.

Emotional arousal was measured by asking the respondents to what extent 13 different emotions were evoked. A 7-point scale ranging from “Not at all” (1) to “To a strong degree” (7) was applied as the measurement unit. A factor analysis showed that three factors explained 71 % of the total variance in the items. On the basis of the results of the factor analysis, three factor-based scales were constructed; *Fear arousal* was measured by three emotions; “Fear”, “Worry” and “Concern” (Cronbach’s $\alpha = .89$). *Intrusive* was measured by the following items: “Anger”, “Displeasure”, “Irritation” and “Provocation” ($\alpha = .87$), while the items “Surprise”, “Interest”, “Excitement” and “Shocked” made up the factor *Novelty* ($\alpha = .83$). The item “Nausea” was dropped due to a very low mean score, and the item “Unpleasant” had high loadings on all three factors. The scores of the three factors were moderately correlated, ranging from $r = .27$ to $r = .44$.

Personal relevance was measured using three items; “The advert concerned me personally” and to which degree they thought that “This could have happened to me” and “This could have happened to someone significant to me”. All items were measured on a 7-point scale and a total score constructed by adding the items ($\alpha = .75$).

Fear control (defensive responses) was measured by asking the respondent to which degree they “Thought about completely different things” and “Thought that the movie was just nonsense” after seeing the advert ($\alpha = .63$). *Danger control (adaptive responses)* was measured by four items asking to which degree they thought about the advert, how much they thought about how they could avoid ending up in the same situation, how to act to avoid ending up in the same situation and how worried they were about ending up in the same situation after seeing the movie ($\alpha = .83$).

Susceptibility/Worry about hurting oneself and others was measured by two items; how worried they were about hurting oneself in a similar accident and how worried they were about hurting others in a similar accident, ranging from (1) not worried at all to (7) very worried ($\alpha = .79$). *Severity* was measured by one item: If you were involved in a similar accident, how seriously injured do you think you would have been?, ranging from (1) not injured at all to (7) very seriously injured/killed.

Message response efficacy was measured by one item; “Do you think the message gave you a clear recommendation of how to avoid ending up in the same type of accident?”. A seven point rating scale ranging from (1) not at all to (7) to a high extent was applied.

Results

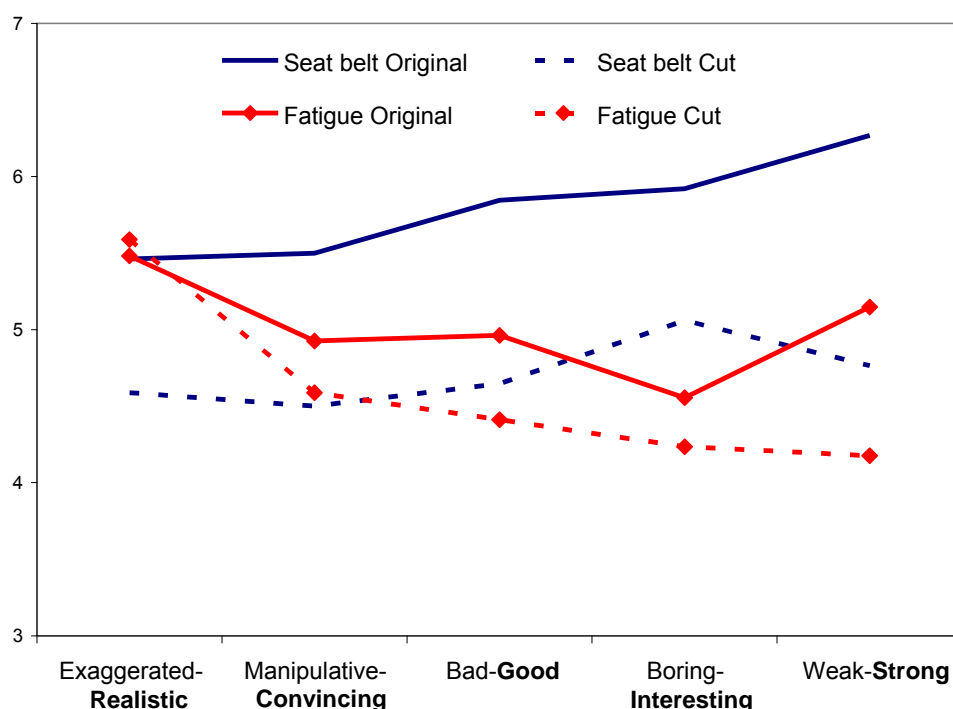


Figure 4.5. Mean scores on characterisation the adverts. Minimum score=1, maximum score=7. Bold writing indicates end point of the scale representing the value 7.

Figure 4.5 shows how the different adverts were characterised. In particular, the original versions of the two TV-adverts received favourable ratings, particularly the seatbelt advert. A MANOVA was conducted to examine whether there was an overall difference in mean scores on the five variables in relation to TV-advert and cut vs. original version. The results of this analysis showed that:

- The seatbelt advert received in general higher ratings than the fatigue advert, $F(5, 77) = 4.38, p < .001$. The differences on the items *exaggerated-realistic* and *manipulative–convincing* were however not significant.
- The original version of both spots was received higher ratings than their respective cut version. $F(5, 77) = 3.26, p < .01$ The difference did not reach significance on the items *exaggerated-realistic*.
- No significant interaction effect was present

A central assumption pertaining to the use of treat appeals is that this actually evokes fear. Figure 4.6 shows how much fear the respondents reported for both movies and versions of them. The same pattern can be seen for both spots; the original version evoked more fear that the cut version ($F(1, 83) = 7.78, p < .01$). There was no significant difference of importance between the original versions of the two adverts, i.e. both evoked the same amount of fear. We also tested whether there were any gender differences in the reporting of fear. As expected, males reported significantly less fear than females ($F(1,80) = 5.75, p < .05$). The mean gender difference was about 1 point on this the 7-point scale. There were no interaction effects between advert, version and gender.

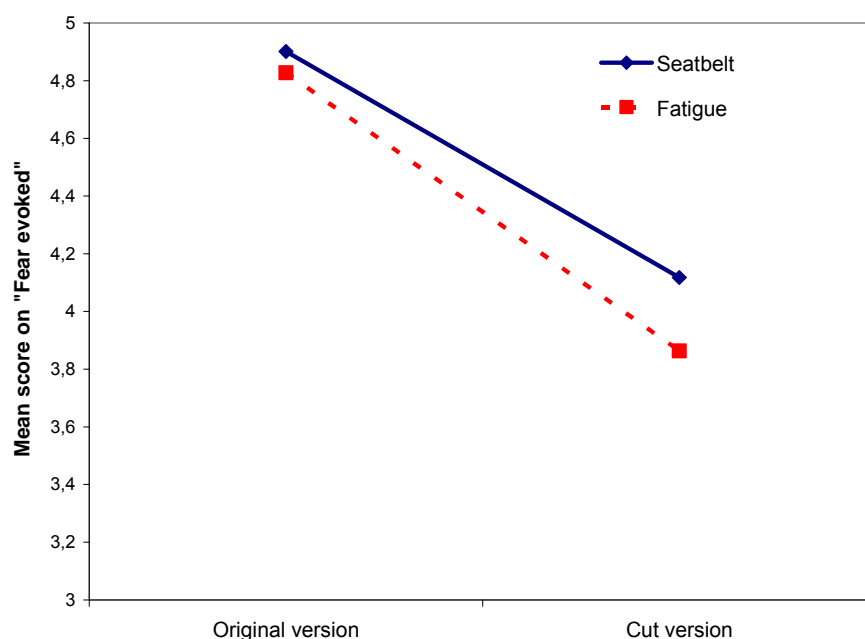


Figure 4.6. Mean scores on fear arousal by TV-advert and version. Minimum score = 1, maximum score = 7.

The same pattern as found in Figure 4.6 is also found when examining the mean scores by movie and version on the other emotions evoked (Figure 4.7). That is, there is no or only minor differences between the two original versions. A MANOVA showed an overall non-significant difference between the two movies. However, the original version of both adverts has higher mean scores on the emotions evoked as compared to their respective cut version $F(4, 80) = 3.27, p < .05$. This difference was significant on all emotions evoked, except from on "Intrusive". The seatbelt advert did however receive higher provocation rating than the fatigue advert, $F(1, 83) = 3.99, p < .05$. The only gender difference found was on fear evoked, where males had lower mean scores than females, $F(1, 83) = 6.10, p < .05$.

Thus, the results indicate that showing the consequences explicitly seem to result in more emotional arousal than not showing the consequences. It is primarily fear and unpleasantness that is the emotions evoked. The mean scores on intrusive were in general low, indicating the respondents did not feel very provoked after seeing the different movies. The latter is interesting since the use of fear appeals is debated, among other things because it might be perceived as intrusive, and thus provoking the receiver. This does not seem to happen to a large extent.

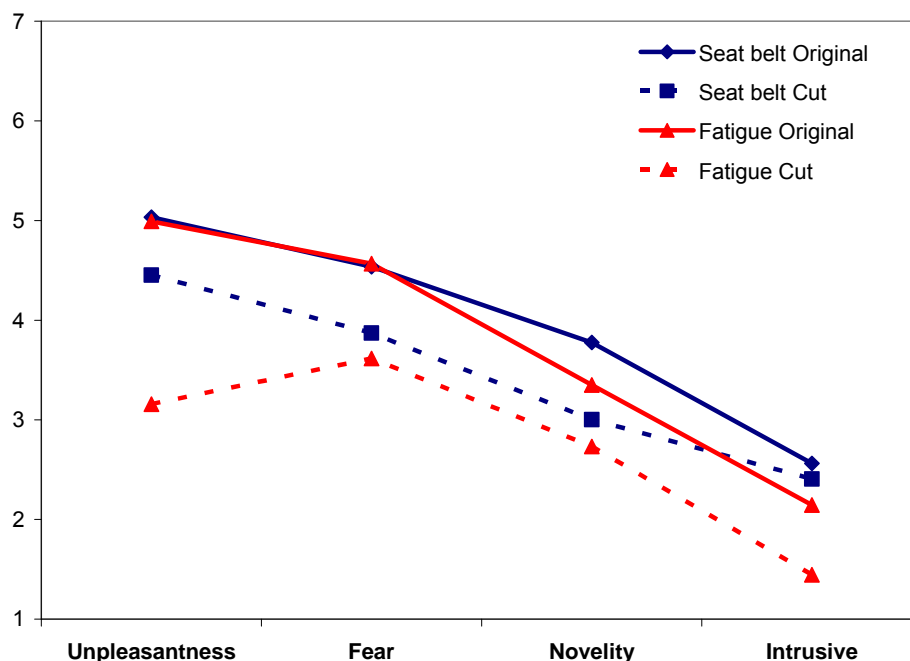


Figure 4.7. Mean scores on emotional arousal by TV-advert and version. Minimum score = 1, maximum score = 7. The mean scores are controlled for gender differences

Figure 4.8 shows mean scores on three selected measures of message response. The figure show a quite consistent pattern; the respondents who were watching the original version of the adverts felt that the message were more personally relevant, displayed more adaptive (danger control) and less defensive responses (fear control) to the message. Results from MANOVA showed that the overall differences was significant, $F(3, 78) = 8.18, p < .001$. The results from the MANOVA also showed that the seatbelt advert differed significantly from the fatigue advert $F(1, 78) = 2.73, p < .05$. A closer inspection revealed that this was due to more danger control (adaptive responses) among those who had seen the seatbelt advert. The difference between the two adverts was however not very large. No significant gender differences were found.

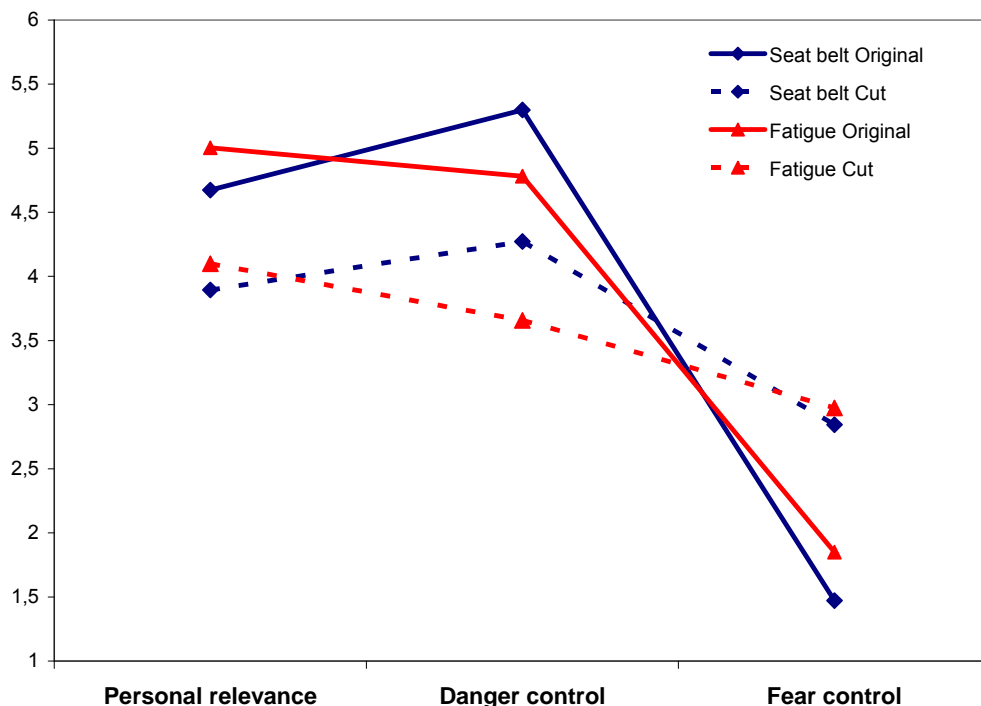


Figure 4.8. Mean scores on rating of message relevance and response by TV-advert and version. Minimum score = 1, maximum score = 7. The mean scores are controlled for gender differences

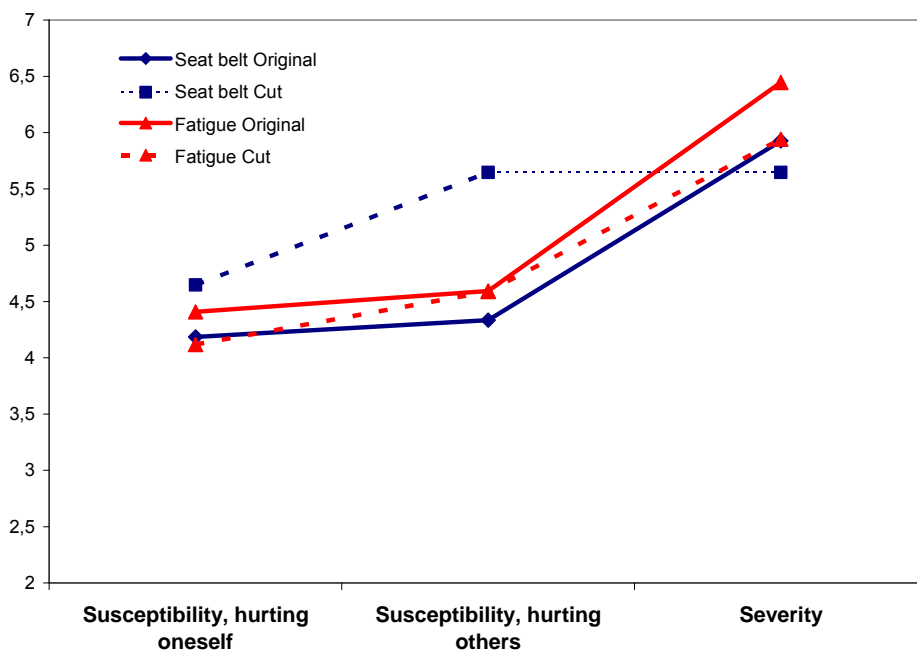


Figure 4.9. Mean scores on rating of susceptibility and severity by TV-advert and version. Minimum score = 1, maximum score = 7. The mean scores are controlled for gender differences.

