Appraisal or Selection

Comparative analysis of traffic risk perception of French and Dutch drivers

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Utrecht, September 2007

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INRETS

Title	**Appraisal or Selection**
Subtitle	Comparative analysis of traffic risk perception of French and Dutch drivers
Course	Master thesis Civil Engineering & Management (CEM) and Psychology (MPS) - University of Twente (UT)
Keywords	Risk perception, traffic safety, between-country comparison, perceptual measures, speed choice
Performed at	Institut National de Recherche sur les Transport et leur Sécurité (INRETS) – Laboratoire de Psychologie de la Conduite (LPC)
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Version	4.1 – final version
P.p.	114 including appendices

Summary

When regarding accident statistics a large difference in traffic safety between France and The Netherlands can be observed. This research examines whether it is likely that a part of this difference can be explained by a difference in traffic risk perception. Based on the survey which was conducted within the scope of this research there is evidence that this is the case.

For the survey an online questionnaire is used. The questionnaire was sent to 2000 residents of Enschede (The Netherlands) and Chartres (France), of which 95 filled it in. In the questionnaire respondents evaluated photographs of six intersections on risk perception. They also stated whether they are familiar with the intersections. Furthermore they filled in a questionnaire on socio-demographic characteristics and Driving Sensation Seeking. Half of the respondents received a questionnaire in which the photographs were manipulated so that the approach to the intersection had additional markings: peripheral transverse lining. The other half of the respondents functioned as a control group.

In this research traffic risk perception is split in two constructs: threat appraisal and action selection. Threat appraisal is measured with one construct; action selection is measured with two: attitude towards crossing an intersection with 60 km/h and preferred speed for crossing the intersection.

French drivers have a higher threat appraisal than Dutch drivers when they approach an intersection with peripheral transverse lining. No difference of this kind is found for the control groups. Although no significant differences between drivers in the intervention and control group are found it seems that French drivers in the intervention group have a higher threat appraisal than those in the control group. For Dutch drivers this seems to be the other way around. This concept is speculatively explained by introducing the concept of macro-familiarity.

In addition it is observed that French drivers under normal conditions have a more positive attitude towards crossing an intersection with 60 km/h . Also, they seem to prefer higher speeds when crossing an intersection. This might be explained by the high speed limits in France. At last it might be concluded that peripheral transverse lining is an effective method to decrease traffic speed in France.

Preface

In March 2007 I arrived at INRETS in Arcueil, a suburb of Paris, to start this research in order to finish my Masters Civil Engineering & Management and Psychology at the University of Twente. During my research I generally received gazed looks when I explained that I was graduating on a combination of civil engineering and psychology. Usually when I explained the subject, traffic safety, people became understanding and tried to assist me with helpful suggestions for my research.

For me this illustrates on one hand the relevance of my research and on the other hand its complexity. Its relevance, because everybody is a traffic participants, most of us are car drivers and traffic accidents are still the leading cause of death for young people in Western countries. Its complexity is partly because of the same reasons; everybody participates in traffic every day and all people seem to know which kind of behaviours hamper traffic safety. Since everybody has an opinion on these subjects, different viewpoints occur, disagree and distort each other. This can be a really confusing experience!

During my research, I have noticed that this process does not only occur when discussing my research with laypeople, but that it is also commonly present in scientific literature. It might even be a general treat of social sciences! It took me a while to realise that, although conducting a graduation project is never an easy task, the real challenge is to combine the theories of engineering studies and psychology on traffic safety, to discuss my work with experts from the Faculty of Engineering Sciences, the Faculty of Behavioural Sciences and the Laboratory of Driver Psychology and to integrate their viewpoints, and still delivering a report which is concise an comprehensible.

For helping me with my research and the preceding period, I would like to thank my tutors from the University of Twente: Martin van Maarseveen, Jan Gutteling and Bas Tutert. I would like to thank them for their enthusiasm and constructive criticism, which made all meetings real 'eye-openers'. Of course, I would also like to thank my tutor from INRETS, Patricia Delhomme. She was very eager to welcome me at the LPC and was tireless in advising me how to improve my thesis it.

In addition I would like to thank Jean-François Peytavin for his effort to get me the statistics I needed. Furthermore, I owe much to Jean-Louis Mondet, Brigitte Inisan and Dorette Alink-Olthof,

helping me with mailing my questionnaire and touring the *campagne* of Eure-et-Loir in order to photograph intersections.

Finally, I would like to thank the people who revised earlier versions and parts of my work. Stéphane Caro, Marie-Frédérique Ranucci and Wouter de Hamer, thank you very much for your suggestions!

Timme Bijkerk

Utrecht, September 24th, 2007

Contents

List of appendices

List of electronic appendices

1 Introduction

The driving task demands that a driver adapts to the characteristics of the road and that he interacts in a safe manner with all other road users (Delhomme, 1994). The quality of this performance is highly variable, being influenced by a variety of determinants within the traffic environment (table 1.1; Wang, Hensher & Ton, 2002). Furthermore, a distinction can be made between internal and external, and stable and transient factors (Delhomme & Meyer, 1998). Transient internal determinants include for example the psychological and physiological state of the driver. Driving experience and personal characteristics are more stable intern determinants. Transient external determinants include for example the visibility and the visual field structure. Examples of stable external variables are the road geometry and the vehicle itself.

Table 1.1 Dimensions of traffic environment (adapted after Wang, Hensher & Ton, 2002)

Road and traffic	**Driver**	**Vehicle**
Road geometry	Driving experience	Vehicle type
Visual field structure	Physiological state	Vehicle condition
Visibility	Psychological state	
Road surface condition	Personal characteristics	
Traffic control device	Driving attitude	
Traffic flow		
Vehicle speed		
Weather condition		

Traffic accidents occur as a result of the drivers' failure to meet the demands which the driving task imposes on him. In a potential dangerous traffic situation, a driver can avoid an accident if the situation is evaluated correspondently and the correct adjustments are made. On the other hand, if a driver systematically fails to appreciate potential hazards also 'safe' traffic situations can evolve in failure of the driving task. In all traffic situations, all types of determinants play a role.

Measures to improve traffic safety come in different forms. First, there are measures which aim at the traffic system itself. These include road improvements, vehicle design, traffic management and legislation. Second, there are interventions which appeal to the motivation of the driver. These measures typically use a communication technique to change the drivers' attitude towards his own driving behaviour, the behaviour of others and road safety (Delhomme, 1994).

This research focuses on the role of risk perception, which is a stable internal determinant of traffic safety. The first section of this chapter discusses the concept of traffic safety (section 1.1). The second section provides a short discussion of the epidemiology of traffic accidents (section 1.2). The third section describes differences in risk perception in France and The Netherlands (section 1.3). In the last section the framework of this research is described (section 1.4).

1.1 Traffic safety

Traditionally safety of the traffic environment is evaluated by physical statistics. Commonly used statistics are injury accident statistics. These statistics suffer from a number of technical problems, of which observation scarcity is probably the most important. Analyses are often expanded to less confronting encounters between road users including slight accidents, potential accidents and even mere conflicts (Svenson, 1998).

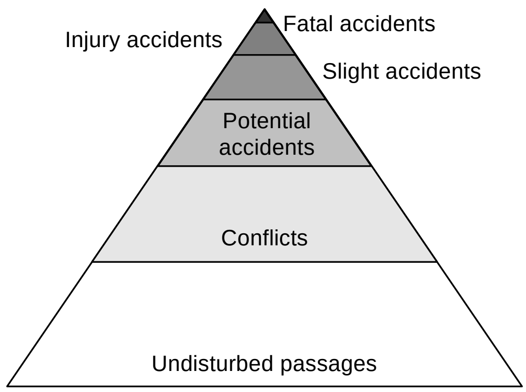

Figure 1.1 Traffic safety pyramid (Svenson, 1998)

In theory it is possible to include those conflicts which ended in a collision between road users into a quantitative analysis by using accident statistics. By making use of conflict analyzing methods like the Traffic Conflicts Technique (Svenson, 1998), the analysis can be expanded to the base of the traffic safety pyramid (figure 1.1), but these methods do not include interactions between road users without conflicts. For example the distance between cars overtaking cyclists and pedestrians typically adds to the traffic safety, but is usually not included. Of course it is possible to measure this distance during a number of overtakes but there are a great number of other circumstances which are increasingly hard to assess in a physical way. Examples of these are the presence of trees along the road, presence of playing children and the layout of the build environment (Steltenpool, 2005; Zwaan, 1996).

Concluding, the number traffic safety aspects which can be included in a physical analysis is limited. Expanding the analysis of (individual) traffic situations to the field of human perception and behaviour adds to the quality of the assessment. In addition most interactions between road users do not end up in a severe conflicts or collisions. For laypeople their perception of danger is often their only indicator of traffic safety. As laypeople are the principle users of any given traffic situation including their perception and behaviour is as important as including accident statistics in a traffic environment analysis.

1.2 Epidemiology of traffic accidents

Although in the traffic environment not all mistakes end up in accidents, traffic accidents are among the leading cause of death in Europe (Niederlaender, 2006). In 2004, approximately 1.3 million car accidents occurred in the EU-25 in which over 43 thousand people died (Bialas-Motyl, 2007). Especially young males are at high risk of dying as a result of a traffic accident (figure 1.2).

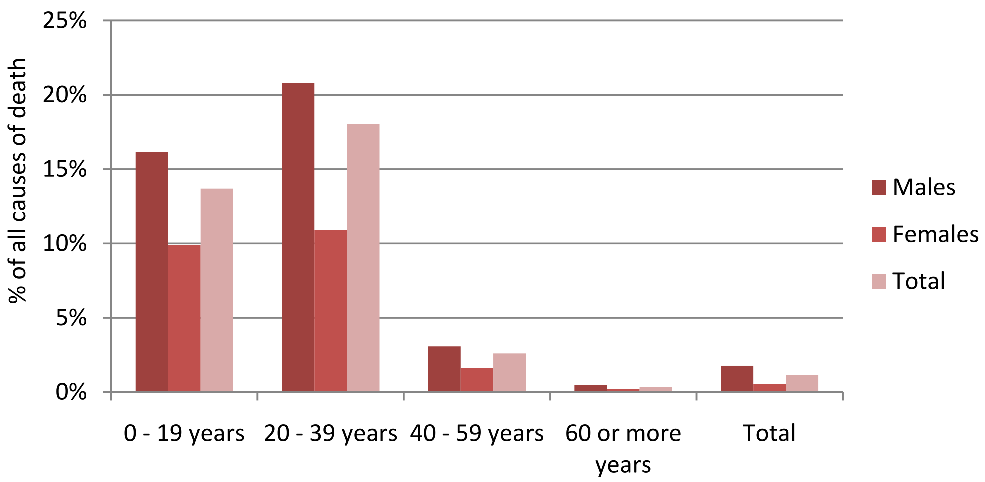

Figure 1.2 Death as result of traffic accidents by gender and age in the EU 25 in 2003 (Eurostat, 2007)

However, traffic accidents impose a major cause of death among a wider age group. In the European Union, traffic accidents are the leading cause of death for people under the age of 24 (Niederlaender, 2006; figure 1.3). This section describes some general characteristics of traffic safety in France and

The Netherlands (sub-section 1.2.1). Also, more detailed statistics are provided on the areas in which are zoomed in at in this research, Eure-et-Loir in France and Overijssel in The Netherlands (sub-section 1.2.2).

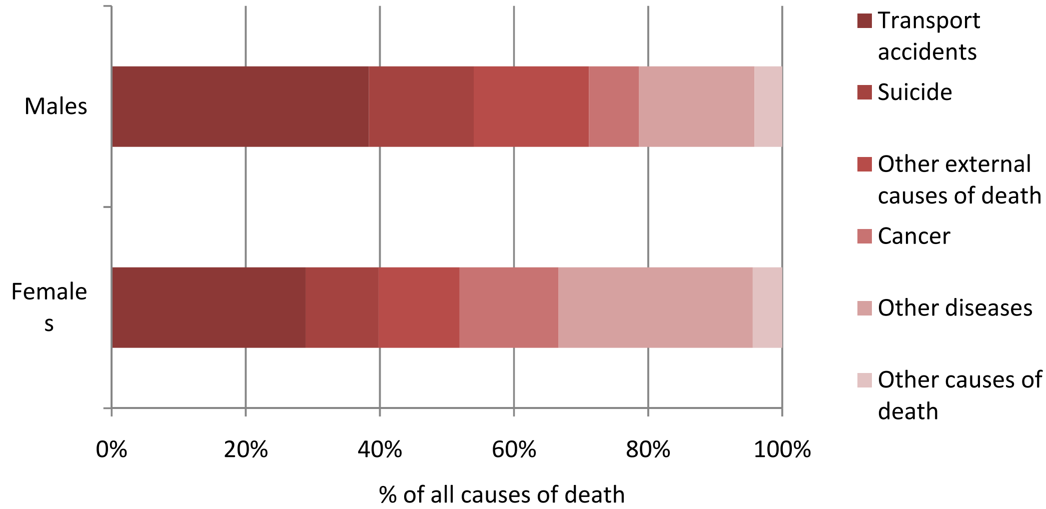

Figure 1.3 Causes of death for adolescents (15 - 24 years) in the EU 25 in 2003 (Eurostat, 2007)

1.2.1 Traffic safety in France and The Netherlands

In both France and The Netherlands traffic accidents are the leading cause of death for young people (figure 1.4). There are some constant factors in accident rates for both countries. As mentioned in at the beginning of this section it must be noted that specifically young males are over-represented in accident statistics (figure 1.3). Looking solely at accident statistics there is a difference between France and The Netherlands. In 2004 per million passenger cars 126 people died as a result of traffic accidents in The Netherlands. For France, this number was 178 (Bialas-Motyl, 2007).

Although most injury accidents occur within built-up areas, most fatal accidents happen on rural roads in both France (50%; ONISR, 2007) and The Netherlands (54%; SWOV, 2006). Relatively many accidents happen on intersections due to the increased chance on meeting conflicting road users (40% in The Netherlands in 2004; SWOV, 2006; 27% of all injury and 12% of all fatal accidents in France in 2003, ONISR, 2007).

Since both France and The Netherlands are Western European countries, with globally the same norms and legislation it is unlikely that there is a large difference in the quality of the road network and legislation regarding traffic safety. In The Netherlands more infrastructure is available for vulnerable road users (cycle tracks) and the speed limit is on average 10 km/h lower than in France. In France, legislation regarding drinking and driving and driving education is stricter.

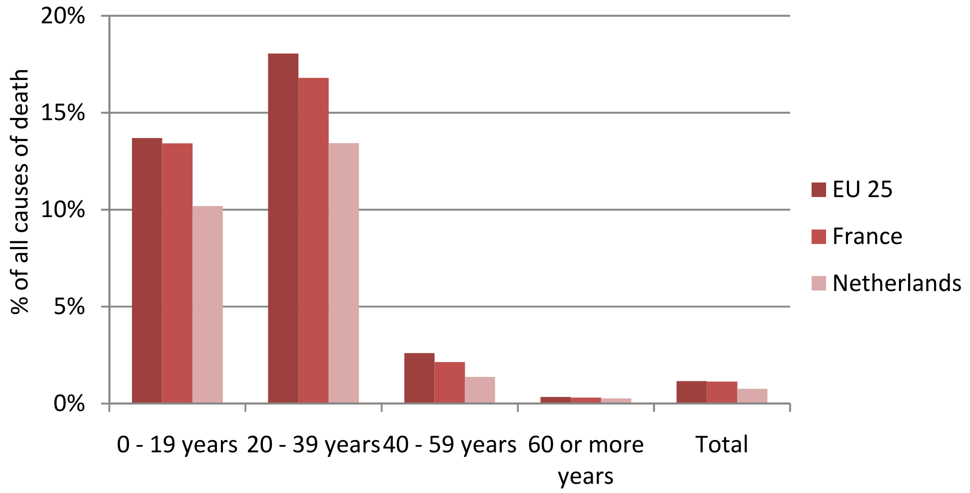

Figure 1.4 Deaths as result of traffic accidents by age and country in 2003 (Eurostat, 2007)

Table 1.2 Victims as a result of traffic accidents in 2000 and 2001 using different data sources

	Centre (Eurostat, 2007)	**Eure-et-Loir (INRETS, 2007)**	**Overijssel (AVV, 2003)**	**Overijssel (Eurostat, 2007)**
Fatalities	484	108	78	86
Injured	5893	282	3240	1002
Fatalities per million private cars	380	507[a]	174[b]	192
Fatalities per million inhabitants	197	263	72[b]	79

[a] Estimation based on ratio between cars and inhabitants in Centre region using Eurostat data (number of cars in Eure-et-Loir in 2005: 213 505, Ministère de l'Écologie, du Développement et de l'Aménagement durables (2006))

[b] Source for number of cars and number of inhabitants: Eurostat (2007)

The precise ratio of differences in accident statistics is largely depending on the source of data that is used and the selection that is made. Table 1.2 provides an overview of key indicators for traffic safety using different sources of data. Specifically the number of injured differs largely which can be explained by the lower registration rates for less severe accidents. In combination with the low fatalities / injuries rate of the French data compared to the Dutch data it can be assumed that the Eurostat (2007) and the INRETS (2007) sources underestimate the number of injured people. Therefore, for more detailed analysis of accident statistics (sub-section 1.3.2) only data on number of fatalities using INRETS (2007) and AVV (2003) data is used. Hereby must be noticed that also this measure can be interpreted differently according to the definition of fatality as a result of a traffic accident.

1.2.2 Deaths as a result of traffic accidents in Eure-et-Loir and Overijssel

As stated earlier accident statistics are an indicator of traffic safety. However, traffic safety is highly depending on external determinants such as environmental characteristics, weather conditions and working hours. Therefore accident statistics have to be corrected for external influences. Since the importance and significance of individual influences is usually unknown, it is difficult to correct for these influences by statistical means. Therefore in this research two regions are chosen which are assumed to be comparable on global characteristics. These regions are Eure-et-Loir in France and Overijssel in The Netherlands. Both regions are primarily flat with a major agricultural function.

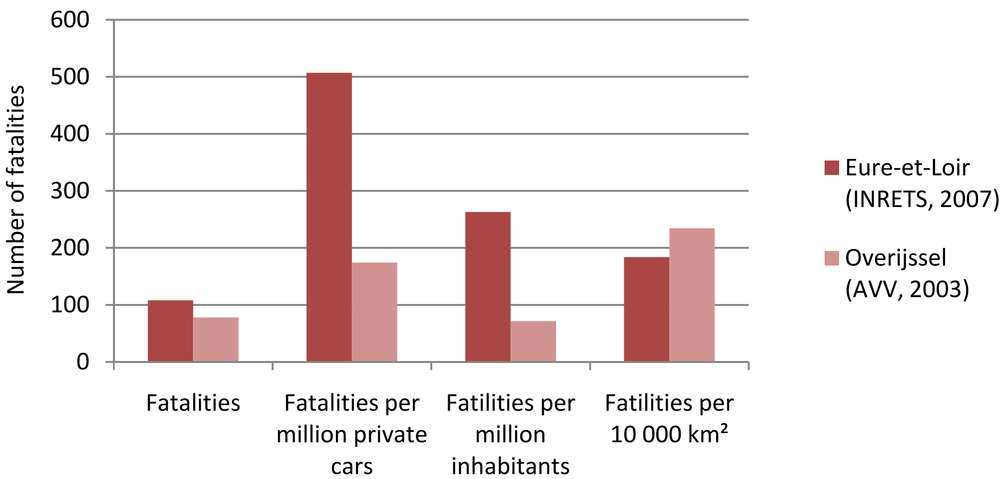

Figure 1.5 Victims as a result of traffic accidents in 2000 (AVV, 2003; INRETS data retrieved in personal communication with J.F. Peytavin, 24 May 2007)

Although Eure-et-Loir has as surface area nearly twice the size of Overijssel (5 880 km^2 compared to 3 327 km^2), the latter has almost three times as much inhabitants (1.1 million compared to 0.4 million). However, in Eure-et-Loir about 37% more people die in traffic accidents each year. When corrected for number of private cars or number of inhabitants this figure is even more dramatic (respectively 191% and 267%; figure 1.5).

Contradictory, when the number of fatalities is corrected for the surface of the regions, the number of traffic deaths in Overijssel is higher. This indicates that people in Eure-et-Loir are probably more depending on their cars for transport, which can be explained by the larger surface of the region. This is another indication that comparisons between both regions should be conducted carefully.

1.3 Risk perception

It is clear that there is a large difference between traffic safety in Eure-et-Loir and in Overijssel. Traffic safety within a geographical region is the result of a large amount of drivers' actions and their interactions. External and internal, and stable and transient variables influence this. Since regions and people are hardly ever comparable, it is not possible to use ceteris paribus research in order to investigate the influence of individual determinants.

It is hypothesized that a cultural component exists, which also accounts for a part of the difference in traffic safety between Eure-et-Loir and Overijssel. It is difficult to quantify culture as a measurable construct. Therefore this research defines this cultural component as risk perception in relation to an individual's nationality.

Risk perception is a relative stable internal factor which depends on individual characteristics and the type of perceived threat. The process enables individuals to gain a mental representation of the danger enclosed within a situation or activity; subjective risk. Slovic and Weber (2002) found that risk perception is largely depending on two factors: the extent to which a potential threat is dreadful and the extent to which it is unknown. Specifically potential threats, which score high on both of these dimensions, have been a subject of investigation. Differences between the risk perception of French and Dutch people regarding risk perception on nuclear energy (Wiegman, Gutteling & Cadet, 1995) and agricultural biotechnology (Zechendorf, 1998) have been found. Although French and Dutch people both have a negative attitude towards these technologies, the French perceive their benefits in general to be higher, resulting in a lower risk perception.

Sivak, Soler, Tränkle and Spagnhol (1989) showed a difference in traffic risk perception for drivers from Spain, Germany, Brazil and the USA. It is assumed that traffic risk perception is related to driving behaviour (Grayson, Maycock, Groeger, Hammond & Field, 2003). It is also assumed that residents of different countries differ in their traffic behaviour (e.g. Lajunen, Parker & Summala, 2004; Özkan, Lajunen, Chliaoutakis, Parker & Summala, 2006; Sivak, Soler & Tränkle, 1989a, 1989b). It is unlikely that a difference in risk perception determines the whole difference in accident statistics in France and The Netherlands.

It can be hypothesized that risk perception plays an important role in traffic safety. Research focussing on this component provides a better insight in differences in traffic behaviour between inhabitants from different countries and the way risk perception influences traffic safety.

