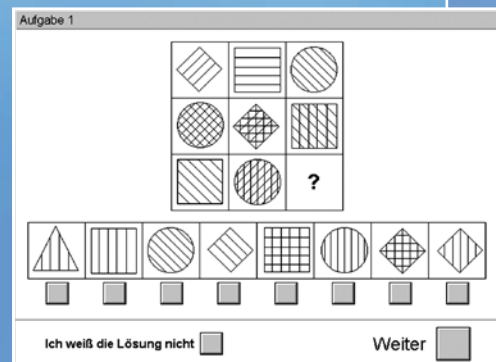


Expert System Traffic

Computerized assessment of fitness to drive



Catalog

3rd edition

 **SCHUHFRIED** 
■ Qualität durch Kompetenz

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Driving-related psychological assessment has a long tradition. The first studies were carried out in Berlin in 1912. As a result of the rapidly growing volume of traffic, driving-related psychological assessment flourished in the 1960s.

This almost euphoric phase was followed by a period of realism and resignation. Because of the low correlation between test results and fitness to drive, the appropriateness of driving-related psychological assessment was more and more called into question. Eventually it was not considered possible to identify drivers who were at risk of having an accident. As a result of this crisis very little further research was carried out.

However, the correlations between test results and fitness to drive were bound to be low and no matter how good the tests used it would have been difficult to improve them significantly. The reason for this is the violation of the principle of symmetry (Wittmann and Süß 1997) - that is, the absence of symmetry between most of the tests used (which are usually unidimensional) and fitness to drive, which is determined by multiple factors.

It is therefore necessary to use a suitable test battery, the results of which are combined into a global judgment. Since linear statistical methods are unsuitable for practical applications, the assessment is usually made on the basis of clinical judgment alone. The literature, however, contains no studies of the validity of this method or of inter-rater reliability. The only contribution to an objective approach is the Appraisal Guidelines for Driver Fitness of the Federal Highway Research Institute.

The firm SCHUHFRIED GmbH has been involved with issues related to traffic psychology since 1959. On account of the high quality of its products, the company has since its inception been the market leader in this field.

In recent years SCHUHFRIED GmbH has devoted increased resources to addressing the problem of this type of aptitude testing: the low correlation between test results and fitness to drive. An innovative approach has enabled the difficulty to be overcome: an artificial neural network is used to bring together the results of a test battery and form an objective and highly valid global judgment.

The Traffic Expert System not only represents a unique methodological step forwards but also offers a number of practical improvements which make everyday work simpler, more efficient and more foolproof.

I should like at this point to thank our users for the very helpful input they have provided. I should also like to thank the universities we work with, especially the University of Vienna, for their excellent cooperation. Special thanks are also due to our partners, the Human Science Center at Ludwig Maximilian University, Bad Tölz, and Factum in Vienna; they came up with first-class solutions to the problems associated with obtaining data for the validation and provided us with data of excellent quality.

The possibility of at last being able to produce an objective global judgment of fitness to drive creates new impetus in other areas. These improvements in traffic-psychological assessment make an important contribution to traffic safety and to issues of continuing mobility. This not only increases acceptance of the method; new areas of application also arise and new jobs are created.

We hope that the information and ideas contained in this catalogue will make your decision easier. Our wealth of experience is here to benefit you.



Dr. Gernot Schuhfried

Expert systems are computer-based systems which help a diagnostician - on the basis of empirical validation studies - to arrive at diagnostic conclusions.

The core of the Expert System Traffic is the **test battery PLUS**, a standardized test battery for **assessing driving-related performance**. A new and innovative feature is the fact that, in addition to the results of the individual tests, it also yields a global judgment of driving-specific ability. This is based on an empirically validated model (Sommer & Häusler, 2006) of the correlation between the test results and a standardized driving test. The global judgment also takes account of the possibility of compensating for performance deficits through strengths in other areas.

Test battery PLUS

Area tested	Test		Reliability	Length
General intelligence	AMT / S11	Adaptive Matrices Test	0.70	20 min.
Concentration	COG / S11	Cognitrone	0.95	10 min.
Stress tolerance	DT / S1	Determination Test	0.99	10 min.
Reaction speed	RT / S3	Reaction Test	0.94	5 - 10 min.
Motor speed			0.98	
Obtaining an overview	ATAVT* / S1	Adaptive Tachistoscopic Traffic Perception Test	0.80	5 - 10 min.
Observational ability			0.96	15 min.
Peripheral perception	PP	Peripheral Perception	0.99	
Divided attention				
			Total length	65 - 75 min.

▶ **Validity coefficient: 0.78**

▶ **Classification rate: 86%**

* TAVTMB (Tachistoscopic Traffic Perception Test) can be continue to be used instead of ATAVT. The two tests have been shown to measure the same latent ability dimension and they scale identically (Schuhfried, 2008). The neural network is configured so that it can process the results of both tests.

Test battery STANDARD

The **test battery STANDARD** has been designed as a less time- and hardware-intensive solution. It is similar to the test battery PLUS but does not include the Peripheral Perception Test; for this reason it has a slightly lower classification rate and validity.

Total length: 50 - 70 min.

▶ **Validity coefficient: 0.68**

▶ **Classification rate: 80%**

Optional tests

Both test batteries can be expanded to include additional performance or personality tests. This enables the Expert System Traffic to be optimally adapted to meet the legal or diagnostic requirements of particular situations.

The optional tests are presented with the other components of the test battery; they are scored automatically and integrated into the diagnostic report. However, the results of these tests are not incorporated into the global judgment.

Optional ability tests

Area tested	Test		Reliability	Length
Orientation Obtaining an overview	LVT / S3	Visual Pursuit Test	0.96	10 min.
Coordination	2HAND / S3	Two-Hand Coordination	0.89	5 min.
Estimation of movement	ZBA / S2	Anticipation of Time and Movement	0.94	10 min.
Memory	VISGED / S1	Visual Memory Test	0.73	10 min.

Optional personality tests

The following tests can be used as part of the Expert System Traffic in special situations, such as when it is necessary to assess **willingness to adapt to traffic conditions** or identify a possible **alcohol problem**:

Area tested	Test		Reliability	Length
Readiness to take risks in traffic	WRBTV	Vienna Risk-Taking Test	0.92	10 min.
Sense of responsibility Self-control Emotional stability Adventurousness	IVPE	Inventory of Driving-related Personality Traits	0.76 0.69 0.75 0.76	10 min.
Aggressive behavior in traffic	AVIS / S2	Aggressive Behavior in traffic	0.97	10 min.
Risk of driving while under the influence of alcohol	FFT / S3	Questionnaire on Functional Drinking	0.89 - 0.96	20 min.

A detailed description of the tests will be found on page 22.

Test batteries for special assessment issues

Recovering fitness to drive after craniocerebral trauma

Becoming fit to drive again after an injury to the central nervous system is a key aspect of quality of life for clients. The compilation of a valid test battery for identifying areas in which training is needed is therefore particularly important.

In a study by Sommer, Heidinger, Grundler, Schmitz-Gielsdorf & Schauer (2007) of patients undergoing rehabilitation after craniocerebral trauma, use of a traffic psychological test battery enabled a very valid prediction to be made of the outcome of a standardized driving test.

With the particular ability and personality variables used the test battery achieved a **classification rate of 92.4%** (sensitivity: 80.3%, specificity: 98.7%) and a **validity of R=0.84**.

Area tested	Test		Relative relevance in the test battery	Length
General intelligence	AMT / S11	Adaptive Matrices Test	9.3%	20 min.
Stress tolerance	DT / S1	Determination Test	14.5 %	10 min.
Reaction speed	RT / S3	Reaction Test	22.4 %	5-10 min.
Obtaining an overview / Observational ability	ATAVT / S1	Adaptive Tachistoscopic Traffic Perception Test	24.4 %	5-10 min.
Readiness to take risks	WRBTV	Vienna Risk-Taking Test	13.0 %	10 min.
Sense of responsibility	IVPE	Inventory of Driving-related Personality Traits	16.4 %	10 min.
			Total length	60 - 70 min.

The test battery can thus be used both to identify the progress made in rehabilitation with regard to fitness to drive and to highlight problem areas for which a deficit-specific training plan can then be drawn up.

Input devices and accessories are designed to be as ergonomic and user-friendly as possible. Even people with little computer experience will find them easy to use.



For all tests the ADVANCED response panel is required. If the test battery PLUS is used the PERIPHERAL PERCEPTION device is also needed.

The ADVANCED response panel can easily be transported in a practical carrying case.

ADVANCED response panel

- 7 colour keys
- 10 number keys
- 1 sensor key
- loudspeaker/headphones
- 2 speed regulators
- foot-operated keys
- USB interface

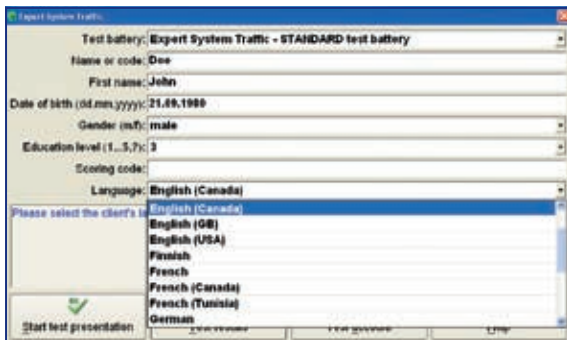
PERIPHERAL PERCEPTION device

- light diode matrix with 8 rows and 64 columns
- ultrasound distance sensor for measuring respondent's precise head position

As a result of detailed attention to quality management in accordance with the stringent requirements of ISO 13485:2003, both the ADVANCED response panel and the PERIPHERAL PERCEPTION device are completely reliable and very durable.