The means scores on severity and susceptibility ratings are shown in Figure 4.9. An overall MANOVA test for differences in mean scores did not find any significant main

effects of advert, but the difference between original and cut version did reach near significance, $F(3,78) = 2,43$, $p = .07$. Further inspections showed that this could be explained by the cut version of seat belt advert, which seemed to produce more worry/susceptibility of hurting others as compared to the original version of the advert (as well as the two fatigue versions). There were as expected a significant overall gender difference, males had in general lower mean scores than females, $F(3,78) = 3.11$ $p < .05$.

To sum up, the two adverts and versions of them did not differ in mean scores on susceptibility of hurting oneself and perceived severity of hurting oneself. However, the cut version of the seatbelt advert seemed to produce more susceptibility (or worry as the question actually was worded) of hurting others, but this effect was not significant.

Individual differences in emotional arousal, severity, susceptibility and message acceptance/rejection

So far, we have examined effects of advert and version of these. The original versions of both adverts seem to give more favourable results than their respective cut version. However, there were large individual differences in emotional arousal within each of the experimental conditions. It could therefore be interesting to examine how individual differences in emotional arousal relate to how they responded to the advert. Is it so that high emotional arousal is beneficial or is an optimum level of fear arousal present?

Emotional arousal and feeling of severity and susceptibility

In order to obtain an effect of fear appeals it is regarded as important that the respondent of the messages feels vulnerable to the threat. In Table 4.3, the results of a multiple regression analysis showing the relationship between different emotions evoked and the respondents' rating of susceptibility and severity is shown. The effects of gender, advert, version seen, as well as the interactive effect between the two latter variables are also included in the model.

The results show that fear arousal relates to susceptibility of hurting oneself and others in a similar accident as the one portrayed in the advert – the higher fear arousal, the more susceptibility of hurting oneself and others. Fear arousal is however not related to severity ratings. One possible reason is a high mean score and low variance on this item ($M = 6.0$, $SD = 1.0$). The feeling of unpleasantness is also related to the three dependent variables, however only showing a significant relationship to susceptibility of hurting others.

Table 4.3. Multiple regression analyses with severity and susceptibility as dependent variables. Standardized coefficients listed (N=88)

	Severity oneself	-hurting hurting oneself	Susceptibility - hurting others
Advert (0= seatbelt, 1 = fatigue)	.23*	.01	-.05
Version (0= original, 1 = cut version)	-.11	.19	.35**
Gender (0 = male, 1 = female)	.25*	.11	-.04
Emotions evoked:			
Fear arousal	.06	.36**	.36**
Intrusive	-.06	-.13	-.02
Surprise	-.08	-.10	-.07
Unpleasantness	.19	.28*	.20
R ²	.18	.23	.23

The interaction effect between advert and version is not presented due to no increase in explained variance of the model.

Emotional arousal and message acceptance/rejection

Another central question is how emotional arousal is related to message rejection and message acceptance. In order to study this relationship, a multiple regression model with the activation of four different emotions and three different measures of message acceptance/rejection as dependent variables (personal relevance, danger control and fear control). In addition, severity, gender, advert seen, and cut/original version and the interaction term advert*version were all included as independent variables in the model.

Table 4.4. Multiple regression analyses with measures of message acceptance/rejection as dependent variables. Standardized coefficients listed (N=88)

	Message acceptance Personal relevance	Danger control (adaptive responses)	Message rejection Fear control* (defensive responses)
Advert (0= seatbelt, 1 = fatigue)	.06	-.21*	.31**
Version (0= original, 1 = cut version)	-.12	-.07	.31**
Gender	-.03	-.08	.01
Emotions evoked:			
Fear arousal	.46**	.50**	-.40**
Provocation	.00	-.11	.32**
Surprise	-.04	-.14	-.14
Unpleasantness	.02	.19	.11
Severity	.12	.12	-.29**
Susceptibility	.13	.15	.02
R ²	.35	.46	.49

The interaction effect between advert and version is not presented due to no increase in explained variance of the model.

*Logarithmic transformed variable

The results of the regression analyses demonstrated quite consistent results (Table 4.4). Fear arousal turns out as the strongest (and in some cases the only) predictor of all the three measures of message acceptance/rejection. This means that within all experimental conditions, participants experiencing most fear arousal also felt that the message was more personally relevant to them; they reported more danger control and less fear control as compared to participants experiencing low fear arousal. The relationship between fear arousal and the three dependent variables

were tested for possible curvilinear relationship (i.e. whether an optimum level of fear arousal was present), but no such relationships were found.

Fear arousal was the only significant predictor of feeling the message as personally relevant. In accordance with previous results, the seatbelt-advert generated a bit more danger control and somewhat less fear control as compared to the commercial portraying fatigue. In addition, the cut version of both adverts generated significantly more fear control (defensive responses) as compared to the original versions.

Discussion of the results from the experiment

The results from this specific experiment indicate that it is beneficial to apply adverts generating high fear arousal. The adverts displaying the consequences of the road accident explicitly generated more emotional arousal, particularly fear arousal. In the next turn, fear arousal was related to more susceptibility of hurting oneself or others, a higher feeling of personal relevance of the message, less fear control (defensive responses) and more danger control (adaptive coping responses). The hypothesis that it is beneficial to let the receivers themselves fill in the missing gaps of the story (i.e. the principle of closure) was not supported.

No evidence for a curvilinear relationship between fear arousal and message acceptance was found. The latter is interesting, since one could expect that if the level of fear is very high, defensive reactions are likely to occur. This does not seem to be the case, the results suggests that the more fear aroused, the better.

It is important to note that although showing the consequences explicitly seems to be advantageous, this does not necessary mean that personal injuries in the crash must be showed explicitly (i.e. the use of “shock” effects like blood, heads smashing into each other etc.). This is because the two original versions of the adverts performed equally well in arousing fear, although the advert portraying fatigue only showed a car crashing and not explicit how the persons inside the car was injured/killed (as done in the seatbelt advert). Thus, the results indicate that it is beneficial to show the full accident story (i.e. the vehicle crashing), but it is not necessary to show consequences of personal injuries in detail.

This was primarily a pilot study and has, of course, many limitations. One is that the effects were measured immediately after the participants had seen the TV-advert. Thus, no long-term effects or effects upon road user behaviour were measured. Including more males in the sample would have improved the external validity of the study. The dominance of females in the sample may have exaggerated the seemingly positive effects of fear arousal since previously mentioned studies have found that females tend to respond more favourably to fear appeals than males (see e.g. Goldenbeld, Twisk and Houwing, 2008, Tay and Ozanna, 2002).

Nevertheless, the results of the different experimental conditions were quite consistent, suggesting that it is advantageous to evoke fear arousal in order to promote cognitive elaboration of the message immediately after seeing the advert. However, we would like to add that this is by no means a general conclusion or recommendation pertaining to the use of fear appeals.

4.8.1.6 Conclusion on the use of fear appeals

The use of fear appeals in campaigns is an area where research has shown that many moderator variables are of importance for the effect such as who the target group is (e.g. males vs. females), their involvement in the subject message (feeling of personal relevance/vulnerability) and the response efficacy of the preventive actions. Furthermore, the effect measured immediately after exposure may be different when measured at later points in time. All these variables are rarely taken into account in the same study, and this is probably one of the main explanations of the seemingly conflicting effects of fear appeal messages (an exemption is, however, the study conducted by Lewis, Watson and White, 2008). Still, the contradicting results from different studies show that it is very difficult to reach a firm conclusion pertaining to the use fear appeals. This conclusion is in line with other recent reviews of the effect of fear appeals in road safety campaigns; see e.g. SWOV (2008).

To sum up, the effects of fear appeals are far from clear and unequivocal. When designing a fear appeal campaign the best advice is to do thorough pre-testing of the message, taking the above mentioned moderator variables into account.

4.8.2 Humour

Humour has been used in road safety campaigns, but not much research has been done on the effect of humour neither in this area nor in the general public health area. One exemption from the field of road safety is a recent study conducted by Lewis, Watson and White (2008) presented in section 4.7.3.4. Still, most of the research on the persuasive effect of using humour in campaigns has been done relating to general advertising. Although it is questionable whether results obtained in this area can be directly transferred to the public health or the road safety area, a review of relevant results is presented in the following sections.

4.8.2.1 Theories behind humorous appeals

Humour is supposed to work primarily through the heuristic/peripheral processing (Lyttle, 2001; Conway & Dubé, 2002). Based on previous literature Lyttle (2001) lines up a number of ways that humour can be effective in persuasion:

- humour can create positive affect, and according to persuasion theory people who are in a good mood are less likely to disagree with a persuasive message
- humour can increase liking for the source of the message
- humour can increase trust in the source of the message
- humour may block systematic processing of the message by distracting the audience from constructing counterarguments.

4.8.2.2 Effect of humorous appeals

The overall result from the advertisement area is in some ways close to the result from the fear appeal results: Many factors seem to be of importance for a positive effect, and the importance of the factors varies according to subject, audience composition, type of humour, type of product to be sold etc.

Weinberger & Gulas (1992) reviewed previous research in the area and found that

- humour attracts attention

- humour does not seem to affect comprehension, although results are varied
- humour does not lead to increased persuasion in comparison to non-humour
- humour does not enhance source credibility
- humour enhances liking (of the product and/or the source)
- humour related to the issue in question work better than unrelated humour
- audience factors affect humour response
- humour works better with existing than with new products.

In a meta-analysis by Berneman, Bellavance, & Jabri (2005) it was found that cognitive measures were not affected by humour in ads, while attitude toward the ad, attitude toward the brand, and purchase intention were higher in the presence of humour. The lack of effect on cognitive measures found in several studies supports the idea that humour mainly works through peripheral processing. Monahan (1995) argues that peripheral processing does not give as lasting effects as central processing, and this is therefore a negative side of humorous messages.

The effect of humour has been studied in a few studies on health issues other than road safety. In comparison to a neutral message some studies find humorous appeals to be more effective (e.g. Biener, Ming, Gilpin & Albers (2004). Weber, Martin & Corrigan (2006), found that viewers of a humorous message on organ donation more often signed up as donors afterwards than viewers of a sad or a neutral message. Other studies do not find humour to be superior to neutral messages (Brooker, 1981). Fear appeals were estimated by the audience as more effective than humorous appeals in one study (Biener, Ming, Gilpin & Albers (2004), but less effective than humour in changing behaviour in another (Brooker, 1981). As shown also for fear appeals the effect found seems to vary with the effect measure level (e.g. retention, attitudes, intention, actual behaviour etc.).

A focus group study on emotional appeals in road safety conducted by Lewis, Watson, White & Tay (2007a) concluded that positive emotions were experienced as superior to negative appeals when it came to promoting the preventive measure. They stressed the importance of including a preventive strategy (ensuring a high degree of efficacy) also in humorous appeals.

Lewis, Watson and White (2008) compared the effects of positive (humorous) vs. negative (fear based) appeals in anti-drink driving messages. The effect upon attitudes, behavioural intentions and behaviour was tested both immediately after and 2-4 weeks after exposure to the message. The results showed that immediately after exposure, those being exposed to negative appeals had less accepting attitudes towards drink driving and had lower intentions to drink and drive compared those being exposed to positive appeals. However, 2-4 weeks after, the group who was exposed to the positive appeal reported more ideal attitudes towards drink driving than immediately after, whereas those seeing the negative appeal had not improved further in their attitudes towards drink driving. This suggests that the effect of fear appeals appears immediately after exposure and is then stable over time (at least for 2-4 weeks), but that the effect of positive appeals appears after a time delay. It is important to note that improvement over time was significant only among those reporting high involvement in the issue (i.e. perceiving the message to be of personal relevance). Although the attitudes in the group being exposed to humourous appeals improved over time, there was still a significant difference in attitudes

between the two types of appeals 2-4 weeks after exposure in favour of the negative appeals.

However, the study suggested that using positive appeals may be more efficient than negative appeals for males with high involvement in the issue (high feeling of personal relevance). Two to four weeks after exposure, males with high involvement being exposed to the positive appeal reported less driving over the legal BAC limit than to males with high involvement being exposed to the negative appeal. Thus, this suggested that it is more effective to expose males for positive than negative appeals as long as they feel that the message is personally relevant to them.

Defensive responses are not expected as a result of humorous appeals as was the case for fear appeals. There are other risks of a negative effect when using humorous appeals on health and road safety, for example if the audience finds it inappropriate or offensive to use humour in connection with serious problems (Weinberger & Gulas, 1992; Lewis, Watson, White & Tay, 2007).

