

Summary:

Speed, feelings and risk: A discussion of inner mechanisms involved in drivers' speed choice

The implementation of road safety measures and their effect on the number of accidents is a central issue in traffic safety research. However, the effectiveness of measures is often considered without adequate theoretical understanding of why measures work as they do. A better theoretical understanding of drivers' choice of driving speed, and how driver behaviour can be influenced, could lead to new and more effective road safety measures. This has motivated the establishment of a Strategic Institute Program (SIP) on driver behaviour models at the Institute of Transport Economics in 1998.

The purpose of the SIP is to develop a comprehensive model of drivers' speed choice and the factors that influence it. A model should facilitate the understanding of drivers' speed choice and the prediction of the effectiveness of safety measures. The integration of a separate model of perception, information processing and decision-making has been especially important as such issues have been inadequately dealt with in earlier driver behaviour models. In report 1 from the SIP, one model of information processing was presented one draft driver behaviour model were presented (figure V2 and 4.1 in the present report – respectively).

The draft model of drivers behaviour uses elements of Wildes Theory of Risk Homeostasis (RHT). A central element in RHT is what Wilde calls a *comparator*. In the SIP's draft model the comparator could be viewed as a place where the influence of all other variables meets and are appraised. The comparator can be viewed as a focal point of drivers' speed choice.

A special issue is how to combine or integrate the two proposed models: The one on information processing, and the draft model. Implicitly this requires support from existing theories and a decision on what elements should be utilized in the elaboration of a comprehensive driver behaviour model.

The present report tries to clarify inner mechanisms involved in appraisal of risk, information processing, and decision-making. The idea of a comparator is discussed in chapter 2 in the light of other driver behaviour models: Gibson and Crooks' field-theory model, Taylor's theory of GSR-constancy, Näätänen and Summalas' 'zero-risk'-theory, Wilde's RHT and Fullers Task-Performance Interface model.

A central issue is the question of how risk is appraised and how processes linked to risk appraisal and speed choice should be modelled. The concepts *comparator* and *monitor* are both used in this discussion. Both concepts play a central part in different models and theories. The concept of a comparator produces an image of something being compared (consciously) and that acts are triggered by differences between images or 'inner scenarios'. The appraisal of inner scenarios means that comparisons are specific.

Monitor implies something being monitored more or less continuously. The main task of a monitor is, as the word says, to monitor the organism and the situation in which it is, identify unpleasantness and danger, propose behaviour change to avoid danger, and/or to achieve a better condition among those that are available as alternatives. These are all tasks to secure or increase the probability of survival. In monitoring there is not necessarily anything being compared and no standpoint is taken towards whether consciousness is involved. A monitor functions universally rather than specific and would not be viewed as a focal point.

In the report, appraisals of risk is viewed with a basis in neurobiological research. This is a perspective that seldom has been used in traffic safety research. We have named this new approach *Damasio's model* because it is based on Antonio R. Damasio's book *Descartes' Error: Emotion, Reason and the Human Brain* (1994). Damasio introduces a distinction between *primary* emotions, *secondary* emotions, and *feelings* (chapter 3). He reserves the concept *emotion* for the myriads of changes in the body that automatically take place when the organism is exposed to events or changes in the situation where it is. *Primary* emotions refers to responses that are innate and unconscious, i.e. what newborn infants bring with them by birth. *Secondary* emotions, however, are learned, they comprise all experiences and the learning history of the organism from birth to adulthood. *Emotions* are responses predisposed to be elicited in certain ways and work directly on the body proper by preparing it for action, as well as sending signals to the brain. While emotions are defined as unconscious responses, feelings are defined as *feeling an emotion*, i.e. the process of becoming consciously aware of an emotional response by experiencing the reactions and changes of the body.

Damasio declares axiomatically that survival is the deepest and most basic motive of the living organism. From this we deduce that the human organism must be fitted with a *risk monitor* that ensures survival. Damasio's distinction between primary emotions, secondary emotions and feelings, and the ability to monitor the organism represented unconsciously as well as consciously, are the main elements in what we choose to call the *risk monitor*.

The active organism is almost constantly exposed to stress and 'emotional disturbances'. There is therefore no randomness regarding what condition the organism seeks to (re)establish in order to ensure survival. Damasio expresses this as follows:

The organism seeks a functional balance – a homeostasis – in all its organs: Heart, lungs, gut, skin, skeletal muscles, endocrine glands etc, - a functional balance where the organism probably operates at its best.

This *functional balance* we also choose to refer to as a '*target feeling*' *the best feeling*' or '*best condition*'. Thus, the risk monitor is essential by linking emotions and feelings to a model of driver behaviour. We propose that we – i.e the drivers – in our minds go through some kind of *account balance of feelings* which is activated whenever the situation demands it. This is discussed in chapter 4 and a comparator or *decision cone* is proposed for dealing with processes involving choices and appraisal of alternatives. This model is proposed as an alternative to the working memory processing and, as an enhancement of the model of information processing described previously. The overall aim of performing an account of feelings is to weight alternatives and thereby finding the alternative that realises *the best feeling*.

The central theme we discuss in this report relates to how drivers perceive and appraise risk. It is postulated that emotions and feelings are the very instruments that enable the organism to assess danger and to choose between alternatives in given situations. The existence of a risk monitor is postulated as something universal and as the essential link between the external world and the inner mechanisms that perceive, process and interpret data from the external world and from the body proper.

In chapter 5, the risk monitor is discussed and distinguished from a comparator. A model of risk monitor is also presented.