Preparation for the test

The first step involves inputting the respondent's details and selecting the required test battery.



The tests can be presented in a range of different languages. New languages are continually being added.

Instruction and practice phase

Each test begins with standardized instructions on the respondent's screen.

Once the instructions have been given, a practice phase follows. This enables the respondent to become familiar with the test and ensures that he understands what is required. The instructions and practice items are often linked and follow the principles of programmed learning.

If necessary the learning loops are repeated several times. If the respondent still fails to understand, the test administrator is alerted to this.

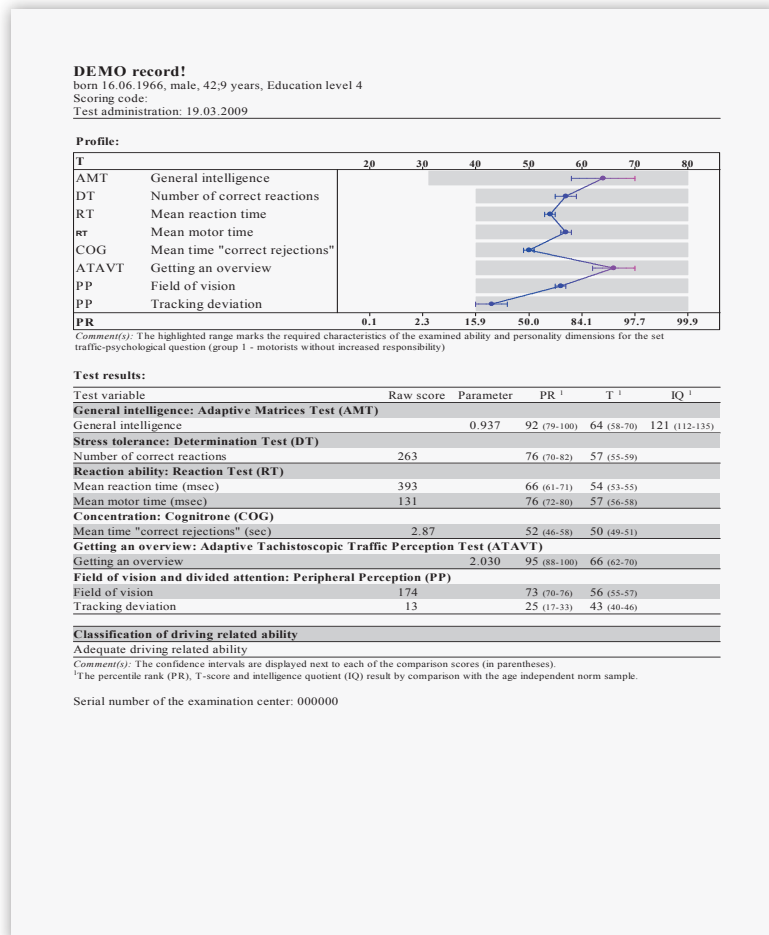
This ensures that respondents are not tested if they do not adequately understand the task.

Test phase

After the instruction and test phase the respondent begins to work through the individual test items.

At the end of the test the results are saved at item level in a database; they can be printed out in an easy-to-interpret form or processed further electronically.

The test results can be displayed at any time on-screen, either in tabular form or as a test profile; they can also be printed out or processed further.



The profile provides a simple and convenient summary of the candidate's test results.

The „test results“ table lists the test variables with the respondent's raw scores and parameter scores as well as the associated percentiles and confidence intervals. The norm score comparisons always relate to an age-independent norm sample that is representative of the driving population.

In addition to the individual test scores, a global judgment of performance in the test battery PLUS or STANDARD is calculated with the aid of an artificial neural network. This provides an evaluation of the client's driving-specific ability, taking account of performance deficits and of any opportunities for compensation.

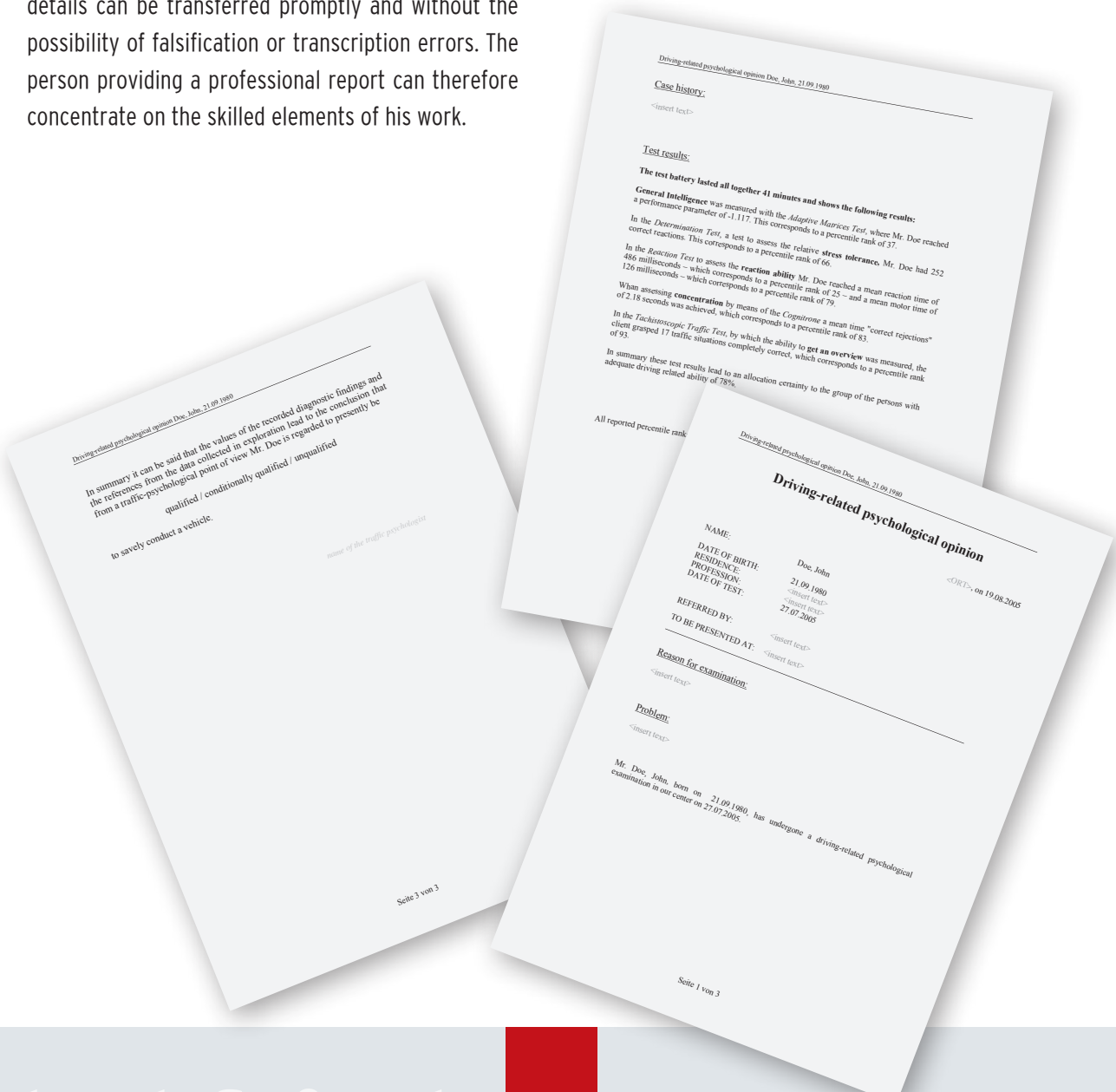
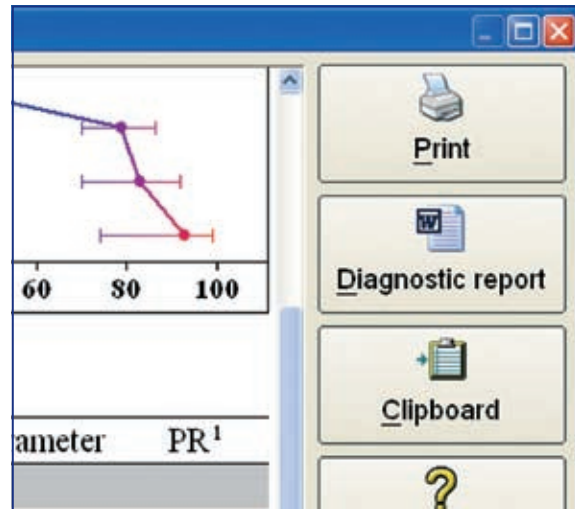
The global judgment should be seen as an aid to interpretation; in a validation study it was shown to have high validity with regard to the external criterion of a driving test (see the section on validation).

Including test data in a diagnostic report

At the press of a button all personal details and all test results, raw scores and percentile rankings can be incorporated into the findings of a traffic-psychological assessment. On the basis of predefined rules the results can also be formulated automatically into simple verbal statements.

Because the Expert System Traffic permits data to be accessed at any time, it is not necessary to draw up the report immediately after testing.

