

WHAT ARE WE ALLOWED TO ASK, WHAT CAN WE KNOW – TRAFFIC PSYCHOLOGICAL ANALYSIS OF DRIVER BEHAVIOUR

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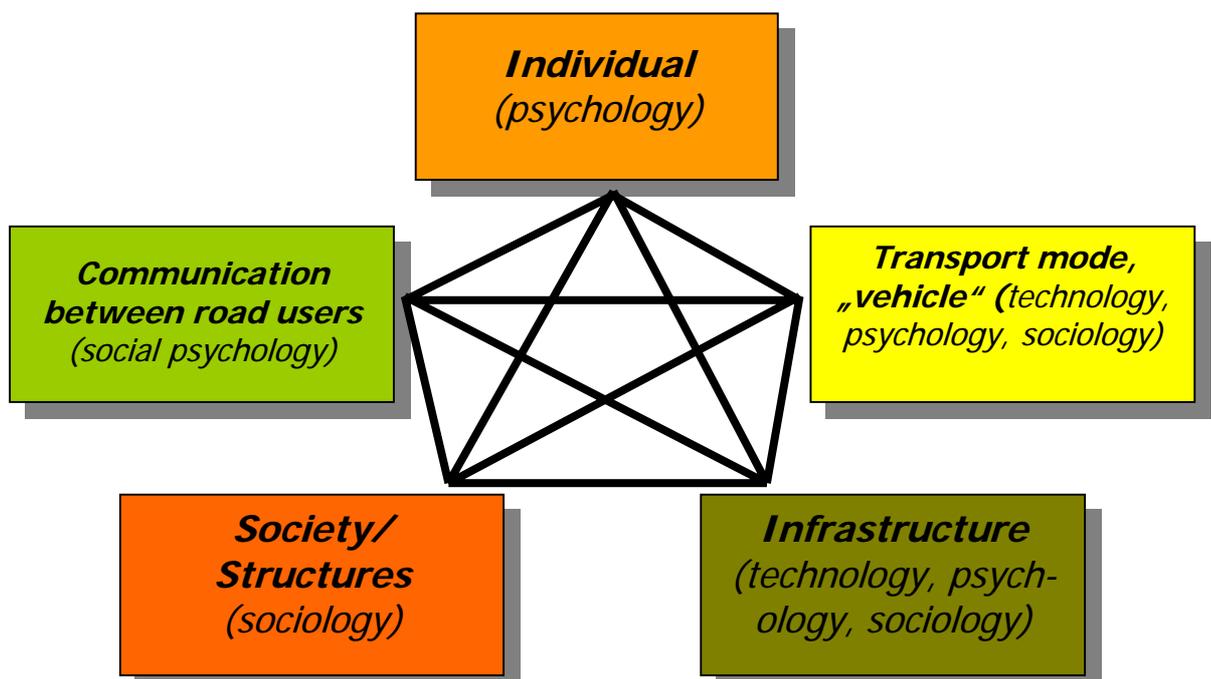
Introduction

In Austria, for different reasons an investigation of a driver's psychophysical abilities and/or his/her willingness to co-operate in traffic is required by law. To investigate both "will and skill" may be necessary in some cases when car drivers have lost their driving licence because of, e.g., driving under the influence of alcohol (above 1.6‰) or if one wants to gain a driver's licence for busses and become a professional driver. Also when authorities suspect that some elderly drivers have lost their psychophysical competences to drive a motor vehicle some testing will be necessary.

Taking the complexity of the traffic system into consideration

When traffic psychologists are asked to give their assessment concerning the probability of drivers to behave adequately in the traffic system, they have to take the complexity of this system into consideration (fig. 1).

Figure 1: Traffic System - Diamond (Risser 2004)



They have to consider the individual and his/her abilities and personality as well as the "playing ground" (i.e. the traffic system) where the individual may perform more or less adequately according to the formal and informal rules of the several parts of this system. To achieve this one has to deal with all these aspects and to give comments on the different abilities, attitudes and the personality. In this connection traffic psychologists use standardised "objective" tests as well as a structured anamnesis, a so-called "exploration". In addition, they sometimes observe driver's behaviour in the field. In Vienna, at the INFAR institute where the author works, this is done by accompanying them in driving-school cars along a standardised route (see "Vienna driving test", Risser 1988). This is very often the case in connection with the diagnosis of elderly people.