This research investigates whether a difference in risk perception between French and Dutch drivers can be found. In order to do this a number of subjects are presented with stimuli in order to assess their perception of risk. Therefore the process of risk perception has to be conceptualized. Furthermore stimuli have to be selected. In addition a behavioural context has to be designed for the subjects to relate to.

As an expansion of the research it is investigated whether it is possible to influence the risk perception of drivers using low cost and easy to implement interventions. The objective of the next chapter (chapter 2) is to draw a theoretical background of these subjects. The third chapter describes the used method (chapter 3). In the fourth chapter the results of the research are included (chapter 4), after which the results are discussed (chapter 5).

2 Theoretical framework

This research investigates whether a difference in traffic risk perception between Dutch and French drivers can be found. Within the field of traffic psychology a lot of research is available which attempts to interpret unsafe traffic behaviour. The interaction between the human and its environment is a central aspect of this.

Traffic psychology is a relative new field of research with just over half a century of research. Within this field a study by Tillmann and Hobbs (1949) is regarded as a classical one. They were the first to notice that “a man drives as he lives”; correlating the extent to which people get involved in accidents with personality traits, setting a trend for the decade of research after the relation between personality and so-called ‘accident-proneness’ (e.g. Dahlen, Martin, Ragan & Kuhlman, 2005; Jonah, Thiessen, Au-Yeung, 2000; Lajunen & Parker, 2001). In the 1960s research on traffic psychology was characterised by a focus on the way that drivers perceive traffic situations. The common paradigm was that traffic accidents occur because drivers are unable to cope with increasing complex traffic situations (e.g. Groeger, 1989; Rumar, 1990).

In the 1970s and 1980s research after the cognitions involved with driving was conducted. A dominating view in traffic psychology during this period was that drivers adapt to their behaviour to the traffic situation and thereby choose the level of risk they want to subject themselves to (e.g. Fuller, 1984; Summala, 1988; Wilde, 1988). In the 1990s research was focused on cognitions involved in the driving tasks such as the way experienced drivers are able to automate much driving tasks (e.g. Michon, 1985; Reason, Manstead, Stradling, Baxter & Campbell, 1990) and the judgement of speed and time-to-collision (Cavallo, Mestre & Berthelon, 1997; Santos, 1997). Today the most common perspective is that driving is an activity performed within a social context. Drivers are influenced by the behaviour of other road users (e.g. Haglund & Åberg, 2000; Harré, 2005; Simons-Morton, Lerner & Singer 2005).

With all its distinct movements traffic psychology is not much different from other behavioural sciences. Psychological mechanisms that are found in surrounding fields of research like sensation seeking (e.g. Dahlen et al., 2005; Jonah et al., 2000), comparative optimism (e.g. Delhomme, 1991; Goszczyńska & Rosłan, 1989; McKenna, Stanier & Lewis, 1991; Rothengatter, 2002; Sivak, Soler

& Tränkle, 1989b; Waylen, Horswill, Alexander & McKenna, 2004) and aggressiveness (Lajunen & Parker, 2001; Lajunen, Parker & Summala, 1999) are commonly found within the context of traffic psychology. Also behavioural models commonly used to predict behaviour like Ajzen's (1991) Theory of Planned Behaviour are used within the field of traffic psychology (e.g. Elliot, Armitage & Baughan, 2003, 2005; Iversen, 2004; Letirand & Delhomme, 2005; Wallén Warner, 2006; Wallén Warner & Åberg, 2006). In addition traffic psychology also developed a variety of measuring tools designed within the context of traffic behaviour. Examples of these include the Driver Behaviour Questionnaire (e.g. Lajunen et al., 2004; Reason et al., 1990) and the Driving Anger Scale (Dahlen et al., 2005; Deffenbacher, Oetting & Lynch 1994; Delhomme & Villieux, 2005).

Traffic psychology also has its own distinct problems. Few other applications of psychology deal with common people having a potential to kill or injure themselves or other people instantly. Cognitive biases such as an illusion of control (I can handle it), comparative optimism (it will not happen to me) and over-justification (the rules do not apply to me) indulge drivers into speeding, not wearing seatbelts or drinking and driving, putting themselves and others at risk (Groeger & Rothengatter, 1998; Rothengatter, 2002).

In this chapter the theoretical background for the research suggested in chapter 1 is drawn. The first section provides an overview of different risk perception models (section 2.1). The aim of this section is twofold. The first aim is to provide an overview of risk models for traffic behaviour. In addition in this section a choice is made for a specific model in order to measure risk perception. The criteria for this are that there must be agreement on the validity of the model within the scientific debate and that it is possible to quantify the used constructs.

In the second section of this chapter an overview is provided of stimuli often used in research after risk perception within a driving context (section 2.2). Third, speed choice is described as behavioural context which is related to risk perception when driving in order to make the research easier for respondents to relate to (section 2.3). Fourth, an intervention aimed to alter the risk perception of drivers is designed (section 2.4). In the last section the research questions are formulated within the context of the presented theoretical framework (section 2.5).

2.1 Risk models for traffic behaviour

The concept risk plays a major role in a number of psychological models for driver behaviour. According to the majority of the classic risk models traffic safety depends on the interaction between objective and subjective risks. Both forms of risk depend on the dimensions of a traffic environment (table 1.1). Perceptual skills differ per person leading to an individual difference in subjective risk. A distinction can be made between models of risk compensation, risk thresholds and risk avoidance models (Michon, 1985).

This section provides an overview of different theories on the subject of risk behaviour within a traffic context. In the first sub-section two risk threshold models are included (sub-section 2.1.1); Klebelsberg's Modell der subjektiven und objektiven Sicherheit (1977) and the zero-risk model as suggested by Näätänen and Summala (1974). The second sub-section describes the risk homeostasis theory as suggested by Wilde (1988); a risk compensation theory (sub-section 2.1.2). The third sub-section includes a description of Fuller's threat-avoidance model (1984); a risk avoidance model (sub-section 2.1.3).

All of these models share the assumption that drivers are motivated to keep their perception of risk below or at certain levels (Van der Molen & Bötticher, 1988); a mechanical viewpoint of looking at behaviour. Therefore this section also describes a model which overcomes one of the complaints of Michon (1985): "the absence of cognitive talk among driving investigators"; the four step model for responding to hazards as suggested by Grayson et al. (2003; sub-section 2.1.4).

2.1.1 Risk threshold models

An example of a risk threshold models is Klebelsberg's Modell der subjektiven und objektiven Sicherheit (1977). It argues that in case the difference between subjective risk (SR) and objective risk (OR) is positive a traffic situation is safe (S > 0; figure 2.1). When this difference is negative, the situation is unsafe and accidents occur (S < 0; figure 2.1; Kanellaidis & Dimitropoulos, 1994; Klebelsberg, 1977; Watts & Quimby, 1980; Wright, Boyle & Redgrove, 1988).

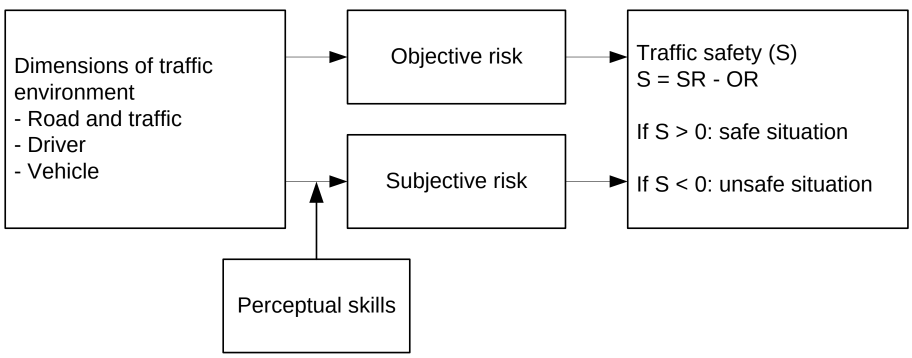

Figure 2.1 Interaction between objective and subjective risk in risk threshold models

Another risk threshold model is the zero-risk model (Näätänen & Summala, 1974). This theory states that drivers aim to perceive no feelings of risk. There can be found a threshold under which drivers have no sensations of risk. Only if drivers perceive that they cross this threshold they adapt their behaviour. It is assumed that drivers are not able to take risks into account to a degree that would be rational from their own or society's point of view. Therefore this threshold is usually too high because of distorting factors like perceptual errors (e.g. not seeing another vehicle), extra motives (e.g. need to safe time) or the extinction of feelings of risk (e.g. comparative optimism). A consequence of this theory is that drivers would never experience increasing levels of risk (Fuller, 1984).

A hampering factor for research aiming to test these theories is that the concept of objective risk is difficult to assess. It is not methodologically sound to use accident statistics (e.g. Groeger & Chapman, 1990; Watts & Quimby, 1980) since using these results in a circular argument. Accident rates do not determine objective risk but are merely a resultant of it. Accidents are the result of situations in which a road user fails to cope with an objective risk; not the risk itself (Kanellaidis & Dimitropoulos, 1994; Wright et al., 1988). Some methods of judging objective risk can be assessed by making a system analysis of a traffic situation (Shinar, 1984; Wright et al., 1988) or by using experts to judge the risk that is enclosed within a certain traffic situation (Kanellaidis & Dimitropoulos, 1994).

When this is done there seems to be a moderate correlation between objective traffic risks and judgements of traffic risks (Kanellaidis & Dimitropoulos, 1994; Shinar, 1984; Groeger & Chapman, 1990; Watts & Quimby, 1980). Apparently participants have an internal comprehension which is an approximation of the 'real' risk involved (Shinar, 1984). In addition there is some evidence that an underestimation of risk is related with an increased number of accidents (Kanellaidis & Dimitropoulos, 1994).

2.1.2 Risk homeostasis theory

The risk homeostasis theory is probably the most recognized risk compensation model. The theory predicts that whenever measures are taken to increase traffic safety, drivers behave in a less safe manner to obtain their previous level of risk. According to this theory, a driver compares the perceived level of risk with a target level (figure 2.2). The target level of risk is a personal parameter which varies among individuals. If the perceived level does not equal the target level an adjustment is made to change the perceived level of risk. In this process the perceived level of risk is continuously evaluated and included in the decision making process of a driver. A comparison with a thermostat is often used to illustrate the theory. The risk homeostasis theory explains why safety improving measurements do not always result in a decrease of the number of traffic accidents (Wilde, 1988).

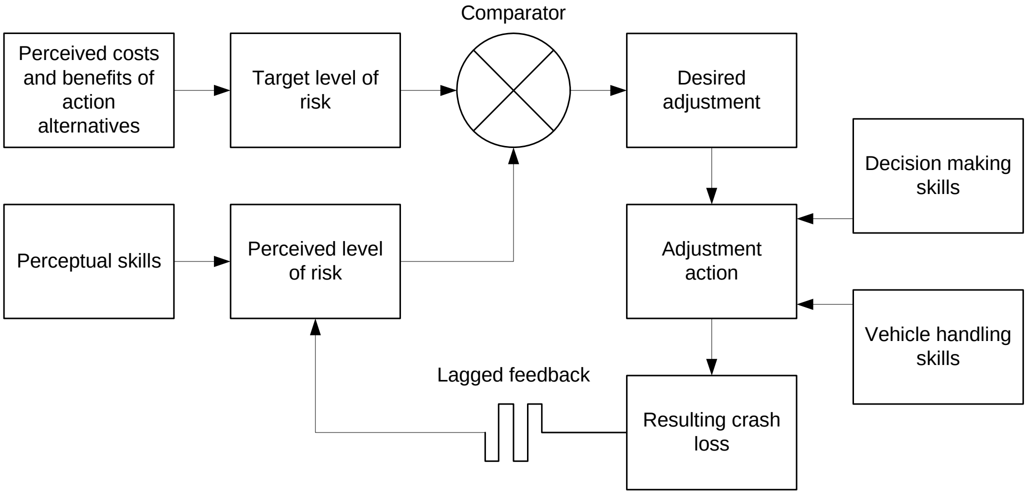

Figure 2.2 Risk homeostasis theory (Wilde, 1988)

There are different cases that provide evidence for the theory. The change from left-side to right-side driving in Sweden (1967) and Iceland (1968) resulted in a temporal decrease of the number of traffic accidents. This can be explained by a temporal increase in the level of perceived risk which leads to a difference between the perceived and the target level of risk. This leaded to an adjustment of driver behaviour in general into safer behaviour (Wilde, 2002). The system works also the other way around, drivers with an anti-lock braking system (ABS) seem to compensate for their increased safety by driving in a riskier way; a process which has also been labelled 'human behaviour feedback' (Evans, 1991, quoted in Horswill & Coster, 2002). According to the risk homeostasis theory road safety can only be improved if the target level of risk of drivers is changed with motivational interventions (chapter 1; Wilde, 1988).

The risk homeostasis theory uses the population as a reference frame. This result in an analysis based upon accident statistics for a whole country (Wilde, 1988) in which case the causal relations is hard to prove. This is even harder when a distinction has to be made between effects from motivational and traditional interventions. In addition some researchers suggest more logical explanations for observed changes in accident rates which are meant to be supportive for the theory (McKenna, 1988). The risk homeostasis theory also fails to explain which cognitive mechanism is responsible for the compensating behaviour of drivers (Rothengatter, 2002).

In general, there seems to be an agreement that some drivers display some compensating behaviour as a response to some measures. However, it is not likely that drivers adjust their behaviour in order to compensate completely for all safety measures (Rothengatter, 2002).

2.1.3 Threat-avoidance model of behaviour

The threat-avoidance model of behaviour was suggested by Fuller (1984) to make up for some of the theoretical flaws in the risk homeostasis model and the zero-risk model. According to Fuller it is not clear what stimulus is used in the assessment of risk in these models (see also McKenna, 1988). The threat-avoidance model tries to circumvent this by replacing risk cognitions for a stimulus-response mechanism in which perceived hazards are the stimulus.

In the threat-avoidance model of behaviour drivers also aim for zero risk. In addition a distinction is made between responding to hazards by anticipating or the delayed avoidance of adverse situations. The behaviour of a 'typical Näätänen and Summala driver' is anticipating, while a 'typical Wilde driver' delays his response until their level of target risk is crossed (Fuller, 1984). The threat-avoidance model is also a model which states that people are rationalist decision makers. This means that they are ought to weigh the advantages and disadvantages of an alternative in a systematic way; a mechanical viewpoint which seems to be borrowed from economic utility-maximizing theory. As in economical decision making the probability that people consider arguments in a rational manner when deciding to take a risk decreases when the complexity of the problem increases.

It can therefore be argued that seeing subjective risk just as a disadvantage of behavioural alternatives does not lead to a valid driver behaviour model. After all, "(…) people (…) run risks, they do not take them" (Wagenaar, 1992, quoted in Fuller, 2005). In addition motivational models such as these tend to have "lots of cake-talk, but little recipe talk" (Michon, 1985); aiming at the lack of risk models in general to explain which cognitive processes determine risk perception and their lack of predictive ability (Van der Molen & Böttiger, 1988).

It is suggested that risk is something that is only in the head of a person. Indeed risk perception is not a stimulus driven perception of events, it is about thoughts, beliefs and constructs (Sjöberg, 2000). However, it is possible to argue that some situations are less safe than others; making a larger demand on the capacities of the driver and the vehicle. Therefore analyzing the way that drivers perceive the risk within a traffic situation is helpful to understand why they respond to these situations as they do and which factors are of influence.

2.1.4 Four step model for responding to hazards

When performing a driving task decision skill is probably the most error-prone component. Therefore it can be regarded upon as the primary source of road accidents (Colbourn, 1978). In the previous sub-sections the discrepancy between objective and subjective risk is introduced as an important source of decision errors. In this sub-section a model which places subjective risk within a cognitive context is introduced. Cognitions are assumed to be the most proximal intrinsic causes of behaviour. Furthermore cognitions mediate the influence of other more distal determinants as personality and social demographic factors (Conner & Norman, 2005).

Tests of 'hazard perception' are often considered to be one of the most promising techniques available for improving driver safety and are therefore worthy of close consideration (Colbourn, 1978; Groeger & Chapman, 1996). Grayson et al. (2003) suggest a model for responding to hazards within a traffic context. They describe four processes involved in responding to risks (figure 2.3).

- Hazard detection; the process of becoming aware that a potential hazard is present.
- Threat appraisal: the process of evaluating whether a perceived hazard is sufficiently important to respond to by performing an evasive action.
- Action selection: the selection of an evasive action from one's repertoire of skills.
- Implementation: the actual performance of the necessary actions that are involved in the response.

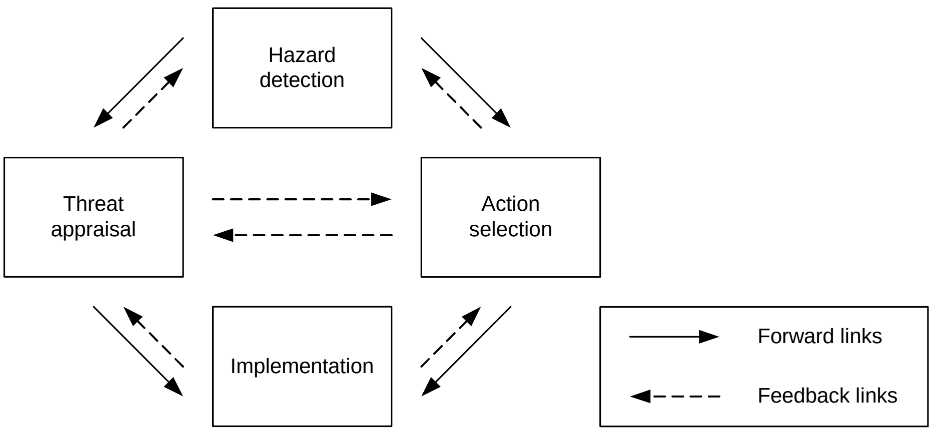

Figure 2.3 Processes involved in responding to risks (adapted after Grayson et al., 2003)

The statistical validity and reliability of the model have been confirmed within laboratory and real-world situations. It can be concluded that it is possible to quantify all involved constructs and to use this model within an experimental context. In addition it was found that threat appraisal and action selection are the most important predictors of actual accident involvement.

This seems no coincidence: when the other constructs are omitted, the model resembles the Protection Motivation Theory (PMT) as it was formulated by Rogers (1975). In the PMT threat appraisal is also included as a separate construct although it is defined differently. Also in the PMT coping appraisal is defined as weighting the "coping responses available to the individual to deal with the threat and factors that increase or decrease the probability of an adaptive response"

(Norman, Boer & Seydel, 2005); a more general description of the construct which is called action selection within the context of the more specific model for responding to hazards suggested by Grayson et al. (2003). The PMT is a valid model in order to predict a variety of health related behaviours (Norman et al., 2005).

Although there are some resemblances between the PMT and the model of Grayson et al. (2003) some differences can be found. In the latter threat appraisal describes whether a perceived hazard is threatening enough to respond to. In the PMT threat appraisal is defined in more detail; depending on an individuals' perception of the severity of the threat, their vulnerability to it and the intrinsic and extrinsic rewards of a response alternative.

In addition the PMT defines coping appraisal closer; introducing the concepts of response efficacy to describe one's perception of the extent to which a response alternative reduces the threat and self-efficacy to describe the perception that one is capable of performing the response alternative. Furthermore coping appraisal is influenced by response costs which impose a barrier to perform the response alternative. Another difference between the PMT and the model of Grayson et al. (2003) is that the PMT distinguishes between maladaptive responses, induced by threat appraisal, and adaptive responses which are induced by coping appraisal (Norman et al., 2005; figure 2.4).

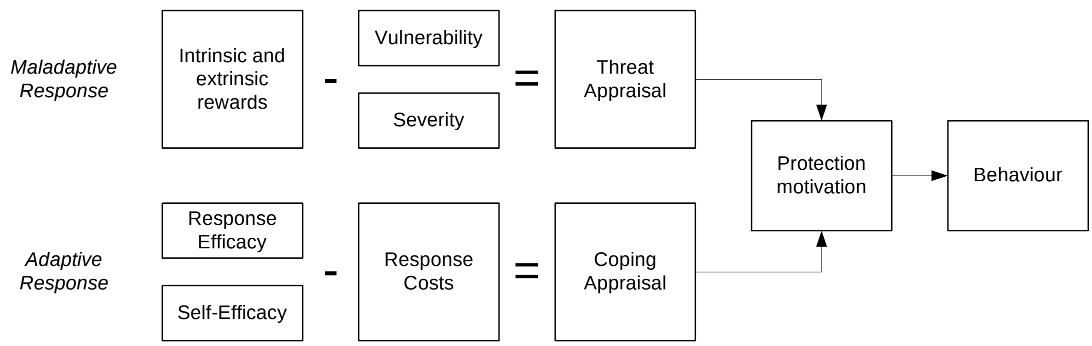

Figure 2.4 Protection motivation theory (Norman, Boer & Seydel, 2005)

It can be argued that to apply the PMT in a driving context a simplified version of the model satisfies. It might be useful to define the concepts of threat appraisal and action selection in the Grayson model closer using PMT terminology. After all it is likely that an individuals' driving behaviour depends on the perception of vulnerability to and severity of a threat. It is also likely that a reaction is influenced by one's driving abilities. However the number of action alternatives when driving and facing a hazard is in general quite limited. In addition the results of an action alternative are short-termed and easy to oversee for any driver. This is an important difference with high-level health behaviour like, for example, smoking in which short-term maladaptive responses (e.g. ignoring the problem) to a perceived threat might outweigh long-term adaptive responses (e.g. quitting).

In general it can be argued that the model of Grayson et al. (2003) specifies the PMT within a traffic context. It seems that after more than three decades of conceptualizing driving behaviour the cognitive approach is the most convenient one. Social Cognition Models (SCMs) have proven to be valid predictors of a variety of heath related behaviour. In addition they overcome much of the arguments which counter older driving behaviour models with a more mechanical viewpoint by placing the driver in a more human context. Within the context of models which are discussed in earlier sub-sections of this section it can be concluded that the four step model as suggested by Grayson et al. (2003) is the most valid and quantifiable model. Therefore in this research risk perception is conceptualized according to this framework.

2.2 Stimuli

In order to assess risk perception of drivers it is necessary to confront respondents with a stimulus and to measure their response. The responses that are measured have been derived in the previous section (section 2.1). This section provides an overview of stimuli often used in research on risk perception within a driving context.