This simple and convenient method of incorporating test data into a report ensures that all required details can be transferred promptly and without the possibility of falsification or transcription errors. The person providing a professional report can therefore concentrate on the skilled elements of his work.



Training advice for poor performers

The purpose of traffic-psychological assessment is not only the identification of unsafe drivers. So that people can be helped to remain mobile, the assessment process should also suggest concrete ways in which respondents can be enabled to become fit to drive.

The artificial neural network of the Expert System Traffic represents an empirically tested, highly valid model of the correlation between the individual dimensions of performance and attainment in a standardized driving test. If driving-related ability is judged to be

inadequate, the model helps to generate training suggestions. These training suggestions not only take into account current research findings on the possibility of improving individual aspects of performance through training; they also make maximum use of the respondent's compensation potential.

The Expert System Traffic thus contributes both to traffic safety and to the maintenance of mobility. In so doing it reflects a modern understanding of traffic-psychological assessment (cf. Kroj, 1995).

Example of training suggestions

Degree of probability (calculation with neural net)

Adequate driving related ability	7%
----------------------------------	----

Determined need for training

Need for training: general intelligence	0 ²
Need for training: stress tolerance	+5 ²
Need for training: reaction speediness	+1 ²
Need for training: motoric speediness	0 ²
Need for training: concentration	0 ²

The training requirements indicate by how many percentile points the respondent needs to improve on a particular dimension of performance in order to achieve a probability of adequate driving-related capability of at least 50%.

Defining the respondent database

To enable the respondent database to be adapted to individual requirements, the number of input fields can be changed. Apart from the standard fields of name, first name, date of birth, gender, educational level, scoring code and language, all the fields can be re-defined.

Exporting data

Via suitable interfaces respondent data and test results can at the touch of a button be exported into the customer's own respondent administration programs.

All data can be exported into standard statistical programs (such as Excel and SPSS) for further statistical processing. An ASCII file can also be produced. If necessary, the data can be exported in anonymized form.

Help function

The Expert System Traffic includes extensive context-sensitive help. Information on all aspects of the system will be found here, from installation and use of the test battery to "hints and tips" and literature references. Manuals for all the tests are available in digital form.

Checking of test devices

A special easy-to-use self-test program is available which can be used to check that the test devices are working properly. The results of the test are displayed on the screen and can be printed out to provide documentary evidence of the equipment test.

Calibration

The various time-critical tests used to measure reaction speed vary widely in their quality (cf. Häusler, Sommer & Chroust, 2007).

The Expert System Traffic is extremely precise in its measurement; this precision can be further increased by calibrating it in a few simple steps to the computer system being used.

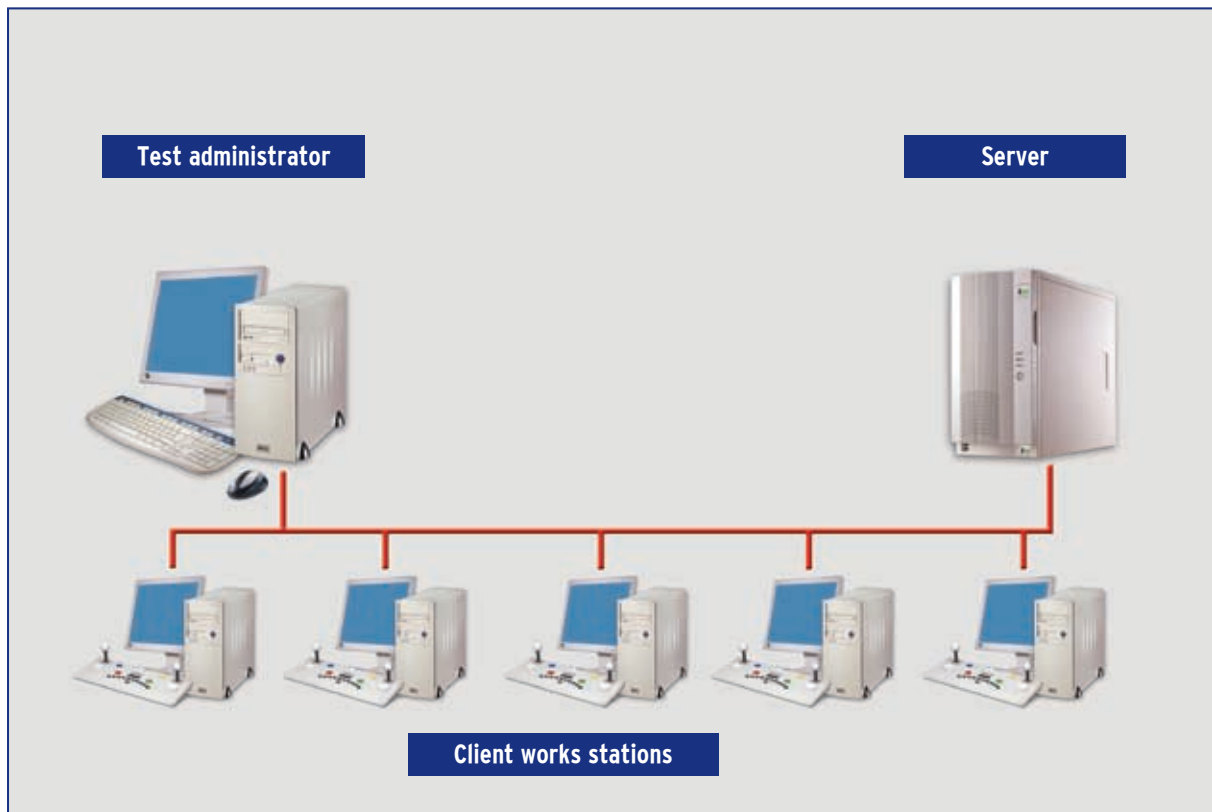


This ensures that the high reliability of the tests themselves is backed up by an outstanding level of technical precision (error $< \pm 1$ percentile rank point).

Data protection

Personal data is saved in the database in encrypted form.

Access can be authorized at three different levels, controlled by passwords. Only authorized individuals can change the system settings or access personal data.



TEST SYSTEM NETWORK - Expert System Traffic

If a large number of respondents are to be tested, it is advisable to use a test system network with a workstation for the test administrator and a number of networked workstations for the respondents.

The test administrator's workstation is used to enter the respondents' details, define the test battery to be used for each candidate and score the results. In addition, the progress of the tests being administered at the individual respondent workstations can be monitored.

The individual workstations are independent of each other. Respondents can start the predefined test battery individually and work through it at their own pace.

The results from all workstations are saved on a central server and printed out on a shared printer.

With appropriate planning of the tests the assessor and the test administrator can optimize the use of their time. Waiting times for respondents are kept to a minimum. In addition, both economy and efficient use of the workstations are increased and optimized.

SCHUHFRIED GmbH is always ready to help in setting up an individual timetabling and sequencing system.

Objectivity

Like all standardized computer tests the tests of the Expert System Traffic have maximum test administrator independence, security against miscalculation and unambiguity of interpretation (cf. Kubinger, 1996). In addition the Expert System Traffic provides a statistically based, objective and valid global judgment.

Reliability

The tests measuring driving-specific ability have reliabilities of between $r=0.70$ and $r=0.99$. For the tests measuring willingness to adapt to traffic conditions, reliabilities are between $r=0.70$ and $r=0.97$. The reliability of the tests can therefore be regarded as high.

The reliabilities of the individual tests are given in the test descriptions.

Economy

None of the test administrator's time is needed for giving instructions or scoring. The automatic transfer of test results into a report significantly reduces transfer and checking work. Test system networks increase economy by enabling staggered testing.

Norms

The tests of the Expert System Traffic fulfill the quality criterion of standardization: the norms are not out of date and the population to which they apply is defined (cf. Kubinger (1996). For methodological and theoretic

cal reasons and in accordance with university recommendations the norms used for comparison purposes are independent of age and representative of the population. More specific samples are not suitable for use in the provision of traffic-psychological reports.

Fairness

Contradicting a frequently expressed opinion, Klinck (2002) shows that, where appropriate test procedures are observed, respondents with little computer knowledge are not put at a disadvantage. The special hardware minimizes the difficulties which may be encountered in dealing with computers as a result of age or educational level.

The instruction and practice phases are so designed that the test itself is not presented until the task has been fully understood. The wording is always simple and easy to understand, and the text size is as large as possible. Any disadvantage for people with impaired vision is therefore kept to a minimum.

Usefulness

"A test is useful if it measures a personality trait for the assessment of which there is a practical need" (Lienert & Raatz, 1994). The Expert System Traffic helps meet the requirements of the state and of society for improvements in traffic safety and therefore has a high degree of usefulness.

Where adequate driving-specific capability is not demonstrated, individualized training suggestions are provided. In this way the system makes an important contribution to maintaining people's mobility.

The problem of classical driver suitability assessment

For any diagnostic assessment to be valid it must first be demonstrated that there is a sufficiently high correlation between test results and the appropriate external criterion. According to Risser (2001), however, traffic--psychological validation studies invariably yield low validity coefficients.

Tests measure relatively specific aspects of ability or personality, while measures of driver safety that are used as external criteria are global and influenced by multiple causal factors. This means that the validity coefficients of individual tests must inevitably be low (cf. Wittmann & Süß, 1997), and the development of alternative tests will not satisfactorily solve the problem.