4.8.2.3 Age, gender and other personal characteristics

As presented above, the study conducted by Lewis, Watson and White (2008) suggests that humorous road safety appeals are most effective for males as long as they perceive the message as personally relevant.

Studies from other areas than road safety have also found that humour has a better effect on men (Weinberger & Gulas, 1992; Berneman, Bellavance, & Jabri, 2005). Weinberger & Gulas (1992) in a review narrows it down to younger men with higher education in advertisement studies. In education studies no gender difference was found, though. They argue that gender difference may partially be explained by differences in what kind of humour is typically being appreciated by men and women respectively, seen in relation to the kind of humour used by the ads. "Much of the variation based on gender, and perhaps age and race as well, may be explained by divergent perspectives of the creator of the humorous manipulation and the receiver of that manipulation. Thus, the 'shared point of view' between the creator of the ad and the target of the ad is a potentially important intervening variable in humour effectiveness." (p.52). Weinberger & Gulas generally stress the importance of taking audience factors such as age, gender, education, culture etc. into account and investigate how these factors relate to the object of the humour (i.e., the butt of the joke).

One study has focused on masculinity traits in personality – irrespective of gender – and the influence of this on the perception of humour (Conway & Dubé, 2002). They based their study on evidence that high-masculinity individuals have a distress-avoidant orientation, and argue that this response is congruent with many features of humour appeals. In agreement with this hypothesis they found, that high-masculinity subjects scored higher in intention to use preventive measures (sunscreen against skin cancer/condoms against AIDS) following a humorous appeal than after a neutral appeal. No difference was found for low-masculinity subjects.

4.8.2.4 Discussion

As for fear appeals it must be concluded that many factors seem to play an important role for the effect of humorous appeals. The main conclusion, however, is that very little is known about the effect of humorous messages in health issues in general and in road safety in particular, as most research up to now has focused on general advertising. Still, there are some indications that the use of humour/positive appeals might be effective for males who feels that the message has personal relevance to them. The use of humour can thus be an alternative to the use of fear appeals, as recent studies suggests that fear appeals are not that effective for this group of males (Lewis, Watson & White, 2008).

The effect of humour was also tested in the CAST meta-analysis of seat belt campaigns, presented in CAST deliverable 1.3. The results showed that seat belt campaigns using a form of humour in the message were found to be less effective than those not using humour (i.e. not as successful in increasing the seat belt wearing rate). This suggests that it is not a good idea to use humour, at least not in seatbelt campaigns. However, it is important to not that is was not possible to examine gender specific effects in the

The use of humour in road safety campaign is quite common in some countries, as shown in CAST deliverable 1.3. Thus, there might be cultural differences in how the receivers respond to the use of humour, meaning the use of humour can be more effective in some countries than others. The recommendation concerning the use of humour in road safety campaigns is that same as for the use of fear appeals: thorough pre-testing of the message is necessary.

5 CONCLUSION

One major dilemma in road safety promotion is that the individual road user often feels that it is quite safe to perform different types of behaviours being related to an increase in the risk of accidents and/or injuries. Therefore, attempts to market/promote safe road user behaviour faces other challenges than promoting new products. It is therefore especially important to understand the motives underlying the road users' behaviour.

Based upon the review of general behavioural models and the development of an eclectic road user model, **a general recommendation is that road safety campaigns should influence road users both inside and outside the context in which the behaviour we want to influence occurs.** Attempts to persuade the road user can take place both within and outside this context. A recommendation drawn from the review presented in chapter 4, is that it is very important to understand the target group's interests and needs in addition to their motives underlying the behaviour we aim to promote or change. This knowledge may help to tailor the message of the campaign to its target group, and thereby increasing the likelihood of the target group perceiving the message as being personally relevant to them. This feeling of personal relevance is believed to enhance the probability of the message being mentally elaborated by the receiver. Additional methods that can enhance mental elaboration of the message are the use of mental heuristics, focusing upon cognitive dissonance and the actor-observer bias, using personal communication and including emotional appeals in the message. The inclusion of a clear response recommendation in the message is also believed to be beneficial.

The results from the CAST meta-analysis of campaign effects suggest that it is advantageous to use personal communication and addressing risk of harm in the campaign message. The use of humour has on the other hand a negative effect on seat belt wearing rate. Still, due to a number of conflicting research results we would not recommend that fear appeals should be included and that humorous appeals should be avoided in the campaign message. Thorough pre-testing of the campaign message is on the other hand strongly recommended to obtain some indications of whether the message has the intended effect.

Another important finding in the CAST meta-analysis is the beneficial effect of applying "In-context" measures, in this case in form of feedback upon drivers' speed, billboards along the roadside etc. and the use of enforcement. The advantage of several of the "In-context" measures is that this easily causes a behavioural change, but the drawback is that the change can be only temporary. For instance, the effect of visible, stationary speed enforcement on speeding may be present for up to six weeks after enforcement is ended, but then tend to disappear (Vaa 1993). The disadvantage of only influencing different kinds of behavioural beliefs (which mostly compromise "Off-context" measures), is that this may have no effect on behaviour at all. However, it is suggested to combine the two strategies. If one succeeds in changing behaviour first (although temporary), an experience of cognitive dissonance between behaviour and beliefs is likely be present. Thus, the receiver may be more open to change his/her behavioural beliefs when these are not in

correspondence with behaviour. Combining this (forced) behavioural change with arguments addressing why one should refrain from e.g. speeding can therefore have the potential of obtaining a change in the different beliefs underpinning behaviour and thereby give a more permanent change in behaviour.

In other words, this suggests that one should aim to influence behaviour directly, before or at the same time one influences the beliefs thought to underpin behaviour. This is a strategy that is a bit different from the classical campaign strategy of indirectly changing behaviour through primarily changing road users' beliefs. However, influencing the most relevant belief is still believed to be advantageous in order to obtain a more permanent change in the motivation underpinning behaviour, as long as this is accompanied by measures taken to influence behaviour directly, like "In-context" measures.

The development of seat belt wearing rate in Norway can exemplify this (Figure 5.1). In the early 1970, information campaigns were applied in order to promote seat belt usage among drivers. The campaigns were not found to have any effect upon seatbelt wearing rate. In 1975, it was mandatory for drivers to use seat-belts and the wearing rate increased a bit, but the largest increase occurred after roadside controls were introduced (i.e. a "forced" behavioural change). Interestingly, attitudes towards seat-belt usage have been quite positive since (Statens vegvesen, 2004). This could be due to the ongoing information campaigns after control activity was introduced giving the driver reasons for using the seat belt.

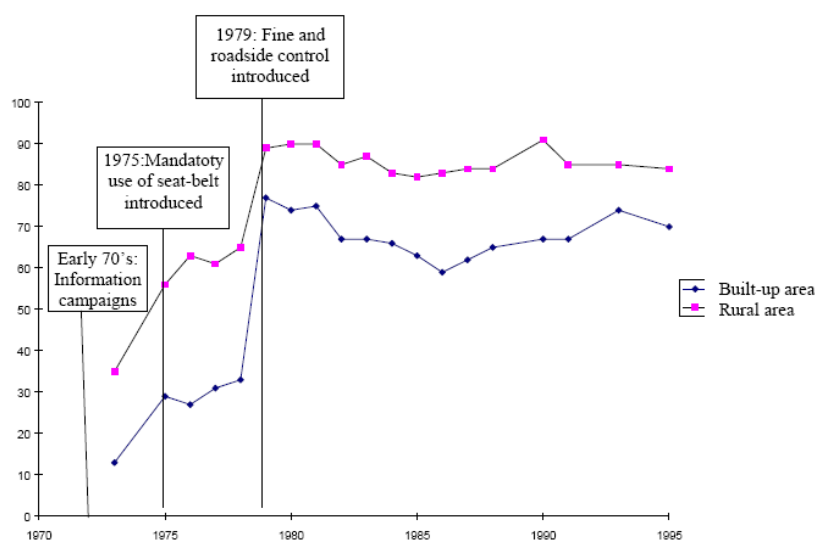


Figure 5.1. Development of seatbelt wearing rate in Norway (Figure adopted from Elvik and Vaa, 2004).

Another more current example of the combination of "In-context" measures and "Off-context" measures is the Belgium fatigue campaign being carried out as a part of the CAST project (WP 5). The target group of the campaign is young drivers aged 18-25 years and aims to prevent them from falling asleep behind the wheel at night-time in

weekends. The central message of the campaign is “If you feel tired, take a powernap!” The campaign includes various “In-context” measures like the distribution of information leaflets outside youth clubs, restaurants and cafés when these closes at night-time in weekends (i.e. just before driving home), radio spots at night-time in weekends (i.e. could be heard when driving and feeling tired), roadside posters showing where the driver can stop to take a nap (called pit-stop). In addition, “Off-context” measures like an online campaign website with information is available and small posters portraying the campaign message is put up on youth clubs etc. (the latter can also be seen as an “In-context” measure since drivers can be reminded of the message just before driving off at night-time). The “In-context” measures can thereby be seen as stimuli (cues to action) reinforcing a feeling that the driver already has or soon will have – the feeling of being tired. This is further reinforced by giving a clear response recommendation and providing “Pit-stops”. This might also be an example of combining attempts to influence emotions (experienced In-context) with more cognitive/rational measures (applied both In-context and Off-context).

The Belgium fatigue campaign can also be an example of applying the general principles of Social Marketing. First, a thorough analysis of the problem and the target group was applied. The terms product, price, places and promotion can also be identified in the campaign strategy. The *product* benefits can be said to avoid accidents and also to do something that the body tells you – to take a nap. The *price* is a bit similar, that is, being involved in an accident. Pit stop - *places* – were established to stop and sleep. The message were *promoted* by advertising, personal communication and billboards along the roadside.

Although this campaign strategy is believed to be effective, it is no guarantee for a successful campaign. Still, too many road safety campaigns are not evaluated at all or the evaluation of these is of limited value. This brings us to our final chapter; key elements of evaluation.

6 KEY ELEMENTS OF EVALUATION

A detailed description of recommended evaluation design (and adherent key elements) will not be the scope here as these issues are addressed separately and thoroughly described in both WP2 and WP3. What is sought here is rather to extract the essence of deliverable 1.3, i.e. the main aspects of the proposed model and convert these aspects to variables that should be observed, measured and analyzed in an evaluation of a given campaign. Deliverable 1.3 specifies three main evaluation areas:

- Key behaviours to be observed and measured
- Models that can explain road user behaviour
- How to influence

6.1 KEY BEHAVIOURS TO BE OBSERVED AND MEASURED

Measurements of accidents/injuries before and after the campaign was implemented are a sort of “gold standard measure” if the aim is to reduce accident/injuries. To obtain this aim, campaigns usually aim at changing certain types of road user behaviour. There is one basic criterion for selecting behaviour that could be subjected to road safety campaigns: A documented relationship between a behaviour and the number of accidents/level of injury, meaning that if you reduce the frequency of a given behaviour a reduction in the number of accidents is expected to follow. Likewise with the level of injury: If the level of seatbelt use or helmet use is increased, a change for the better regarding level of injury is expected to follow. As shown in D1.2 such relationships are documented for these behaviours:

- Behaviours associated with the number of accidents: Speeding, drink driving, drug driving, yielding violations, close following, dangerous overtaking, red-light running, driving when fatigued, violation of driving-and-resting-time regulations, use of mobile telephones
- Behaviours associated with reduced level of injury: Increasing seatbelt use, child restraint, helmet wearing and protective clothing

Thus, before-and-after measurements of the behaviour we aim to influence are essential in order to find out if the aimed behavioural change has occurred after implementing the campaign.

Furthermore frequency and intensity of a given behaviour should be considered and measured on evaluating the campaign effects: the *frequency* is the number of violations (e.g. exceeding the speed limit twice a week) and the *intensity* is how severely the violation has been violated....”

If this is measured through a self-report questionnaire, the following scenario can be included:

Speeding in an urban area: You are driving through an urban area. Cars are parked on each side of the road and there are about ten pedestrians who are walking on the pavement. The time is 11.30 on a fine and dry day. The road has a 50 km/hr speed limit but you are driving at 65 km/hr;

To assess *frequency* a measure of how often the behaviour is carried out could be added. To assess the *intensity* one further question could be included with the respondents being asked to consider the same scenario and then indicate how fast they can imagine themselves to be driving.

6.2 KEY VARIABLES PREDICTING BEHAVIOUR AND ACCIDENTS TO BE OBSERVED AND MEASURED

Behaviour is usually not influenced directly in road safety campaigns, but indirectly through influencing variables believed to influence behaviour. In chapter 2, several theoretical behavioural models were presented, and a comparison between these showed a great deal of overlap between the different models. In addition, more specific road user models were presented and an eclectic model was finally proposed.

The theoretical model underpinning the intervention can in many cases be regarded as a causal chain – e.g. influencing drivers' attitudes, perception of social norms etc. is expected to change intention which in turn is expected to be closely linked to behaviour (and thereby hopefully reduce the number of injuries/accidents). If possible changes in these variables are monitored, then possible explanations of why the campaign worked or not worked could be reached. Even though a campaign is not explicitly based upon a theoretical model, the main principles below are still relevant – try to measure changes in the believed “causal chain “ that is believed to end up in a behavioural change and/or change in injuries/accidents. However, in this context a note of warning is needed which refers to specificity. The problem with many studies in the past is that they try to explain specific behaviours from general attitudes or vice versa. Many drivers would argue that speed limits are desirable but some of them would still violate. If the aim is to establish whether the link between attitude and behaviour has become stronger after the campaign, it is not very useful to collect information on drivers' general attitudes to speed limits if the campaign tried to reduce the speed in urban areas. Instead both attitude and behaviour needs to be measured on the same level (i.e. 65 km/hr in an urban area) and more specific questions are therefore needed.

Very few intervention studies use theoretical models and if they do, the models are more used as a framework. Surveys very rarely include the suggested measures and furthermore very few analyze the data as indicated by the theories. Thus, at the present stage it is very difficult to ascertain whether it is beneficial for campaigns to be based upon specific theoretical framework or not. We are thus not able to reach any firm conclusion of which theories road safety campaign should use or which variables they should try to influence. Examining whether the campaign succeeds in changing key variables believed to influence behaviour is therefore not only

advantageous for the evaluation of a single campaign, but this will also provide much needed knowledge about the effectiveness of different theoretical models used for interventions.