The most important threat to the internal validity of the research is the extent to which respondents are capable to identify themselves with stimulus (mundane realism), for example: road users in a presented traffic situation. It is unlikely that road users derive the same perception of risk from a representation of a traffic situation (e.g. photographs, overview sketches) as they would have from a real-world situation. Even when using highly sophisticated methods of representation (e.g. simulator) this imposes a problem.

Since an important topic of this research is how unsafe respondents perceive a traffic situation to be, the quality of the representation of traffic situations is essential. This section lists a number of methods used to represent traffic situations in comparable research after drivers' perceptions (sub-section 2.2.1, 2.2.2 and 2.2.3).

2.2.1 Real-world measurements

The most realistic method of representing reality is of course using reality itself. A number of researchers used real-world measurements. A method commonly used is driving with subjects along a predefined track, assessing their performance by means of a questionnaire (e.g. Kanellaidis & Dimtropoulos, 1994); using an experienced in-car observer (e.g. Grayson et al., 2003) and physical measures such as speed and acceleration (e.g. Quimby, Maycock, Palmer & Buttress 1999; Watts & Quimby, 1980). However, using this method places a researcher in an environment which is hard to control and to keep constant over a number of trials due to external influences.

It might also be argued that participating in a survey alters the behaviour of the subjects (Grayson et al., 2003). This can be overcome by measuring physical quantities such as speed or lateral position of the vehicle without the informed consent of the involved drivers (e.g. Haglund & Åberg, 2000; Howarth, 1988; Quimby et al., 1999). However, to gain data on personal characteristics and other variables that might influence driving behaviour, additional questioning has to be done (e.g. Haglund & Åberg, 2000; Quimby et al. 1999).

2.2.2 Computerized assessments and simulators

Computerized assessments of skills hypothesized to be related to driving are commonly used in risk perception research (e.g. Colbourn, 1978; Grayson et al., 2003; Sivak, Soler & Tränkle, 1989a). A more advanced type of technology is a car simulator. Although simulator-based research offers more possibilities to increase mundane realism compared to questionnaire-based research the basic problem of mundane realism is the same. Simulator studies are often used to examine more low-level types of behaviour like time-to-collision judgements (e.g. Cavallo et al., 1997) and detection times of other road users and hazards (e.g. Crundall & Underwood, 1997; Santos, 1997). In these studies, it is the representation of movement which is of importance; not specifically the layout of the traffic situation itself.

2.2.3 Visual stimuli

An easy method to represent traffic situations is using visual stimuli. Assessment of risk perception using video clips is commonly used in research after the interpretation of potential traffic conflicts, in which movement is important (e.g. Colbourn, 1978; Hoffmann & Mortimer, 1993; Groeger & Chapman, 1996; Shinar, 1984; Kruysse, 1991) and general risk perception (Wang et al., 2002). Also more simple visual representation methods like photographs (e.g. Benda & Hoyos, 1983; Colbourn, 1978; Delhomme & Meyer, 1998; Roth, 2006; Sivak, Soler, Tränkle & Spagnhol, 1989) and overview sketches (e.g. Björklund & Åberg; 2005) are commonly used in risk perception research. Contra-intuitively it is not always the case that less advanced methods result in a worse representation. Often the more advanced a representation method is, the more subjects are aware of the differences between the representation and reality (Colbourn, 1978).

Responses to complex traffic situations are based upon internal representations of these situations. The same internal representation can be used for judging risk of filmed or photographed traffic situations (Kruysse, 1991). Risk perception is about thoughts, beliefs and constructs (Sjöberg, 2000). Therefore the 'real' stimulus is the internal representation of a situation a subject has.

2.3 Speed choice as behavioural measure

In order to asses risk perception it is essential to define a behaviour which is related to risk within a driving context. For this purpose speed choice is selected. Speed choice is a concept drivers can relate to. In addition the probability of answering in social desirable way is decreased since speeding violations are not regarded upon as serious offences (Letirand & Delhomme, 2005). From a risk model perspective speed choice can be seen as a behavioural evaluation of subjective traffic risk. For example when a driver encounters a traffic situation which he perceives to be dangerous the driver is likely to decrease the speed of the vehicle. As been argued before there is no evidence that this functions as a mechanism to compensate risk (sub-section 2.2.2) and the process is highly dependent on internal and external factors (chapter 1). However, speed choice is an important determinant of traffic risk. The higher the speed of a vehicle, the less time a driver has to anticipate on a possible collision. In addition the higher the speed of a vehicle, the greater the damage will be in case of a collision. It is therefore that much interventions aiming to increase traffic safety aim to decrease speeding behaviour.

Speed choice has been proven to be measurable using derived constructs like behavioural intention and attitude towards speed choice. Therefore the Theory of Planned Behaviour (TPB) is used as a theoretical framework (Azjen, 1991; figure 2.5). The TPB states that behaviour is predicted by the intention one has to perform the behaviour and the perceived behavioural control one has towards the intended behaviour. The intention towards behaviour is predicted by three constructs.

- Attitude; the sum of behavioural beliefs, which are hypothesized to comprise of expectancies towards the outcome of behaviour and the evaluation of these outcomes.
- Subjective norm; which comprises of beliefs about the norms one think other (significant) people have and the motivation one has to comply with these norms.
- Perceived behavioural control; which comprises of beliefs about the likelihood of encountering factors which hamper or stimulate the behaviour and beliefs about the power of these factors (Elliot et al., 2005).

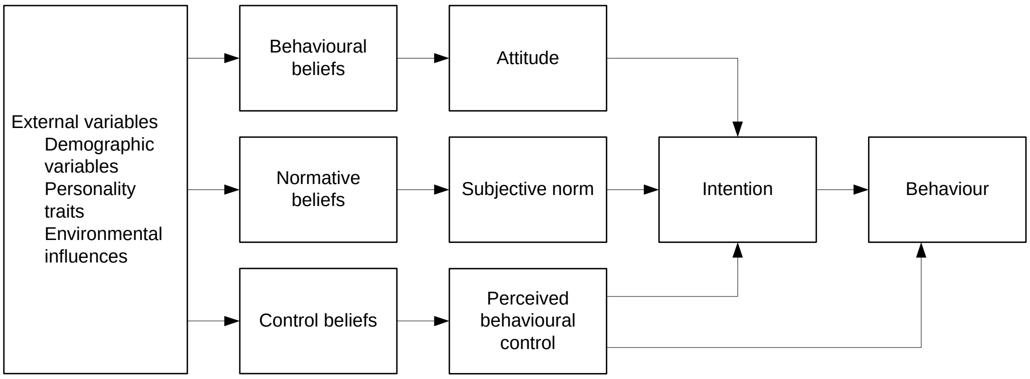

Figure 2.5 Theory of Planned Behaviour (adapted after Ajzen, 1991)

The TPB has provided a good account of drivers' intentions to speed and their subsequent speeding behaviour on several occasions (e.g. Elliot et al., 2005; Iversen, 2004; Wallén Warner, 2006; Wallén Warner & Åberg, 2006). Using the TPB it was also found that there is a relation between self-reported speeding and actual speeding (Haglund & Åberg, 2000; Wallén Warner & Åberg, 2006) which is higher for rural than for urban environments (Fildes, Rumbold & Leening, 1991).

In a meta-analysis of Ajzen and Fishbein (1977), comparing 109 researches making use of the TPB, it was found that attitudes can be used as estimators for actual behaviour if both are defined on an equal level of aggregation (principle of compatibility). According to the TPB attitude towards behaviour can be measured to provide an estimate of the actual behaviour (Fishbein, 1967). Therefore it can be concluded that attitudes towards speeding and self-reported speed choices might be used to predict speed choice in real-world situations.

2.4 Design of intervention

As mentioned before (section 1.4) it would be interesting to know whether risk perception of drivers can be altered using perceptual measures. Road markings can be a low cost perceptional countermeasure against speeding by influencing drivers' perception of speed. It is assumed that the threat perception of drivers within a given situation rises with their perception of speed. Through this process their choice of speed can be influenced as well (Fildes & Jarvis, 1994). To assess whether this is the case and whether a practical application of this research can be found, an intervention aimed to influence drivers' choice of speed is designed.

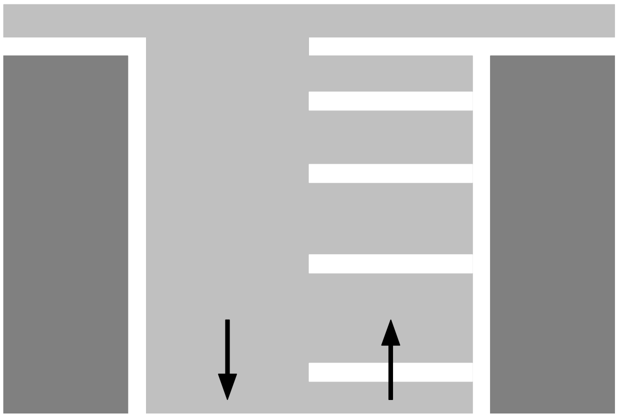

Figure 2.6 Transverse lines

A perceptual road treatment which is widely recognized to be effective in reducing driving speed is the application of transverse lines. This treatment consists of a series of contrasting lines painted across the road on the approach to a road hazard that increase in frequency as the hazard approaches (figure 2.6). The short term speed reductions after the application of transverse lines range up to 10%. Over a longer period the number of speed related accidents decreases substantially (Fildes & Jarvis, 1994).

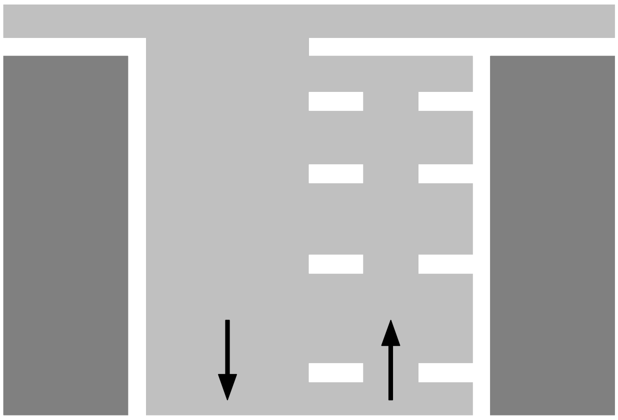

Figure 2.7 Peripheral transverse lines (adapted after Macaulay, Tziotis & Fildes, 2002)

A variant of transverse markings is formed by transverse striping on the edges and shoulders of roads (figure 2.7). These so called 'peripheral transverse lines' seem to have a long term effect reducing the speed of vehicles approaching intersections (Macaulay, Tziotis & Fildes, 2002). The four experimental conditions which can be distinguished in this research are summarized in table 2.1.

Table 2.1 Experimental conditions in research

	Control	**Intervention**
French	French respondents evaluate threat appraisal and action selection of intersections (appendix D).	French respondents evaluate threat appraisal and action selection of intersections with added peripheral transverse lines (appendix E).
Dutch	Dutch respondents evaluate threat appraisal and action selection of intersections (appendix D).	Dutch respondents evaluate threat appraisal and action selection of intersections with added peripheral transverse lines (appendix E).

2.5 Research questions

This section lists the research questions. The main research question of this project is:

- Do French and Dutch drivers perceive risk in a traffic environment differently?

To answer this research question, a number of sub-questions have to be answered first.

- How threatening do French drivers appraise a number of given traffic situations to be? How threatening do Dutch drivers appraise these same traffic situations to be? Are there any differences between the Dutch and the French appraisals? Are there any differences between the control and the intervention situation?
- What is the attitude of French drivers towards different action alternatives under these traffic situations? What is the attitude of Dutch drivers in the same situation? Are there any differences between the Dutch and the French evaluations? Are there any differences between the control and the intervention situation?
- What conclusions can be drawn on base of the found differences?

3 Methodology

This section provides a description of the research method. The research makes use of a questionnaire, a commonly used method in research after traffic behaviour (e.g. Björklund & Åberg, 2005; Elliott et al., 2003, 2005; Iversen, 2004; Letirand & Delhomme, 2005; Quimby, Maycock, Palmer & Grayson, 1999; Sivak et al., 1989b). A number of photographs (section 3.1) of intersections are shown to respondents (section 3.3) which are asked to indicate whether they perceive the situation to be dangerous and at which speed they would cross the intersection (section 3.4). In order to test the questionnaire a pilot-survey is held (section 3.2). The questionnaire is constructed in English (appendix A) and translated into Dutch (appendix B) and French (appendix C). After this the hypotheses for the research are listed (section 3.5). The last section summarizes the relation between the variables, the hypotheses and the questionnaire items in a measuring model (section 3.6).

3.1 Traffic situations

The size of the selection of traffic situations is mainly determined by the size of the questionnaire. It can be assumed that the response is negatively correlated with the length of the questionnaire. Therefore the number of traffic situations is limited to six. The selection criteria for the sites are summed up in the second sub-section (sub-section 3.1.2). After selection the sites are photographed to represent them according to section 3.1.3.

3.1.1 Comparability of traffic situations

Respondents evaluate all traffic situations using the same questionnaire items. In order to prevent ceiling and floor effects individual traffic situations have to be as comparable as possible. Therefore all selected traffic situations are intersections located in rural country. As described before two regions (Overijssel and Eure et Loir) which are assumed to have roughly the same landscape characteristics are selected for this purpose (section 1.3). Furthermore all situations are photographed under the same circumstances: no traffic, bright weather, middle of the day.

The traffic situations are globally comparable. However there will always be interaction effects; French road users are more likely to be familiar with French traffic situations even if they do not recognize the specific traffic situation than Dutch road users. Therefore the research includes both French and Dutch locations.

3.1.2 Accident locations

To test for the internal validity of the representation method real-world situations and respondents which are likely to know (some of) these situations are selected. The rationale for this is that a road user who is familiar with a situation uses his prior knowledge of the situation to induce his perception of the situation. Therefore a road user has two sources of knowledge on traffic risk: the representation of the traffic situation and prior knowledge of the situation. Under these circumstances a new construct has to be added to each representation of a traffic situation: familiarity with the traffic situation (section 3.4). By using this method the method of representation can be validated by comparing each traffic situation between respondents who are and who are not familiar with the situation.

It is essential that a representative number of respondents are familiar with each traffic situation. To increase the probability that a respondent is familiar with a situation accident locations are selected. The definition of an accident location in this research is a location on which one or more injury accidents happened during the period 2002-2005. In order to select the locations GIS data from the Dutch Ministry of Transport (AVV, n.d.) and CETE Normandie Centre (L. Faucher, personal communication, 19 March 2007) is used. To minimize the number of potential accident locations four-legged intersections in rural areas are selected. As stated before relatively much fatal traffic accidents occur at these locations (section 1.2).

3.1.3 Representation method

In this research an intersection is visualized by three photographs from the road user perspective (approximately -10°, 0° and 10° with respect to the longitudinal axis of the right hand lane). The photos are pasted together using photo-editing software resulting in a widescreen representation of an intersection (900 x 300 pixels; appendix D). The intervention situations are constructed by adding peripheral transverse lines to the selected intersections using photo-editing software (appendix E). To minimize the influence of transient external and internal variables participants might take into account spontaneously the photographs are accompanied with a description of the situation and the circumstances under which the drivers approaches it.

There are certain classes of hazard which are generic indicators of threat (looming characteristics) which drivers easily perceive to be a risk (Grayson et al., 2003; Kruysse, 1991). It is important that the answering scale confirms with the represented traffic situations to prevent potential differences from being distorted by so-called ceiling or floor effects (all subjects indicating the extremes of the scale for specific sites). Therefore it is important that the represented traffic situations are not perceived to be too hazardous or too safe. In order to assess this a pilot survey is held (section 3.2).

3.2 Pilot-survey

Before the questionnaire is sent to the respondents (section 3.3) it is pre-tested in a pilot-survey (appendix F). The aim of this pilot-survey is fivefold:

- To find and correct errors made writing the questionnaire;
- To test whether all items are formulated in a comprehensible way;
- To test for internal consistency of the scales;
- To test the scales for ceiling or floor effects; and
- To gain experience with data-collecting and data-analysis.

This section describes the results of the pilot-survey. First, a description is provided of the respondents (sub-section 3.2.1). Second, the validation of the threat appraisal scales is included (sub-section 3.2.2). Third, the validation of the action selection scales is described (sub-section 3.2.3). Fourth, the used self-efficacy scales are discussed (sub-section 3.2.4). The items on familiarity (see appendix F) are not included due to the fact that the respondents in the pre-test cannot be expected to be familiar with traffic situations. Possible effects of respondents being familiar with specific intersections can be ignored since this does not influence the validation of the scales. A summary of the results of the pilot-survey is provided in electronic appendix B.

3.2.1 Respondents

The questionnaire was sent to 49 employees of the University of Twente and 6 employees of INRETS using e-mail. Of the 55 people it was sent to, 29 people filled in (a part of) the questionnaire (53%). 18 people (33%) filled in the complete questionnaire: 5 French (28%) and 13 Dutch (72%). The main reason for people to quit filling in the questionnaire was its length (four of the respondents replied to the invitation e-mail to indicate this). In addition 5 respondents used the space provided to them for additional comments to complain about the length. Therefore the questionnaire is shortened.

3.2.2 Threat appraisal

Threat appraisal is measured by asking respondents to judge upon the probability of getting involved in an accident while crossing the intersection. They are also asked to evaluate to what extent their car would be damaged if they would get involved and to what extent they would be injured under these circumstances. Also respondents are asked to judge upon these items considering another driver who is familiar with the intersection and one who is not.

Judgements of probability, damage and injury for the respondent himself and for other drivers are correlated ($0.71 < r < 0.91$, $p < 0.01$). A threat appraisal (QC_iS) scale is constructed by multiplying judgements of probability with judgement of damage and injury. To construct the scales a formula is used based on the engineering concept of risk (R) as a function of probability (P) and consequence (C; equation 3.1).

$$R = P \cdot C^2 \quad : \quad QC_iS_j = \frac{QC_iS_{j,a} \cdot \left(8 - QC_iS_{j,b}\right) \cdot \left(8 - QC_iS_{j,c}\right)}{7^3} \qquad (3.1)$$

In this formula the QC_iS_j variables refer to the original questionnaire items on threat appraisal by intersection (i): index 'a' indicates the perceived probability of getting involved in an accident, and subscripts 'b' and 'c' indicate the estimated damage to respectively one's car and oneself. Index 'j' refers to the appraisal of threat to respectively oneself ($j = 1$), an imaginary driver who is familiar with the intersection ($j = 2$)and one who is not ($j = 3$) (e-appendix B). The division by powers of seven is done in order to convert the scales to a factor. The correlations between QC_iS_1, QC_iS_2 and QC_iS_3 are included in table 3.1. Paired sample T-tests showed no difference between the three scales (e-appendix B).

*Table 3.1 Pearson's correlation (r) for own threat appraisal, QC_iS_1, that of a familiar driver, $QCiS_2$ and that of an unfamiliar one, $QCiS_3$ (** $p < 0.01$)*

	QC_iS_1	**QC_iS_2**	**QC_iS_3**
QC_iS_1	1.00	0.87 **	0.90 **
QC_iS_2	0.87 **	1.00	0.77 **
QC_iS_3	0.90 **	0.77 **	1.00

The constructed threat appraisal scale by intersection (C_i) is included in figure 3.1. Based on the fact that there are no additional comments on the threat appraisal scale and the use of the complete scale over different respondents and intersections (e-appendix B) it seems likely that the scale is valid. This is enforced by the fact that there seems to be a distinction between intersections when regarding threat appraisal. Intersections which are easier to oversee are evaluated as less threatening. In addition the distinction between own threat appraisal and the appraisal of threat to other drivers is not significant. Therefore threat appraisal is measured only by the three items on own threat appraisal ($QC_iS_{1,x}$) in the actual survey.

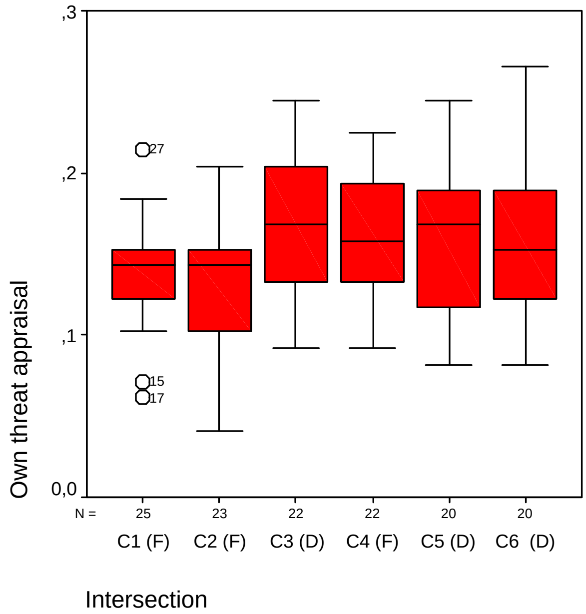

Figure 3.1 Box plot of own threat appraisal (0 = no threat; 1 = high threat) by intersection (C_i)

3.2.3 Action selection

Action selection is measured by asking respondents to complete four items (unsafe – safe, harmful – beneficial, unpleasant – pleasant, negative – positive) when evaluating three different action alternatives (decrease speed to 40 km/h, maintain speed of 60 km/h, increase speed to 80 km/h) considering that they are approaching the intersection with a speed of 60 km/h. Also respondents are asked to indicate their preferred speed on a four point scale (40, 60, 80 km/h and other). Figure 3.2 shows a box plot for the preferred speed (newspeed) by intersection (C_i). As can be seen no respondents indicated a preferred speed over 60 km/h. As with the threat appraisal scale this action selection scale seems valid on sight. In general respondents choose a higher speed in order to cross intersections which are easier to oversee.