Driver diagnostics and selection

Activities in this area are considered to be of value, although there is sometimes debate about test criteria in the sense of validity and reliability. One strongly held view is that if psychologists do not do the selection of drivers - and there will always be some sort of selection, even if officially none is mentioned - other groups will do that, less appropriate than psychologists. Psychologists perceive themselves as being the best equipped discipline for this task, and diagnostics in general are an important part of psychological activities.

Thus, it has to be seen to it that the methods psychologists use improve constantly. In fact, one can see that there have been improvements of the instruments all the time. Psychologists are right now enhancing improvements in all European countries more systematically (Bukasa et al. 2003, Risser ed. 1997, Risser 2001). Among other things, it becomes clearer that the "will-vs.-skill-dilemma" has to be tackled better: It is not mainly skill (i.e. psychophysical performance) but will (i.e. that causes problems - can be tackled better and better: Efforts even have been made to improve attitude and personality assessment.

It is also widely agreed that the validity of tests must be improved, especially with respect to different target groups of testees (e.g. professional drivers) so that the numbers of false positives and erroneous rejections are kept low. As this is very difficult or impossible to be done on a basis of a simple predictor-criteria relationship (e.g., test result is bad → accident risk is high), weight also has to be put on the communication process between the psychologist and the testees: Verdicts have to be understandable and plausible, following a line of reasoning that explains why a person is apt, or is not apt, to drive a car in the future. To draw conclusions from test results is always a heuristic process.

In sum, the main target of traffic psychological assessment is to make a prognosis concerning the individual behaviour of the driver in the frame of traffic-psychology know-how, not least by taking special models into consideration like that one of Michon (1996), which will be discussed later on. Other psychological aspects that have to be considered are results from experimental psychology, social psychology, developmental psychology etc. Otherwise it would not be possible to understand a driver's behaviour under varying and very special conditions in practice. One would not be able to predict the driver's behaviour in the near future.

This broader approach of understanding is necessary because not all functions of all behaviour levels can be analysed and interpreted only by using standardised tests. First, these tests never can tell "the truth", objectively speaking. Under the presumption that tests are valid we can only talk about probabilities of possible behaviour segments or attitudes of a person in the future. We cannot anticipate all

different kind of circumstances, that maybe would cause situations where the person is not able to show his/her optimum performance, for instance because of being disturbed by other events in pursuing the primary task of driving the car. Nor can we exactly predict whether a person always will be willing to show his/her optimum performance, or if she/he will decide that, for example, "it is not necessary to be cautious her, because the situation is not dangerous".

Another important aspect is compensation: The driver assessment in Austria includes a so called exploration = a kind of a prolonged in-depth interview with the persons to be tested. Thus there is the possibility to find out if there (still) exist conditions within the client's personality or his personal surroundings which support his/her willingness to change behaviour, if this is necessary. For instance, if the cause, which led to the problem in traffic has been drunken driving or driving repeatedly with an exceeded speed.

Kroj (1995) talks about four main causes for disadvantageous prognosis for wellbehaving in traffic, viz. such preconditions that make compensation unlikely:

- Malfunction of the psychophysical system: e.g. disturbances in co-ordination of perception and motion
- Insufficient internal and external feedback-systems: e.g. non-existing feedback or incorrect feedback by others or by the own body in respect of ones own malbehaviour
- Inadaquate planning or total ignorance of planning of ones own driving behaviour, e.g. if one despite knowledge of ones own deficits in vision travels by night or under bad conditions (= no avoidance of risks)
- Social maladaptation, readiness for aggression or disturbance of the ability of critical self reflection and self observation

The more of these negative preconditions of the individual and his/her social circumstances one can find, the worse will be the individual's prognosis for the future.

Second, standardised tests cannot read "between the lines". This also has to be done by the traffic psychologist, by personal communication with the client, behaviour observation during the test and exploration period, and/or during a standardised driving test in the field. E.g., in a special test for investigation of drinking behaviour the testee is asked among other questions like "Do you recently suffer from intense nervousity?" The answer of a testee may be: yes

This may be understood either in the frame of the special behaviour setting of people with actual alcohol problems or, if more in-depth interrogation takes place, it could be found out that it is the sign of a special short-termed situation which causes heavy stress for the client (e.g. at his working place).