For instance, the Foolspeed campaign described in chapter 2 did not seem to produce a change in neither intention to speed nor speeding behaviour. Since the campaign did not seem to change the most important predictor of intention and behaviour (perceived behaviour control) this might be a possible explanation of why a change in intentions and behaviour did not occur. This is, however, one of the few evaluations also measuring changes in key variables thought to influence behaviour.

As presented in chapter 3, cognitive elaboration of the message seems to be important if a (permanent) change in beliefs/attitudes is sought. This may be an explanation why a campaign failed or succeed. Furthermore, the degree of felt personal relevance to the message is important in order to motivate for mental elaboration of the message. Thus, examining how much the campaign succeeded in creating a feeling of personal relevance and promoting mental elaboration of the message could be an additional key variable to include.

A recommendation is therefore that the evaluations ideally should aim to **measure changes in the target variables that the campaign aims to influence**, that is not only the final outcome variable(s). In WP2 and WP3, it is described more in detail how to measure such variables.

6.2.1 The reporting of outcome measures for future use in meta-analysis

An experience from CAST, GADGET and INFOEFFEKT projects is that a number of studies had to be dropped from the meta-analysis because they do not contain enough statistical information about the central outcome variables. In many cases changes in e.g. mean speed before and after may have been reported, but standard deviations are not reported. The latter is necessary in order to estimate an effect size necessary for including the study in a meta-analysis. Other studies report percentage speeding. A standard way of reporting speeding would help a lot when comparing different campaign evaluations. As suggested by this report measures used to assess changes in speeding, drink-driving and other behaviours, should ideally describe *intensity* as well as *frequency* of behaviour where this is relevant. Another problem in CAST was that a change in the percentage of drivers wearing a seatbelt was reported, but the sample size was not reported. This made it difficult to give the study the appropriate statistical weight in the meta-analysis. Attempts were also made in CAST to assess the effects of campaigns on attitudes, but the measures used to assess attitudes were nearly always lacking, either in the extent to which they related specifically to the desired impact campaign message and/or in their statistical robustness; often only one item was used to assess an attitude.

Independent of outcome variable, it is also worth re-stating the message from GADGET and INFOEFFEKT that too many studies do not report even the minimum of one before and one after measure. Even when these are reported, the precise timing of each measure in relation to the campaign period can be absent from the evaluation study. It is recommended that before and after measures are reported in graphs, tables and texts not just as 'before' and 'after' levels of the outcome measure

but '[amount of time] before' and '[amount of time] after'. This will enable learning about any growth or decay in the strength of campaign effects, and force the reader to consider timing in relation to their own campaign.

In order to satisfy the inclusion in meta-analysis, evaluation studies must report:

- sample size
- mean and standard deviations before and after for key variables with a continuous measurement level
- absolute change in numbers before and after, not only percentage change if the key variables is measured at categorical level (e.g. using seatbelt/not using seatbelt)
- precise timing of measures taken in relation to campaign period
- behavioural intensity, where relevant

6.3 KEY ELEMENTS REGARDING “HOW TO INFLUENCE”

In chapter 3, general and specific principles of how to influence were presented. These are mainly specific types of measures, and the effect of including some of these could partly be examined in the CAST meta-analysis. Having completed GADGET (1999), INFOEFFEKT (2004) and the coming completion of the CAST project, a common denominator of evaluation studies is the lack of details in providing information about what has been going on during a campaign period. This is especially true regarding the impact of media that has been used. Very seldom are there any documentation of frequency, duration, content, audience, catchment area, etc. To understand the impact of media, detailed characteristics of media use is required. In these respects, evaluation studies are far from perfect. Given the limitations, however, a picture of predictors emerges and some comments of the relevance of probable predictors are put forward as follows, according to whether they describe the way the campaign is delivered, the content that is delivered, or the backdrop to the campaign:

Delivery predictors

- The **main mass media** is usually defined as TV, radio and newspapers. However, mass media should also include the use of the internet, email and SMS (text messages using mobile phones). The use of these “new” technologies has gained growing popularity, and will probably be central channels for distributing messages in future road safety campaigns. An interesting characteristic with these “new” technologies, is that these may open up the possibility of interactive communication and the opportunity of delivering the message in personalised manner. Measurements of these media are naturally important and must be reported if used even if the success of their impact so far has been limited. More detailed descriptions of the cost, frequency and number of e.g. spots, site hits, SMS sent are needed.
- The status of media as **posters, leaflets and billboards** is rather unclear, sometimes they are classified as “mass media” – sometimes not, and the distinction between posters and billboards is often not clear. The precise context in which they are used and handed out is often unclear and seldom

described, but handouts may be significant if they initiate talks and discussions with a target group. If this is the situation, it may initiate and resemble some form of personal communication, but this is impossible to judge if not reported specifically in the evaluation report.

- **Personal communication** is important as a variable to be recorded in a campaign. It was one of the few significant predictors in INFOEFFEKT; in CAST the effect is lower, but still present. If personal communication has been applied, the type (face-to-face, peer influence, two-step model, personal letters) should be described.
- **DVD, video, cinema, internet:** No effects are found so far, but they may be important in given contexts, for example by initiating talks and discussions with/in the target group. Few evaluations of internet-based campaigns have been found so far, but is of course a coming medium that must be recorded if present.
- **“On-the-road”-information: Billboards** may be different from leaflets and posters and may be classified in three distinct types: 1) As static information at fixed (urban) sites away from the road, 2) As static information on boards at the roadside, or 3) presented at the roadside along the road where people are driving. If billboards are of the latter types, they may have impacts on drivers by providing information and “thoughts” that may be provoked or elicited when people are driving by. Active **feedback**, for example of driving speeds, seatbelt use rates or local road fatalities, is a potentially influential measure that should be recorded, although the range of effects – “the distance halo” - might be limited.
- **Enforcement** of campaign message, which could also be considered as a type of “on-the-road”-delivery of the information (different to billboards or feedback), should be recorded whenever present.
- **Duration of campaign:** Duration was a significant predictor in INFOEFFEKT and still is in CAST, even though the length of those durations that are significant are different between the two.
- **Scale of campaign:** Should be recorded even if the status of regional/province/local is unclear and difficult to define. Further, we may spot a move from more national towards more local campaigns in terms of effectiveness and also in terms of target audience.
- **Target:** Clear identification of the target audience for delivery may be important for campaign effectiveness.
- **Scope.** Attempts were made in CAST to identify the size of the target group in relation to the whole audience captured by the delivery media. There was not enough information in the evaluation studies to be able to pursue this ratio but it remains a potentially useful predictor. In the absence of this ratio, a qualitative assessment about whether the campaign was focused on a **limited area**, such as an organisation or car park could be made, as done in CAST.

Content predictors

- **Theme of campaign:** It is self-evident that campaign themes must be specified and recorded. INFOEFFEKT indicated that multi-theme campaigns were less effective, but this is not confirmed in CAST. A significant issue might be whether the theme – or themes – is clearly communicated to the target audience i.e. single-theme campaigns might be more effective than multi-theme campaigns in terms of communication ease with the target audience.
- **Content of the message:** Evaluation of campaigns might only focus on if the person has noted the campaign, that is, mere exposure. However, this says very little about if it has started a process of elaboration and how it has been interpreted. So the right question to ask is not “*what does our message do to the target group*” but “*what does the target group do with our message*”. Important predictors which need to be monitored are therefore, if it is seen to be important, useful, clear, trustworthy, attractive and, in particular, **personally relevant**.
 - **Use of emotion/showing consequences.** The effect of campaigns attempting to elicit **fear** is still unclear and findings are so far inconclusive. A further recording of its use is then naturally justified. If a fear/threat appealing message is applied, it is important to register whether effective provide clear and efficient recommendations or coping strategies of how to avoid the threat, that is, whether the message includes high or low **response efficacy**. Regarding seat-belt campaigns, the use of **humour** seems negative, it does not improve the effect, rather the opposite. The result is quite persistent across several predictor models that have been tested. In CAST two main attempts were made to explore effects of emotion in campaign content, by identifying first whether campaigns showed shocking or non-shocking consequences, and second whether their content was generally emotional, rational or both emotionally and rational. The difficulty of these subjective assessments was again exacerbated by the limited descriptions of campaign content found for most evaluation studies. The bottom line is that the use of emotions, with or without combining it with more neutral or rational message styles, is far from conclusive. A further recording of “emotional predictors“ is not only justified, but a classification, “what to look for”, and “what to record” needs further discussion - a discussion that will continue beyond the CAST project.
- **Risk:** Studies should identify whether the campaign content addresses risk of apprehension (by authorities) or risk of harm (to self or others). Risk of apprehension might even be more important than enforcement, as it might be the *increase* of the risk of apprehension effected by the campaign content that is the significant mechanism, not necessarily the presence of enforcement itself. Showing the risk of harming others or oneself if not using seatbelts, seems beneficial for promoting seatbelt use, and maybe related to emotion.

- **Key variables:** If the campaign is based on a theoretical model then it should be clear how the different constructs are addressed both in the message itself and how it is being evaluated.

Background predictors

- **Decade or year of publication:** This predictor is included automatically, but its indirect relevance may be that the effects of more recent campaigns might be explained differently than of older campaigns.
- **Country:** Is recorded automatically. Confirmed to be a significant predictor.

This information is of course not that relevant for evaluating a single campaign, but very relevant for including the evaluation study in a meta-analysis. Giving detailed information about these variables certainly make the process of conducting meta-analysis easier as well as ensuring the inclusion of more evaluation studies in future meta-analyses.

7 REFERENCES

- AAB Asea Brown Boveri (1993). *Das Programm T50*
- Åberg, L. (1993). Drinking and driving: Intentions, attitudes, and social norms among Swedish male drivers. *Accident Analysis and Prevention*, 3, 289-296.
- Abraham, C., & Sheeran, P. (2003). Evidence that anticipated regret strengthens intentions, enhances intention stability, and improves the intention-behaviour consistency. *British Journal of Social Psychology*, 42, 495-511.
- Abraham, C., & Sheeran, P. (2004). Deciding to exercise: The role of anticipated regret. *British Journal of Health Psychology*, 9, 269-278.
- Ahrens S. (1987). *Ein Beitrag zur Beschreibung des Sicherheitsempfindens von Fußgängern auf innerstädtischen Straßen*, BAST Forschungsbericht 165, Bergisch Gladbach
- Ajzen, I. & Fishbein, M (1980) *Understanding attitudes and predicting social behaviour*. Prentice Hall, Englewood Cliffs. N.J.
- Ajzen, I (1985) From intentions to actions: A theory of planned behaviour. In Kuhl, J & Beckmann (eds): *Action control. From cognition to behaviour*. Berlin, Springer Verlag, pp 11-40
- Ajzen, I. (1988), *Attitudes, personality, and behaviour*. Milton Keynes, UK: Open University Press.
- Ajzen, I. (1991). The theory of planned behaviour. *Organizational Behaviour and Human Decision Processes*, 50, 179-211.
- Ajzen, I. (2002). Perceived behavioural control, self-efficacy, locus of control, and the theory of planned behaviour. *Journal of Applied Social Psychology*, 32, 1-20.
- Ajzen, I. (2005). Laws of human behaviour: symmetry, compatibility, and attitude-behaviour correspondence. In Beauducel, A., Biehl, B., Bosnjak, M., Conrad, W., Schönberger, G., & Wagener, D. (Eds.). *Multivariate Research Strategies*. (pp. 3-19). Aachen, Germany: Shaker Verlag.
- Ajzen, I. (2006). Construction of a TpB questionnaire: conceptual and methodological considerations. September 2002 (Revised January, 2006. www-unix.oit.umass.edu/~ajzen/.
- Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behaviour*. Englewood Cliffs, NJ: Prentice-Hall.
- Ajzen, I., & Driver, B. L. (1991). Prediction of leisure participation from behavioural, normative, and control beliefs: an application of the theory of planned behaviour. *Leisure Sciences*, 13, 185-204.