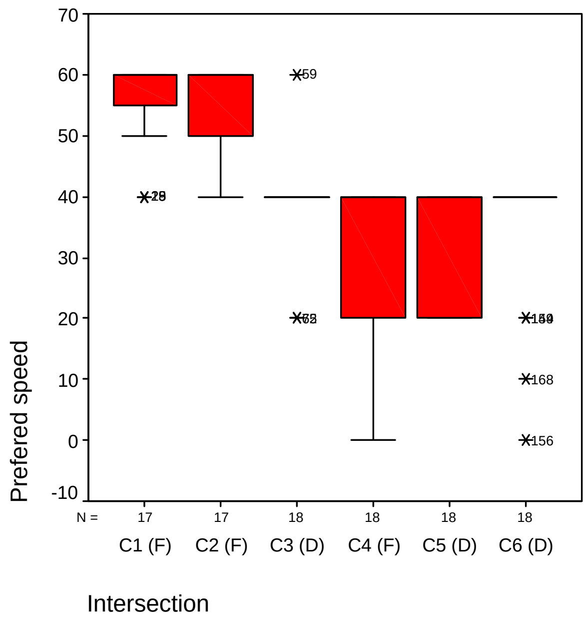

Figure 3.2 Box plot for preferred speed (newspeed) by intersection (C_i)

All attitude items ($QC_iB_{j,x}$) provide an internally consistent scale ($0.88 < \alpha < 0.93$). A t-test to investigate the difference between the attitudes towards different action alternatives by preferred speed (categories > 50 km/h and < 50 km/h) indicates a significant distinction between these categories for attitude towards 60 km/h ($t(104) = 9.41$, $p < 0.001$) and attitude towards 80 km/h ($t(104) = 8.09$, $p < 0.001$). Figure 3.3 shows a box plot for attitude towards 60 km/h (QC_iB1) by intersection (C_i). This scale seems also valid on sight; assuming that it is in general safer to cross an intersection with a lower speed. In general respondents indicated a more negative attitude towards crossing with this speed at intersections which are less easy to oversee.

Since no respondents indicated a preferred speed over 60 km/h and attitude towards 60 and 80 both are a significant predictor of preferred speed, attitude towards 60 km/h is included in the real questionnaire. In addition there seems to be a distinction between intersections by action selection. Attitude towards driving with a speed of 60 km/h is in general more positive for intersections which are easier to oversee. However, due to the limited number of respondents this effect is not quantified.

Multiple respondents indicated that they did not understand two items of the scale (beneficial – harmful, negative – positive). Omitting these two items leads to a new two-item scale with a high internal consistency ($\alpha = 0.93$) and a high correlation with the old scale ($r = 0.97$, $p < 0.001$). This can be seen as an argument in favour of omitting the items from the questionnaire, since items which are ill-understandable for respondents are likely to induce alienation from the research. On the other hand, it is questionable if a scale with only two items can be regarded as a ‘true’ scale. Since the probability of alienation is also greatly reduced by omitting other items, the two attitude items are kept in the real survey.

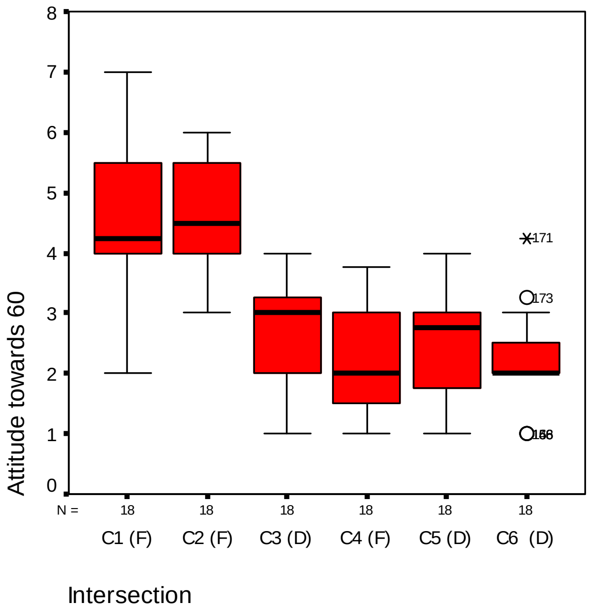

Figure 3.3 Box plot for attitude towards 60 (QC_iB_1; 1 = negative attitude, 7 = positive attitude) by intersection (C_i)

A second improvement of the action selection scale is found in adapting the preferred speed scale. Since multiple respondents indicated alternatives which are not present on the scale (stopping and decreasing to 20 km/h) it seems logical to expand the scale.

3.2.4 Self-efficacy

In order to validate the threat appraisal and the action alternative scales a self-efficacy scale on driving was added to the pilot-questionnaire. Self-efficacy is the “cognitive subjective judgement of the person’s own possibilities of carrying out certain behaviours given adequate skills and sufficient motivation” (Wiegman & Gutteling, 1995). Self-efficacy is known to correlate with risk appraisal (Delhomme & Meyer, 2000; Taubman – Ben-Ari, Mikulinces & Iram, 2004) and as predicted by the PMT (sub-section 2.1.4). Therefore a high correlation between this construct and the constructed scales is an indicator of the validity of these scales. To measure self-efficacy a scale designed and validated by Taubman – Ben-Ari et al. (2004) is used. The scale is translated into Dutch and French for this research.

The self-efficacy scale consists of fourteen different behaviours which are all legal felonies. Respondents are asked whether they feel confident while committing these behaviours (QSE_1) and to what extent they control the behaviours (QSE_2). Like Taubman – Ben-Ari et al. (2004) a high internal consistency for both scales is found (QSE_1: α =0.89 and QSE_2: α = 0.99). However, several respondents reported not understanding one question of the scale (QSE_2). Also, the evaluated behaviours can be regarded as being quite rare. It is doubtful whether evaluations of these behaviours are representative of more day-to-day driving behaviours such as crossing a four-legged intersection. Therefore in the real survey the scales are replaced by a Driving Sensation Seeking scale (sub-section 3.4.3)

3.3 Respondents

Respondents of the survey are residents of the regions in which the traffic situations are located (sub-section 3.1.2). Respondents are invited by a letter to participate in the research. In this letter a URL is included which can be entered in a web browser to access the on-line questionnaire.

Thefirst sub-section describes the number of respondents that is needed in order for the expected differences to be significant (sub-section 3.4.1). In the second sub-section the sample framework is described (sub-section 3.4.2).

3.3.1 Necessary number of respondents

The needed sample size is determined according to equation 3.2 (Six Sigma, 2007). In this formula, $z_{\alpha/2}$ is the positive z value that is at the boundary of the α/2 area in the right tail of the standard normal distribution, σ is the population standard deviation and E is the maximum value of the error between the sample mean, x, and the underlying population mean, μ.

$$E = z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}} \tag{3.2}$$

Since the objective of this study is to compare two samples of drivers who are drawn from the same population (all drivers), E has to be replaced with a term which expresses the minimum effect size which has to be proved significant. Suppose a population with mean μ out of which two samples with means x and y are drawn. The maximum difference between both sample means exists when E is maximal, x = μ + E and y = μ – E. Under these circumstances the maximum value of error, or in this case, minimal significant difference E is:

$$E = \frac{x - y}{2} \tag{3.3}$$

Therefore, formula (3.2) can be rewritten to determine the minimal needed sub-sample size for both x and y (3.4).

$$n = \left(\frac{2 \cdot z_{\alpha/2} \cdot \sigma}{x - y} \right)^2 \tag{3.4}$$

With α = 0.05, $z_{\alpha/2}$ is given as 1.96. Assumed that on a seven-point scale σ = 0.5 (e-appendix B) and x – y = 0.5, the minimum required sub-sample size is 16. Multiplied by four sub-samples (control Dutch, control French, intervention Dutch and intervention French) and corrected for an estimated 5% response the number of questionnaires that need to be send is 2 000.

3.3.2 Sample framework and mailing

In the previous section it is determined that a sample of 2 000 potential respondents has to be drawn in order for the expected differences to be significant. Since there are four experimental groups each group consists of 500 potential respondents. Therefore 1 000 inhabitants of Overijssel (out of 1.1 million inhabitants) and 1 000 of Eure-et-Loir (out of 0.4 million inhabitants) are selected.

The Dutch respondents are selected on basis of their postal code. The addresses of six postal code zones (7511, 7512, 7513, 7514, 7533, 7535) in the eastern part of Enschede (population approximately 155 000) are bought. The selected postal codes represent a total of 21 178 addresses. Of these, 1 000 are selected at random (4.7%). The French respondents are selected on basis of the city they live in. A total of 1 000 randomly selected addresses of inhabitants of Chartres (population approximately 40 000) is bought.

All respondents received a letter with a short explanation of the context and the subject of the research and an invitation to participate. Participants also received a hyperlink which they had to enter in an Internet browser in order to fill in the questionnaire online. There are different hyperlinks, one referring to each of the experimental conditions (section 2.4). After two to four weeks, all respondents have been reminded by another letter with the same hyperlink that was sent to them originally.

3.4 Variables

This section lists the variables included in the research. A distinction is made between socio-demographic (sub-section 3.4.1), dependent (sub-section 3.4.2) and a validation variable (sub-section 3.4.3). The questionnaire is included in appendices A, B and C.

3.4.1 Socio-demographic variables

In France and in The Netherlands accident rates differ for specific groups (Bialas-Motyl, 2007; ONISR, 2006; SWOV, 2006). Therefore it is important to include a number of socio-demographic variables. Gender and age (Dahlen et al. 2004; Harré, 2000; McKenna et al., 1991; SARTRE 3, 2004; Sivak et al., 1989a, 1989b; Simons-Morton et al., 2005), driving experience (Waylen et al., 2004) and vehicle characteristics (Horswill & Coster, 2002) are commonly regarded as determinants of road accidents and risk perception. Therefore these are included in the questionnaire (QED_{1-17}). Since obtaining the difference between French and Dutch drivers is the objective of this research, nationality is also included (QED_3).

Since the extent of familiarity with a situation is used in this research in order to improve and test the internal validity of the risk perception scales an index is constructed to measure this. Four items per intersection (C_i) are included to measure knowledge about the intersection due to own experience (QC_iF_{1-2}) and due to information from acquaintances (QC_iF_{3-4}).

3.4.2 Dependent variables

Risk perception can be conceptualized into a process which consists of four different constructs: hazard detection, threat appraisal, action selection and implementation (sub-section 2.1.4). As described in section 2.1.4 the most important constructs within the process of risk perception are threat appraisal and action selection. Therefore this research focuses on the role of these two constructs. Threat appraisal and action selection are measured by presenting the stimuli to the respondents and asking them to evaluate a number of items. To minimize the influence of transient variables participants might take into account spontaneously the photographs are accompanied with a description of the situation (chapter 1).

Threat appraisal is measured by three items (QC_iS_{1-3}). Respondents are asked to evaluate the probability of getting involved in an accident at the intersection (likely – unlikely). They are also asked to judge upon the amount of damage to their car (much damage – no damage) and injuries (many injuries – no injuries) they expect given that they would get involved in an accident at that intersection.

To measure action selection the attitude of participants (section 2.2) towards one action alternative (crossing an intersection with a speed of 60 km/h) is measured using a four-item scale (safe – unsafe, unpleasant – pleasant, harmful – beneficial, negative – positive; QC_iB_1). All items are scored on a seven-point Likert scale in order to obtain an optimum balance between distinctive ability and recognisability (Sjöberg, 2000). In addition respondents are asked to indicate the speed at which they would approach the intersection (0 km/h – 100 km/h).

3.4.3 Validation variable

In order to validate the threat appraisal and the action alternative scales a Driving Sensation Seeking scale is added to the questionnaire. Sensation seeking can be defined as a trait expressed in "the need for varied, novel, and complex sensations and experiences and the willingness to take physical and social risk for the sake of such experiences" (Zuckerman, 1979). Like self-efficacy (sub-section 3.2.4), sensation seeking is also known to be correlated with risky driving behaviours (Dahlen et al., 2005; Jonah, 1997; Yagil, 2001). Therefore a negative correlation between this construct and threat appraisal, and a positive correlation with preferred speed and attitude towards crossing an intersection with 60 km/h is an indicator of the validity of the scales.

In order to measure sensation seeking a scale constructed by Yagil (2001) is used. The scale was translated into French by Delhomme, Blotiére and Lenk, (2007). For this research the scale is also translated into Dutch.

3.5 Hypotheses

As described in section 3.1 respondents are asked to judge the risk of traffic situation. Therefore the first hypothesis is:

- French respondents score lower on threat appraisal than Dutch respondents.

Second, participants are asked about their attitude towards crossing an intersection with 60 km/h. It is assumed that it is in general safer to cross the presented intersections with a lower speed. Therefore the following hypothesis is formulated:

- Dutch respondents have a more negative attitude towards crossing an intersection with 60 km/h.

Consequently the same holds true for a respondents' choice of speed:

- French respondents choose a higher speed to cross the junction than Dutch respondents.

As described in section 2.4 adding transverse lines to the photographs (the intervention situation) aims to raise the respondents' perception of risk. Therefore the following three hypotheses are derived analogous to the former three:

- Respondents in the intervention situation score higher on threat appraisal than respondents in the control situation;
- Respondents in the intervention situation have a more negative attitude towards crossing the intersection with 60 km/h than respondents in the control situation; and

- Respondents in the intervention situation choose a lower speed to cross the intersection than respondents in the control situation.

3.6 Measuring model

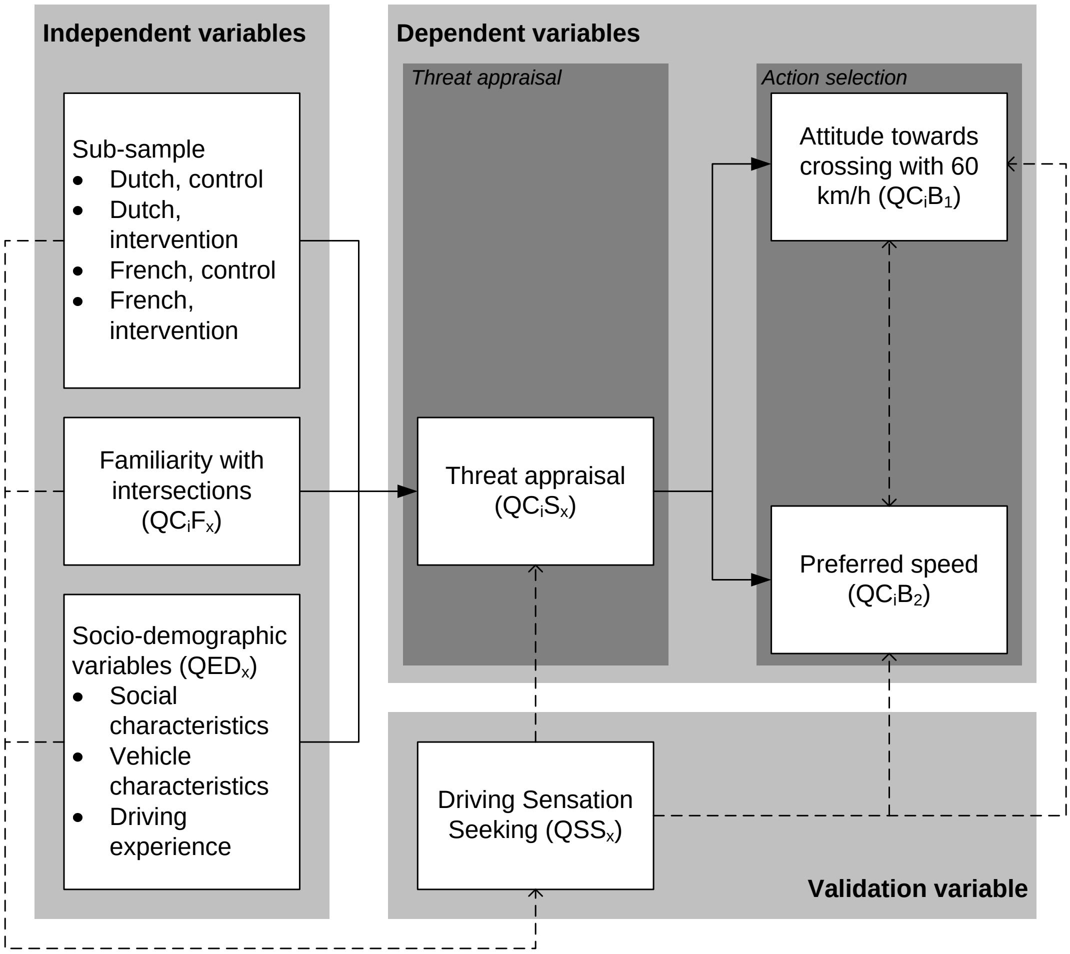

Figure 3.4 Measuring model: solid lines denote hypothetical correlations; dashed lines denote validation correlations; variables between brackets refer to questionnaire items.

In figure 3.4 the variables between brackets refer to the questionnaire items (appendices A, B & C). The links between the variables and the questionnaire items are summarized in table 3.2.

Table 3.2 Summary of links between variables and questionnaire items

Type of variable	**Part of questionnaire**	**Items**
Socio-demographic variables	Parts 1 & 6	QF_x (3 items), QED_x (16 items)
Threat appraisal	Part 2	QC_iS_x (6 x 3 items)
Action selection	Part 3	QC_iB1_x (6 x 4 items), QC_iB2_x (6 x 1 item)
Familiarity	Part 4	QC_iF_x (6 x 4 items)
Driving sensation seeking	Part 5	QSS (7 items)

In the previous sections of this chapter the way the different variables are measured using the questionnaire is described (section 3.4). Also, the hypothesized relations between them are listed (section 3.5). These can be summarized in the measuring model as included in figure 3.4. The model shows the hypothetical relations between the independent and dependent variables (solid lines; section 3.6). Furthermore it describes the relations that are tested in order to validate the threat appraisal and the action selection scales (dashed lines; sub-section 3.5.3).

4 Results

In this chapter the results of the survey are summarized. A more extensive analysis is included in electronic appendices C to F. This chapter first describes the socio-demographic background of the respondents (section 4.1). In the second section the construction and validation of the scales is described (section 4.2). The last section includes the testing of the hypotheses (section 4.3).

4.1 Participants

A total of 2 000 invitations to participate in the research was sent (sub-section 3.3.2), 103 of these did not reach the intended recipient (5.1%). Of the 1 897 people who received an invitation, 95 started filling in the questionnaire (5.0%) and 78 filled it in completely (82.1%). There are no significant between-group differences regarding response rates (e-appendix F).

4.1.1 Characteristics of respondents

Most respondents are in the possession of a drivers' license (90%; mean age of drivers' license: 24.1 years, minimum: 1 year, maximum: 59 years). Also, the majority of the respondents (86.8%) drive one or more cars on a regular basis. Just over a half of the respondents are male (65.3%; Dutch: 74%, French: 56%) and the mean age is 43.8 years (minimum: 20 years, maximum: 83 years). Because this research focuses on car drivers only respondents who own a drivers' license and drive one or more cars on a regular basis are selected for further analysis.

4.1.2 Driving experience

The number of kilometres driven by the respondent last year was on average 18 691 (minimum: 300, maximum: 125 000), the number of kilometres driven during the past three years was on average 53 536 (minimum: 1 000, maximum: 370 000). Most drivers reported that they did not drive in the other country during the last three years (73.6%). This percentage is higher for French drivers (78.4%) than for Dutch drivers (57.1%).

4.1.3 Characteristics of vehicles

The most popular brands of vehicles are Citroën (13.9%), Peugeot (12.7%) and Renault (11.4%). Most respondents are aware of the engine size of their cars (83.5%). Also, most respondents owned the car they used most frequently (86.1%). The average age of cars is 6.7 years (minimum: less than a year, maximum: 24 years).

4.1.4 Traffic fines and accident involvement

Most French drivers stated that they have 12 merit points on their drivers' license (64.9%). Most Dutch drivers have been fined at least once during the past three years (76.2%). Speeding is the most occurring offence; 53.5% of the Dutch drivers have been fined for speeding during the last three years, this is only the case for 16.3% of the French drivers. The majority of the respondents do not report any accidents during the past three years (81.9%). In addition most drivers do not remember having any near-misses during the past three years (55.6%).

4.2 Scale construction

This section describes the construction of the risk appraisal scales and the familiarity scale. All scales are tested for internal consistency and the influence of socio-demographic variables. First, all socio-demographic variables are categorized into nominal and ordinal variables (table 4.1).

Table 4.1Recoding of variables

Variable	Description	Categories
QF2	Age of drivers' license	0 – 9 years, 10 – 19 years, 20 – 29 years, 30 – 39 years, 40 years or more
QF3	Number of vehicles driven frequently	none, one or more
QED2	Age of respondent	24 years or less, 25 – 34 years, 35 – 44 years, 45 – 54 years, 55 – 65 years, 65 years or more
QED4	Kilometres driven past year	less than 10 000, 10 000 – 20 000, over 20 000
QED5	Kilometres driven past three years	less than 25 000, 25 000 – 50 000, over 50 000
QED8	Engine size	less than 1500 cc, 1500 cc – 1999 cc, 2000 cc or more, do not know

QED9	Owner of car	own car, other's car
QED10	Year car was built	before 1990, 1990 – 1994, 1995 – 2000, 2000 – 2004, 2005 or later, do not know
QED12	Fines for speeding during past three years	none, 1 or more
QED13	Number of accidents during past three years	none, 1 or more
QED14	Number of near-misses during past three years	none, 1 or more

4.2.1 Threat appraisal

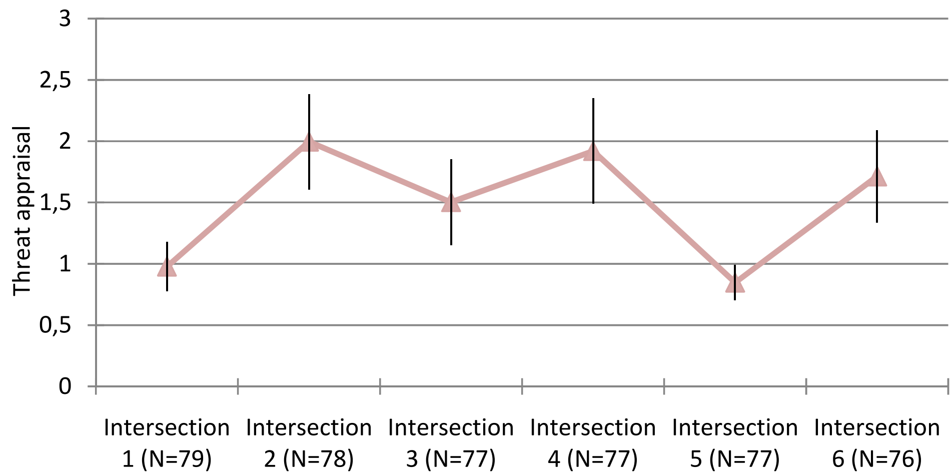

Figure 4.1 Threat appraisal by intersection (0 = low threat appraisal, 7 = high threat appraisal; the intervals indicate 95%-CI)

A threat appraisal scale by intersection is constructed according to equation 4.1. In this formula QC_iS is threat appraisal by intersection (i). QC_iS_1 indicates the perceived probability of getting involved in an accident at intersection i, QC_iS_2 and QC_iS_3 indicate the estimated damage to respectively one's car and oneself at intersection i (e-appendix F). The division by powers of seven is done in order to convert the scales to its original size.

$$QC_iS = \frac{QC_iS_1 \cdot (8 - QC_iS_2) \cdot (8 - QC_iS_3)}{7^2} \qquad (4.1)$$

Threat appraisal by intersection is shown in figure 4.1. A general threat appraisal is constructed per respondent by averaging the scales for all intersection ($\alpha = 0.81$).