The solution lies in combining the data from individual tests to form a global judgment. Here the assessor working in the practical field can draw on methods of clinical and statistical judgment formation. In clinical

judgment formation the practitioner uses his specialist knowledge and experience to bring together the results of a test battery in a global judgment. In statistical judgment formation the combining of results is carried out with the aid of empirically validated mathematical equations or equation systems.

Both methods have disadvantages: while clinical judgment formation suffers from a lack of objectivity and stability of assessment, classical methods of statistical judgment formation are sensitive to violations of their conditions. In addition, unless the assessor has prior knowledge it is not possible to accurately depict compensatory effects or interactions between the predictors.

New approaches with artificial neural networks

Artificial neural networks provide a very promising alternative to classical methods of statistical judgment formation (Anderson & Rosenfeld, 1988; Bishop, 1995; Dorffner, 1991; Kinnebrock, 1992; Rojas, 2000). They can in principle be seen as robust tools, not dependent on particular preconditions, for the identi-

cation of patterns. Artificial neural networks model non-linear relationships and compensatory interactions. This new approach has already proved effective in a number of studies and it is the one used in the Expert System Traffic.

Validity of the Expert System Traffic

The Expert System Traffic was validated on a sample of 222 individuals with an average age of 59 and a standard deviation of 18 years. The data was collected in the course of a multi-center study carried out in Vienna (FACTUM, Vienna) and Bad Tölz (Human Science Center, Ludwig Maximilian University, Bad Tölz, Germany).

On the basis of appropriate theory a comprehensive test battery was compiled; the test battery took four hours to complete and was administered in one session with a number of breaks. The external criterion was the global judgment of the individual's driving behavior in a standardized driving test. Respondents were divided into a group who received a positive global judgment and a group who received a negative global judgment. Sixty percent of the sample received a positive assessment of their driving ability.

Using this data, an artificial neural network was set up. Economy indices and an adjusted validity coefficient were used to avoid an overfit to the available data. With the help of these two measures the architecture of the artificial neural network was defined (for details see Risser et al., in press; Sommer & Häusler, 2006). This method revealed which tests made

the best contribution to the information gathering process. These tests were then incorporated into the test battery PLUS. In a further evaluative step, the artificial neural network was able to learn which combinations of characteristics are associated with a positive or negative assessment of driving ability. The stability of the results was tested by means of a jackknife validation, a bootstrap validation and a validation of a second independent data set obtained from actual medical/psychological assessment (for details see Risser et al., in press). The results described here are those from the jackknife validation. These results indicate the degree of certainty with which the artificial neural network assigns the individual respondents to the group of fit or unfit drivers.

The test battery STANDARD was developed for mobile test systems; it omits the Peripheral Perception Test. The resulting reduction in the validity coefficient compared to the test battery PLUS was accepted because of the benefits of the transportability of this system.

Validity of the test battery PLUS

Results of the jackknife validation show that 84% of the respondents were correctly assigned to the group of drivers with positive or negative assessment of their performance in the standardized driving test. This corresponds to a validity coefficient of $R=0.77$. The sensitivity is 86% and the specificity 80%.

The X-axis shows the probability with which the respondent is assigned by the artificial neural network, on the basis of his test results, to the group of individuals with a positive assessment of their performance in the standardized driving test. The Y-axis shows the relative frequency of individuals who were assessed positively (yellow bar) or negatively (blue bar) in the standardized driving test. The blue bar at 0.00 - 0.10 thus represents the relative frequency of drivers who actually received a negative assessment

who were, on the basis of their test results, allocated with a probability of between 0 and 10% to the group of drivers whose driving performance was assessed positively; whereas the yellow bar at 0.91 - 1.00 represents the relative frequency of drivers who actually received a positive assessment who were, on the basis of their test results, allocated with a probability of > 90% to the group of drivers whose driving performance was assessed positively.

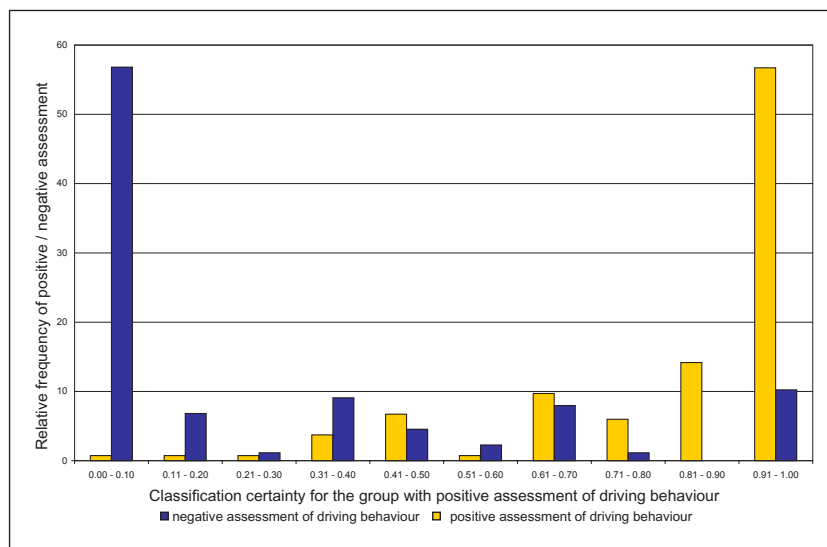


Figure 1: *Distribution of the sample to the classification probabilities in the jackknife validation.*

As the illustration makes clear, the majority of correct assignments were made with high assignment certainty. In a few cases, however, respondents were

incorrectly assigned. This is explained in part by the fact that only performance aspects were taken into account.

Validity of the test battery STANDARD

For the test battery STANDARD the jackknife validation showed that around 80% of individuals were correctly assigned to the group of drivers with positive or negative assessment of their performance in the standardized driving test. This corresponds to a validity coefficient of $R=0.68$. The sensitivity is 82% and the specificity 79%.

The X-axis shows the probability with which the respondent is assigned by the artificial neural network, on the basis of the test results, to the group of individuals with a positive assessment of their performance in the standardized driving test. The Y-axis shows the relative frequency of individuals who were assessed positively (yellow bar) or negatively (blue bar) in the standardized driving test. The blue bar at 0.00 - 0.10 thus represents the relative frequency of drivers who actually received

a negative assessment who were, on the basis of their test results, allocated with a probability of between 0 and 10% to the group of drivers whose driving performance was assessed positively; whereas the yellow bar at 0.91 - 1.00 represents the relative frequency of drivers who actually received a positive assessment who were, on the basis of their test results, allocated with a probability of > 90% to the group of drivers who driving performance was assessed positively.

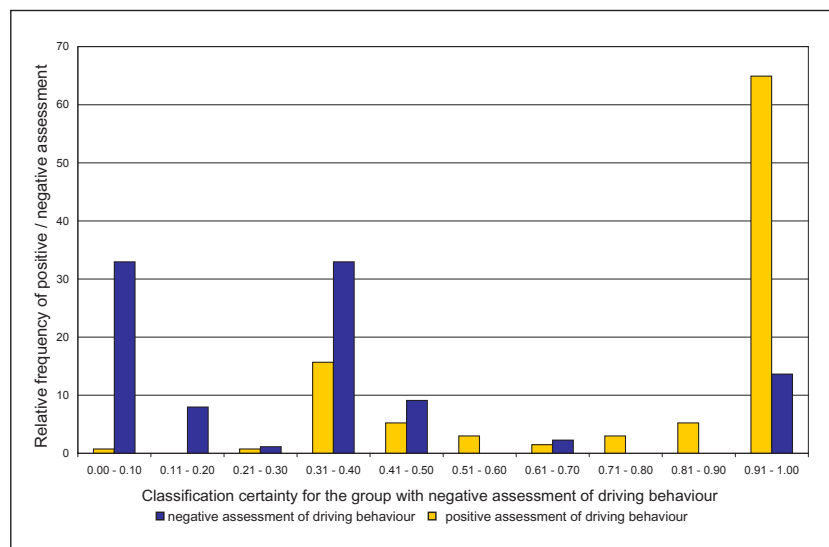


Figure 2: *Distribution of the sample to the classification probabilities in the jackknife validation.*

The majority of correct assignments to the group of individuals whose driving performance was assessed positively were made with high assignment probability. In a few cases respondents were incorrectly assigned. This is explained in part by the fact that only

performance aspects were taken into account. In the case of correct assignments to the group of drivers who received a negative assessment the effect of assignment probability is not as pronounced.

If you are interested in a test that is not shown as being available in a particular language, please contact us or one of our dealers. We are continually translating tests into different languages and enlarging the range on offer.