- Ajzen, I. & Fishbein, M. (2000). Attitude and the attitude-behaviour relation: reasoned and automatic processes. In W. Stroebe, & M. Hewstone (Eds.). *European Review of Social Psychology, Vol 11*, pp. 1-33. Chichester, UK: Wiley.
- Ajzen, I. & Fishbein, M. (2005). The influence of attitudes on behaviour. In D. Albarracín, B. T. Johnson & Zanna (Eds.). *The Handbook of Attitudes* (pp173-221). Mahwah, NJ: Erlbaum.
- Albarracín, B. T. Johnson & Zanna (Eds.). *The Handbook of Attitudes* (pp173-221). Mahwah, NJ: Erlbaum.
- Albarracín, D., Fishbein, M., Johnson, B. T., & Muellerleile, P. A. (2001). Theories of reasoned action and planned behaviour as models of condom use: A meta-analysis. *Psychological Bulletin, 127*, 142-161.
- Allais, M. (1979): The Foundations of a Positive Theory of Choice Involving Risk and a Critism of the Postulates and Axioms of the American School. In M. Allais & O.
- Alm, H. & Nilsson, L (1995) The effects of a mobile telephone task on driver behaviour in a car following situation, *Accident Anal. Prev.* **27** (1995), pp. 707–715
- Amundsen, A.H. (2004) *Sikring av små barn i bil. Evaluering av et informasjons- og kontrollprosjekt i seks fylker [Use of child restraint systems in Norway]*, TØI report 732/2004.
- Appleton, A. (2007): *Appeals in road safety advertising: What do young adults respond to in the mass media?* University of Otago, National Honours Colloquium Paper 2007
- Armitage, C. J., & Conner, M. (2001). Efficacy of the theory of planned behaviour: A meta-analytic review. *British Journal of Social Psychology, 40*, 471-499.
- Armitage, C. J., & Conner, M. (2001). Efficacy of the theory of planned behaviour: A meta-analytic review. *British Journal of Social Psychology, 40*, 471 – 499.
- Arnold, L.N. & Quine, L. (1994). Predicting helmet use among schoolboy cyclists: An application of the Health Belief Model. In: Rutter, D.R. and Quine, L., Editors, 1994. *Social psychology and health: European perspectives*, Avebury, Aldershot, pp. 101–130.
- Arnold, P.K., Hartley, L., Corry, A., Hochstadt, D., Penna, F. & Feyer, A.M. (1997) Hours of work, and perceptions of fatigue among truck drivers, *Accident Analysis and Prevention* **29**, 471–477.
- Aschenbrenner, KM, Biehl, B. & Wurm, GW (1987) *Einfluß Der Risikokompensation auf die Wirkung von Verkehrssicherheitsmassnahmen am Beispiel ABS*. Schriftenreihe Unfall- und Sicherheitsforschung Straßenverkehr, Heft 63, 65-70. Bergisch Gladbach, Bundesanstalt für Strassenwesen (BAST)

- Aspinwall, L. G., Kemeny, M. E., Taylor, S. E., Schneider, S. G., & Dudley, J. P. (1991). Psychosocial predictors of gay men's AIDS risk-reduction behaviour. *Health Psychology, 10*, 432-444.
- Assum, T, Bjørnskau, T, Fosser, S. & Sagberg, F (1999) Risk compensation – the case of road lighting. *Accid Anal and Prev, 31*, 545-533
- Atkinson, RL, Atkinson, RC, Smith, EE, Bem, DJ, Nolen-Hoeksema, S (1996) *Hilgard's Introduction to Psychology*. Twelfth Edition. Harcourt Brace College Publishers
- Ausserer I., Ausserer K., Krammer O., Reiter D., Risser A., Risser R. & Wunsch D. (2006). *Telechance. Telematik im Öffentlichen Verkehr: Eine Möglichkeit zu mehr Chancengleichheit im Verkehr für Menschen mit Körper- und Sinnesbeeinträchtigungen*, im Auftrag des Bundesministerium für Verkehr, Innovation und Technologie in Kooperation mit der FFG, Wien
- Bagozzi, R. P. (1981). Attitudes, intentions, and behaviour: A test of some key hypothesis. *Journal of Personality and Social Psychology, 41*, 607-627.
- Ballabio E. & Moran R. (1988), *Older people and people with disabilities in the information society. Addressing the needs and potential of older people and people with disabilities*, DG XIII
- Bamberg, S., Ajzen, I., & Schmidt, P. (2003). Choice of travel mode in the theory of planned behaviour: the roles of past behaviour, habit, and reasoned action. *Basic and Applied Social Psychology, 25*, 175-187.
- Bamberg, S., & Schmidt, P. (2003). Incentives, morality, or habit? Predicting student' car use for university routes with the models of Ajzen, Schwartz, and Triandis. *Environment and Behaviour, 35*, 265-285.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioural change. In Cacioppo, J. T. & Petty, R. E. (Eds.). *Social Psychophysiology: A source book*. New York, Guilford Press.
- Bandura, A. (1986). *Social foundations of thought and action. A social cognitive theory*. Englewood Cliffs; NJ: Prentice Hall.
- Bechara, A., Damasio, H., Tranel, D & Damasio, A.R (1997): Deciding Advantageously Before Knowing the Advantageous Strategy. *Science*, Vol 275, 28. February 1997, pp 1293-1295.
- Bein N., Petica St., Plichtova J., Petrjánošová M., Risser R., Sardi G.M. & Ståhl A. (2004). Final Report, of the EU-Project HOTEL: How to analyse Life Quality, an accompanying measure within the EU fifth Framework Programme Key action „Improving the Socio Economic Knowledge Base“; HPSE-2002-60057, Bratislava & Vienna
- Bell P.A., Greene T.C., Fisher J.D. & Baum A. (1996). *Environmental Psychology*. 4th Edition, Harcourt Brace College Publishers, New York, Montreal, London, Sydney, Tokyo

- Berge G. (1996). *Livsstil og transportmiddelvalg (Lebensstil und Verkehrsmittelwahl)*, Transportøkonomisk Institutt Oslo
- Berneman, C., Bellavance, F. & Jabri, S. (2005): *A meta-analysis of the effects of humour on advertising*. Centre Emile Bernheim, Bruxelles.
- Biener, L., Ming, J., Gilpin, E.A. & Albers, A.B. (2004): The impact of emotional tone, message, and broadcast parameters in youth anti-smoking advertisements. *Journal of Health Communication*, 9, 259-274.
- Bläsing W. (1983). *Der behinderte Mensch als Verkehrsteilnehmer*, Bruderhilfe-Akademie für Verkehrsicherheit, Vortragsreihe Heft 11, Kassel
- Blockey, P.N. and Hartely, L.R. (1995). Aberrant driving behaviour: errors and violations. *Ergonomics*, 38, 1759-1771.
- Bourdieu P. (1976). *Entwurf einer Theorie der Praxis*, Wissenschaftliche Sonderausgabe Suhrkamp
- Boyd, B. & Wandersman, A. (1991). Predicting undergraduate condom use with the Fishbein and Ajzen and the Triandis attitude-behaviour models: Implications for public health interventions. *Journal of Applied Social Psychology*, 21, 1810-1830.
- Brittany, N.; Campbell, B.N.; Smith, J.D.; & Najm, W.G. (2004). *Analysis of fatal crashes due to signal and stop sign violations*. Report no. DOT HS-809-779. Washington, DC: National Highway Traffic Safety Administration.
- Brög W. (1990). Möglichkeiten der Verhaltensbeeinflussung. Das Public-Awareness Konzept, In: *Vereinigung der Stadt-, Regional- und Landesplaner (Hrsg.), Umweltorientiertes Verkehrsverhalten. Ansätze zur Förderung der ÖPNV-Nutzung*, SRL-Schriftenreihe 29, Bochum
- Brög W. (1997). *Verkehrsmittelwahl im Stimmungswandel*, In: *Giese E. (Hrsg.) 1997, Verkehr ohne (W)Ende? Psychologische und sozialwissenschaftliche Beiträge*, dgvt Verlag, Tübingen
- Brooker, G. (1981): A Comparison of the Persuasive Effects of Mild Humour and Mild Fear Appeals. *Journal of Advertising*, 10, 29-40.
- Brown, R.C., Sanders, J.M. & Schonberg, S.K. (1986). Driving safety and adolescent behaviour. *Pediatrics*, 77.
- Budd, R.J., North, D. & Spencer, C. (1984). Understanding seat-belt use: A test of Bentler and Speckart's extension of the theory of reasoned action. *European Journal of Social Psychology*, 14, 69-78.
- Burwitz H., Koch H. & Krämer-Badoni Th. (1992), *Leben ohne Auto. Neue Perspektiven für eine menschliche Stadt*, rororo aktuell
- Cannon T. (1992). *Basic Marketing. Principles and Practice*, 3rd edition, London

- Chaiken, S. (1980) Heuristic versus systematic information processing and the use of source versus message cues in persuasion. *Journal of Personality and Social Psychology*, 39, 1387-1397.
- Chen, L.H., Baker, S.P., Braver, E.P. & Li, G. (2000). Carrying passengers as a risk factor for crashes fatal to 16- and 17-year-old-drivers. *Journal of American Medical Association*, 283, 1578-1582
- Cialdini, Robert B. (1993). *Influence*. New York:Harper Collins College Publishers
- Clark, A.W. (1976). A social role approach to driver behaviour. *Perceptual and Motor Skills*, 42, 325-326.
- Conner, M., & Flesch, D. (2001). Having casual sex: Additive and interactive effects of alcohol and condom availability on the determinants of intentions. *Journal of Applied Social Psychology*, 31, 89-112.
- Conner, M., Smith, N., & McMillan, B. (2003). Examining Normative Pressure in the Theory of Planned Behaviour: Impact of Gender and Passengers on Intentions to Break the Speed Limit. *Current Psychology: Developmental, Learning, Personality, Social*, 22 (3), 252-263.
- Connor, M., & Norman, P. (1996). *Predicting health behaviour. Search and practice with social cognition models*. Buckingham, UK: Open University Press.
- Conway, M. & Dubé, L. (2002): Humour in persuasion on threatening topics: Effectiveness is a function of audience sex role orientation. *Personality and Social Psychology Bulletin*, Vol. 28. Pp. 863-873.
- Cooper, J., Mirabile, R. & Scher, S. J. (2005). Actions and Attitudes. The Theory of Cognitive Dissonance. In Brock, T. C. & Green, M. (Ed.). *Persuasion – Psychological Insights and Perspectives*, Sage Publications Inc. California.
- Damasio, A.R. (1994): *Descartes' Error: Emotion, Reason and the Human Brain*. New York, G.P. Putnam's & Sons.
- Delaney, A., Lough, B., Whelan, M. & Cameron, M. (2004). *A review of mass media campaigns in road safety*. Report no. 220. Monash University Accident Research Centre, Victoria.
- Delhomme, P; Vaa, T; Meyer, T; Harland, G; Goldenbeld, C; Järmark, S; Christie, N; Rehnova, V (1999): *Evaluated Road Safety Media Campaigns: An Overview of 265 Evaluated Campaigns and Some Meta-Analysis on Accidents*. INRETS. Project funded by EC and partners under EU 4th Framework Programme. Paris March 1999.
- Diaz, E. M. (2002). Theory of planned behavior and pedestrians' intentions to violate traffic regulations. *Transportation Research Part F: Traffic Psychology & Behaviour*, 5, 169-176.

- Dillard, J. P. & Nabi, R. L. (2006): The persuasive influence of emotion in cancer prevention and detection messages. *Journal of Communication*, Vol. 56. Pp 123-139.
- Dutta-Bergman, M. J. (2005). Theory and practice in health communication campaigns: a critical interrogation. *Health Communication*, 18, 103-122.
- Eagly, A. H., & Chaiken, S. (1993). *The psychology of attitudes*. Forth Worth, TX: Harcourt Brace Jovanovich.
- Eagly, A.H. & Chaiken, S. (1993). *The Psychology of Attitudes*. Harcourt Brace Jovanovich Publishers, Fort Worth.
- EC Recommendation (2004): *Commission Recommendation of 6 April*
- Economic Commission for Europe, Geneva (2005) *Statistics of 2004 on enforcement in the field of road safety*. <http://europa.eu.int/>
- Edwards, J.D., Tindale, R.S., Heath, L., & Posavac, E.J. (1990). *Social Influence Processes and Prevention: Social Psychological Applications to Social Issues*. Vol. I. New York: Plenum.
- Ekman L. (1996). *On the treatment of Flow in Traffic Safety Analysis - a non-parametric approach applied on vulnerable road users*, Department of Traffic Planning and Engineering, Bulletin 136, Lund, Sweden
- Elliott, B. (1993): *Road Safety Mass Media Campaigns: A Meta-analysis*. The Federal Office of Road Safety, CR 118. Canberra, August 1993.
- Elliott, M. A., Armitage, C. J., & Baughan, C. J. (2003). Drivers' compliance with speed limits: An application of the theory of planned behavior. *Journal of Applied Psychology*, 88 (5), 964-972.
- Ellsberg, D. (1961): Risk, Ambiguity, and the Savage Axioms. *The Quarterly Journal of Economics*, 75 (4), 643-669.
- Elvik, R, Vaa, T (2004) *The Handbook of Road Safety Measures*. Oxford, Elsevier
- Elvik, R. (2000). Evaluating the effectiveness of Norway's "Speak Out!" road safety campaign. The logic of causal inference in road safety evaluation studies. *Transportation Research Record 1717*, 66-75.
- Elvik, R., Christensen P., Amundsen, A. (2004). *Speed and road accidents. Evaluation of the Power Model*. Report 740. Institute of Transport Economics, Oslo.
- ESCAPE (2002): *Traffic enforcement in Europe: effects, measures, needs and future. Final report of the ESCAPE consortium*
- ETSC (1997) *A strategic road safety plan for the European Union*. Brussels, European Transport Safety Council, 1997

- ETSC Fact Sheet (2006). *Promoting Child Safety*
- ETSC Fact Sheet (2006). *Promoting Seat Belt Use*
- ETSC Fact Sheet (2008). *Drink Driving in the EU and Road Traffic Law Enforcement*
- Evans, D., & Norman, P. (1998). Understanding pedestrians' road crossing decisions: An application of the theory of planned behaviour. *Health Education Research*, 13 (4), 481-489.
- Evans, D., & Norman, P. (2003). Predicting adolescent pedestrians' road-crossing intentions: an application and extension of the Theory of Planned Behaviour. *Health Education Research*, 18 (3), 267-277. Department of Transport: London.
- Evans, R.I., Rozelle, R.M., Lasater, T.M., Dembroski, T.M. & Allen, B.P. (1970): Fear arousal, persuasion, and actual versus implied behavioural change. New perspective utilizing a real-life dental hygiene program. *Journal of Personality and Social Psychology*, 16, 220-227.
- Falk, B (2008) *Promoting traffic safety among young drivers – the role of mental elaboration*. Doctoral thesis in psychology. Stockholm University, Sweden.
- Falk, B. and Montgomery, H. (2007). Developing traffic safety interventions from conceptions of risk and accidents. *Transportation Research Part F, Traffic Psychology and Behaviour*, 10, 410-427.
- Falk, B. and Montgomery, H. (2008). Promoting traffic safety among young drivers by means of elaboration-based techniques. *Transportation Research Part F, Traffic Psychology and Behaviour*, in press
- Fell, 1994 Fell, D. (1994). *Safety update: problem definition and countermeasure summary: fatigue*. RUS 5. New South Wales Road Safety Bureau.
- Festinger, L. (1957). *A Theory of Cognitive Dissonance*. Stanford University Press, California.
- Fishbein, M. (1967). Attitude and the prediction of behaviour. In M. Fishbein (Ed.). *Readings in attitude theory and measurement*, (pp.477-492). New York: Wiley.
- Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behaviour: An introduction to theory and research*. Reading, MA: Addison-Wesley.
- Fishbein, M., & Ajzen, I. (1976). Misconceptions about the Fishbein model: Reflections on a study by Songer-Nocks. *Journal of Experimental Social Psychology*, 12, 579-584.
- Fishbein, M., & Stasson, M. (1990). The role of desires, self-perceptions, and perceived control in the prediction of training session attendance. *Journal of Applied Social Psychology*, 20, 173-198.

