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INTRODUCTION

Research in stress and strain has been a point of main interest for the Federal Highway Research Institute in Cologne in the last few years. One study on this topic has recently been conducted and finished at the Technical University of Munich.

The aim of the project was to investigate the relation between information load and perceived stress of car drivers with special regard to the influence of traffic situations and driver characteristics.

THEORETICAL APPROACH

Working out a methodological approach to the measurement of stress had to be preceded by the layout of a theoretical concept of stress generation and coping processes. We followed a psychological model introduced by Kastner (1978) which is closely connected to the ideas of Lazarus (1966) and McGrath (1976). The interaction between the driver and the traffic situation is modelled as a circle process: the objective situation is perceived by the driver on the background of his personal experiences. The comparison between the perceived demands and the estimated coping possibilities results in a subjective confidence to control the situation and finally leads to decisions between possible plans of action. The importance of the cognitive-emotional parts of the estimation process will decrease for increasing automation of the associated actions. The action itself leads to a change in the
objective situation and thus the circle closes and the whole process starts all over again. The utility of such a model is the possibility of derivating different levels of stress measuring procedures.

METHODS

40 male students drove an instrumented car on a standardized way through Munich and its surroundings. 68 urban and rural traffic situations had been chosen and analysed using a questionnaire for task analyses purposes which had to be modified for the study. In each of these thoroughly defined situations the following groups of variables were measured for all drivers:

(1) The driver ratings of stress intensity, its duration and their perceived degree of control.
(2) Driver behaviour (e.g. mean velocity, steering wheel movements, break handling).
(3) Physiological measures (e.g. heart rate, GSR).

In addition to these data pools we investigated the static demands of each situation using the Task Analysis Questionnaire; the dynamic components of the actual situations were scored afterwards by experts from a video tape.

A day before the run the subjects had to score on several personality inventories. In total, a set of 44 variables was measured.

RESULTS

Special results from the great body of data gathered during the experiment can of course not be presented here, instead I try to summarise our main findings in a more general form.

1) Stress showed to be a multidimensional construct, stress reactions showed very different patterns of feelings and behaviour as well as in the physiological system.

2) No matter if focus is on the average driver or the average situation, correlations between all variables are rather low. The most consistent and useful indicators were the driver's ratings.
3) The obvious hypothesis of an increasing degree of stress with increasing amount of information being processed could be confirmed, whereas the type of information processing did not lead to differences with respect to the drivers reaction.

4) The amount of stress depends on the kind of traffic situations; but differences between groups of similar situations are quite small. Thus, finding and eliminating the most stressing types of situations cannot be recommended as a very effective strategy in road safety work.

5) In spite of the homogeneity of our sample of drivers, considerable parts of the variance in our data were originated by inter-driver differences. Groups with different levels of stress and with typical coping styles could be identified.

6) Are the most stressing situations or the most stressed drivers also the most dangerous ones? There is no such simple relation: Where the situation is very demanding, drivers react with a change to more cautious behaviour, typically with a considerable speed reduction. The same holds true with respect to different drivers: those who felt and rated more stress drove significantly slower than other drivers. All correlations between average velocity and stress ratings are negative.

7) Stress indicators, e.g. in the physiological reaction patterns were always associated with higher ratings, i.e. the drivers were always informed about their state of arousal or stress.

REFERENCES