	Arabic	Bulgarian	Chinese	Croatian	Czech	Dutch	English	Finnish	French	German	Greek	Hindi	Hungarian	Italian	Portuguese	Romanian	Russian	Serbian	Slovakian	Spanish	Swedish	Turkish		
2HAND	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	
AMT		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	
AVIS							X		X	X			X	X							X			
ATAVT							X		X	X						X				X			X	
COG	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
DT	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
FFT						X	X		X	X				X	X	X								
IVPE			X	X	X		X		X	X			X	X		X	X		X	X			X	
LVT	X			X		X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	
PP	X			X	X	X	X	X	X	X	X		X	X	X		X	X	X	X			X	
RT	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
TAVTMB			X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X	X		X	
VISGED			X		X		X	X	X	X				X		X					X			
WRBTV				X	X	X	X		X	X	X		X	X	X	X	X	X	X				X	
ZBA	X	X	X		X	X	X	X	X	X			X	X	X	X					X			

Evaluation with artificial neural network

Version: March 2009

Test battery PLUS

AMT	Adaptive Matrices Test
ATAVT	Adaptive Tachistoscopic Traffic Perception Test
COG	Cognitrone
DT	Determination Test
RT	Reaction Test
PP	Peripheral Perception

Test battery STANDARD

AMT	Adaptive Matrices Test
ATAVT	Adaptive Tachistoscopic Traffic Perception Test
COG	Cognitrone
DT	Determination Test
RT	Reaction Test

Optional ability tests

2HAND	Two-Hand Coordination
LVT	Visual Pursuit Test
VISGED	Visual Memory Test
ZBA	Time-Movement Anticipation

Optional personality tests

AVIS	Aggressive Driving Behavior
FFT	Questionnaire on Functional Drinking
IVPE	Inventory of Driving-Related Personality
WRBTV	Vienna Risk-Taking Test Traffic

The tests are described in detail in the following pages.



AMT Adaptive Matrices Test

Theoretical background:

The AMT is a non-verbal test for assessing general intelligence as revealed in the ability to think deductively. The items resemble classical matrices, but in contrast to these they are constructed on the basis of explicit psychologically-based principles involving detailed analysis of the cognitive processes used in solving problems of this type. The 266 items created were evaluated in three extensive studies involving large numbers of people in Katowice (Poland), Moscow and Vienna. The items were analyzed using the Rasch dichotomous probabilistic test model and the corresponding characteristic values were estimated for the items (cf. Hornke, Küppers and Etzel, 2000). The resulting item pool now enables the test to be presented adaptively, with all the advantages of modern computerized testing and assessment. These include shorter administration times yet improved measurement precision, and a high level of respondent motivation since the items presented are selected as being appropriate to the respondent's ability.

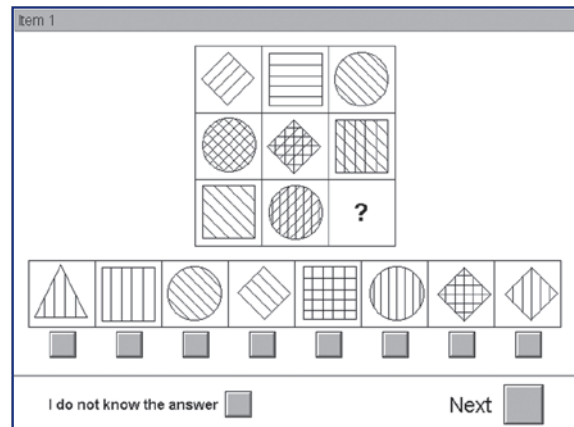
Scoring:

Main variable: *General intelligence*

The estimate is made on the basis of the Rasch model according to the maximum likelihood method.

Reliability:

Because of the validity of the Rasch model, reliability in the sense of internal consistency is given. The minimum precision specified for the adaptive algorithm is $\alpha=0.70$. A longitudinal study yielded a test-retest reliability coefficient of $r=0.74$ and a stability coefficient over three months of $r=0.62$.



Validity:

A study still in progress yielded a correlation of $r=0.242$ between the AMT and the global judgment of driving performance in the Vienna Driving Test. Evidence of criterion validity is also provided by a study of Sommer, Arendasy, Schuhfried & Litzenberger (2005) which showed that a test battery that included the AMT could distinguish at a significant level between accident-free drivers and drivers who had been involved in two or more accidents in which they had been at fault. Further evidence of the criterion validity of the AMT comes from the study by Risser et al. which showed that the ability tests of the Expert System Traffic can distinguish at a significant level between safe and unsafe drivers.

Norms:

Representative norm sample $N=461$.

Time required for the test:

approx. 20 minutes

ATAVT - Adaptive Tachistoscopic Traffic Perception Test

Theoretical background:

The ATAVT tests observational ability by briefly presenting pictures of traffic situations. The items are constructed according to explicit theory-led principles based on detailed analysis of the cognitive processes involved in working the test. 84 items were drawn up and evaluated using the 1PL Rasch Model. The resulting item pool enables the test to be presented adaptively, with all the associated advantages that this brings.

Scoring:

The test yields an estimate of the respondent's ability according to the maximum likelihood method on the basis of the 1PL Rasch model. A percentile ranking and T-score in relation to a norm sample are also given.

Reliability:

Because of the validity of the 1PL Rasch Model, reliability in the sense of internal consistency is given. The precision of measurement is set at a critical standard error of measurement of 0.49. This corresponds to a reliability of $r=0.80$. The pre-defined precision of measurement applies to all respondents at all ability levels.

Validity:

Evidence of construct validity is provided by a study by Sommer et al. (in prep.), which yielded a multiple correlation of $R=0.90$ between the empirical difficulty parameters of the 1PL Rasch model and the construction rationale of the tasks. With regard to criterion validity, Sommer et al. (2004) showed that a test battery that included a precursor version of the ATAVT correctly predicted 74.7% of global judgments of driving performance in a standardized driving test.



Risser et al. (2008) also studied the predictability of driving performance in a standardized driving test, but used a significantly more comprehensive battery of ability tests. The authors report classification rates of 80.2% and 86.5%; the precursor version of the ATAVT used here contributed a relative relevance of 17.6% and 5.8%. The results obtained by Risser et al. (2008) were replicated in a study by Sommer et al. (in revision). The authors furthermore showed that the precursor version of ATAVT that they used also contributes incrementally to the prediction of driving behavior in a standardized driving test when, in addition to ability tests, traffic-related personality traits are also taken into account.

Norms:

A norm sample consisting of $N=1190$ individuals is available. Person parameters corrected for age with norm scores are also provided.

Time required for the test:

approx. 10 minutes

COG - Cognitrone

Theoretical background:

The Cognitrone measures attention and concentration using comparisons of the congruence of different figures. It is based on the theoretical model of Reulecke (1991), which sees concentration as a state that can be described in terms of three variables:

Energy: the concentrative state is demanding and consumes energy;

Function: the function of concentration in performing a task;

Precision: the quality of task performance.

In the test forms with unlimited working time the variable "Energy" as defined by Reulecke (1991) is measured by the time taken at a preset level of precision and function.

Scoring:

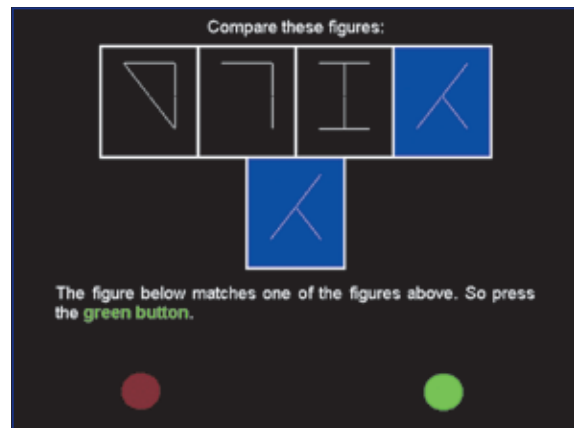
Main variable: Mean time "Correct rejection"

Reliability:

A split-half coefficient of $r=0.95$ was found for the variable Mean time "Correct rejection". A longitudinal study yielded a retest reliability of $r=0.88$ and a stability over a period of 3 months of $r=0.79$.

Validity:

Calé (1992) showed that the results obtained on the Cognitrone can be used to predict driver typologies (N=246). Working with a sample of N=72 drivers who had been involved in more than one accident within a short period of time, Calé found significant correlations between test result and accident frequency. Evidence of validity was also provided by a study that used a precursor version of the test (Bukasa, Wenninger & Brandstätter, 1990).



The study involved a group of N=248 volunteer drivers. The Cognitrone can distinguish between fit and unfit drivers. The success rate in assigning respondents to driver typologies on the basis of their test results was 83%. A second group of N=120 respondents who had committed motoring offenses and were being assessed for fitness to drive was also tested. There was a clear correlation between the test results and the errors and conflicts recorded in the observation of driving behavior. A comparison of extreme groups with regard to driving performance categories also revealed significant differences in performance on this test. Further evidence of the criterion validity of COG comes from the study by Risser et al. which showed that the ability tests of the Expert System Traffic can distinguish at a significant level between safe and unsafe drivers.

Norms:

Representative norm sample N=1475.

Time required for the test:

approx. 10 minutes

DT Determination Test

Theoretical background:

The Determination Test measures reactive stress tolerance and the related reaction speed. The test requires the respondent to use his cognitive abilities to distinguish different colors and sounds, to memorize the relevant characteristics of stimulus configurations and response buttons, to memorize assignment rules, and to select the relevant responses according to the assignment rules laid down in the instructions and/or learned in the course of the test. The difficulty of the DT arises from the need to sustain continuous, rapid and varying responses to rapidly changing stimuli.

Scoring:

Main variable: *Number of correct reactions*

Subsidiary variables: *Median reaction time, omitted and incorrect reactions.*

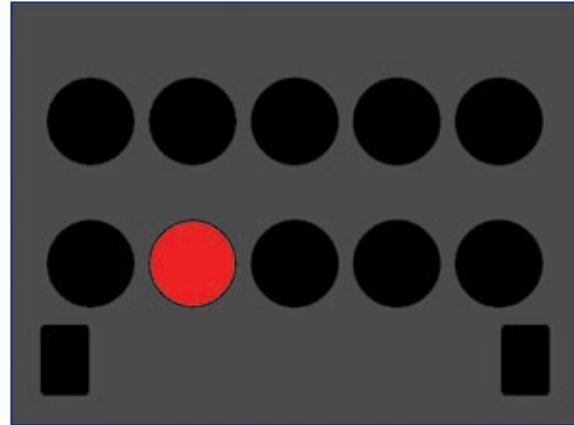
Reliability:

Internal consistency is $\alpha=0.99$. A longitudinal study yielded a retest reliability of $r=0.89$ and a stability over a period of 3 months of $r=0.82$.