- Flade A. (1994). *Mobilitätsverhalten. Bedingungen und Veränderungsmöglichkeiten aus umweltpsychologischer Sicht*, Beltz - Psychologie Verlags Union, Weinheim
- Floyd, D.L, Prentice-Dunn, S. & Rogers, R.W. (2000) A meta-analysis on research on protective motivation theory. *Journal of Applied Psychology*, 30(2), 17(6), 759-774.
- Flyvbjerg B. (1996). *Rationality and Power*, Chicago University Press
- Forward, S. (1994). *Theoretical models of attitudes and the prediction of drivers' behaviour*. Upsala University, Upsala.
- Forward, S and Lewin, C. (2006) *Medvetna felhandlingar i trafiken. En litteraturundersökning [Violations in traffic - a literature review]*. VTI report 534, Linköping, Sweden
- Fuller, R (1984) A conceptualization of driving behaviour as threat avoidance. *Ergonomics*, 1984 27:1139-1155
- Fuller, R (2000) The Task-Capability Interface Model of the driving process, *Recherche Transports Sécurité*, no 66, Jan-Mars 2000, pp 47-59.
- Fuller, R (2005) Towards a general theory of driver behaviour. *Accident Analysis and Prevention*, 37 461-472
- Fylan, F., Hempel, S., Gunfeld, B., Connor, M, Lawton, R. (2006). *Effective interventions for speeding motorists*. Road Safety research report No. 66, Department of Transport, London.
- Gårder, P., & Alexander, J. (1995). Fatigue related accidents and continuous shoulder rumble strips (CSRS). In *Transportation Research Board 74th Annual Meeting*.
- Gärling, T., Eek, D., Loukopoulos, P., Fujii, S., Johansson-Stenman, O., Kitamura, R., Pendyala, R., & Vilhelmson, B. (2002). A conceptual analysis of the impact of travel demand management on private car use. *Transport Policy*, 9, 59-70.
- Gibson, J.J, Crooks, L. E. (1938). A theoretical field-analysis of automobile-driving. *The American Journal of Psychology*, Vol 11, No 3, July 1938.
- Gillibrand, R., & Stevenson, J. (2006). The extended health belief model applied to the experience of diabetes in young people. *British Journal of Health Psychology*, 11, 155-169.
- Glad, A (1985). *Research on driving and driving in Norway. A survey on recent research on drinkigng and driving and drink drivers*. Oslo, Institute of Transport Economics.
- Goldenbeld, C., Twisk, D. and Houwing, S (2008). Effects of persuasive communication and group discussions on acceptability of anti-speeding

- policies for male and female drivers. *Transportation Research Part F: Traffic Psychology and Behaviour* 11, 207-220
- Gregersen, N.P., Brehmer, B. and Moren, B. (1996) *Road safety improvement in large companies. An experimental comparison of different measures.* *Accident Analysis and Prevention*, 28, 297–306
- Summala, H. and Mikkola, T. (1994) Fatal accidents among car and truck drivers: effects of fatigue, age, and alcohol consumption, *Human Factors* 36 2, 315–326.
- Hagen (eds.). *Expected Utility Hypothesis and the Allais Paradox – Contemporary Discussions of Decisions under Uncertainty with Allais Rejoinder* (pp. 27-145). Dordrecht: D. Reidel Publishing Company. Originally published 1953.
- Hamilton, M.A., Hunter, J.E. and Boster, F.J. (1993). The Elaboration Likelihood Model as a Theory of Attitude Formation: A Mathematical Analysis. *Communication Theory*, 3(1), 50-65.
- Hardeman, W., Johnston, M., Johnston, D., Bonetti, D., Wareham, N. & Kinmonth, A.L. (2002) Application of the Theory of Planned Behaviour in Behaviour Change Interventions: A Systematic Review. *Psychology & Health*, 17, 123-158.
- Harmon-Jones, E. & Mills, J. (1999). *An Introduction to Cognitive Dissonance Theory and an Overview of Current Perspectives on the Theory.* American Psychological Association. Washington D. C.
- Harris, W. & Mackie, R.R. (1972). *A study of the relationship among fatigue, hours of service and safety of operations of truck and bus drivers.* Goleta, CA: Human Factors Research Inc. Report No. 1727-2
- Hatakka M. (1998). *Novice drivers' risk- and self-evaluations.* Turun Yliopisto, Turku
- Hatakka M., Keskinen E., Gregersen N.P., Glad A., Hernetkoski K. (1999). *Results of EU-project Gadget, Workpackage 3.*
- Heider, F. (1958). *The psychology of interpersonal relations.* New York: Wiley.
- Henderson D. (1991) The Redevelopment of Transport for People with Disabilities in New Zealand since 1981, in: Norrbom C.-E. & Ståhl A. 1991, *Mobility and Transport for elderly and disabled persons*
- Hochbaum, G. M. (1956). Why people seek diagnostic X-rays. *Public Health Reports*, 71, 377-380.
- Hom, P. W., & Hulin, C. L. (1981). A competitive test of the prediction of reenlistment by several models. *Journal of Applied Psychology*, 66, 23-39.
- Horne, J.A. & Reyner, L.A. (1995). Sleep-related vehicle accidents, *British Medical Journal* 310, 565–567.

- Houston F.S. & Gassenheimer (1987). Marketing and exchange. *Journal of Marketing*, 51, p 3-18
- Huijbers, J.J.W (1988) *Motorrijders en hun helmen : een onderzoek naar de wijze van bevestiging van de kinband en naar de conditie van helmen van motorrijders*. SWOV report R-88-40.
- Hyden C., Nilsson A., Risser R. (1998). *How to enhance Walking and Cycling instead of shorter car trips and to make these modes safer*. Final Report of the EU-Project WALCYNG funded in the 4th Framework Programme, Lund
- Jessor, R. & Jessor, S. L. (1977). Problem behaviour and psychosocial development – A longitudinal study of youth. In Forward, S. (1994). *Theoretical models of attitudes and the prediction of drivers' behaviour*. Upsala University, Upsala.
- Jessor, R. (1991). Risk behaviour in adolescent: A psychosocial framework for understanding and action. In Forward, S. (1994). *Theoretical models of attitudes and the prediction of drivers' behaviour*. Upsala University, Upsala.
- Jones, E.E. and Nisbet, R.E. (1971). *The Actor and the Observer: Divergent Perceptions of the Causes of Behaviour*. New York: General Learning Press.
- Kahneman, D. & Tversky, A. (1979): Prospect Theory: An Analysis of Decision under Risk. *Econometrica*, 47, 263-292.
- Kahneman, D. & Tversky, A. (2000): *Choices, Values, and Frames*. New York: Cambridge University Press.
- Kahneman, D. (2002): *Maps of bounded rationality: A perspective on intuitive judgment and choice*. Nobel Prize Lecture (December 8) pp. 449-489. <http://nobelprize.org/economics/laureates/2002/kahneman-lecture.html>.
- Kaiser H.J. & Myllymäki-Neuhoff J. (1995). *Die Verkehrsteilnahme älterer Menschen am Straßenverkehr*. Deutsche Verkehrswacht, Verkehrswachtforum Heft 1, Nürnberg
- Kayser, R.E., Schippers, G M., Van der Staak, C.P. (1995) Evaluation of a dutch educational "Driving While Intoxicated (DWI)" prevention program for driving schools. *Journal of Drug Education*, 25, 379-93
- Kass, J. (2007): *Effectiveness and ethicality of fear appeals: Are there alternatives?* The University of Adelaide, National Honours Colloquium. Australia, Adelaide.
- Katz, E and Lazarsfeld. P (1955). *Personal Influence*, New York: The Free Press.
- Katzmann W. & Schrom H. (1986). *Umweltreport Österreich*. Kremayr und Scheriau, Wien
- Katzmann W. & Schrom H. (1991). *Umweltreport Österreich*. Kremayr und Scheriau, Wien

- Kelley, H.H. (1973). The process of causal attribution. *American Psychologist*, 28, 107-128.
- Kellner D. (1997). Jugend im Abenteuer Postmoderne. In: SPOKK (Hrg.). *Kursbuch JugendKultur, Stile, Szenen, Identitäten vor der Jahrtausendwende*, Bollmann, Mannheim
- Keskinen E. (1996). *Why do young drivers have more accidents?* BASt, Mensch und Sicherheit, Heft M 52, Bergisch Gladbach
- Keskinen E. (2007). What is GDE all about and what it is not, in: Henriksson W., Stenlund T., Sundström A., Wiberg M. 2007, Proceedings from the conference: *The GDE-Model as a guide in driver training and testing, Umea May 7-8 2007*, p. 3-13
- Keul A. (1995). *Wohlbefinden in der Stadt. Umwelt- und gesundheitspsychologische Perspektiven*, Beltz - Psychologie Verlags Union, Weinheim
- Kienast G. (1988). *Mit den Betroffenen. Impulse zur praktischen Zusammenarbeit mit Bürgerinitiativen*, Signum-Verlag Wien
- Kohn, P. M., Goodstadt, M. S. & Cook, G. M. (1982): Ineffectiveness of threat appeals about drinking and driving. *Accident Analysis & Prevention*, Vol. 14, No. 6. Pp. 457-464.
- König R. (1993). *Fachdiskurs „Fahrerunterstützung im Straßenverkehr“.* *Technikfolgenabschätzung zur Sicherheit in der Informationstechnik*, Bad Aibling
- Kotler Ph., Armstrong G., Saunders J. & Wong V. (1996) *Marketing. The European Edition*, Prentice Hall, London New York Madrid Mexiko City Munich
- Kotler Ph., Zaltmann G. (1973) Social Marketing: An approach to Planned Social Change in: *Social Marketing*, Hrsg. Laser W., Kelley E.J., Homewood I., S 52 ff
- Laberge-Nadeau et al., 2003 C. Laberge-Nadeau, U. Maag, F. Bellavance, S.D. Lapierre, D. Desjardins, S. Messier and A. Saïdi, Wireless telephones and the risk of road crashes, *Accident Anal. Prev.* **35** (2003), pp. 649–660
- Lajunen, T., & Räsänen, K. (2004). Can social psychological models be used to promote bicycle helmet use among teenagers? A comparison of the Health Belief Model, Theory of Planned Behaviour and the Locus of Control. *Journal of Safety Research*, 35, 115-123.
- Lam, L.T. (2002). Distractions and the risk of car crash injury: the effect of drivers' age, *Journal of Safety research*, 33. 411–419.
- Lamnek S. (1989). *Qualitative Sozialforschung*. Psychologie Verlags Union, München

- Laroche-Reeff (1986). Draußen spielen, zitiert in: Risser R., Chaloupka Ch. Gluske H., Reetz A., Riedl R., Tscherteu G. & Tuma F. 1990, *Straßenverkehr und Lebensqualität*, Literas, Wien
- Lazarsfeld, P., Berelson, B., and Gaudet H. (1948). *The People's Choice*. New York: Columbia University Press.
- Leach, M., Hennesy, M., & Fishbein, M. (2001). Perception of easy-difficulty: Attitude or self-efficacy? *Journal of Applied Social Psychology*, 31, 1-20.
- Letirand, F. & Delhomme, P. (2005): Speed behaviour as a choice between observing and exceeding the speed limit. *Transportation Research Part F*, 8, 481-492
- Leventhal, H. (1992). Findings and theory in the study of fear communications. In L. Berkowitz (Ed.): *Advances in experimental social psychology*, Vol. 5. Pp. 119-186. New Your: Academic Press
- Lewis, I., Watson, B. & Tay, R. (2007): Examining the effectiveness of physical threats in road safety advertising: The role of the third-person effect, gender, and age. *Transportation Research Part F*, Vol 10, No. 1. Pp. 48-60.
- Lewis, I.M., Watson, B., Tay, R. & White, K.M. (2007): The role of fear appeals in improving driver safety: A review of the effectiveness of fear-arousing (threat) appeals in road safety advertising. *International Journal of Behavioural and Consultation Therapy*, 3, 203-222.
- Lewis, I. M., Watson, B., White, K. M. & Tay, R. (2007a): Promoting public health messages: Should we move beyond fear-evoking appeals in road safety? *Qualitative Health Research*, 17, 61-74.
- Lewis, I.M., Watson, B. & White, K.M. (2008): An examination of message-relevant affect in road safety messages: Should road safety advertisements aim to make us feel good or bad? *Transportation Research Part F*, 11, 403-417.
- Lin, Nan, Walter M. Ensel and John C. Vaughn (1981), "Social resources, strength of ties and occupational status attainment." *American Sociological Review*, 46:39-405.
- Liska, A. E. (1984). A critical examination of the causal structure of the Fishbein/Ajzen attitude-behaviour model. *Social Psychology Quarterly*, 47, 61-74.
- Lyttle, J. (2001): The effectiveness of humour in persuasion: The case of business ethics training. *The Journal of General Psychology*, Vol. 128, no. 2. Pp. 206-216.
- Madden, T. J., Scholder Ellan, P., & Ajzen, I. (1992). A comparison of the theory of planned behaviour and the theory of reasoned action. *Personality and Social Psychology Bulletin*, 18, 3-9.