The influence of the socio-demographic variables is tested using analyses of variance (ANOVA). To control for these variables a five-step algorithm is used.

1. For all socio-demographic variables between-category differences in threat appraisal are tested using ANOVA.

2. The levels of significance for all between-category differences are compared with each other. The variable with the most significant between-category difference is selected.

3. For all categories (k) of the selected variable the mean (X_k) and the standard error (SE_k) is calculated.

4. A new threat appraisal scale is constructed by normalizing the variable by category (4.2). In this formula QC_iS_c is the new threat appraisal scale, QC_iS is the original general threat appraisal scale, X_k is the mean threat appraisal for category k and SE_k is the standard error of the mean for category k.

$$QC_iS_c = \frac{QC_iS - \overline{X}_k}{SE_k} \qquad (4.2)$$

5. As a result of normalizing for one variable the level of significance for the between-category differences of other socio-demographic variables change as well. When a variable correlates positively with the variable for which is controlled for, the level of significance decrease; when it correlates negatively it increases. Therefore the algorithm is repeated until there are no significant between-group differences for any of the socio-demographic variables.

In the current research only one variable, fines for speeding during the past three years is found to be of significant influence on threat appraisal ($F(1,70) = 10.701$; $p < 0.01$). Figure 4.2 includes an overview of the changes in level of significance for all socio-demographic variables due to controlling for this variable. A more extensive summary of this process is included in electronic appendix F. As a result of controlling the significant difference in threat appraisal between the Dutch and the French sample ($F(1,74) = 13.119$; $p < 0.01$) becomes smaller ($F(1,74) = 6.059$; $p < 0.05$).

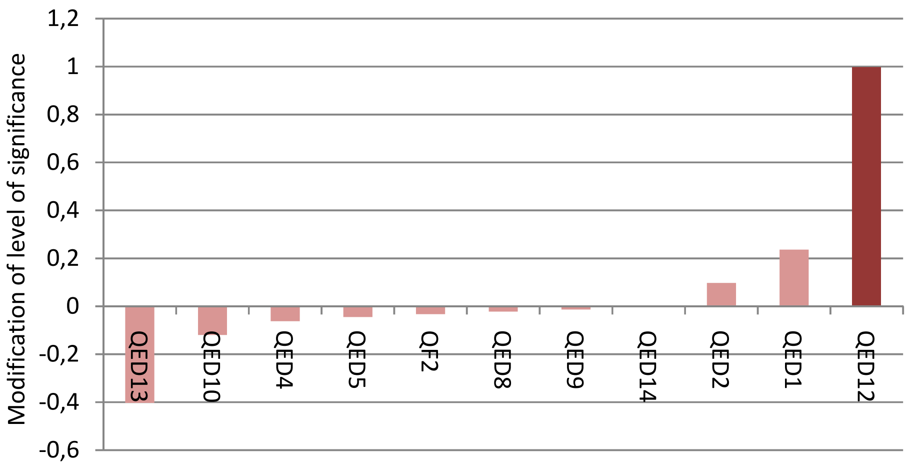

Figure 4.2 Modification of level of significance per variable as a result of the controlling algorithm; fines for speeding during the past three years (QED12) is found to be of significant influence ($F(1,70) = 10.701$; $p < 0.01$).

4.2.2 Action selection

For each intersection an action selection scale is constructed by averaging the four attitude items ($0.87 < \alpha < 0.97$; figure 4.3). A general action selection scale per respondent is constructed by averaging the obtained scales. The internal consistency of this scale is tested using Cronbach's alpha ($\alpha = 0.96$).

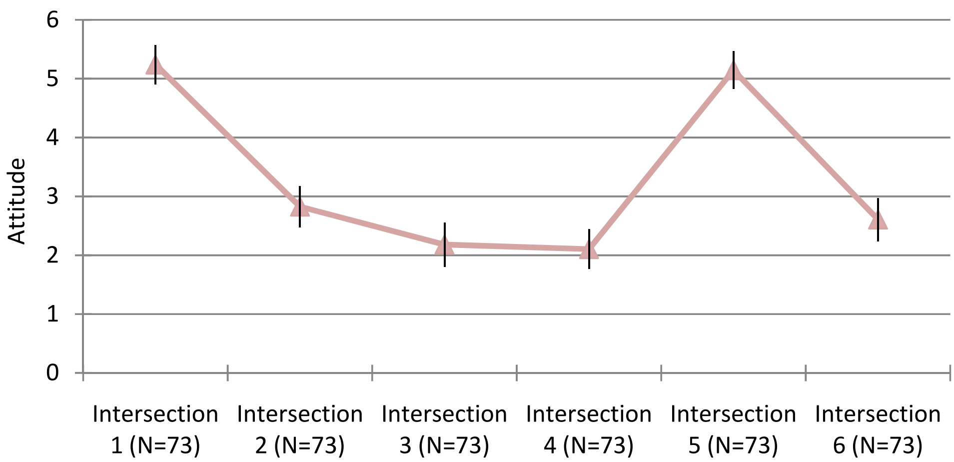

Figure 4.3 Attitude towards crossing an intersection with 60 km/h by intersection (1 = negative attitude, 7 = positive attitude; the intervals indicate 95%-CI)

Preferred speed by intersection is shown in figure 4.4. A general preferred speed scale over all intersection is constructed by averaging the preferred speeds for all intersections (α = 0.77). To control for the influence of socio-demographic variables the algorithm as described in sub-section 4.2.1 is used. For both 'attitude towards 60 km/h' and preferred speed no socio-demographic variables are found to be of significant influence.

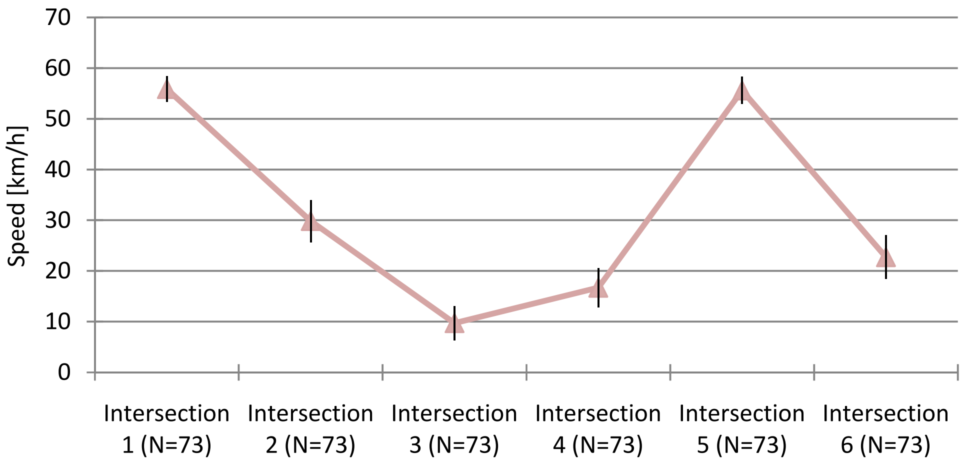

Figure 4.4 Preferred speed by intersection (in km/h); the intervals indicates 95%-CI

4.2.3 Familiarity with traffic situations

The four familiarity items are combined in an ordinal scale. The scale exists of three categories: not familiar (do not know where intersection is located), occasional crossing (knows where intersection is located, crosses intersection less than once a month), very familiar (knows where intersection is located and crosses intersection once a month or more / knows where intersection is located and heard acquaintances talk about the intersection or have an acquaintance who has had an accident at the intersection). Familiarity by intersection is shown in figure 4.5.

The effect of familiarity on threat appraisal, attitude towards 60 km/h and preferred speed is tested using all participant-intersection combinations (N = 438). Therefore, analogue to the control algorithm described in sub-section 4.2.1, these three scales are controlled for the between-intersection influences. After this, threat appraisal, attitude towards 60 km/h and preferred speed are tested for differences as a function of familiarity. No significant differences are found.

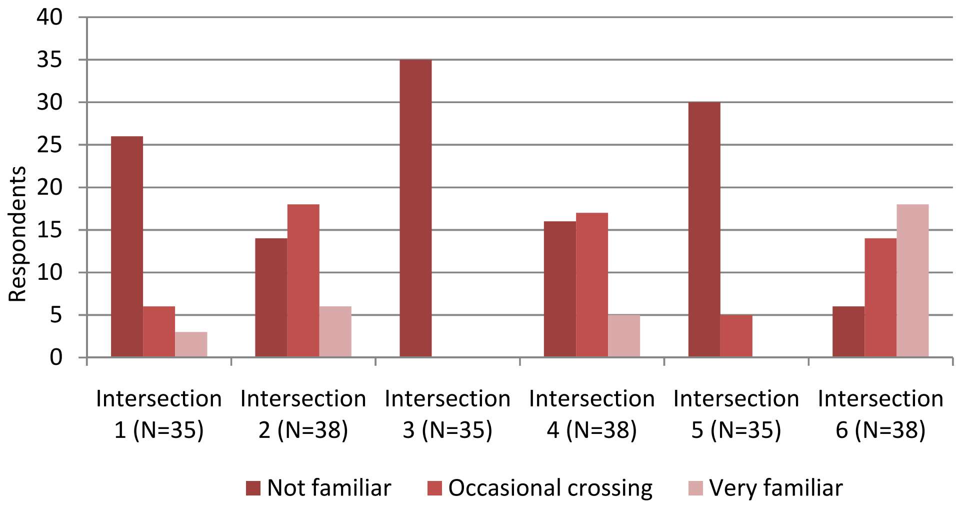

Figure 4.5 Number of respondents who are not familiar, occasionally cross or are very familiar with a crossing; only French respondents are questioned about French intersections, only Dutch respondents are questioned about Dutch intersections.

4.3 Validity of the theoretical model

In this research a theoretical model suggested by Grayson et al. (2003; sub-section 2.1.4) is used to design the risk perception constructs. This section analyzes whether the designed constructs relate to each other in a way that is predicted by the theoretical model. In order to do this a number of methods are used. First, a validation construct, Driving Sensation Seeking, is added (sub-section 4.3.1). Second, correlations between the risk perception scales are calculated (sub-section 4.3.2). Based on this it is likely that constructed scales can be improved in order to improve the model fit. Therefore an analysis by intersection is conducted (sub-section 4.3.3) and inter-scales correlations are calculated using the improved scales (sub-section 4.3.4).

4.3.1 Driving Sensation Seeking

A Driving Sensation Seeking Scale is constructed by averaging the seven sensation seeking items (α = 0.57). This scale can be improved by omitting item QSS1. The rationale for this is that this item has a negative correlation with multiple other items (table 4.2). The constructed scale has an internal consistency (α = 0.64) which approaches the one obtained by Delhomme et al. (α = 0.68; 2007).

*Table 4.2 Inter-item Pearson's correlation for Driving Sensation Seeking Scale (*p < 0.05, ** p < 0.01), QSS1: I would like to drive without a pre-planned route and without a schedule., QSS2: I often feel like being a racing-driver, QSS3: I like a 'wild' drive, QSS4: I like to drive on roads with many sharp turns, QSS5: I would like to learn to drive cars that can exceed the speed of 300 km/h, QSS6: I do not have patience for people who drive cars in a predictable and boring manner, QSS7: I think I would enjoy the experience of driving very fast on a steep road.*

N = 73	QSS1	QSS2	QSS3	QSS4	QSS5	QSS6	QSS7
QSS1	1.00	0.01	0.15	0.15	0.04	-0.03	-0.3
QSS2	0.01	1.00	0.41 **	0.14	0.32 **	0.43 **	0.45 **
QSS3	0.154	0.41 **	1.00	0.26 *	0.03	0.20	0.29 *
QSS4	0.15	0.14	0.26 *	1.00	0.27 *	-0.01	0.25 *
QSS5	0.04	0.32 **	0.03	0.27 *	1.00	0.07	0.45 **
QSS6	-0.03	0.43 **	0.20	-0.01	0.07	1.00	0.23
QSS7	-0.03	0.45 **	0.29 *	0.25 *	0.45 **	0.23	1.00

4.3.2 Inter-scales correlations

Sensation seeking is added to the survey to validate the constructed risk perception scales. A positive correlation between sensation seeking and the action selection scales and a negative correlation with threat appraisal provides evidence for the validity of the constructed scales. The correlation between threat appraisal, attitude towards 60 km/h, preferred speed and sensation seeking is examined (table 4.3).

*Table 4.3 Pearson's correlation between threat appraisal, attitude towards crossing an intersection with 60 km/h, preferred speed and Driving Sensation Seeking (** p < 0.01)*

N = 73	Threat appraisal	Attitude towards 60	Preferred speed	Sensation seeking
Threat appraisal	1.00	-0.13	-0.04	-0.07
Attitude towards 60	-0.13	1.00	0.51 **	0.00
Preferred speed	-0.04	0.51 **	1.00	0.05
Sensation seeking	-0.07	0.00	0.05	1.00

In addition it can be hypothesized that there is a negative correlation between threat appraisal and the two action selection scales. Also a positive correlation between attitude towards 60 km/h and preferred speed can be expected.

When the complete dataset is used the positive correlation between the two action selection scales is the only one of the expected correlations which is found. As can be observed in table 4.2 none of the other hypothesized correlations are present. An analysis is conducted using the Dutch and French sub-samples separately (tables 4.4 & 4.5).

*Table 4.4 Pearson's correlation between Driving Sensation Seeking, threat appraisal, attitude towards crossing an intersection with 60 km/h and preferred speed (Dutch respondents only; *p < 0.05, ** p < 0.01)*

N = 38	**Threat appraisal**	**Attitude towards 60**	**Preferred speed**	**Sensation seeking**
Threat appraisal	1.00	-0.40 *	-0.14	-0.06
Attitude towards 60	-0.40 *	1.00	0.55 **	0.14
Preferred speed	-0.14	0.55 **	1.00	0.12
Sensation seeking	-0.14	0.14	0.12	1.00

Using the Dutch sub-sample the expected correlations between the risk perception scales are found. The correlations between sensation seeking and the risk perception scales also point in the right directions although they are not significant. This could be explained by the small sample size. When the French sub-sample is used only the expected correlation between attitude towards 60 and preferred speed is found. Moreover a number of correlations do not point in the right directions.

*Table 4.5 Pearson's correlation between Driving Sensation Seeking, threat appraisal, attitude towards crossing an intersection with 60 km/h and preferred speed (French respondents only; ** p < 0.01)*

N = 35	**Threat appraisal**	**Attitude towards 60**	**Preferred speed**	**Sensation seeking**
Threat appraisal	1.00	0.03	-0.08	0.12
Attitude towards 60	0.03	1.00	0.51 **	-0.20
Preferred speed	-0.08	0.51 **	1.00	-0.06
Sensation seeking	0.12	-0.20	-0.06	1.00

4.3.3 Analysis by intersection

The data seems to fit the theoretical model as suggested by Grayson et al. (2003). However when the French data is used inter-scale correlations are not as expected. To improve the risk perception scales an analysis by intersection is conducted. In order to do this correlations between the three risk perception constructs are calculated (table 4.6).

*Table 4.6 Pearson's correlation between risk perception scales by intersection (*p < 0.05; ** p < 0.01)*

N = 73	Threat appraisal / Attitude towards 60	Threat appraisal / Preferred speed	Preferred speed / Attitude towards 60
Intersection 1 (French)	-0.18	0.19	0.21
Intersection 2 (Dutch)	0.00	-0.17	0.52 **
Intersection 3 (French)	-0.24 *	-0.02	0.24 *
Intersection 4 (Dutch)	-0.21	0.08	0.54 **
Intersection 5 (French)	-0.04	-0.03	0.31 **
Intersection 6 (Dutch)	-0.23	-0.09	0.50 **

As can be seen in table 4.6 there are some differences between intersections. The most notable difference is in the correlation between preferred speed and attitude towards 60. This correlation is higher for the Dutch intersections than for the French. It can be assumed that the data on the French intersections hamper the model fit. In order to assess this alternative risk perception scales based on the separate Dutch and French intersections are constructed. The internal consistencies of these scales are shown in table 4.7.

Table 4.7 Cronbach's alpha for risk perception scales based on Dutch and French intersections

N = 3	Cronbach's α (Dutch intersections)	Cronbach's α (French intersections)
Threat appraisal	0.90	0.43
Attitude towards 60	0.78	0.49
Preferred speed	0.80	0.50

Looking at the internal consistencies (table 4.7) it can be concluded that it is possible to use scales based on the Dutch intersections. Therefore the inter-item correlations between the risk perception items and Driving Sensation Seeking are calculated (table 4.8)

*Table 4.8 Pearson's correlation between Driving Sensation Seeking, threat appraisal, attitude towards crossing an intersection with 60 km/h and preferred speed (risk perception scales based on Dutch intersections; ** p < 0.01)*

N = 73	Threat appraisal	Attitude towards 60	Preferred speed	Sensation seeking
Threat appraisal	1.00	-0.17	-0.05	-0.06
Attitude towards 60	-0.17	1.00	0.59 **	0.12
Preferred speed	-0.05	0.59 **	1.00	-0.02
Sensation seeking	-0.06	0.12	-0.02	1.00

With the exception of the correlation between preferred speed and Driving Sensation Seeking all correlations are in the direction as predicted by the theoretical model. Not all correlations are however significant. This might be explained by the relatively small sample size. When focussing on the separate Dutch and French sub-samples also the expected correlations are found (tables 4.9 & 4.10). It can be noticed however that the correlation between attitude towards 60 km/h and preferred speed is much higher for Dutch than for French respondents.

It is concluded that risk perception scales which are based on solely the Dutch intersections provide a superior fit with the model compared to a set of scales based on all intersections. Therefore the former are used in the testing of the hypotheses (section 4.4).

*Table 4.9 Pearson's correlation between Driving Sensation Seeking, threat appraisal, attitude towards crossing an intersection with 60 km/h and preferred speed (using Dutch respondents only; risk perception scales based on Dutch intersections; *p < 0.05; ** p < 0.01)*

N = 38	Threat appraisal	Attitude towards 60	Preferred speed	Sensation seeking
Threat appraisal	1.00	-0.32 *	-0.20	-007
Attitude towards 60	-0.32 *	1.00	0.69 **	0.19
Preferred speed	-0.20	0.69 **	1.00	0.06
Sensation seeking	-0.07	0.19	0.06	1.00

*Table 4.10 Pearson's correlation between Driving Sensation Seeking, threat appraisal, attitude towards crossing an intersection with 60 km/h and preferred speed (using French respondents only; risk perception scales based on Dutch intersections; *p < 0.05; ** p < 0.01)*

N = 35	**Threat appraisal**	**Attitude towards 60**	**Preferred speed**	**Sensation seeking**
Threat appraisal	1.00	-0.39 *	-0.07	-0.22
Attitude towards 60	-0.39 *	1.00	0.24	0.13
Preferred speed	-0.07	0.24	1.00	0.31
Sensation seeking	-0.22	0.13	0.31	1.00

4.4 Between-group differences

In this section the hypotheses (section 3.5) are tested. This means that the threat appraisal and action selection scales are tested for between-country differences and for differences between the intervention and the control group. As described in sub-section 4.3.3 risk perception based on solely the Dutch intersections are used.

4.4.1 Threat appraisal

As described in section 3.5 it is hypothesized that French drivers have a lower threat appraisal than Dutch drivers. Furthermore it is hypothesized that drivers in the intervention situation have a higher threat appraisal than drivers in the control situation.

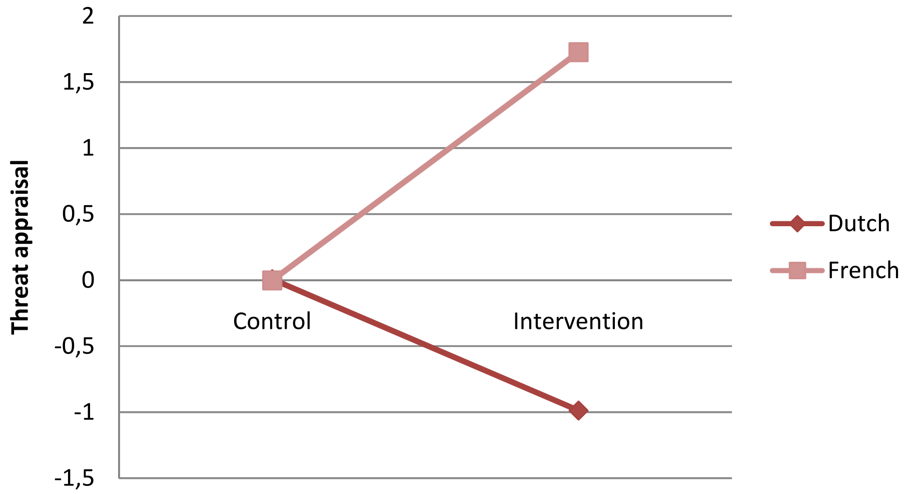

Figure 4.6 Threat appraisal between-groups

Threat appraisal is tested for between-country differences using MANOVA. With controlling for 'fines received for speeding during the past three years' and 'age of drivers' license' no between-country differences or differences between the intervention and the control group can be observed. In addition the threat appraisal scores for the four experimental groups are calculated (figure 4.6). A significant difference between Dutch and French drivers in the intervention situation is found ($t(42) = 3.082$; $p < 0.01$); French drivers have a higher threat appraisal under these circumstances. There is no difference between Dutch and French drivers in the control situation.

4.4.2 Action selection

As described in section 3.5 it is hypothesized that French drivers have a more positive attitude towards crossing an intersection with 60 km/h than Dutch drivers. Also French drivers are expected to prefer higher speeds. Furthermore it is hypothesized that drivers in the intervention situation have a more positive attitude and prefer higher speeds than drivers in the control situation.

Attitude towards 60 is tested for between-country differences using MANOVA. After controlling for 'age of drivers' license' no significant difference is found. Also no significant difference is found between the control and the intervention situation. A significant between-country difference is found for preferred speed ($F(69,1) = 5{,}04$; $p < 0.05$) after controlling for 'owner of car'. The French respondents prefer in general a higher speed than the Dutch drivers. No significant interaction effect is found.