Therefore traffic psychologists have to look at special items of the personality or attitude tests, as well. However, we have to know the possible lacks of these tests very well. To be able to compensate those lacks we have to talk to road users in order to get more information about life circumstances, usual social feedback situations, possibilities or hindrances within or outside a person with respect to modifying their behaviour (see Kroj 1995 above), but also about possible preconditions outside the person that at the moment disturb necessary adaptation processes in the traffic system.

Third, special behaviour that can be summarised as "compensational" behaviour, such as definite communication/interaction with other road users, anticipatory behaviour etc., can only be observed in real-life circumstances in traffic itself.

Fourth, according to the theory of Singer & Schachter, individuals sometimes take signs of their body res. their physical status as information about their whole psychophysical situation and emotional state ("I don't cry because I am sad, but I am sad because I cry"). E.g. a young male finds out during the first part of the driver assessment test, that he gets on very well. This raises his self-esteem and supports him to think about himself being very fit for driving a car. Furtheron this may lead to a behaviour in traffic which could be very risky.

Strategical, tactical and operational levels in the decision-process of driving

In order to be able to give an adequate prognosis it is necessary to know several things:

- 1) the correlation between all three possible analysis areas:
 - a) standardised tests of psychophysics, attitude and personality,
 - b) testee's personal explanations of the behaviour in the past and anticipations of road users regarding their future, and
 - c) behaviour observation on the spot viz. in the traffic field
- 2) pros and cons of the results in relation to the driving task; the driving task itself is seen as a perpetual decision-process on three levels (see fig. 2 below).

To make use of data according to 1a) and 1b) above is demanded by law. The problem is that data according to 1b) are hardly ever operationalised in a systematic way, they go as "expert's judgement" and thus are often out of reach for scientific evaluation and development. And only rarely has one the possibility to observe a road user's driving behaviour, because behaviour observation in the field is done only voluntarily. At the same time, behaviour observation in the field can to some degree be seen as a criterion, however under the perspective of the question: what can a one-hour driving test reveal?

In the figure below you can see the different "strength" or relevance of the analysis methods to explain attitude and/or behaviour of a driver during the performance of the three levels of decision-process of the "driving task".

Figure 2: Analysis strategies and their relevance for the three different decision levels of the driving task according to the model of Michon (1996)

Psycho - physical		Tests
Driving	Behaviour	Observation
<i>Strategic Level</i>¹ Decisions before travelling (reflections about ones own physical status, driving route, condition of the car etc.)	<i>Tactical Level</i> Anticipatory driving manoeuvres (estimation of distance and speed)	<i>Operational Level</i> Actual manoeuvres to avoid danger (braking, swerving, speeding)
Personality	and attitude	Tests
	Exploration	

Legend:

	Low relevance for explanation on this level
	Medium relevance for explanation on this level
	High relevance for explanation on this level

Source: Chaloupka & Risser 2004

The model of Michon includes all objectives in the frame of the driving task. Each level needs different psychophysical abilities that are triggered by different motives and attitudes. Motives and attitudes may reflect more or less social conformity and willingness to comply with rules and regulations.

The study

In order to get more information about the relationships between all analysis methods the institute FACTUM of Vienna, in co-operation with Schuhfried GmbH (www.schuhfried.at) who produces psychological tests in a computerised version as well as the hardware, carried out a validation study.

There, it should be tried to find out appropriate indicators for the prognosis of future traffic behaviour, not only on the basis of the standardised tests of the psychophysical status, but also considering the background of the clients with the help of the results of the "exploration". As said, up to now validation studies of traffic-psychological assessment did not include the exploration systematically. Till now no-one tried to "standardise" this interrogation.

¹ Michon (1995), Different levels of decision and the time needed to behave adequately

The field study lasted from July to November 2004.

The outside criterion, as said, was the driving behaviour of at least 100 test persons observed with the help of the "Wiener Fahrprobe", the "Vienna driving test". The behaviour observation in the field has a dual character in this connection: As a criterion, as a mark is given after the driving test, dividing between apt or not apt for driving; and as a set of predictors, as many observation results can be used for completing the assessment, and for improving prognoses, e.g. about possibilities of compensation of bad test results. This could be the case if the testee for instance shows clear anticipatory strategies when driving, good communication with the social environment, etc.