- Major, B. (1980). Information acquisition and attribution processes. *Journal of Personality and Social Psychology*, 39, 1010-1023
- Marcil, I., Bergeron, J., & Audet, T. (2001). Motivational factors underlying the intention to drink and drive in young male drivers. *Journal of Safety Research*, 32, 363-376.
- Maticka-Tyndale, E., Herold, E. S., & Mewhinney, D. (1998). Casual sex on spring break: intentions and behaviours of Canadian students. *The Journal of Sex Research*, 35, 254-264.
- Mattson, M. (1999). Toward a reconceptualization of communication cues to action in the health belief model: HIV test counseling. *Communication Monographs*, 66, 240-265.
- Maycock, G. (1997) Sleepiness and driving: the experience of UK car drivers, *Accident Analysis and Prevention*, 29, 453–462.
- Mayfield, Zelda (2007): Fear Appeal Messages and their effectiveness in advertising. Associated Content. www.associatedcontent.com
- McArthur, L. H., Holbert, D., & Forsythe, W. A., III. (2006). Compliance with food safety recommendations among university undergraduates: application of the health belief model. *Family and Consumer Sciences Research Journal*, 35, 160-170.
- McCartt, A.T., Ribner, S.A., Pack, A.I., & Hammer, M.C. (1996), The scope and nature of the drowsy driving problem in New York State, *Accident Analysis and Prevention* 28 (1996) (4), pp. 511–517.
- McGuire, W.J. (1985) Attitudes and attitude change. In: G Lindzey & E. Aronson (Eds), *Handbook of social psychology*, Vol. 2, pp. 233-346. Random House, New York.
- McKnight, A.J. & McPerson, K. (1985): Evaluation of peer intervention training for high school alcohol safety education. *Accident Analysis and Prevention*, 18, 339-347.
- Meyer, M. D. (1999). Demand management as an element of transportation policy: using carrots and sticks to influence travel behaviour. *Transportation Research A*, 33, 575-599.
- Michon J.A. (1985), A critical view of driver behaviour models: what do we know, what should we do? in: Evans L. & Schwing R.C. (Eds): *Human Behaviour and Traffic Safety* , p 485 –520
- Monahan, J. L. (1995): Thinking positively. Using positive affect when designing health messages. In: E. Maibach & R. L. Parrott (Eds.): *Designing health messages. Approaches from communication theory and public health practice*. Sage Publications.

- Näätänen, R, Summala, H (1974) A model for the role of motivational factors in drivers' decision-making. *Accident Analysis and Prevention* 6, 243-261
- Nelson, G. D., & Moffitt, P. B. (1988). Safety belt promotion: theory and practice. *Accident Analysis and Prevention*, 20, 27-38.
- Newman, S., Watson, B., & Murray, W. (2004). Factors predicting intentions to speed in work and personal vehicle. *Transportation Research Part F: Traffic Psychology & Behaviour*, 7, 287-300.
- Noar, S.M. & Zimmerman, R.S. (2005). Health Behaviour Theory and cumulative knowledge regarding health behaviours: are we moving in the right direction? *Health Education Research*, 20, 275-290.
- Noordzij, P., Forke, E., Brendicke, R. and Chinn, B. (2001). *Integration of needs of moped and motorcycle riders into safety measures*. Liedschendam: SWOV Institute for Road Safety Research
- Nordbakke, S. (2004). *Driver fatigue and falling asleep – experience, knowledge and action among private drivers and professional drivers*. TØI report 706. Oslo: Institute of Transport Economics.
- O'Keefe D. (1990). *Persuasion. Theory and Research*, Sage Publications, Newbury Park, London, New Delhi
- O'Keefe, D. (1990): *Persuasion Theory and research*. Newbury Park, CA: Sage
- OECD Road Transport Research (1993) *Marketing of Traffic Safety*, OECD, Paris
- OECD Road Transport Research (2006) *Speed management report*, OECD, Paris
- O'HANLON, J.F. (1978). What is the extent of the driving fatigue problem? In *Driving Fatigue in Road Traffic Accidents*, Brussels: CEC Report No. EUR6065EN, 19-25.
- Overskeid, G (2000) The Slave of the Passions: Experiencing problems and Selecting Solutions. *Review of General Psychology*, 4, 284-309, 2000
- P.L. Zador, S.A. Krawchuk & Voas, R.B. (2000) Alcohol-related relative risk of driver fatalities and driver involvement in fatal crashes in relation to driver age and gender: an update using 1996 data. *J. Stud. Alcohol* 61, 387–395.
- Pajunen K. (1994). Safety of traffic compared to other human activities, In: *KfV & ICTCT, Safety Evaluation of Traffic Systems: Traffic Conflicts and other Measures, ICTCT Workshop 1993, KfV Salzburg und ICTCT, Wien*
- Parker, D (2002) Changing drivers' attitudes towards speeding: using the Theory of Planned Behaviour. In D. Rutter and L. Quine (eds), *Changing Health Behaviours*. Buckingham: Open University Press.

- Parker, D., Lajunen, T., & Stradling, S. (1998). Attitudinal predictors of interpersonally aggressive violations on the road. *Transportation Research Part F: Traffic Psychology & Behaviour*, 1, 11-24.
- Parker, D., Manstead A.S.R, Stradling, S. & Reason, J.T. (1992). Determinants of intention to commit driving violations. *Accident Analysis and Prevention*, 24, 117-131
- Parker, D., Manstead, A. S. R., & Stradling, S. G. (1995). Extending the theory of planned behaviour: The role of personal norm. *British Journal of Social Psychology*, 24, 127-137.
- Parker, D., Manstead, A. S. R., & Stradling, S. G. (1995). Extending the theory of planned behaviour: The role of personal norm. *British Journal of Social Psychology*, 34, 127-137.
- Parker, D., Manstead, A. S. R., & Stradling, S. G., Reason, J. T., & Baxter, J. S. (1992). Intention to Commit Driving Violations: An Application of the Theory of Planned Behavior. *Journal of Applied Psychology*, 77 (1), 94-101.
- Parker, D., Reason, J.T., Manstead, A.S.R. and Stradling, S.G. (1995). Driving errors, driving violations and accident involvement. *Ergonomics*, 38, 1036-1048.
- Pasanen, E. (1997). *Safety problems*. Report from WALCYNG – WP4. City of Helsinki, City Planning Office, Finland. 1997
- Patel R., Tiwari G. & Mohan D. (1994). *Introduction to traffic calming*, Centre for Biomedical Engineering, Indian Institute of Technology, New Delhi
- Patten, C., Kirchner, A., Östlund, J. and Nilsson, L. (2004) Using mobile telephones: cognitive workload and attention resource allocation. *Accident analysis and prevention*, 36, 341-350.
- Pervin, L.A. (1989). *Personality theory and research*. (5th ed). New York: Wiley.
- Petty R.E. & Cacioppo R.T. 1986, *Communication and Persuasion: Central and peripheral routes to attitude change*. Springer-Verlag New York
- Petty, R. E. & Cacioppo, J. (1986): The elaboration-likelihood model of persuasion. In L. Berkowitz (Ed.): *Advances in experimental social psychology*, Vol. 19, Pp. 123-205. San Diego, CA: Academic Press. (
- Petty, R.E. and Wegener, D.T. (1998) Attitude change. Multiple roles of persuasion variables. In D. Gilbert, S. Fiske, and G. Lindsey: *The handbook of social psychology* (4. ed) Boston MS, McGraw-Hill.
- Porter, B.E. and Berry, T.D. (2001) A nationwide survey of self-reported red light running: measuring prevalence, predictors, and perceived consequences, *Accid. Anal. Prev.* 33, pp. 735–741.

- Posavac, E.J., Kattapong, K.R. & Dew, D.E. Jr. (1999). Peer-based interventions to influence health related behaviours and attitudes: A meta-analysis. *Psychological Reports*, 85, 1179-1194.
- Praschl M. & Risser R. (1996) *Strategien zur sachgerechten Berücksichtigung von Akzeptanzaspekten*. Das Projekt Traidersbergtunnel, ÖBB Wien
- Praschl M., Chaloupka Ch. & Risser (1992). *Akzeptanzbildung für gesellschaftliche Anliegen*, FACTUM Wien
- Praschl M., Scholl-Kuhn M. & Risser (1993). Gute Vorsätze und Realität. Die Diskrepanz zwischen Wissen und Handeln am Beispiel Verkehrsmittelwahl, Bundesministerium für Umwelt, *Jugend & Familie*, Schriftenreihe der Sektion 1
- Prisching M. (1992). *Soziologie. Grundlagen des Studiums*, Böhlau Studienbücher, Wien, Köln, Weimar
- Quine, L., Rutter, D. and Arnold, L. (1998). Predicting and understanding safety helmet use among schoolboy cyclists: a comparison of the theory of planned behaviour and the health belief model. *Psychology and Health*, 13, 251–269.
- Rasmussen, J. (1986). *Information processing and human-machine interaction*. Amsterdam: Elsevier.
- Reardon, K. K. (1991): *Persuasion in practice*. Newbury Park: Sage Publications.
- Reason P. & Rowan J. (1981). *Human Inquiry. A Sourcebook of New Paradigm Research*, John Wiley & Sons, Chichester New York Brisbane Toronto
- Reason, J (1990) *Human error*. Cambridge University Press, Cambridge
- Reber, A.S; Reber, E (2001): *The Penguin Dictionary of Psychology*. Third Edition. Penguin Books.
- Redelmeier and Tibshirani (1997) Association between cellular telephone calls and motor vehicle collisions, *New England Journal of Medicine* 336, 453–458
- Retting, R.A., R.G. Ulmer, & Williams, A.F (1999). "Prevalence and Characteristics of Red-Light-Running Crashes in the United States." *Accident Analysis and Prevention*. 31, 687-694.
- Reyner and Horne, 1998 L.A. Reyner and J.A. Horne, Evaluation of 'in-car' countermeasures to sleepiness: cold air and radio, *Sleep* 21 (1998) (1), pp. 46–50.
- Richard, R., van der Pligt, J., & de Vries, N. (1995). Anticipated affective reactions and prevention of AIDS. *British Journal of Social Psychology*, 34, 9- 21.
- Richard, R., van der Pligt, J., & de Vries, N. (1996a). Anticipated regret and time perspective: Changing sexual risk-taking behavior. *Journal of Behavioral Decision Making*, 9, 185-199.

- Richard, R., van der Pligt, J., & de Vries, N. (1996b). Anticipated affect and behavioral choice. *Basic and Applied Social Psychology*, 18 (2), 111-129.
- Richard, R., de Vries, N. K., & van der Pligt, J. (1998). Anticipated regret and precautionary sexual behavior. 68
- Rise, J. (2006): *En sosialpsykologisk analyse av et fryktvekkende budskap: en kvasiekperimentel undersøkelse*. Report 11 from Hemil/Sirius. Sirius Skrifter nr. 5/2006. Oslo, Statens Institutt for Rusmiddelforskning.
- Risser R. & Chaloupka Ch. (1993). *PROMETHEUS and the Social Sciences*, FACTUM & Lund Institute of Technology/Department of Traffic Planning and Engineering
- Risser R. (1989) *Kommunikation und Kultur des Straßenverkehrs*, Literas Universitätsverlag, Wien
- Risser R. (1994). What is sustainable traffic? Are safety, mobility and life quality competing with each other? In: *KfV & ICTCT, Safety Evaluation of Traffic Systems: Traffic Conflicts and other Measures, ICTCT Workshop 1993, KfV Salzburg und ICTCT, Wien*
- Risser R. (1995). Kriterien für einen guten Verkehr, In: Risser R. (Hrsg.), 35. bdp-Kongreß für Verkehrspsychologie (pp 337 - 349), Deutscher Psychologen Verlag
- Risser R. (2000). Measuring influences of speed reduction on subjective safety, *Proceedings of the ICTCT Workshop on Traffic Calming*, New Delhi, Vienna
- Risser R., Alteneider W. & Hanneschläger Ch. (1993). *Attraktivität des Wiener Öffentlichen Verkehrs. Hintergründe und Motive für die Verkehrsmittelwahl*, Seminarbericht, FACTUM Wien
- Risser R., Chaloupka Ch., Gluske H., Reetz A., Riedl R., Tscherteu G. & Tuma F. (1990). *Straßenverkehr und Lebensqualität*, Literas, Wien)
- Risser R., Lehner U. (1998), *Acceptability of Speeds and Speed Limits to Drivers and Pedestrians/Cyclists*. D6 of the EU Project MASTER No. RO-96-SC.202, Wien
- Risser R., Schmidt L., Snizek, Hulmak M. & Scheidl M. (1990) *Konflikte Fußgänger-Radfahrer in Wien*, MA 18, Stadtstrukturplanung, Wien
- Risser R., Steinbauer J., Amann A., Roest F., Anderle F.G., Schmidt G.A., Lipovitz G. & Teske W. (1988). *Probleme älterer Personen bei der Teilnahme am Straßenverkehr*, Literas, Wien
- Rogers, R. W. (1975). A protection motivation theory of fear appeals and attitude change. In Cacioppo, J. T. & Petty, R. E. (1983) (Eds.). *Social Psychophysiology: A source book*. New York, Guildford Press.