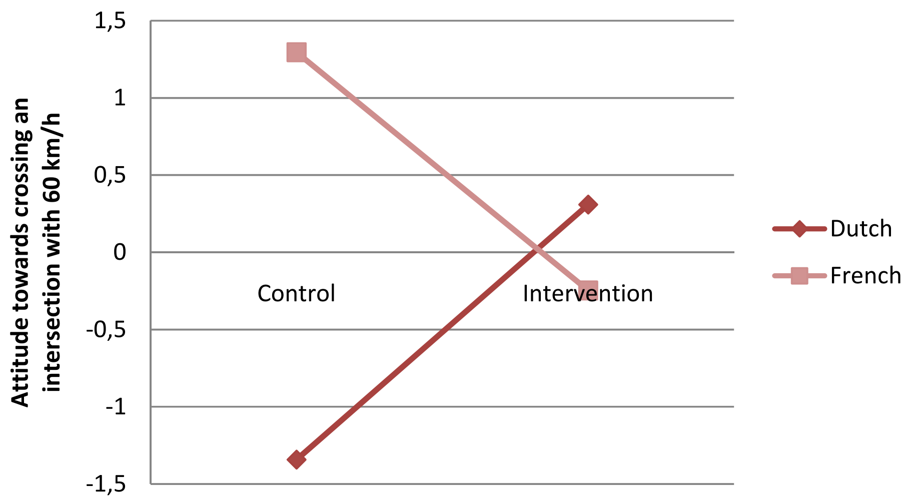

Figure 4.7 Attitude towards crossing an intersection with 60 km/h between-groups

Both scales are examined by group (figures 4.7 & 4.8). It is found that French drivers in the control group have a more positive attitude towards crossing an intersection with 60 km/h than their Dutch counterparts (t(28) = 2.095); $p < 0.05$). Also, a significant difference in preferred speed between Dutch and French drivers in the control situation is found (t(28) = 2.404; $p < 0.05$); French drivers prefer a higher speed than Dutch drivers under these circumstances. Both observations are in line with the expectations. There are no differences between Dutch and French drivers in the intervention situation.

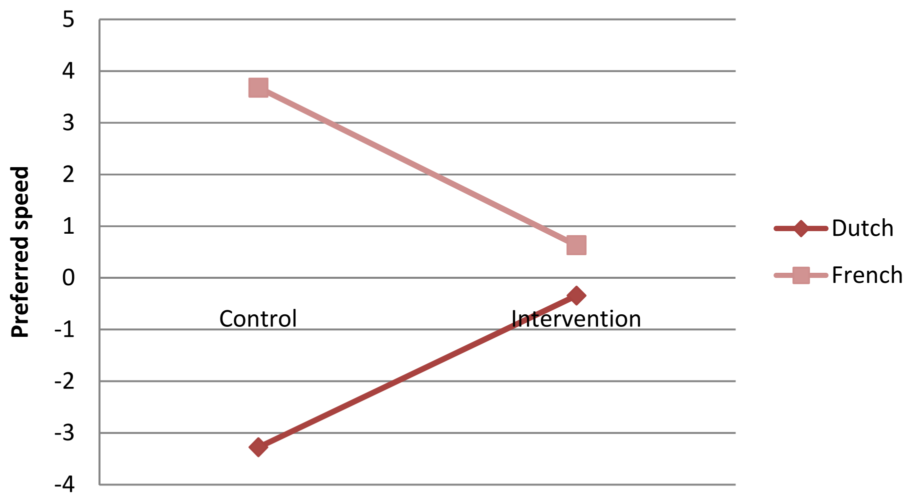

Figure 4.8 Preferred speed between-groups

Summarizing it is concluded that there evidence for the hypotheses that French drivers have a more positive attitude towards crossing an intersection with 60 km/h. However this can only be confirmed in the control situation. In addition the French respondents prefer to drive faster than the Dutch. Also this difference is more pronounced in the control situation. There is no evidence that this is caused by a difference in threat appraisal since this the level of threat appraisal is identical for the French and the Dutch sub-samples in the control group.

There is no direct evidence that there is a difference in risk perception between respondents in the control and the intervention group. With other words, none of the scales display a significant difference between respondents in the intervention and the control group. On the other hand, there is some indirect evidence for a difference between the intervention and the control situation. Between-country effects observed between both control groups are not present between the corresponding intervention groups or vice versa. It might be concluded that the peripheral transverse lines induce a heightened threat appraisal in French drivers, which results in a more negative attitude towards crossing an intersection with 60 km/h and a preference of lower speeds. For Dutch drivers peripheral transverse lines seem to have the opposite effect.

5 Conclusions and discussion

This chapter summarizes the results of this research and its impacts on the research questions (section 5.1). Furthermore, it discusses the reliability (section 5.2) and the validity of the research (section 5.3). This report concludes with discussing the implications of the research (section 5.4).

5.1 Between-country differences

The main objective of this study is whether French and Dutch drivers perceive traffic risks differently. In order to answer this question a number of sub-questions are stated (sub-section 2.5). These sub-questions are defined closer in a set of hypotheses (sub-section 3.5) which are tested using statistical means (section 4.4). This section discusses the impact of these results and answers the research questions.

5.1.1 Differences in risk perception

First, it is concluded that there is a difference in risk perception between the French and the Dutch respondents. Although it seems that drivers from both countries appraise threats in a similar fashion, French drivers draw different conclusions from their observation. In general they have a more positive attitude towards higher speeds. They also choose higher speeds for crossing an intersection. The central research question can therefore be answered positively.

However when focusing on the effect of peripheral transverse lines in both countries the results are more ambiguous. On a between-group basis a significant difference in threat appraisal can be observed between French and Dutch drivers in the intervention group. French drivers have a higher threat appraisal than Dutch drivers when they approach an intersection with peripheral transverse lining. No difference of this kind is found for the control groups. Although no significant differences between drivers in the intervention and control group are found it seems that French drivers in the intervention group have a higher threat appraisal than those in the control group. For Dutch drivers this seems to be the other way around; a contra-intuitive observation on first sight.

This is also the case for both action selection scales; no significant differences between the intervention and the control group for respondents from both countries are present. However a difference in both attitude towards 60 and preferred speed between French and Dutch respondents in the control situation is measured which can not be observed between drivers from both countries in the intervention situation. Therefore it is likely that drivers from both countries adjust their action selection correspondingly to the model of Grayson et al. (2003) to their levels of threat appraisal. This means that French drivers in the intervention situation select a lower speed than their counterparts in the control situation. Dutch drivers select a higher speed which corresponds to their lowered threat appraisal. This is remarkable since it is expected that all drivers experience a heightened risk perception when confronted with peripheral transverse lines, regardless of their original risk perception. Instead Dutch drivers seem to obtain a lower risk perception in response to the intervention.

5.1.2 Macro-familiarity

A possible explanation for this can be found in a notion already mentioned in sub-section 3.1.1. It might be that French drivers are more familiar with French traffic situations regardless of their familiarity with the individual traffic situations. For example, all traffic situations are located in rural country. The countryside in Eure-et-Loir however provides the drivers with more farsighted views than rural areas in Overijssel. This effect of ‘macro-familiarity’ might be enforced because the risk perception scales are based on Dutch intersections only. The opposing effects of peripheral transverse lines can now be explained in terms of macro-familiarity. For French drivers the additional lines heighten the experienced ‘macro-unfamiliarity’ resulting in a higher risk perception. Dutch drivers, which are in general more accustomed to a wide variety of road markings, experience the lines as a familiar object, hence the lowered risk perception. It might therefore be concluded that peripheral transverse lines can be an effective mean to decrease speeding in France. The long term effects are however questionable.

In this research it is found that familiarity has no direct influence on risk perception. Therefore it is important to notice that macro-familiarity is not related with risk perception the same way as familiarity. It was hypothesized that a driver uses his familiarity with a specific traffic situation in a cognitive way; judging which speed to take considering previous encounters with the traffic situation and (negative) experience or acquainted drivers. Macro-familiarity is related with the experienced unfamiliarity when driving in a foreign country or on motorways for people who are not acquainted with fast driving.

Using the concept of macro-familiarity it might also be explained why the hypothesized difference in threat appraisal between French and Dutch drivers in the control situation is not found. It can be hypothesized that this difference is compensated by a lowered macro-familiarity French drivers experience. It must be noted however that the existence of this concept is unclear and further research is needed in order to derive less speculative evidence.

5.1.3 Causes of differences in risk perception

In this research a significant difference between risk perception of French and Dutch drivers is found. The question arises which underlying factor causes this difference. Of course this research is based on correlations and possible causes are not included as separate constructs. Any perceived relations can therefore never be 'proved' in a quantitative manner. However, this sub-section lists a number of speculative causes for the found difference in risk perception.

One of these is that the Dutch government has succeeded in improving the behaviour of Dutch drivers by a great number of traffic safety campaigns in recent years. This improvement can also be explained by the large share of 'weak' traffic participants (cyclists) in Dutch traffic and their protected stature in Dutch legislation. This hypothesis is however contradicted by findings from the SARTRE 3 project (2004) which show that Dutch drivers report no better driving behaviour then French drivers when looking at domains classically associated with unsafe driving behaviour such as speeding, driving through amber lights and seatbelt use.

A more plausible explanation is the difference in speed limits. Limits are in France slightly higher than in The Netherlands. In general it can be assumed that drivers do not drive at the maximum speed while crossing an intersection, so speed limits are not directly related. However it can be hypothesized that French drivers are accustomed to driving faster than Dutch drivers and are therefore less likely to drive slow. Consequently they have a less negative attitude towards driving fast and they also associate driving fast to a lesser extent with increased risks on accidents. This explanation is in line with the result of the survey.

5.1.4 Alternative explanations for differences in traffic safety

This research explains the difference in traffic safety between The Netherlands and France in terms of risk perception. The question arises which other explanations are plausible for the difference in traffic safety.

It is likely that a part of the difference can be explained in terms of external variables such as layout of traffic situations and law enforcement (SARTRE 3, 2004). However, since both France and The Netherlands are Western European countries, with globally the same norms and legislation it is unlikely that these differences explain a large share of the variance.

A transient external variable which might have a large influence is drinking and driving. Although attitudes towards drinking and driving are negative in both France and The Netherlands, attitudes are slightly more positive in the former (SARTRE 3, 2004). There are also more accidents in which alcohol is involved in France compared to The Netherlands (respectively 19% versus 8%; Eurocare, 2003). However, this difference is not large enough to be a major determinant of the difference in traffic safety (section 1.3).

The same holds true for the major stable internal determinants of traffic safety, gender and age (Dahlen et al. 2004; Harré, 2000; McKenna et al., 1991; Sivak et al., 1989a, 1989b; Simons-Morton, et al., 2005). Although these are significant determinants of accident involvement, it is unlikely that they account for the difference in traffic safety in Eure-et-Loir and Overijssel (e-appenidx A).

As said before, it is unlikely that there is one single explanation which account for the whole difference in accident statistics. Furthermore possible explanations listed in this section are merely speculative without a quantitative basis. Further research is needed to pinpoint all plausible explanations for between-country differences in traffic safety.

5.2 Reliability

The question of reliability addresses whether it is likely that the used constructs measure what they are designed to measure. As in the pilot-survey (section 3.2) all used scales have a sufficiently high internal consistency. They also posses ‘face-validity’ in a way that the scales display the distinction between intersections which could be presumed a priori: intersections which are easier to oversee are evaluated as less threatening and provoke higher preferred speeds. There are however a number of other indicators which can be used to judge upon the reliability of the research. One is the fit between the data and the theoretical model (sub-section 5.2.1). The other is the familiarity scale (sub-section 5.2.2).

5.2.1 Theoretical model

This research uses the four step model for responding to hazards as suggested by Grayson et al. (2003). The constructs on which this research focuses are threat appraisal and action selection. Threat appraisal is measured using one scale; action selection is measured using two: attitude towards 60 and preferred speed. To confirm whether the model is valid correlations between the three scales have been calculated. It can be expected that there is a positive correlation between the two action selection scales and a negative correlation between the action selection and threat appraisal scales.

The expected correlations are partly found. The positive correlation between the two action selection scales is quite evident; the other correlations are less significant. When the data is divided into a French and a Dutch sub-sample, negative correlations between threat appraisal and the two action selection scales are found, although the correlation with preferred speed is not significant. This might be explained by the small sample size. For the French sub-sample the correlations are less convincing.

The model can however be improved when only the Dutch intersections are used to construct the scales. When this is done the expected correlations are found although not all correlations are significant. It seems that the Dutch intersections provoke a reaction which can be better described in terms of risk perception. This might be due to the fact that the Dutch intersections are in generally evaluated as being riskier (section 4.2). It can also be concluded that the model can be applied on respondents from both countries, although the expected correlation between attitude towards crossing an intersection with 60 km/h and preferred speed is stronger for Dutch than for French respondents.

In sub-section 2.1.4 a parallel between the four step model for responding to hazards (Groeger et al., 2003) and the PMT (Rogers 1975) is drawn. Based on this research it is plausible that the PMT is also applicable within a traffic context. As stated before the PMT is however more detailed than the model of Groeger et al. (2003). This research also splits threat appraisal in probability of an accident and the perceived consequences; which might be interpreted as respectively vulnerability and severity in the PMT. The difference between coping appraisal in the PMT and action selection as introduced in this research is however more pronounced. It might be interesting to split action selection also in different evaluations; self-efficacy and response efficacy as suggested by the PMT are logical alternatives for this. However in order to do this a serious hazard must be introduced as stimulus. The argument for this is twofold.

First, as can be seen in sub-section 4.2.1 the threat appraisal scale makes it possible to distinguish between different traffic situations. None of the situations are however perceived as really threatening. It is likely that a respondent evaluates the available action alternatives equally: if there is no real hazard it is not necessary to weigh different responses against each other. A respondent must be convinced that an accident is certain if the current behaviour is maintained in order to judge the efficacy of different evasive responses. When this is done it is also possible to increase the variety of the responses, introducing other alternatives besides speed choice such as pulling over.

Second, as described in sub-section 3.2.4 self-efficacy is already introduced in this research during the pilot-survey. The scale was omitted because respondents had difficulties relating themselves to it. This might be due to the fact that they were questioned about legal felonies, which were not representative of the behaviour asked for when evaluating the traffic situations. The validity of the scale could be improved when self-efficacy items are added related to the specific traffic situations and the potential responses. This also calls for more complex response alternatives than speed choice.

5.2.2 Familiarity

As described in section 3.1 a familiarity construct is added to the questionnaire to assess whether the used photographs are a reliable representation method. When comparing the responses with drivers who are familiar with an intersection with those who are not familiar, no significant differences are found. Therefore it can be concluded that respondents make a representative judgement of the risk involved in a traffic situation when viewing photographs.

Altogether it can be concluded that it is likely that the scales used in the survey are reliable. In order to make a better assessment of this a larger sample is needed, preferably using only one version of the questionnaire. Furthermore improvements can be found in using photographs with more dangerous traffic situations.

5.3 Validity

There are a number of factors which impose a potential source of bias. These can be a threat to the validity of this research if it is likely that they systematically differ for participants in the different experimental groups. These factors are distortion by comparative optimism (sub-section 5.2.1), by unknown transient internal determinants (sub-section 5.2.2) and by effects due to the different languages in which the questionnaire is distributed (sub-section 5.2.3). Furthermore this section discusses to what extent the results of this research can be generalized (sub-section 5.2.4).

5.3.1 Comparative optimism

Drivers have in general a tendency to underestimate their own risk of getting involved in an accident, compared to the risks they think other drivers face (chapter 2). To estimate the influence of this ‘comparative optimism’, drivers can be asked to rate their own risk, but also the risk of other drivers under similar circumstances.

Items addressing comparative optimism are included in the pilot-survey. In the pilot the difference between the evaluation of one’s own risk and that of a comparable driver is found to be not significant. Therefore, and to shorten the questionnaire, these items were omitted from the real survey. This might be a source of error. However it is unlikely that this error is systematically different for French and for Dutch drivers, let alone for the intervention and the control condition.

5.3.2 Transient internal determinants

In this research a lot of effort is done to minimize the influence of determinants of traffic safety which are not examined in order to keep the research as ceteris paribus as possible. However it is difficult to control for transient internal determinants since there is no insight in the psychological and physical state of participants when they are filling in the questionnaire. Although it can be assumed that participants only fill in the questionnaire when they have enough time to do so. There is no way to ensure whether they have been drinking or are in another state which may influence their perception and evaluation capacities. Also this error is unlikely to be systematically different for the different experimental conditions.

5.3.3 Translation effects

Since the questionnaire is distributed in four different versions bias might occur due to unforeseen differences between these versions. The bias between the control and intervention situation as a result from this version incompatibility is likely to be small, since the contents of the photographs is the only difference between the two. The bias as a result from version incompatibility between the French and Dutch condition can be expected to be larger due to translation effects.

It is difficult to translate a text without its meaning being changed. Even if a literal translation is made, the interpretation of the text might be different for speakers of both languages due to idiomatic differences between languages. Also the emotions which are associated with a word are not always comparable for different languages. This is likely to result in a bias which increases with the ‘vagueness’ of an item. For example, speed can be considered the same in every language, an attitude cannot.

To minimize these translation effects, the questionnaires were translated by native speakers in both languages. To estimate the size of the translation effect, correlations between two different constructs (attitude towards 60, preferred speed) measuring the same construct (action selection) are compared for French and Dutch drivers (chapter 4). Although these are slightly different the same, bias due to translation effects can not be separated from between-country differences in risk perception since it is possible that the relation between attitude and speed preferences differs between groups.

5.3.4 External validity

This research focuses on differences in risk perception between French and Dutch drivers. Due to the sampling process the results cannot be generalized to the whole populations of both countries. Moreover the results are likely to be biased by self-selection of participants.

The response on the invitation to participate in this research is 5.0 %. First, people who are more interested in research in general or traffic safety in particular are more likely to participate in the research. Second, since this research is based on an online questionnaire people who are in the possession of an Internet connection are more likely to participate as well.

It is shown that there is no difference in response rates between the different experimental conditions. This is an indication that there is no between-group difference in self-selection bias. The reasons whether people do or do not participate are unknown. Therefore it is unlikely that the results of this research are representative for the whole sample framework; inhabitants from Enschede (east) and Chartres.

It can be assumed that participants from France and The Netherlands are comparable. For the differences that do occur it is possible to control for using the variables which are designed for this purpose. Therefore it is likely that a part of the differences in risk perception are determined by the variables related to the nationality of the participants. Further research using larger and less specific samples is needed in order to gather additional insight in between-country differences in traffic risk perception.

5.4 Implications

This last section lists a number of implications of this research. The most important implication is that this research provides insight in the psychological process of traffic risk perception, the way this influences traffic safety and differences in traffic risk perception between different populations. The implications of this research are however larger.

First, it addresses a number of methodological issues. The reliability of photographs as a stimulus in traffic risk perception research is assessed and made plausible. This research also shows that it is possible to invite respondents in an online survey using postal means. Since transferring people from one medium to another imposes an additional barrier it is on the other hand likely that this is partly responsible for the low response rate.

Second, this research shows that traffic risk perception can be manipulated using low-cost perceptual measures. It also shows that the extent to which this possible differs between groups. It can be concluded that safety measures and policies which are successful in one country can not be exported to another disregarding history with respect to traffic safety.

Third, it shows that it is possible to distinguish groups of people from one another using the concept of risk perception and that this has a practical implication. Using this notion it might be possible to use a ‘risk perception in-test’ when starting driving education to focus on individual preferences. It would be interesting to study whether this has an effect by introducing a ‘risk-perception out-test’ when a student has obtained his drivers’ license.

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A Questionnaire on car driving (English)

Version 7.3 English – 30 May 2007

Dear Sir / Madam,

My name is Timme Bijkerk. I am studying Civil Engineering at the University of Twente in the Netherlands. To obtain my masters I am performing a research internship in Paris. Within the framework of this research I am studying the differences between traffic safety in the Netherlands and in France. I am particularly interested in the crossing of intersections. In order to do this, I am using a questionnaire. It would be a great aid to my research if you would take the effort of filling it out. Answering the questionnaire will take about 15 minutes.

Unless indicated otherwise, you can answer by ticking the box of your choice. Unless indicated otherwise, you can only provide one answer at each question. If you are finished answering all the questions on a page, click “next” to continue to the next page. At the end of the questionnaire, you can press “end” to submit the questionnaire.

Thank you very much for your efforts.

Timme Bijkerk

<<< NEXT >>>

A.1 Part 1

To start with, we would like to ask you some questions to determine weather this questionnaire is for you. Fill out all the questions on this page, then click “next” to continue to the next page.

QF1: Do you own a drivers’ license for cars?

[Yes] / [No]

QF2: When did you obtain your driver’s license?

[<Open>] month [<Open>] year

QF3: In how many vehicles do you drive on a regular basis?

[0] / [1] / [2] / [3 or more]

<<< NEXT >>>

If QF1 = [No] or QF2 = [No], end of questionnaire.

A.2 Part 2

In this part of the questionnaire you are asked to judge upon six different intersections.

<<< NEXT >>>

A.2.1 Photo i

On the photographs below you see the intersection of the <…> and the <…> close to <…>.

<<< PHOTO 1 >>>

Imagine that you are approaching the intersection. It is 14:00h, the sun is shining and you are alone in your car. You are on your way over to a friend.

QCiS1: For me to get involved in an accident crossing this intersection would be:

very unlikely [1] [2] [3] [4] [5] [6] [7] very likely

QCiS2: If I would get involved in an accident crossing this intersection, it would result in:

very much damage to my car [1] [2] [3] [4] [5] [6] [7] no damage to my car

QCiS3: If I would get involved in an accident crossing this intersection, it would result in:

very many injuries to me [1] [2] [3] [4] [5] [6] [7] no injuries

<<< NEXT >>>

A.3 Part 3

In this part of the questionnaire you are asked to evaluate at which speed you would cross the intersections.

<<< NEXT >>>

A.3.1 Photo i

On the photographs below you see the intersection of the <…> and the <…> close to <…>.

<<< PHOTO 1 >>>

Imagine that you are approaching the intersection. It is 14:00h, the sun is shining and you are alone in your car. You are on your way over to a friend. You are driving with a speed of 60 km/h.