Validity:

A study still in progress has found correlations of $r=-0.41$ and $r=0.40$ between the variables Number correct and Median reaction time and the global judgment in a standardized driving test. A study by Karner & Neuwirth (2000) also found highly significant correlations between the result of the DT and a driving test. This finding was later replicated by Sommer (2002). In addition, the study of Karner & Neuwirth (2000) found that respondents who obtained a percentile rank of <33 on the DT were assessed as less good by the psychologist on the driving test. A similar result was obtained at a cut-off score of $PR<16$.

Using a precursor version of the DT and working with a sample of $N=72$ drivers who had been involved in more



than one accident within a short period of time, Calé (1992) found significant correlations between test result and accident frequency. Using a sample of $N=246$ he was also able to show that the test results can be used to predict driver typologies, and that this continues to apply for individuals over the age of 60. Another study still in progress of the safety of older drivers in traffic yielded a correlation of $r=0.387$ between the variable Mean reaction time and the global judgment of driving performance in the Bad Tölz driving test. A study by Karner (2000) found significant differences between drivers convicted of alcohol-related offenses and the norm group. Neuwirth (2001) showed that the Determination Test can separate psychiatric and neurological patients or respondents recovering from alcohol abuse from the norm group. Further evidence of the criterion validity of the DT comes from the study by Risser et al. which showed that the ability tests of the Expert System Traffic can distinguish at a significant level between safe and unsafe drivers.

Norms:

Representative norm sample $N=1179$.

Time required for the test:

approx. 10 minutes

RT - Reaction Time

Theoretical background:

The critical stimulus combination to which the respondent is required to react consists of an acoustic and an optical stimulus (alertness). The use of a rest key and a reaction key makes it possible to distinguish between reaction and motor time. Reaction time refers to the period that elapses between a signal and the start of a mechanical movement response when the respondent is instructed to react as quickly as possible (Dorsch, 1994). In the present form of the RT the reaction time for a single-choice reaction is measured. A test of simple acoustic reaction time may suffice if the need is to identify how fast an individual can in general react. In this situation the stimulus constellation needs to be designed to be as simple as possible in order to reduce the influence of factors other than the simple reaction (Lesky, 1998).

Scoring:

Main variable: *Mean reaction time, mean motor time.*
Reaction time is the time that elapses between a signal and the start of the mechanical movement response; motor time is the total duration of this movement response.

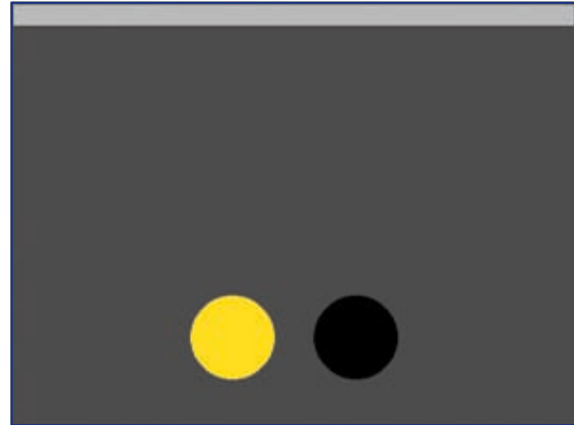
Reliability:

Internal consistency for the variable Mean reaction time is $\alpha=0.94$. A longitudinal study yielded a retest reliability of $r=0.77$ and a stability over a period of 3 months of $r=0.56$.

Internal consistency for the variable Mean motor time is $\alpha=0.98$. A longitudinal study yielded a retest reliability of $r=0.86$ and a stability over a period of 3 months of $r=0.79$.

Validity:

Calé (1992) showed that the results obtained on the Reaction Test (using a precursor version of the test) can be



used to predict driver typologies (N=246). Working with a sample of N=72 drivers who had been involved in more than one accident within a short period of time, Calé also found significant correlations between test result and accident frequency. Karner & Neuwirth (2000) and Sommer (2002) found a significant correlation between respondents' scores on the RT and the global judgment of performance in a standardized driving test. In addition, Sommer, Arendasy, Olbrich & Schuhfried (2004) found that a test battery that included the RT correctly predicted 74.7% of global judgments of driving performance in a standardized driving test. A comparison between the traffic-psychological test battery and the corresponding tests of the ART90 found highly significant correlations between the RT and the DR2 (Karner & Biehl, 2000). Further evidence of the criterion validity of the RT comes from the study by Risser et al. which showed that the ability tests of the Expert System Traffic can distinguish at a significant level between safe and unsafe drivers.

Norms:

Representative norm sample N=855.

Time required for the test:

approx. 5-10 minutes

PP Peripheral Perception

Theoretical background:

The PP is designed as a purely behavior-based instrument that meets high methodological standards. Good visual perception is extremely important when driving a motor vehicle. In the literature on the visual aspects of driving, peripheral visual perception is usually mentioned in connection with three issues:

1. Estimating speed (high angular velocities arise in the peripheral field of vision)
2. Handling the vehicle (objects at the side of the carriageway move past peripherally)
3. Monitoring the motoring environment (detection of events and objects, e.g. overtaking cars or vehicles emerging from a side street).

Scoring:

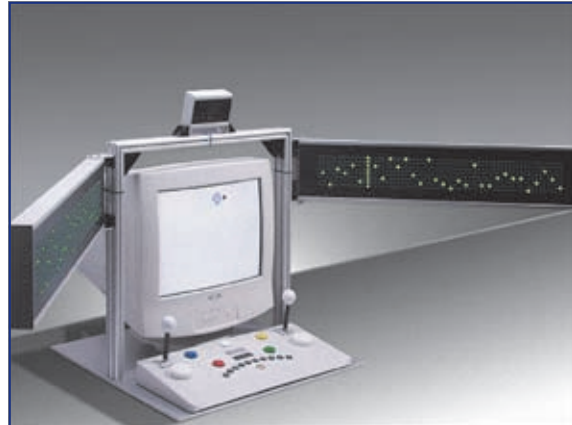
Main variable: *Total field of vision, tracking deviation*

Reliability:

Internal consistency is $\alpha=0.96$ for the variable Field of vision and $\alpha=0.98$ for *Tracking deviation*.

Validity:

Logical content validity can be assumed. For the variables Field of vision and Tracking deviation Burgard (2004) reports correlations with the overall assessment in the Bad Tölz driving test of $r=-0.39$ and $r=0.628$ respectively. A study still in progress of the safety of



older drivers in traffic found correlations between driving performance and the variables Field of vision and Tracking deviation of $r=-0.375$ and $r=0.420$ respectively. Another as yet unfinished study found correlations between the overall assessment in the Vienna Driving Test and the variables Field of vision and Tracking deviation of $r=-0.387$ and $r=0.392$ respectively. Further evidence of the criterion validity of the PP comes from the study by Risser et al. which showed that the ability tests of the Expert System Traffic can distinguish at a significant level between safe and unsafe drivers.

Norms:

Representative norm sample $N=360$.

Time required for the test:

approx. 15 minutes

LVT - Visual Pursuit Test

Theoretical background:

The LVT assesses the aspect of visual orientation performance involved in tracking simple visual elements in a relatively complex environment. The respondent is required to work in a focused way, ignoring distractions, while under time pressure. The test is thus also suited to the assessment of selective visual attention.

Scoring:

Main variable: *Score*

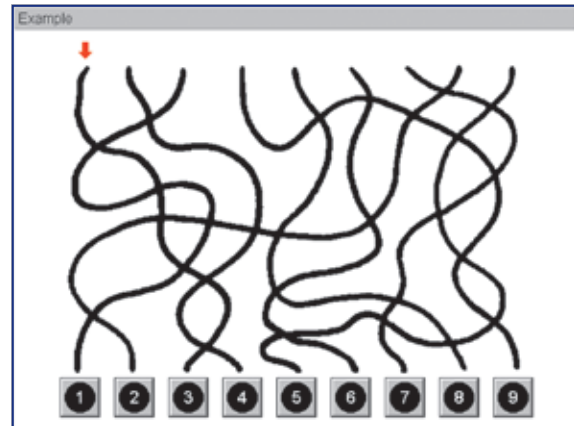
This variable takes account of both the speed and accuracy of the test results. High scores reflect fast and accurate perception in terms of orientation ability.

Reliability:

Internal consistency is $\alpha=0.96$.

Validity:

Calé (1992) showed that the results of the LVT can be used to predict driver typologies (N=246). Working with a sample of N=72 drivers who had been involved in more than one accident within a short period of time, Calé found significant correlations between test result and accident frequency. A study by Karner (2000) found significant differences in the Visual Pursuit Test between drivers who had committed alcohol-related offenses and the norm group. The test results of drivers who had committed alcohol-related offenses were significantly worse than those of the norm population. It can thus be concluded that the test is sensitive to alcohol-induced deterioration processes.