All testees (n= 103) were "real" clients who had to go through a traffic-psychological assessment. 70% had to undergo the whole test because of problems with their driving licence, 30% owned a licence already and wanted to gain the Bus-licence in order to become a professional driver. All people were told that the driving observation was not a usual part of the investigation and that they could say no, if they did not want to do it. They were also told, that the results of the driving test were not taken into consideration by the traffic psychologist who had to write the expert opinion.

As we are obliged by law the clients were tested as follows:

- A) psychophysical status: concentration, reaction time, stress resistance, visual ability, senso-motoric ability, intelligence, short time memory
- B) personality/attitudes: aggression tendencies, readiness for risky behaviour, emotional stability, emotional relation to the car viz. to driving, drinking habits and function of alcohol (e.g. socialising factor), etc.

In addition, the exploration focused especially on the possible misunderstanding of special questions of the attitude tests. We also tried to get answers to the special conditions of the client according to Krojs assumptions about positive intra- and interpersonal circumstances (see above) or socialisation factors.

The driving behaviour observation „Vienna driving test“ is arranged as follows:

All test persons, which were observed drove along a standardised route, which is about 25 km long. The test-route includes different speed limits (30 km/h, 50 km/h, 60 km/h, 80 km/h and 100 km/h) and different kinds of road-types (small one-way roads, roads with two-way traffic, motorway etc.).

The observations were made with a driving school car and a driving instructor sitting next to the observed test person (the driving instructor was needed to intervene in possibly accuring conflict situations). In the backyard of the car two observers were seated. One observer (socalled "standardised") counted all errors which were made by the test person, (correct using of indicator, choice of speed in different situations, distance to the car ahead etc.). The second observer (socalled "free") registered all kind of communication procedures with other road users, including behaviour at zebra-crossings etc. For a better overview the test-route was divided in 25 different section. After each observation the two observers and the driving instructor reviewed the driving test and appointed a mark between 1 (very good) and 5 (very bad) for the observed client.

In respect to literature and expert know-how some expectations/hypotheses occurred in advance.

We expected:

1. **Small correlation** between personality/attitude tests/exploration on the one side and psychophysical tests / behaviour observation on the other side of the strategical and operational level acc. to MICHON but better correlation on the tactical level
2. **Small correlation** between behaviour observation and the qualification („Appropriateness“) by the traffic psychologist
3. In principle: **high correlation** between psychophysical tests on the one hand and driving behaviour observation on the other on the operational level but
4. **Little correlation** between psychophysical tests on the one hand and driving behaviour observation on the other on the operational level **if** personality, attitude and socialisation interfere on the strategical and tactical level
5. Differences between age-groups
6. Differences between client groups (bus and others)
7. Same amount of mistakes but difference in quality of mistakes in different populations (age-groups, client groups etc.)

Results till now

Table 1: Classification of the test persons into "good" and "bad" drivers

Classification into "good" and "bad" drivers (mark 1-3: good; mark 3,33-5: bad)		
	frequency	percent
Good	76	73,8
Bad	27	26,2
Sum	103	100

One quarter of the testees were classified as „bad“ drivers which means they got a mark less than „3“ as a after the driver observation

Table 2: Appropriateness of the clients

Appropriateness		
	frequency	percent
Ok without any comments	26	25,2
Appropriate with restrictions	60	58,3
Not appropriate	17	16,5
sum	103	100

Further results are:

- **Significant correlation** exists between the number of errors made by the test persons and their classification into "good" and "bad" drivers which means that the behaviour observation is valid.
- **Significant correlation** exists between age of the test persons and the classification into "good" and "bad" drivers but till now we do not know which kind of mistakes elderly people made
- **No correlation** between age and "appropriateness"
- **No correlation** between the classification into "good and "bad" drivers and their "appropriateness"

Discussion

- The driver´s behaviour observation seems to be a valid method
- Expectation 2 and 5 came true
- **Expectation 3 in combination with 4** seems to be true – but we need more results
- There seem to exist some interfering elements which hinder testees to show as good results in the tests as in the behaviour observation and vice versa. Could it be attitude / self-esteem, socialisation? This has to be checked by using results from the exploration.
- Expectations 1 and 3 could not be analysed fully till now because we do not have results from the psychophysical tests up to now.
- The **amount** of mistakes **alone** is no sufficient description of the qualification of a driver. Here it needs information about **quality** of mistakes (see expectation 7).

We expect final results of this study in autumn 2005. The report will also represent an extensive description of the statistical methods which includes the so-called "neuronal web" design.



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