QCiB1: If I would maintain my speed of 60 km/h while crossing this intersection it would be:

A:	very unsafe	[1] [2] [3] [4] [5] [6] [7]	very safe
B:	very unpleasant	[1] [2] [3] [4] [5] [6] [7]	very pleasant
C:	very harmful	[1] [2] [3] [4] [5] [6] [7]	very beneficial
D:	very negative	[1] [2] [3] [4] [5] [6] [7]	very positive

QCiB2: If were approaching this intersection with a speed of 60 km/h, I would change my speed to:

[I would stop] / [10 km/h] / [20 km/h] / [30 km/h] / [40 km/h] / [50 km/h, I would just take my foot of the gas] / [60 km/h, I would not change my speed] / [70 km/h] / [80 km/h] / [90 km/h] / [100 km/h] / [Other, namely: [<Open>]]

<<< NEXT >>>

A.4 Part 4

In this part of the questionnaire we would like to know whether you are familiar with the intersections we showed you.

<<< NEXT >>>

A.4.1 Photo i

On the photographs below you see the intersection of the <…> and the <…> close to <…>.

<<< PHOTO 1 >>>

QCiF1: Do you know where this intersection is located?

[Yes] / [No]

QCiF2: During the past 3 years, how regular did you cross this intersection?

[Never] / [Less than once a month] / [One to three times a month] / [Four to ten times a month] / [Ten to twenty times a month] / [More than twenty times a month] / [Not applicable: I do not know where this intersection is located]

QCiF3: Have you heard acquaintances (family, friends, neighbours) talk about this intersection?

[Yes] / [No]

QCiF4: Do you have acquaintances (family, friends, neighbours) who have been involved in an accident at this intersection?

[Yes] / [No]

<<< NEXT >>>

A.5 Part 5

In this part of the questionnaire we would like to ask you some questions about your opinion on particular behaviours when driving a car.

QSS: Please indicate if any of these sentences describes you as a driver on a scale from 1 “not at all” to 5 “completely”.

QSS1: I would like to drive without a pre-planned route and without a schedule.

Not at all [1] / [2] / [3] / [4] / [5] Completely

QSS2: I often feel like being a racing-driver.

Not at all [1] / [2] / [3] / [4] / [5] Completely

QSS3: I like a ‘wild’ drive.

Not at all [1] / [2] / [3] / [4] / [5] Completely

QSS4: I like to drive on roads with many sharp turns.

Not at all [1] / [2] / [3] / [4] / [5] Completely

QSS5: I would like to learn to drive cars that can exceed the speed of 300 km/h.

Not at all [1] / [2] / [3] / [4] / [5] Completely

QSS6: I do not have patience for people who drive cars in a predictable and boring manner.

Not at all [1] / [2] / [3] / [4] / [5] Completely

QSS7: I think I would enjoy the experience of driving very fast on a steep road.

Not at all [1] / [2] / [3] / [4] / [5] Completely

A.6 Part 6

This is the last part of the questionnaire. In this part, we would like you to answer some questions about your personal situation and your driving experience.

QED1: Are you a man or a woman?

[Man] / [Woman]

QED2: What is your date of birth?

[<Open>] month [<Open>] year

QED3: What is your nationality?

[French] / [Dutch] / [Other, please specify [<open>]]

QED4: How many kilometres did you approximately drive as a driver of a car last year? (You can estimate the amount of kilometres you drove as a driver of a car last year by multiplying the number of kilometres you drive each month with twelve.)

[<Open>]

QED6: How many kilometres did you approximately drive as a driver of a car during the past 3 years? (You can estimate the amount of kilometres you drove as a driver of a car by multiplying the number of kilometres you drive each month with 36.)

[<Open>]

QED5: From which brand is your car? (Or the car you use most frequently.)

[Alfa Romeo] / [Audi] / [BMW] / [Citroën] / [Daewoo] / [Daihatsu] / [Fiat] / [Ford] / [Hyundai] / [Kia] / [Mazda] / [Mercedes] / [Mitsubishi] / [Nissan] / [Opel] / [Peugeot] / [Renault] / [Saab] / [Seat] / [Subaru] / [Suzuki] / [Toyota] / [Volkswagen] / [Volvo] / [Anders, namelijk: [<Open>]]

QED7: What is the model of your car? (Or the car you use most frequently.) For example: Peugeot 306, Renault Clio.

[<Open>]

QED8: What is the size of the engine of your car? (Or of the car you use most frequently.)

[Less than 1000 cc (cubic centimetres) or 1 litre] / [1000 – 1500 cc (cubic centimetres) or 1 – 1.5 litre] / [1500 – 2000 cc (cubic centimetres) or 1.5 – 2 litre] / [2000 – 2500 cc (cubic centimetres) or 2 – 2.5 litre] / [more than 2500 cc (cubic centimetres) or 2.5 litre] / [I do not know]

QED9: Who owns the car you use most frequently?

[I own the car] / [This is a company car] / [I borrow this car from friends of family] / [I rent this car] / [Other, namely: [<Open>]]

QED10: In which year was your car built? (Or the car you use most frequently.)

[<Year>] / [I do not know]

In case of French questionnaire QED12F: How many merit points do you have on your drivers' license?

[12] / [11] / [10] / [9] / [8] / [7] / [6] / [5] / [4] / [3] / [2] / [1] / [0] / [I do not know] / [I do not have a drivers' license]

If you have lost one or multiple points, please answer the next question, if not, please continue with question QED13.

In case of French questionnaire QED12F: For which violation(s) did you lose merit points (please tick the boxes of your choice; multiple answers possible)?

[Speeding violation] / [Causing an accident] / [Driving under influence] / [Other, please specify: [<Open>]]

In case of Dutch questionnaire QED11D: How many traffic fines did you obtain during the past three years?

[0] / [1] / [2] / [3] / [4] / [5 or more]

If you had one or multiple fines, please answer the next question, if not, please continue with question QED13.

In case of Dutch questionnaire QED12D: For which violation(s) did you obtain (a) traffic fine(s)? (Please tick the boxes of your choice; multiple answers possible)

[Speeding violation] / [Causing an accident] / [Driving under influence] / [Other, please specify: [<Open>]]

QED13: In how many accidents were you involved during the past 3 years? (An accident is a collision between your car and another object like another car, a bicycle or a tree, even if it is not claimed on your or another one’s insurance.)

[0] / [1] / [2] / [3 or more]

QED14: How many near-misses did you have at intersections during the past 3 years? (A near-miss is an occasion on which a collision between your car and another object like another car, a tree or a cyclist, was just avoided.)

[0] / [1] / [2] / [3] / [4] / [5 or more]

In case of Dutch questionnaire QED15D: During the past 3 years, how often did you go to France by car?

In case of French questionnaire QED15F: During the past 3 years, how often did you go to the Netherlands by car?

[Not] / [One to three times] / [Four to ten times] / [More than ten times]

<<< NEXT >>>

Thank you very much for your time!

QED16: If you have any comments regarding this questionnaire you can write them down below.

[Open]

<<< END >>>

B Vragenlijst autorijden (Dutch)

Versie 7.3 Nederlands 30 mei 2007

Beste heer/mevrouw,

Mijn naam is Timme Bijkerk, ik studeer Civiele Techniek aan de Universiteit Twente. In het kader van mijn afstudeerproject doe ik een afstudeerstage in Parijs. In het kader hiervan onderzoek ik de verkeersveiligheid van Nederland en Frankrijk. Ik ben vooral geïnteresseerd in het oversteken van kruispunten. Voor mijn onderzoek maak ik gebruik van een vragenlijst. U bent mij erg van dienst wanneer u deze invult. Het beantwoorden van de vragenlijst neemt ongeveer vijftien minuten in beslag.

U kunt antwoorden door het vakje van uw keuze aan te klikken, behalve indien anders is aangegeven. Over het algemeen kan er slechts één antwoord per vraag worden gegeven, indien dit niet het geval is dan is dit ook aangegeven. Als u klaar bent met het beantwoorden van alle vragen op een pagina drukt u op “volgende” om door te gaan naar de volgende pagina. Aan het einde van de vragenlijst, kunt u op “einde” drukken om de vragenlijst op te sturen.

Bij voorbaat hartelijk bedankt voor uw moeite!

Met vriendelijke groet,

Timme Bijkerk

<<< VOLGENDE >>>

B.1 Deel 1

Om te beginnen willen we u graag wat vragen stellen om te bepalen of deze vragenlijst door u ingevuld kan worden.

QF1: Bent u in het bezit van een rijbewijs voor personenauto’s?

[Ja] / [Nee]

QF2: Wanneer heeft u uw rijbewijs gehaald?

[<Open>] maand [<Open>] jaar

QF3: In hoeveel auto's rijdt u regelmatig?

[0] / [1] / [2] / [3 of meer]

B.2 Deel 2

In dit onderdeel van de vragenlijst stellen we u vragen over zes verschillende kruispunten.

<<< VOLGENDE >>>

B.2.1 Foto i

Op de onderstaande foto ziet u het kruispunt van de <…> met de <…> buiten <…> in <…>.

<<< FOTO i >>>

Stelt u zich voor dat u dit kruispunt oversteekt. Het is twee uur 's middags, de zon schijnt en u bent alleen in uw auto. U bent op weg naar een kennis.

QCiS1: Bij een ongeluk betrokken raken terwijl ik dit kruispunt oversteek is:

erg onwaarschijnlijk [1] [2] [3] [4] [5] [6] [7] erg waarschijnlijk

QCiS2: Mocht ik bij een ongeluk betrokken raken terwijl ik dit kruispunt oversteek, dan verwacht ik:

Veel schade aan mijn auto [1] [2] [3] [4] [5] [6] [7] geen schade aan mijn auto

QCiS3: Mocht ik bij een ongeluk betrokken raken terwijl ik dit kruispunt oversteek, dan verwacht ik:

Zwaar gewond te zijn [1] [2] [3] [4] [5] [6] [7] ongedeerd te zijn

<<< VOLGENDE >>>

B.3 Deel 3

We vragen u nu aan te geven met welke snelheid u de u heeft gezien kruispunten over zou steken.

<<< VOLGENDE >>>

B.3.1 Foto i

Op de onderstaande foto ziet u het kruispunt van de <…> met de <…> buiten <…> in <…>.

<<< FOTO i >>>

Stelt u zich voor dat u dit kruispunt oversteekt. Het is twee uur ’s middags, de zon schijnt en u bent alleen in uw auto. U bent op weg naar een kennis. U rijdt met een snelheid van 60 km/u.

QCiB1: Als ik 60 km/u per uur zou rijden terwijl ik dit kruispunt oversteek dan is dat:

A:	erg onveilig	[1] [2] [3] [4] [5] [6] [7]	erg veilig
B:	erg onprettig	[1] [2] [3] [4] [5] [6] [7]	erg prettig
B:	erg schadelijk	[1] [2] [3] [4] [5] [6] [7]	erg voordelig
B:	erg negatief	[1] [2] [3] [4] [5] [6] [7]	erg positief

QCiB2: Als u dit kruispunt zou naderen met 60 km/u, met welke snelheid zou u het dan oversteken?

[Ik zou eerst stoppen] / [10 km/u] / [20 km/u] / [30 km/u] / [40 km/u] / [50 km/u, ik zou alleen mijn voet van het gaspedaal halen] / [60 km/u, ik zou mijn snelheid niet aanpassen] / [70 km/u] / [80 km/u] / [90 km/u] / [100 km/u] / [Anders, namelijk: [<Open]]

<<< VOLGENDE >>>

B.4 Deel 4

In dit onderdeel willen we graag weten of u bekend bent met de kruispunten die we u hebben laten zien.

<<< VOLGENDE >>>

B.4.1 Foto i

Op de onderstaande foto ziet u het kruispunt van de <…> met de <…> buiten <…> in <…>.

<<< FOTO i >>>

QCiF1: Weet u waar dit kruispunt zich bevindt?

[Nee] / [Ja]

QCiF2: Hoe regelmatig steekt u dit kruispunt over?

[Nooit] / [Minder dan één keer per maand] / [Één tot drie keer per maand] / [Vier tot tien keer per maand] / [Elf tot twintig keer per maand] / [Meer dan twintig keer per maand] / [Niet van toepassing: ik weet niet waar dit kruispunt zich bevindt]

QCiF3: Heeft u mensen in uw omgeving (familie, vrienden, buren) horen praten over dit kruispunt?

[Nee] / [Ja]

QCiF3: Heeft u mensen in uw omgeving (familie, vrienden, buren) die een ongeval hebben gehad op dit kruispunt?

[Nee] / [Ja]

<<< VOLGENDE >>>

B.5 Deel 5

In dit voorlaatste onderdeel van de vragenlijst vragen we u naar uw mening over bepaalde vormen van rijgedrag.

QSS: Kunt u aangeven of de onderstaande zinnen u beschrijven als u auto rijdt? Op deze schaal betekent 1 “totaal niet” en 5 “volledig”.

QSS1: Ik rijd graag zonder een geplande route en zonder dat ik weet hoe laat ik aankom.

Totaal niet [1] / [2] / [3] / [4] / [5] Volledig

QSS2: Ik voel me vaak een autocoureur.

Totaal niet [1] / [2] / [3] / [4] / [5] Volledig

QSS3: Ik houd van een ‘wilde’ rit.

Totaal niet [1] / [2] / [3] / [4] / [5] Volledig

QSS4: Ik houd ervan om te rijden op wegen met veel scherpe bochten.

Totaal niet [1] / [2] / [3] / [4] / [5] Volledig

QSS5: Ik zou graag leren rijden in auto’s die sneller kunnen dan 300 km/u.

Totaal niet [1] / [2] / [3] / [4] / [5] Volledig

QSS6: Ik heb geen geduld met mensen die voorzichtig en voorspelbaar autorijden.

Totaal niet [1] / [2] / [3] / [4] / [5] Volledig

QSS7: Ik denk dat ik het leuk zou vinden om erg snel te rijden op een steile weg.

Totaal niet [1] / [2] / [3] / [4] / [5] Volledig

B.6 Part 6

Dit is het laatste onderdeel van de vragenlijst. In dit onderdeel stellen we u enkele vragen over uw persoonlijke situatie en uw rijervaring.

QED1: Bent u een man of een vrouw?

[Man] / [Vrouw]

QED2: Wat is uw geboortedatum?

[<Open>] maand [<Open>] jaar

QED3: Wat is uw nationaliteit?

[Nederlands] / [Anders, namelijk [<open>]]

QED4: Hoeveel kilometer heeft u afgelopen jaar ongeveer gereden als de bestuurder van een auto? (U kunt het aantal kilometers dat u gereden hebt als de bestuurder van een auto schatten door het aantal kilometers dat u per maand rijdt te vermenigvuldigen met 12.)

[<Open>] kilometer

QED5: Hoeveel kilometer heeft u ongeveer gereden als de bestuurder van een auto gedurende de afgelopen drie jaar? (U kunt het aantal kilometers dat u gereden hebt als de bestuurder van een auto schatten door het aantal kilometers dat u per maand rijdt te vermenigvuldigen met 36.)

[<Open>] kilometer

QED6: Welk merk heeft uw auto? (Of de auto waarin u regelmatig rijdt.)

[Alfa Romeo] / [Audi] / [BMW] / [Citroën] / [Daewoo] / [Daihatsu] / [Fiat] / [Ford] / [Hyundai] / [Kia] / [Mazda] / [Mercedes] / [Mitsubishi] / [Nissan] / [Opel] / [Peugeot] / [Renault] / [Saab] / [Seat] / [Subaru] / [Suzuki] / [Toyota] / [Volkswagen] / [Volvo] / [Anders, namelijk: [<Open>]]

QED7: Van welk model is uw auto? (Of de auto waarin u regelmatig rijdt.) Bijvoorbeeld: Peugeot 306, Renault Clio.

[<Open>]

QED8: Wat is de motorinhoud van uw auto? (Of van de auto waarin u regelmatig rijdt.)

[Minder dan 1000 cc (kubieke centimeter) of 1 liter] / [1000 – 1500 cc (kubieke centimeter) of 1 - 1,5 liter] / [1500 – 2000 cc (kubieke centimeter) of 1,5 - 2 liter] / [2000 – 2500 cc (kubieke centimeter) of 2 - 2,5 liter] / [Meer dan 2500 cc (kubieke centimeter) of 2,5 liter] / [Weet ik niet]

QED9: Van wie is de auto waarin u regelmatig rijdt?

[Van mij] / [Het is een bedrijfsauto] / [Ik leen deze auto van vrienden of familie] / [Ik huur deze auto] / [Anders, namelijk [<Open>]]

QED10: Wat is het bouwjaar van uw auto? (Of de auto waarin u regelmatig rijdt.)

[<Jaar>] / [Weet ik niet]

QED11D: Hoeveel verkeersboetes heeft u ontvangen gedurende de afgelopen drie jaar?

[0] / [1] / [2] / [3] / [4] / [5 of meer]

Indien u één of meerdere verkeersboetes heeft ontvangen, beantwoord de volgende vraag, zo niet, ga direct door naar vraag 13.

QED12D: Voor welke verkeersovertreding(en) heeft u een boete ontvangen gedurende de afgelopen drie jaar? (Meerdere antwoorden mogelijk.)

[Snelheidsovertreding] / [Veroorzaken van een ongeluk] / [Rijden onder invloed] / [Ik heb geen verkeersboetes ontvangen] / [Anders, namelijk: [<open>]]

QED13: Bij hoeveel ongelukken bent u betrokken geweest gedurende de afgelopen drie jaar? (Een ongeluk is een aanrijding van uw auto met een ander object zoals een andere auto, een boom of een fietser ook wanneer dit niet op uw of een andere verzekering verhaald is.)

[0] / [1] / [2] / [3 of meer]

QED14: Bij hoeveel bijna-ongelukken bent u betrokken geweest gedurende de afgelopen drie jaar? (Een bijna-ongeluk is een geval waarbij een aanrijding van uw auto met een ander object zoals een andere auto, een boom of een fietser maar net vermeden kon worden.)

[0] / [1] / [2] / [3] / [4] / [5 of meer]

QED15D: Hoe vaak bent u gedurende de afgelopen drie jaar met de auto in Frankrijk geweest?

[Geen enkele keer] / [Één tot drie keer] / [Vier tot tien keer] / [Meer dan tien keer]

Hartelijk bedankt voor uw tijd!

QED16: Indien u opmerkingen heeft naar aanleiding van deze vragenlijst dan kunt u deze hieronder kwijt.

[Open]

<<< EINDE >>>

C Questionnaire sur la conduite automobile (French)

Version 7.4 Français – 30 mai 2007

Cher Monsieur / Chère Madame,

Je m'appelle Timme Bijkerk. Je suis élève ingénieur en Génie Civil à l'Université de Twente aux Pays-Bas. Pour l'obtention de mon diplôme, je fais un stage à Paris. Durant ce stage, je réalise une étude sur la comparaison de la sécurité routière entre la France et les Pays-Bas. Je m'intéresse plus spécifiquement au franchissement d'intersections. Pour mon étude j'utilise un questionnaire. Vous m'aideriez beaucoup si vous le remplissiez. Il vous faudra environ quinze minutes pour le remplir.

Le plus souvent, vous aurez à répondre en donnant une seule réponse par question, pour cela vous cocherez la case de votre choix. Lorsque vous aurez terminé de répondre aux questions présentées sur un écran cliquez sur « continuer » pour passer à l'écran suivant. A la fin du questionnaire, cliquez sur « fin » pour m'envoyer le questionnaire.

Merci beaucoup pour votre participation !

Timme Bijkerk

<<< CONTINUER >>>

C.1 Part 1

Tout d'abord, nous vous posons quelques questions pour déterminer si ce questionnaire vous concerne.

QF1 : Avez-vous votre permis de conduire automobile ?

[Oui] / [Non]

QF2: Si oui, quand avez-vous obtenu votre permis de conduire automobile ?

[<Ouvert>] mois [<Ouvert>] année

QF3: Combien de voitures conduisez-vous fréquemment ?

[0] / [1] / [2] / [3 ou plus]

<<< CONTINUER >>>

C.2 Part 2

Dans cette partie du questionnaire, nous vous demandons d'évaluer six intersections différentes.

<<< CONTINUER >>>

C.2.1 Photo i

Sur la photo ci-dessous vous pouvez voir l'intersection de la <…> et de la <…> près de <…>, <…>

<<< PHOTO 1 >>>

Imaginez que vous vous approchez de cette intersection. Il est 14 heures, il fait beau et vous êtes seul(e) dans votre voiture. Vous allez chez un(e) ami(e).

QCiS1: Pour moi, être impliqué(e) dans un accident en franchissant cette intersection serait :

très improbable [1] [2] [3] [4] [5] [6] [7] très probable

QCiS2: Si j'étais impliqué(e) dans un accident en franchissant cette intersection, je devrais m'attendre à ce que ma voiture :

soit très endommagée [1] [2] [3] [4] [5] [6] [7] ne soit pas endommagée du tout

QCiS3: Si j'étais impliqué(e) dans un accident en franchissant cette intersection, je devrais m'attendre à:

être gravement blessé(e) [1] [2] [3] [4] [5] [6] [7] ne pas être blessé(e) du tout

<<< CONTINUER >>>

C.3 Part 3

Nous vous demandons maintenant d'évaluer à quelle vitesse vous franchiriez les intersections qui vous ont été presentées.

<<< CONTINUER >>>

C.3.1 Photo i

Sur la photo ci-dessous vous pouvez voir l'intersection de la <…> et de la <…> près de <…>, <…>

<<< PHOTO 1 >>>

Imaginez que vous vous approchez de cette intersection. Il est 14 heures, il fait beau et vous êtes seul(e) dans votre voiture. Vous allez chez un(e) ami(e). Vous roulez à 60 km/h.

QCiB1: Si je roulais à 60 km/h pour franchir cette intersection, ce serait :

A:	très dangereux	[1] [2] [3] [4] [5] [6] [7]	très sûr
B:	très désagréable	[1] [2] [3] [4] [5] [6] [7]	très agréable
C:	très nuisible	[1] [2] [3] [4] [5] [6] [7]	très bénéfique
D:	très négatif	[1] [2] [3] [4] [5] [6] [7]	très positif

QCiB2: Si je roulais à 60 km/h à l'approche de cette intersection, à quelle vitesse je la franchirai ?

[Je m'arrêterai] / [10 km/h] / [20 km/h] / [30 km/h] / [40 km/h] / [50 km/h, je ralentirai seulement] / [60 km/h, je ne changerai pas ma vitesse] / [70 km/h] / [80 km/h] / [90 km/h] / [100 km/h] / [Autre, précisez : [<Ouvert>]]

<<< CONTINUER >>>

C.4 Part 4

Nous cherchons ici à savoir si vous êtes familiarisé(e) avec les intersections qui vous ont été présentées.