A study by Neuwirth (2001) showed that the Visual Pursuit Test can distinguish between patients referred for psychiatric and neurological treatment and the norm group. Karner & Neuwirth (2000) found that individuals with a score of PR<33 on the LVT received a significantly worse assessment from the psychologist of their performance in the standardized driving test. In addition, Sommer, Arendasy, Olbrich & Schuhfried (2004) found that a test battery that included the LVT correctly predicted 74.7% of global judgments of driving performance in a standardized driving test. With regard to the usefulness of the test for older drivers, Burgard (2004) reports a correlation of $r=-0.418$ between the main variable Score and the global judgment of driving performance in the Bad Tölz driving test.

Norms:

Representative norm sample N=722.

Time required for the test:

approx. 10 minutes

VISGED - Visual Memory Test**Theoretical background:**

The test items are created on the basis of an explicit construction rationale and measure visual memory performance, which is an important aspect of orientation in that it requires the building up of "landmark" knowledge. The development of the test items is based primarily on Kosslyn's (1980) theory of visual imagery and the integrative information-processing model of Haenggi (1989).

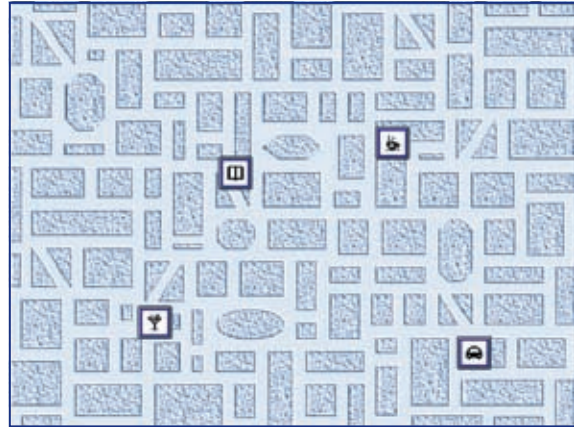
Scoring:

Main variable: *Visual memory performance*

The test yields a person parameter in accordance with the Rasch model and a norm comparison.

Reliability:

All items fit the Rasch model and it is therefore evident that they measure the same ability dimension. Since item presentation is adaptive, precision of measurement is optimized at each ability level. This means that the required measurement precision is achieved with significantly fewer items. The target reliability of the adaptive algorithm is $\alpha=0.73$.

**Validity:**

The item characteristics derived from the construction principle correlate with the difficulty parameters of the items at 0.94; the test can therefore be assumed to have construct validity.

A study of criterion validity in the field of traffic- psychological assessment is currently being planned.

Norms:

Representative norm sample N=481.

Time required for the test:

approx. 10 min.

ZBA - Time-Movement Anticipation

Theoretical background:

An important function in traffic psychology is an individual's ability to imagine the effect of a movement and correctly estimate the movement of objects in space. In the ZBA the respondent is required to estimate the speed and movement of objects in space.

Scoring:

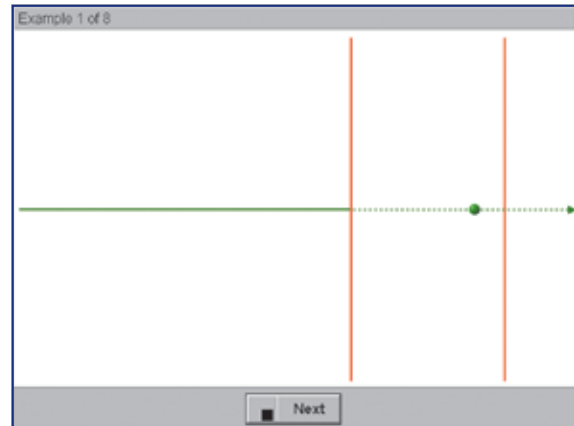
Main variable: *Median deviation time (total), median direction deviation (total)*

Reliability:

Internal consistency is $\alpha=0.98$ for *Median deviation time (total)* and $\alpha=0.76$ for *Median direction deviation (total)*.

Validity:

Validity studies are currently available for a precursor version of the test. The results of an evaluation study involving a driving test show that in real-life traffic situations the overestimation of distance causes more problems than underestimation of distance.



Norms:

Representative norm sample N=301.

Time required for the test:

approx. 10 minutes

AVIS – Aggressive Behavior in Traffic

Theoretical background:

The first stage of item construction involved assembling situations in which drivers may display aggressive behavior. The next step was the theory-led construction of items relating to the dimensions that are considered significant in the literature on aggression. Combining of redundant dimensions reduced the number of dimensions to 14. Dimensions that seemed less relevant to driving behavior or that were rated as difficult to assess were excluded. In addition, items were constructed to measure the tendency to give socially desirable answers.

Scoring:

Main variables: *Instrumental aggression, aggravation, acting out, enjoyment of violence, negativism, social conformity*

A total score on the scales other than *social conformity* is also calculated.

Reliability:

The internal consistency of the test was calculated as Cronbach's Alpha. For the normal condition the internal consistency (mean value of all scales) is $\alpha=0.96$; for the stress condition it is $\alpha=0.97$.

Validity:

There are many studies of the construct and criterion validity of AVIS; for a summary see Herzberg (2001a). Construct validation is based on the analysis of inter-individual differences in the test results, studies of the convergent and discriminant validity of AVIS and common factor analyses with tests that have related and divergent validity - these included psychometric personality tests, interpretative tests, driving-related tests and observer ratings.

Question 1 of 67

How often do you normally ...

honk your horn when you are driving?

1 2 3 4 5 6 7 8

very rarely very often

Next

The construct validity of the AVIS has been proven. The criteria used were the number of warnings and fines issued, the current total of points registered with the Central Index of Traffic Offenses in Flensburg and the number of points registered in the last three years, the total number of accidents, the number of accidents in which the respondent had been at fault and the number of times the driving license had been revoked. Because of the distribution characteristics of the criteria and the associated general problems of reliability (Klebensberg, 1982), the analysis of the correlations between the AVIS scales and the criteria was carried out using structural equation models. Significant statistical correlations between AVIS and all the criteria were found.

Norms:

Representative norm sample N=342.

Time required for the test:

approx. 10 minutes

FFT - Questionnaire on Functional Drinking

Theoretical background:

The FFT builds on the results of alcoholism research based on social and cognitive psychology and learning theory; the results of this research are also being used increasingly to elaborate strategies for dealing with recidivism in alcohol-dependent individuals. This approach focuses on the significance of alcohol as a reinforcer for individuals who lack alternative behavioral strategies. The FFT is one of the few questionnaires that are homogenous in terms of the Rasch model. The questionnaire deliberately avoids using questions (for example, about the amount of alcohol consumed) that can evoke denial in people dependent on alcohol.

Scoring:

Items from 17 different alcohol-related functions are categorized into 5 scales that are scaled according to the Rasch model and that assess:

1. *the excitatory effect of alcohol*
2. *the psychopharmacological effect of alcohol*
3. *the social function of alcohol*
4. *background drinking that exploits social norms* and
5. *the symptoms of mental and physical dependency.*

Reliability:

Because of the validity of the Rasch model, internal consistency is given for all five scales. The reliabilities for the five scales (Cronbach's Alpha) lie between $\alpha=0.87$ and $\alpha=0.96$.

Question 1 of 93

Under the influence of alcohol I am a lot more relaxed and unconstrained in how I act with other people.

For me the statement applies...

not at all somewhat mostly fully

Next

Validity:

Even without the inclusion of scale 5, the FFT distinguishes with a high level of certainty between normal drinkers and respondents who are dependent on alcohol. Profile differences are also found related to gender, age, type of dependency and the degree of chronification.

Norms:

Representative norm sample N=284.

Time required for the test:

approx. 20 minutes

IVPE – Inventory of Driving-related Personality Traits

Theoretical background:

The inventory is a computerized personality test for the assessment of personality traits relevant in the field of traffic psychology. Social behavior in traffic is viewed primarily in terms of the ability and motivation required to abide by norms and rules. Assessment of the sense of social responsibility is based on the three-component model of attitudes to social values of Stahlberg and Frey (1990). Construction of the items of the self-control scale is based on the General Theory of Crime of Gottfredson and Hirschi (1990). Emotional stability is measured by personality traits which Ostendorf (1990) has shown to be the best indicators of this latent personality dimension. The construct of sensation-seeking is measured using a scale constructed on the basis of the thrill and adventure-seeking subdimension postulated by Zuckermann (1994). This subscale has been included on account of its significance for safe driving behavior (cf. Jonah, 1997).

Scoring:

Main variables: *Sense of social responsibility, self-control, emotional stability, sensation-seeking and adventurousness.*

Reliability:

Because of the validity of the Rasch model, reliability of the individual scales in the sense of internal consistency is given. The measurement precision of the four scales (Cronbach's alpha) lies between $\alpha=0.69$ and $\alpha=0.76$.

Validity:

Sommer et al. (2004) showed that the results on the IVPE of accident-free drivers differed significantly from the results of competent individuals who were referred to a traffic psychological examination center under § 14 (2) FSG-GV (Austrian driving license law - health ordinance).