- Rogers, R. W. (1983). Cognitive and Physiological Processes in Fear Appeals and Attitude Change: A Revised Theory of Protection Motivation. Chapter 6 in Cacioppo, J. T. & Petty, R. E. (1983) (Eds.). *Social Psychophysiology: A source book*. New York, Guildford Press.
- Rosenbloom S. The US Approach to the Needs of elderly and Disabled 1991, in: Norrbom C.-E & Ståhl A. (1991). *Mobility and Transport for elderly and disabled persons*
- Rosenstock, I. M. (1966). The health belief model and preventive health behaviour. *Health Education Monographs*, 2, 354-386.
- Rosenstock, I. M. (1966). Why people use health services. *Millbank Memorial Fund Quarterly*, 44, 94-127.
- Rosenstock, I. M. (1974). The historical origins of the health belief model. *Health Education Quarterly*, 15, 175-183.
- Rothe J.P. (ed.) (1987), *Rethinking young drivers*, Insurance Corporation, British Columbia, Canada
- Rothengatter, T (1988) Risk and the absence of pleasure: A motivational approach to modelling road user behaviour. *Ergonomics* 31:599-607
- Rothman, A. J., Bartels, R. D., Wlaschin, J. & Salovey, P. (2006): The Strategic Use of Gain- and Loss Framed Messages to Promote Healthy Behaviour: How Theory Can Inform Practice. *Journal of Communication*, 56(1), S202-S220.
- Ruiter, Robert A.C.: *Scary warnings and rational precautions. A study into fear arousal and its contribution to precautionary motivation*. Maastricht, 2000.
- Rumar, K. (1985). The role of perceptual and cognitive filters in observed behaviour. In L.Evans and R.C. Schwing (Eds.). *Human Behaviour and Traffic Safety*. Plenum Press, NY.
- Running Crashes in the United States." *Accident Analysis and Prevention*. Vol. 31, 1999, pp.
- Sachs W. (1984). *Die Liebe zum Automobil. Ein Rückblick in die Geschichte unserer Wünsche*, Rowohlt-Verlag Reinbek
- Sagberg, F (1999) Road accidents caused by drivers falling asleep, *Accident Analysis and Prevention* 31 (6), pp. 639–649.
- Sagberg, F (2001).Accident risk of car drivers during mobile telephone use. *International Journal of Vehicle Design*, 26 57–69
- Sagberg, F, Fosser, S, Saetermo, IAF (1997) An Investigation Of Behavioural Adaptation To Airbags And Antilock Brakes Among Taxi Drivers. *Accid Anal and Prev* 29:293-302

- Sammer G. (1986). *Die verkehrspolitischen Einstellungen der Grazer*, Verlag der TU Graz
- SARTRE 3 (2004) *European drivers and road risk. Part 1. Report on principal results*. INRETS, France
- Schmidt L. (1995). Öffentlichkeitsarbeit für eine sozial- und umweltverträgliche Mobilität - ungenutzte Ressourcen der Verkehrspsychologie, In: Risser R. (Hrsg.), *35. bdp-Kongreß für Verkehrspsychologie* (pp 337 - 349), Deutscher Psychologen Verlag
- Schulze H.(1991). Zur Ökologie jugendlichen Freizeit- und Verkehrsverhaltens, in: Cohen A.S. & Hirsig R. (Hrsg.) 1991, *Fortschritte der Verkehrspsychologie '90, Mensch-Fahrzeug-Umwelt Bd. 27*, Verlag TÜV Rheinland, Köln, Deutscher Psychologen-Verlag, Bonn
- Schulze H.(1993). Risikoverhalten jugendlicher Verkehrsteilnehmer, in: Lang E. & Arnold K., *Der Mensch im Straßenverkehr - Band 6*, Schriftenreihe der Hamburg Mannheimer Stiftung für Informationsmedizin
- Sheehan, M., Najman, J., Siskind, V., Schofield, F., & Smithhurst, B. (1990a). *A longitudinal evaluation of a drink driving intervention*. Brisbane: Department of Social and Preventive Medicine, University of Queensland.
- Sheeran, P., & Orbell, S. (1999). Augmenting the theory of planned behavior: Roles for anticipated regret and descriptive norms. *Journal of Applied Social Psychology, 29*, 2107-2142.
- Sherran, P., & Taylor, S. (1997). Predicting intentions to use condoms: Meta-analysis and comparison of the theories of reasoned action and planned behaviour. *Journal of Applied Social Psychology, 29*, 1624-1675.
- Sheth, J. N. (1982). Some comments on the Triandis model of choice behaviour in marketing. *Research in Marketing* (Supplement 1), 163-167.
- Shinar D, & McKnight AJ: The effects of enforcement and public information on compliance. In Schwing RC og Evans L (eds): *Human Behaviour and Traffic Safety*, New York, Plenum Press, 1985.
- Skalkidou, A., Petridou, E, Papadopoulos, F., Dessypris, N., Trichopoulos, D (1999) Factors affecting motorcycle helmet use in the population of Greater Athens, Greece *Injury Prevention* 264-267
- Slovic, P. & Lichtenstein, S. (1983): Preference Reversals: A Broader Perspective. *The American Economic Review, 73* (4), 596-605.
- Slovic, P. & Lichtenstein, S. (1973): Response-induced reversals of preference in gambling: An extended replication in Las Vegas. *Journal of Experimental Psychology, 101* (1), 16-20.
- Smart Risk (2007): Effective Use of Social Marketing, *National Institute for Farm Safety 2007 Conference*, www.smartrisk.ca

- Smith W.A. 2006: Social marketing: An overview of approach and effects.
http://injuryprevention.bmj.com/cgi/content/full/12/suppl_1/i38
- Socialdata (1992). *Einschätzungen zur Mobilität in Europa*, München
- Stalvey, B. T., & Owsley, C. (2000). Self-perceptions and current practices of high-risk older drivers: implications for driver safety interventions. *Journal of Health Psychology*, 5, 441-456.
- Stasson, M and Fishbein, M. (1990) The Relation Between Perceived Risk and Preventive Action: A Within-subject Analysis of Perceived Driving Risk and Intentions to Wear Seatbelts, 20 *Journal of Applied Social Psychology*. 1541.
- Statens vegvesen (2004) *Tilstandsundersøkelser 2003*. Report from TS-seksjonen 02/2004.
- Stead M., McDermott L., Angus K., & Hastings G. (2006): *Marketing Review*. Final Report,
- Stead, M., Tagg, S., MacKintosh, A. M., & Eadie, D. (2005). Development and evaluation of a mass media Theory of Planned Behaviour intervention to reduce speeding. *Health Education Research*, 20 (1), 36-50.
- Sutton, S.R. (1982): Fear-arousing communications: A critical examination of theory and research. In J.R. Eiser (Ed.), *Social psychology and behavioural medicine* (pp. 303-337). London: Wiley. (Cited after Witte, 1992).
- SWOV fact sheet, february 2007
- SWOV fact sheet, January 2008: *Fear-based communication campaigns*.
- Taubman Ben-Ari, O., Florian, V. & Mikulincer, M.: Does a threat appeal moderate reckless driving? A terror management theory perspective. *Accident Analysis and Prevention*, vol. 32, No. 1, 2000, pp. 1-10.
- Tay, 2005 The effectiveness of enforcement and publicity campaigns on serious crashes involving young male drivers: Are drink driving and speeding similar? *Accident Analysis and Prevention*, vol. 37, No. 5. Pp. 922-929.
- Tay, R. and Ozanne, L. (2002) Who Are We Scaring With High Fear Road Safety Advertising Campaigns? *Asia Pacific Journal of Transport* 4, pp. 1-12.
- Tay, R., Watson, B., Radbourne, O. & DeYoung, B. (2001) The influence of fear arousal and perceived efficacy on the acceptance and rejection of road safety advertising messages. *Melbourne: 2001 Road Safety Research, Policing and Education Conference* (Regain the Momentum).
- Taylor, D.H. (1964): Driver's galvanic skin response and the risk of accidents. *Ergonomics*, 7, 439-451.
- Thaler, R. H. (1980): Toward a Positive Theory of Consumer Choice. *Journal of Economic Behaviour and Organization*, 1, 39-60.

- Trafimow, D., & Fishbein, M. (1994). The importance of risk in determining the extent to which attitudes affect intentions to wear seat belts. *Journal of Applied Social Psychology*, 24, 1-11.
- Tränkle U. (Hrsg.) 1994, *Autofahren im Alter, Mensch-Fahrzeug-Umwelt*, Bd. 30, Verlag TÜV Rheinland, Köln
- Triandis, H. C. (1977). *Interpersonal behaviour*. Monterey, CA: Brooks/Cole.
- Triandis, H. C. (1980). Values, attitudes, and interpersonal behaviour. In H. E. Howe & M. M. Page (Eds.), *Nebraska symposium on motivation 1979* (pp. 195-259). Lincoln: University of Nebraska Press.
- Triandis, H. C. (1982). A model of choice in marketing. *Research in Marketing* (Supplement 1), 147-162.
- UK Department of Transport, 2002 UK Department of Transport (2002). *Sleep-related vehicle accidents on sections of selected trunk roads and motorways in the UK 1995–1998*. Road Safety Research Report 22.
- Ulleberg, P. (2002) Personality subtypes of young drivers. Relationship to risk-taking preferences, accident involvement and response to a traffic safety campaign. *Transportation Research Part F*, 4, 279- 297.
- Ulleberg, P. (2003). *Motorcykelsikkerhet - en litteraturstudie och meta-analys*. [Motorcycle safety – a literature review and a meta-analysis]. TØI report 681/2003. Oslo
- Ulleberg, P. (2004). *Aggressiv kjøring - en litteraturstudie*. [Aggressive driving – a literature review]. TØI report 709/2004. Oslo
- Ulleberg, P. and Christensen, P. (2007). *Does the “Speak out!” philosophy work? Development in the number of injured and killed adolescents car occupants in two Norwegian counties*. TØI report 881, Oslo
- Uniroyal 1996, *Chaos und urbanes Leben, Ergebnis der 20. Uniroyal-Verkehrsuntersuchung über die Verkehrssituation in Großstädten*
- Vaa, T. (1993): *Politiets trafikkontroller: Virkning på atferd og ulykker. En litteraturstudie*. Oslo, Transportøkonomisk institutt
- Vaa, T (2001) Cognition and emotion in driver behaviour models: Some critical viewpoints. Proceedings of the *14th ICTCT Workshop, Caserta 2001*. (www.ictct.org)
- Vaa, T (2003) *Impairments, diseases, age and their relative risk for accident involvement. Results from meta-analyses*. TØI report 690/2003
- Vaa, T (2003) *Survival or deviance? A Model for Driver Behaviour. Final report*. Oslo, Institute of Transport Economics. TØI-report no 666/2003. (In Norwegian, with summary in English)

- Vaa (2007a): Modelling Driver Behaviour on Basis of Emotions and Feelings: Intelligent transport systems and behavioural adaptations. In Cacciabue, P. C. (ed): *Modelling Driver Behaviour in Automotive Systems – Critical Issues in Driver Interactions with Intelligent Transport Systems*. Springer-Verlag London Limited 2007, pp 208-232.
- Vaa, T (2007b) The Risk Homeostasis Theory: Accept, reject or modify? – An Opposition to Gerald Wilde’s RHT. *Proceedings of the 20th ICTCT Workshop, Valencia, 2007*. (www.ictct.org)
- Vaa, T., Assum, T., Ulleberg, P., & Veisten, K. (2004). *Effekter av informasjonskampanjer på atferd og trafikkulykker – forutsetninger, evaluering og kostnadseffektivitet*. [Effects of information campaigns on behaviour and traffic accidents] TØI rapport 727/2004, Transportøkonomisk institutt,
- Vaa, T; Bjørnskau, T (2002): *Fart, følelser og risiko: Drøfting av indre mekanismer ved bilførerers fartsvalg*. SIP Føreratferdsmodeller: Rapport 3. (Speed, feelings and risk: A discussion of inner mechanisms involved in driver speed choice. In Norwegian with English summary). TØI-report 607/2002. Oslo, Institute of Transport Economics, 2002.
- Vaa, T. & Ulleberg, P. (2007). Veioppmerking, kjørefeltbredde og valg av hastighet: En simulatorstudie. [Road marking, lane width and choice of speed. A simulator study]. Institute of Transport Economics, Oslo
- Verplanken, B., & Faes, S. (1999). Good intentions, bad habits, and effects of forming implementation intentions on healthy eating. *European Journal of Social Psychology*, 29, 591-604.
- Violanti and Marshall, 1996 J.M. Violanti and J.R. Marshall, Cellular phones and traffic accidents: an epidemiological approach, *Accident Anal. Prev.* **28** (1996), pp. 265–270
- Walton, D. & McKeown, P. C. (2001): Drivers’ biased perceptions of speed and safety campaign messages. *Accident Analysis & Prevention*, Vol. 33, No.5. Pp. 629-640.
- Watson, D. (1982). The actor and the observer: How are the perceptions of causality divergent? *Psychological Bulletin*, 92, 682-700.
- Watzlawik P., Beavin J.H. & Jackson D.D. (1974). *Menschliche Kommunikation*. Formen, Störungen, Paradoxien, Huber Verlag Bern
- Weary, G., Harvey, J.H., Schweiger, P., Olson, C.T., Perloff, R. and Prtichard, S. (1982). Self-presentation and the moderation of self-serving attributional biases. *Social Cognition*, 1, 140-159.
- Weber, K., Martin, M. M. & Corrigan, M. (2006): Creating persuasive messages advocating organ donation. *Communication Quarterly*, Vol. 54, No. 1. Pp. 67-87.

- Weimann, G. (1982), On the importance of marginality: One more step into the two-step flow of communication. *American Sociological Review*, vol. 47, no.6:764-773.
- Weinberger, M. G. & Gulas, C. S. (1992) The impact of humour in advertising: A review. *Journal of Advertising*, Vol. 21, No. 4. Pp. 35-59.
- Weiner B. 1988, *Motivationspsychologie*, Psychologie Verlags Union, München Weinheim
- Weinstein, N.D. (1993) Testing four competing theories of health-protective behaviour. *Health Psychology*, 12, 324-333.
- Westley, Bruce (1971). *Communication and social change*. American Behavioural Scientist 14:719-42.
- Weyland, K. (1996): Risk Taking in Latin American Economic Restructuring: Lessons from Prospect Theory. *International Studies Quarterly*, 40, 185-208.
- Whysall, P. (2000): Stakeholder Mismanagement in Retailing: A British Perspective. *Journal of Business Ethics*, 23(1), 19-28.
- Wilde, G. S. J (2001): *Target Risk 2*. Second (revised) edition. Toronto, PDE Publications, 2001.
- Wilde, G.J.S (1988): Risk homeostasis theory and traffic accidents: Propositions, deductions and discussion of dissension in recent reactions. *Ergonomics*, 1988, vol 31, no 4, 441-468.
- Wilde, GJS (1982) The theory of risk homeostasis: Implications for safety and health. *Risk Analysis* 2:209-225.
- Windahl S., Signitzer B. & Olson J.T. 1992, *Using communication theory. An introduction to planned communication*, Sage Publications, London
- Witte, K. & Allen, M. (2000): A meta-analysis of fear appeals: Implications for effective public health campaigns. *Health Education & Behaviour*, Vol. 27. Pp. 591-615.
- Witte, K. (1992): Putting the fear back into fear appeals: The extended parallel process model. *Communications Monographs*, Vol. 59, December 1992, pp. 329-349.
- Yates B.A., Dowrick P.W. (1991) Stop the drinking driver: A behavioral school-based prevention program. *J Alcohol Drug Educ* 36,12–19.
- Zador, P. L., Krawchuk, S. A., & Voas, R. B. (2000). Alcohol-related relative risk of driver fatalities and driver involvement in fatal crashes in relation to driver age and gender: An update using 1996 data. *Journal of Studies on Alcohol*, 61, 387–395.

Zaidel, D.M. (2001). *Non-compliance and accidents*. The ESCAPE Project.
www.vtt.fi.

Zuckerman, M. (1994) *Behavioural Expressions and Biosocial Bases of Sensation Seeking*. Cambridge: University of Cambridge Prepared for the National Institute for Health and Clinical Excellence, Stirling