<<< CONTINUER >>>

C.4.1 Photo i

Sur la photo ci-dessous vous pouvez voir l'intersection de la <…> et de la <…> près de <…>, <…>

<<< PHOTO 1 >>>

QCiF1: Savez-vous où se trouve cette intersection ?

[Non] / [Oui]

QC1F2: Depuis trois ans, à quelle fréquence avez-vous franchi cette intersection ?

[Jamais] / [Moins d'une fois par mois] / [Une à trois fois par mois] / [Quatre à dix fois par mois] / [Onze à vingt fois par mois] / [Plus de vingt fois par mois] / [Pas applicable : je ne sais pas où cette intersection est localisée]

QCiF3: Y a-t-il des gens dans votre entourage (famille, ami(e)s, voisin(e)s) qui vous ont déjà parlé de cette intersection ?

[Oui] / [Non]

QCiF4: Y a-t-il des gens dans votre entourage (famille, ami(e)s, voisin(e)s) qui ont été impliqué(e)s dans un accident dans cette intersection ?

[Oui] / [Non]

<<< CONTINUER >>>

C.5 Part 5

Dans cette avant-dernière partie du questionnaire, nous vous cherchons à connaître votre opinion sur différents comportements de conduite.

QSS: Vous me direz si chacune d'elles vous décrit en tant qu'automobiliste à l'aide d'une échelle allant de 1 « pas du tout » à 5 « tout à fait ».

QSS1: Vous aimeriez conduire avoir prévu ni l'itinéraire ni l'heure d'arrivée.

Pas du tout [1] / [2] / [3] / [4] / [5] Tout à fait

QSS2: Vous avez souvent l'impression de conduire comme un pilote de course.

Pas du tout [1] / [2] / [3] / [4] / [5] Tout à fait

QSS3: Vous aimez conduire comme un(e) casse-cou.

Pas du tout [1] / [2] / [3] / [4] / [5] Tout à fait

QSS4: Vous aimez conduire sur les routes où il y a beaucoup de virages serrés.

Pas du tout [1] / [2] / [3] / [4] / [5] Tout à fait

QSS5: Vous aimeriez apprendre à conduire des voitures qui peuvent dépasser les 300 km/h.

Pas du tout [1] / [2] / [3] / [4] / [5] Tout à fait

QSS6: Vous manquez de patience avec les gens qui conduisent d'une façon prévisible et ennuyeuse.

Pas du tout [1] / [2] / [3] / [4] / [5] Tout à fait

QSS7: Vous pensez que conduire très vite dans une grande descente vous amuserait beaucoup.

Pas du tout [1] / [2] / [3] / [4] / [5] Tout à fait

C.6 Part 6

Merci de répondre dans cette dernière partie du questionnaire à des questions sur votre situation personnelle et votre expérience de conduite.

QED1: Êtes-vous un homme ou une femme ?

[Homme] / [Femme]

QED2: Quelle est votre date de naissance ?

[<Ouvert>] mois [<Ouvert>] année

QED3: Quelle est votre nationalité ?

[Française] / [Autre, précisez : [<Ouvert>]]

QED4: Combien de kilomètres environ avez-vous parcourus en tant que conducteur au cours de la dernière année ? (vous pouvez estimer le nombre de kilomètres que vous avez parcourus au cours de la dernière année en multipliant le nombre de kilomètres parcourus chaque mois par 12)

[<Ouvert>]

QED5: Combien de kilomètres environ avez-vous parcourus en tant que conducteur au cours des trois dernières années ? (vous pouvez estimer le nombre de kilomètres que vous avez parcourus au cours des trois dernières années en multipliant le nombre de kilomètres parcourus chaque mois par 36)

[<Ouvert>]

QED6: Quelle est la marque de votre voiture ? (ou de la voiture qui vous utilisez le plus souvent)

[Alfa Romeo] / [Audi] / [BMW] / [Citroën] / [Daewoo] / [Daihatsu] / [Fiat] / [Ford] / [Hyundai] / [Kia] / [Mazda] / [Mercedes] / [Mitsubishi] / [Nissan] / [Opel] / [Peugeot] / [Renault] / [Saab] / [Seat] / [Subaru] / [Suzuki] / [Toyota] / [Volkswagen] / [Volvo] / [Autre, précisez : [<Ouvert>]]

QED7: Quel est le modèle de votre voiture ? (ou de la voiture qui vous utilisez le plus souvent) Par exemple : Peugeot 306, Renault Clio.

[<Ouvert>]

QED8: Quelle est la puissance de votre voiture ? (ou de la voiture qui vous utilisez le plus souvent)

[Moins de 1000 cc (centimètres cubique) ou 1 litre] / [1000 – 1500 cc (centimètres cubique) ou 1 – 1.5 litre(s)] / [1500 – 2000 cc (centimètres cubique) ou 1.5 – 2 litres] / [2000 – 2500 cc (centimètres cubique) ou 2 – 2.5 litres] / [Plus de 2500 cc (centimètres cubique) ou 2.5 litres] / [Ne sait pas]

QED9: A qui est la voiture qui vous utilisez le plus souvent ?

[C'est la mienne] / [C'est la voiture de l'entreprise] / [J'emprunte la voiture à des amies ou à ma famille] / [Je loue la voiture] / [Autre, précisez : [<Ouvert>]]

QED10: En quelle année votre voiture a-t-elle été fabriquée ? (ou la voiture qui vous utilisez le plus souvent)

[<Année>] / [Ne sait pas]

QED11: Combien de points avez-vous sur votre permis de conduire ?

[12] / [11] / [10] / [9] / [8] / [7] / [6] / [5] / [4] / [3] / [2] / [1] / [0] / [Je ne sait pas] / [Je n'ai pas un permis de conduire]

Si vous avez perdu un ou plusieurs points, répondez à la question suivante, si non allez directement à la question QED13:

QED12F: Pour quelle(s) infraction(s) avez-vous perdu des points ? (s'il vous plaît, cochez les cases de votre choix ; vous pouvez donner plusieurs réponses)

[Excès de vitesse] / [Avoir causé un accident] / [Conduite d'état d'ébriété] / [Autre, précisez : [<Ouvert>]]

QED13F: Dans combien d'accidents avez-vous été impliqués au cours des trois dernières années ? (un accident est une collision entre votre voiture et un autre objet comme une autre voiture, un arbre ou un vélo, même si vous ne l'avez pas déclaré à votre assurance)

[0] / [1] / [2] / [3 ou plus]

QED14: Combien de quasi-accident(s) avez-vous eu au cours des trois dernières années ? (un quasi-accident est une situation dans laquelle une collision entre votre voiture et un autre objet comme une autre voiture, un arbre ou un cycliste a été évitée de justesse)

[0] / [1] / [2] / [3] / [4] / [5<]

QED15F: Au cours des trois dernières années, combien de fois avez-vous conduit une voiture aux Pays-Bas ?

[Jamais] / [Une à trois fois] / [Quatre à dix fois] / [Plus de dix fois]

Merci beaucoup pour votre participation !

QED16: Si vous avez des remarques sur ce questionnaire, vous pouvez les écrire ci-dessous.

[Ouvert]

<<< FIN >>>

D Photographs: control situation

Figure D.1 Intersection 1: D101 – D328 outside of Maintenon (Eure-et-Loir, France)

Figure D.2 Intersection 3: Glanerveldweg – Lonnekerweg outside of Enschede (Overijssel, Netherlands)

Figure D.3 Intersection 4: D322 – D20 outside of Saint-Ange-et-Torçay (Eure-et-Loir, France)

Figure D.4 Intersection 5: Kleine Boekelerveldweg – Telgendijk outside of Enschede (Overijssel, Netherlands)

Figure D.5 Intersection 2: D106.4 – D106.2 outside of Bailleau (Eure-et-Loir, France)

Figure D.6 Intersection 6: Schukkingweg – Zuid Esmarkerrondweg outside of Enschede (Overijssel, Netherlands)

E Photographs: intervention situation

Figure E.1 Intersection 1: D101 – D328 outside of Maintenon (Eure-et-Loir, France)

Figure E.2 Intersection 3: Glanerveldweg – Lonnekerweg outside of Enschede (Overijssel, Netherlands)

Figure E.3 Intersection 4: D322 – D20 outside of Saint-Ange-et-Torçay (Eure-et-Loir, France)

Figure E.4 Intersection 5: Kleine Boekelerveldweg – Telgendijk outside of Enschede (Overijssel, Netherlands)

Figure E.5 Intersection 2: D106.4 – D106.2 outside of Bailleau (Eure-et-Loir, France)

Figure E.6 Intersection 6: Schukkingweg – Zuid Esmarkerrondweg outside of Enschede (Overijssel, Netherlands)

F Pilot questionnaire on car driving (English)

Version 6.4 (Pilot) English – 14 May 2007

Dear Sir / Madam,

My name is Timme Bijkerk. I am studying Civil Engineering at the University of Twente in the Netherlands. To obtain my masters I am performing a research internship in Paris. Within the framework of this research I am studying the differences between traffic safety in the Netherlands and in France. I am particularly interested in the crossing of intersections. In order to do this, I am using a questionnaire. It would be a great aid to my research if you would take the effort of filling it out. Answering the questionnaire will take about 15 minutes.

Unless indicated otherwise, you can answer by ticking the box of your choice. Unless indicated otherwise, you can only provide one answer at each question. If you are finished answering all the questions on a page, click “next” to continue to the next page. At the end of the questionnaire, you can press “end” to submit the questionnaire.

Thank you very much for your efforts.

Timme Bijkerk

<<< NEXT >>>

F.1 Part 1

To start with, we would like to ask you some questions to determine weather this questionnaire is for you. Fill out all the questions on this page, then click “next” to continue to the next page.

QF1: Do you own a drivers’ license?

[Yes] / [No]

QF2: In how many vehicles do you drive on a regular basis?

[0] / [1] / [2] / [3 or more]

<<< NEXT >>>

If QF1 = [No] or QF2 = [No], end of questionnaire.

F.2 Part 2

In this part of the questionnaire you are asked to judge upon six different intersections.

<<< NEXT >>>

F.2.1 Photo i

On the photographs below you see the intersection of the Snellenweg and the Vliegveldweg outside of Enschede.

<<< PHOTO 1 >>>

Imagine that you are approaching the intersection. It is 14:00h, the sun is shining and you are alone in your car. You are on your way over to a friend.

QCiS1a: For me to get involved in an accident crossing this intersection would be:

very unlikely [1] [2] [3] [4] [5] [6] [7] very likely

QCiS1b: If I would get involved in an accident crossing this intersection, it would result in:

very much damage to my car [1] [2] [3] [4] [5] [6] [7] very few damage to my car

QCiS1c: If I would get involved in an accident crossing this intersection, it would result in:

very much injuries to me [1] [2] [3] [4] [5] [6] [7] very few injuries to me

Imagine now that another driver approaches this intersection. It is 14:00h, the sun is shining and s/he is alone in her/his car. S/he is on his/her way over to a friend.

QCiS2a: For the driver <u>who is familiar</u> with this intersection to get involved in an accident crossing it would be:

very unlikely [1] [2] [3] [4] [5] [6] [7] very likely

QCiS2b: If a driver <u>who is familiar</u> with this intersection would get involved in an accident it would result in:

very much damage to his/her car [1] [2] [3] [4] [5] [6] [7] very few damage to his/her car

QCiS2c: If a driver <u>who is familiar</u> with this intersection would get involved in an accident it would result in:

very much injuries to him/her [1] [2] [3] [4] [5] [6] [7] very few injuries to him/her

QCiS3a: For the driver <u>who is not familiar</u> with this intersection to get involved in an accident crossing it would be:

very unlikely [1] [2] [3] [4] [5] [6] [7] very likely

QCiS3b: If a driver <u>who is not familiar</u> with this intersection would get involved in an accident it would result in:

very much damage to his/her car [1] [2] [3] [4] [5] [6] [7] very few damage to his/her car

QCiS3c: If a driver <u>who is not familiar</u> with this intersection would get involved in an accident it would result in:

very many injuries to him/her [1] [2] [3] [4] [5] [6] [7] very few injuries to him/her

<<< NEXT >>>

F.3 Part 3

In this part of the questionnaire you are asked to judge upon three different actions while you are imagining you are approaching the intersection in a car. These actions are: decreasing your speed, maintaining your speed and increasing your speed.

<<< NEXT >>>

F.3.1 Photo i

On the photographs below you see the intersection of the Snellenweg and the Vliegveldweg outside of Enschede.

<<< PHOTO 1 >>>

Imagine that you are approaching the intersection. It is 14:00h, the sun is shining and you are alone in your car. You are on your way over to a friend. You are driving with a speed of 60 km/h. You do not see any other road users.

QCiB1: If I would decrease my speed of 60 km/h with 20 km/h while crossing this intersection it would be:

A:	very unsafe	[1] [2] [3] [4] [5] [6] [7]	very safe
B:	very harmful	[1] [2] [3] [4] [5] [6] [7]	very beneficial
C:	very unpleasant	[1] [2] [3] [4] [5] [6] [7]	very pleasant
D:	very negative	[1] [2] [3] [4] [5] [6] [7]	very positive

QCiB2: If I would maintain my speed of 60 km/h while crossing this intersection it would be:

A:	very unsafe	[1] [2] [3] [4] [5] [6] [7]	very safe
B:	very harmful	[1] [2] [3] [4] [5] [6] [7]	very beneficial
C:	very unpleasant	[1] [2] [3] [4] [5] [6] [7]	very pleasant
D:	very negative	[1] [2] [3] [4] [5] [6] [7]	very positive

QCiB3: If I increase my speed of 60 km/h with 20 km/h while crossing this crossing it would be:

A:	very unsafe	[1] [2] [3] [4] [5] [6] [7]	very safe
B:	very harmful	[1] [2] [3] [4] [5] [6] [7]	very beneficial
C:	very unpleasant	[1] [2] [3] [4] [5] [6] [7]	very pleasant
D:	very negative	[1] [2] [3] [4] [5] [6] [7]	very positive

QCiB4: If I would be approaching the intersection with a speed of 60 km/h, I would:

[Decrease my speed with 20 km/h] / [Maintain my speed] / [Increase my speed with 20 km/h] / [Other, please specify: [<open>]]

<<< NEXT >>>

F.4 Part 4

In this part of the questionnaire we would like to know whether you are familiar with the intersections we showed you.

<<< NEXT >>>

F.4.1 Photo i

On the photographs below you see the intersection of the Snellenweg and the Vliegveldweg outside Enschede.

<<< PHOTO 1 >>>

QCiF1: Do you know where this intersection is located?

[No] / [Yes] / [I do not know]

In case QCiF1 = [Yes] QCiF2: During the past 3 years, how regular did you cross this intersection?

[Never] / [Less than once a month] / [One to three times a month] / [Four to ten times a month] / [Ten to twenty times a month] / [More than twenty times a month] / [Not applicable: I do not know where this intersection is located]

In case QCiF1 = [Yes] QCiF3: Have you heard about this intersection by local media? (In example newspapers or television.)

[No] / [Yes]

<<< NEXT >>>

F.5 Part 5

In this part of the questionnaire we would like to ask you some questions about your opinion on particular behaviours when driving a car.

QSE1: To what extent do you feel confident while committing the following driving behaviours?

1. Driving trough red light.

A: Not at all [1] [2] [3] [4] [5] [6] very much

2. Parking in a non-parking zone.

B: Not at all [1] [2] [3] [4] [5] [6] very much

3. Driving at a higher speed than allowed.

C: Not at all [1] [2] [3] [4] [5] [6] very much

4. Not stopping in a ‘‘stop’’ sign.

D: Not at all [1] [2] [3] [4] [5] [6] very much

5. Driving when tired.

E: Not at all [1] [2] [3] [4] [5] [6] very much

6. Not obeying a ‘‘slow down’’ sign.

F: Not at all [1] [2] [3] [4] [5] [6] very much

7. Overtaking another vehicle on a continuous white line (no pass zone).

G: Not at all [1] [2] [3] [4] [5] [6] very much

8. Not keeping the right distance from the vehicle in front of me.

H: Not at all [1] [2] [3] [4] [5] [6] very much

9. Not looking at the side mirrors while overtaking.

I: Not at all [1] [2] [3] [4] [5] [6] very much

10. Driving slowly in a highway.

J: Not at all [1] [2] [3] [4] [5] [6] very much

11. Entering a street with a ‘‘no entry’’ sign.

K: Not at all [1] [2] [3] [4] [5] [6] very much

12. Not using seat-belts.

L: Not at all [1] [2] [3] [4] [5] [6] very much

13. Driving under the influence of alcohol.

M: Not at all [1] [2] [3] [4] [5] [6] very much

14. Turning in high speed.

N: Not at all [1] [2] [3] [4] [5] [6] very much

<<< NEXT >>>

QSE2: To what extent do you evaluate that you control the following driving behaviours?

1. Driving trough red light.

A: Not at all [1] [2] [3] [4] [5] [6] very much

2. Parking in a non-parking zone.

B: Not at all [1] [2] [3] [4] [5] [6] very much

3. Driving at a higher speed than allowed.

C: Not at all [1] [2] [3] [4] [5] [6] very much

4. Not stopping in a ‘‘stop’’ sign.

D: Not at all [1] [2] [3] [4] [5] [6] very much

5. Driving when tired.

E: Not at all [1] [2] [3] [4] [5] [6] very much

6. Not obeying a ‘‘slow down’’ sign.

F: Not at all [1] [2] [3] [4] [5] [6] very much

7. Overtaking another vehicle on a continuous white line (no pass zone).

G: Not at all [1] [2] [3] [4] [5] [6] very much

8. Not keeping the right distance from the vehicle in front of me.

H: Not at all [1] [2] [3] [4] [5] [6] very much

9. Not looking at the side mirrors while overtaking.

I: Not at all [1] [2] [3] [4] [5] [6] very much

10. Driving slowly in a highway.

J: Not at all [1] [2] [3] [4] [5] [6] very much

11. Entering a street with a ‘‘no entry’’ sign.

K: Not at all [1] [2] [3] [4] [5] [6] very much

12. Not using seat-belts.

L: Not at all [1] [2] [3] [4] [5] [6] very much

13. Driving under the influence of alcohol.

M: Not at all [1] [2] [3] [4] [5] [6] very much

14. Turning in high speed.

N: Not at all [1] [2] [3] [4] [5] [6] very much

<<< NEXT >>>

F.6 Part 6

This is the last part of the questionnaire. In this part, we would like you to answer some questions about your personal situation and your driving experience.

QED1: Are you a man or a woman?

[Man] / [Woman]

QED2: What is your date of birth?

[<Open>] month [<Open>] year

QED3: What is your nationality?

[French] / [Dutch] / [Other, please specify [<open>]]

QED4: When did you obtain your driver's license?

[<Open>] month [<Open>] year

QED5: How many kilometres did you approximately drive as a driver of a car last year? (You can estimate the amount of kilometres you drove as a driver of a car last year by multiplying the number of kilometres you drive each month with twelve.)

[<Open>]

QED6: How many kilometres did you approximately drive as a driver of a car during the past 3 years? (You can estimate the amount of kilometres you drove as a driver of a car by multiplying the number of kilometres you drive each month with 36.)

[<Open>]

QED7: From which brand is your car? (Or the car you use most frequently.)

[Alfa Romeo] / [Audi] / [BMW] / [Citroën] / [Daewoo] / [Daihatsu] / [Fiat] / [Ford] / [Hyundai] / [Kia] / [Mazda] / [Mercedes] / [Mitsubishi] / [Nissan] / [Opel] / [Peugeot] / [Renault] / [Saab] / [Seat] / [Subaru] / [Suzuki] / [Toyota] / [Volkswagen] / [Volvo] / [Anders, namelijk: [<Open>]]

QED8: What is the model of your car? (Or the car you use most frequently.) In exemple: Peugeot 306, Renault Clio.

[<Open>]

QED9: What is the size of the engine of your car? (Or of the car you use most frequently.)

[Less than 1000 cc (cubic centimetres) or 1 litre] / [1000 – 1500 cc (cubic centimetres) or 1 – 1.5 litre] / [1500 – 2000 cc (cubic centimetres) or 1.5 – 2 litre] / [2000 – 2500 cc (cubic centimetres) or 2 – 2.5 litre] / [more than 2500 cc (cubic centimetres) or 2.5 litre] / [I do not know]

QED10: Is your households' car leased? (Or the car you use most frequently.)

[Yes] / [No]

QED11: In which year was your car built? (Or the car you use most frequently.)

[<Year>] / [I do not know]

In case of French questionnaire QED12F: How many merit points do you have on your drivers' license?

[12] / [11] / [10] / [9] / [8] / [7] / [6] / [5] / [4] / [3] / [2] / [1]

If you have lost one or multiple points, please answer the next question, if not, please continue with question QED14.

In case of French questionnaire QED13F: For which violation(s) did you lose merit points (please tick the boxes of your choice; multiple answers possible)?

[Speeding violation] / [Causing an accident] / [Driving under influence] / [Other, please specify: [<Open>]]

In case of Dutch questionnaire QED12D: How many traffic fines did you obtain during the past three years?

[0] / [1] / [2] / [3] / [4] / [5 or more]

If you had one or multiple fines, please answer the next question, if not, please continue with question QED14.

In case of Dutch questionnaire QED13D: For which violation(s) did you obtain (a) traffic fine(s)? (Please tick the boxes of your choice; multiple answers possible)

[Speeding violation] / [Causing an accident] / [Driving under influence] / [Other, please specify: [<Open>]]

QED14: In how many accidents were you involved during the past 3 years? (An accident is a collision between your car and another object like another car, a bicycle or a tree, even if it is not claimed on your or another one's insurance.)

[0] / [1] / [2] / [3] / [4] / [5<]

QED15: How many near-misses did you have at intersections during the past 3 years? (A near-miss is an occasion on which a collision between your car and another object like another car, a tree or a cyclist, was just avoided.)

[0] / [1] / [2] / [3] / [4] / [5<]

In case of Dutch questionnaire QED16D: During the past 3 years, how often did you go to France by car?

In case of French questionnaire QED16F: During the past 3 years, how often did you go to the Netherlands by car?

[Not] / [One to three times] / [Four to ten times] / [More than ten times]

<<< NEXT >>>

Thank you very much for your time!

QED17: If you have any comments regarding this questionnaire you can write them down below.

[Open]

<<< END >>>