A validation study involving the Vienna Driving Test that is still ongoing has yielded correlations of 0.276 and 0.315 between the global judgment of driving behavior and the scales *Emotional stability and Sensation-seeking and adventurousness respectively*. Evidence of criterion validity is also provided by a study of Sommer, Arendasy, Schuhfried & Litzenberger (2005) which showed that a test battery that included the IVPE could distinguish at a significant level between accident-free drivers and drivers who had been involved in two or more accidents in which they had been at fault. Vogelsinger (2005) reports consistently highly significant correlations of between $r=-0.19$ (*Self-control*) and $r=0.56$ (*Sensation-seeking and adventurousness*) between the scales of the IVPE and self-reported maximum speed on motorways. In addition, the author found highly significant correlations of between $r=-0.19$ (*Self-control*) and $r=0.39$ (*Sensation seeking and adventurousness*) with average speed on motorways. She also found correlations of $r=0.22$ (*Self-control*) and $r=0.30$ (*Sensation-seeking and adventurousness*) with the total number of punishable traffic offenses.

Norms:

Representative norm sample $N=360$.

Time required for the test: approx. 10 minutes

WRBTV - Vienna Risk-Taking Test Traffic

Theoretical background:

This test assesses behavior in potentially dangerous traffic situations. In the literature the term "risk" is used in a manner that is far from uniform. Common to the different definitions, however, are the potential danger and the possibility of harm. WRBTV is based on the risk homeostasis model of Wilde (1994) and is used to measure the subjectively accepted level of risk.

Scoring:

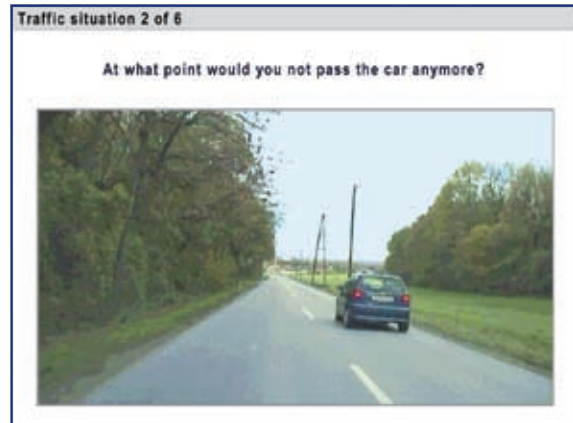
The variable Willingness to take *risks in traffic situations* measures behavior in potentially hazardous driving situations.

Reliability:

Internal consistency is given because of the applicability of the latency model (Scheiblechner, 1978; 1985). Measurement precision is $\alpha=0.89$.

Validity:

The construct validity of the subtest Behavior in traffic in terms of the risk homeostasis model of Wilde (1994) was demonstrated by Hergovich, Arendasy, Sommer, Bognar & Olbrich (2004) using the latency model (Scheiblechner, 1978, 1985). Evidence of criterion validity is also provided by a study of Sommer, Arendasy, Schuhfried & Litzenberger (2005) which showed that a test battery that included the WRBTV could distinguish at a significant level between accident-free drivers and drivers who had been involved in two or more accidents in which they had been at fault.



In addition, Vogelsinger (2005) reports a correlation of $r=0.32$ between the variable *Willingness to take risks in traffic situations* and the individual's maximum motorway speed and a correlation of $r=0.23$ between *Willingness to take risks in traffic situation* and average motorway driving speed.

Resistance to falsification

In an as yet unpublished study (N=287) no difference was found between the mean scores of individuals studied in a laboratory environment and those tested in a real-life situation (traffic-psychological examination). Similarly, Großmann (2004) found no significant differences in mean scores between individuals participating under "honest" and under "faking good" conditions.

Norms:

Representative norm sample N=895.

Time required for the test:

approx. 10 minutes

Computer

- PC or laptop with Pentium or compatible CPU (e.g. Celeron, Athlon), min. 1 GHz
- at least 256 MB RAM
- Graphics card with 24 or 32-bit color (16 million colors)
- USB headset. Please ask us about suitable models.
- CD or DVD drive, hard drive, mouse, keyboard
- USB ports for the license dongle and peripheral devices (if all the computer's USB ports are in use, a USB hub with external power supply will be required)
- Serial or parallel ports (only if older VTS hardware is used)
- Network connection (e.g. for setting up a test system network)
- Windows 2000/XP/2003/Vista (Windows NT4 upon request)

Monitor

CRT or TFT color monitor with 15"-19" screen diagonal

For tests involving measurement of reaction time (e.g. DT, RT), the confidence intervals reported cannot be guaranteed to be valid to within one percentile rank point unless the monitor has been calibrated with an optical sensor (USB response panel required).

For CRT monitors the refresh rate must be at least 75 Hz.

For TFT monitors please note the following:

- We recommend the use of TFT monitors with a resolution of at least 1280 x 960 pixels.
- For technical reasons it is not possible to use a light pen with a TFT monitor. A monitor with built-in touch screen can be used instead. Please ask us about suitable models.

Printer

- Laser or inkjet printer, black and white or color

Technical data

ADVANCED response panel

- 7 color keys
 - 10 number keys
 - 1 sensor key
 - 2 twist buttons
 - loudspeaker or headphones
 - foot-operated keys
- Current consumption: via USB port, max. 500 mA
Length x depth x height = 495x230x50mm
Weight: 1.8 kg

Version: March 2009

PERIPHERAL PERCEPTION device

- light diode matrix with 8 rows and 64 columns
- ultrasound distance sensor for measuring respondent's precise head position

Current consumption: 230 V 250 VA
Length x depth x height = 1700 x 650 x 820 mm
Weight: 1.8 kg

SCHUHFRIED GmbH has set up a quality management system in accordance with EN ISO 13485:2003. This is a version of EN ISO 9001:2000 which is specially adapted for medical products.

The company's products are developed and produced in accordance with the requirements of the EU guideline 93/42/EWG. They comply with the Medical products Act and therefore carry the CE mark.

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- Quality management
- Good financial standing
- Innovative products
- Commitment to research and development
- Ongoing company development

Fewer than 0.5% of Austrian companies are awarded this distinction!



For the purposes of this catalogue descriptions of the studies have been reduced to their key findings and results.

If you require further information we shall be happy to provide copies of the following traffic-psychological publications:

Study pack: New studies in traffic psychology

- Sommer, M.; & Häusler, J. (2005). Non-Linear Methods for the Identification of Drivers at Risk to Cause Accidents. In L. Dorn (ed), Driving Behavior and Training. Volume II (pp. 425- 436). Hampshire: Ashgate.
- Hergovich, A.; Arendasy, M.; Sommer, M.; Bognar, B. (2007). The Vienna Risk-Taking Test-Traffic: A New Measure of Road Traffic Risk-Taking. *Journal of Individual Differences*, 28, 198-204
- Risser, R.; Chaloupka, C.; Grundler, W.; Sommer, M.; Häusler, J.; & Kaufmann, C. (2008). Using non-linear methods to investigate the criterion validity of traffic-psychological test batteries. *Accident Analysis and Prevention*, 40, 149-157.
- Sommer, M.; Heidinger, C.; Grundler, W.; Schmitz-Gielsdorf, J.; & Schauer, S. (2007). Predicting fitness to drive after brain injury: Results from a multi-centric study. [submitted]
- Sommer, M.; Herle, M.; Häusler, J.; Risser, R.; Schützhofer, B. & Chaloupka, Ch.: (in press) Cognitive and personality determinants of fitness to drive. *Transportation Research Part F: Traffic Psychology and Behavior*

Study pack: Precision of time measurement

- Häusler, J.; Sommer, M.; & Chroust, S. (2007). Optimizing Technical Precision of Measurement in Computerized Psychological Assessment on Windows platforms. *Psychology Science*, 49, 116-131.

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Benefit of ergonomically optimized input devices and the accustomed Windows user interface.

Assured of a dependable future

The products are structured in a modular fashion and are expandable in a flexible way. The continuous further development is guaranteed.

Quality assurance

Extensive standardisation and validation studies are carried out in our own research laboratory. Finished products are thoroughly tested there before they are released.

Quality according to the most rigorous criteria

We are certified according to the ISO 9001 quality norm. All our products comply with the strict European medical product law and bear the CE mark.

Biofeedback 2000 *x-pert*

Biofeedback



A new feature of **Biofeedback 2000** *x-pert* is the wireless transmission of readings to the computer.

Four radio modules are available, designed for high precision and ease of use:

- MULTI:** EDA: Skin conductance
- PULS: Pulse amplitude and frequency
- TEMP: Temperature
- MOT: Motility
- RESP: Respiration
- EMG: Muscle tension
- EEG: Electroencephalogram

The wireless transmission of data opens up new therapeutic applications, for example in sports medicine.

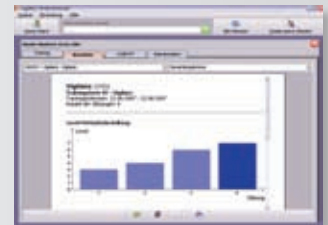
Therapy modules for specific applications can be purchased individually and combined as required.

CogniPlus and RehaCom

Cognitive training



CogniPlus is a newly developed training battery which uses the latest computer technology in a multimedia approach to the training of cognitive functions.



The tests of the Vienna Test System and the corresponding training tools of CogniPlus are based on the same theoretical models; this provides an efficient and theoretically sound link between assessment, training and the subsequent analysis of effectiveness.

RehaCom is the ideal tool for training cognitive functions. With the twenty motivatingly designed training programs you can improve cognitive functions such as memory and reaction certainty.

Market leader in computerized psychological assessment - W O R L D W I D E -



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Qualität durch Kompetenz

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