

Guidelines for the Psychological Assessment of Train Drivers and other safety related personnel

CER Psychologists' Subgroup

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1 Introduction – Purpose of the guidelines

1.1 The reasons to carry out psychological assessment when selecting train drivers

Psychological assessment methods are used to identify someone who has the appropriate knowledge, skills, and abilities to become a train driver. A rigorous selection process is important in ensuring a safe and effective railway service.

There is a long history that provides empirical evidence for the effectiveness of a psychological approach to assessment. Primarily this is because psychological assessment has the benefit of being an objective and scientific way to evaluate knowledge, skills, and abilities. In the safety critical role of train driving, it is important to consider the effect of employing someone that does not meet required standards.

A core requirement is to ensure that these methods are fair to all applicants and only discriminates on suitability for the role. The efficient use of an assessment process must take the following into consideration:

- fulfil the specific needs for safe operation according to national requirements for safety and psychological health;
- the company's need that this be done in an economic way.

1.2 Scope of the guidelines

This document covers the following aspects of train driver selection:

- competencies of people undertaking psychological assessment
- the role of safety related psychological assessment within the recruitment process
- the evaluation process for the safety related criteria:
 - Definition of selection criteria
 - Use of selection tools
 - Assessment of applicants
 - The selection decisions
 - Feedback to the applicant and client
- useful links and references

This document has the scope to improve a common frame of reference in psychological assessment to harmonise practices among European States. It's a part of Risk Management related to human factor and safety tasks.

1.3 Target group of the guidelines

These guidelines set out the requirements for the psychological assessment of train drivers to comply with the conditions of the European Directives 96/48/EC, 2001/16/EC, 2004/49/EC, 2004/50/EC, 2004/0048 (COD), the Driver Licence Directive 2007/59/EC.

The guidelines are relevant to those who are responsible for setting the arrangements for train driver selection and the thorough psychological principles can be used for guidance in the assessment of other safety related personnel (e.g., signallers, dispatchers ...).

The guidance contained within this document is relevant to the selection of all train drivers belonging to the companies which are represented by the CER.

2 Role of safety related psychological assessment within the recruitment process of train drivers

2.1 Definition

Train driver tasks are without doubt psychologically demanding.

The train driver needs to interact with incoming information, both auditive and visual stimuli, both from inside and outside the train cabin, discriminating and processing them, to prepare and drive the tractive unit, to take decisions whilst respecting procedures.

Human reliability is therefore one of the safety critical aspects within the railways. The interaction with rail traffic rules, the technical safety equipment and safety management makes up the blend of safety risk factors. Human reliability depends on many factors, one of them being recruitment of train drivers who have the required cognitive, psychomotor and behavioural abilities.

Psychological assessment within the recruitment process of train drivers is a **part of general working ability assessment** that includes, besides the psychological one, all other kinds of abilities (physical, technical, special etc.). Assessment of the psychical status (status praesens psychicus) within the physical examination (if practised) does not replace safety related psychological assessment within the recruitment process of train drivers. Safety related psychological assessment tries to find out if the psychological **criteria required for the position of train driver are satisfied**.

2.2 Purpose

From the point of view of the competence to work as a train driver, psychological ability is understood as an integral, dynamic unit of personality abilities. These capabilities are set and recognized according to job demands, imposing requirements onto applicants' skills and characteristics.

The psychological assessment is provided as grounds for both operational **abilities for the train driver position** and **onward professional development** and placement within the company. The aim is to estimate the reliability of assessed persons with utmost precision. Only the thorough study of human resources characteristics (besides physical, technical, etc) can take effect as **accident prevention**. Data, gathered by safety related psychological assessment may work as a good and useful indicator of train driver's future behaviour in real traffic service.

2.3 Content

Psychological assessment focuses on psychometric criteria, cognitive qualities, on personality and behaviour. For each of these characteristics a **wide range of psychological assessment tools is used** to estimate safety related performance. Assessment tools which are used need to be related to the requirements of the job of a train driver.

3 Definition of competencies of professionals conducting safety-related psychological assessments

3.1 Preface

Across European railway structures, tasks comparison* undertaken shows the different roles and professional competencies, in compliance with the rules and practices of each country.

At the same time, safety related psychological assessment sets out a common frame of reference as pertains to the level of responsibility and qualification of persons managing the assessment.

*Tasks comparison refers to the work done during CER Railway Psychologists' Subgroup meetings and has congruency with international guidelines on tests.

3.2 The specialist in occupational psychological assessment

In reference to Directive 2007/59/EC chapter 11.3, psychologists or medical doctors have to be accredited or recognized in accordance with Article 20.

In order to refine the criteria for approval, the evaluators involved in occupational psychological examinations, and following the TSI model on this issue, the CER Psychologists' Subgroup recommends:

- the application of national laws regarding the evaluators' respective professions, and
- that the evaluators have:
 - the expertise and experience required to practice in occupational psychology;
 - knowledge of work hazards and of the railway environment;
 - understanding of how measures intended to eliminate or reduce the risks from those hazards could be affected by lack of occupational psychological fitness.

These professionals determine the assessment contents, the choice of the psychological tools, the procedure of standardization, evaluation and judgment, are able in training and guidance of other personnel involved in examination, likewise can administer and interpret psychological tools.

Knowledge and qualifications required:

- Methods of job description and job analysis.
- Methods of personnel selection
- A range of relevant assessment tools
- Compliance with the ethical code of conduct as outlined in the relevant professional psychological body within the respective country
- Compliance with the rules and national laws of the respective country
- Psychometric principles and procedures of descriptive and inference statistics
- Technical requirements of tests (reliability, validity, standardization, etc.)
- Theories and techniques on aptitude and personality tests
- Guidelines on computer based tests
- Principles and techniques of the occupational interview
- How to carry out validity and reliability studies
- Principles to train assessors and technicians
- Railway environment and safety tasks
- Procedures for appeals and re-assessment of applicants

Typically, this person will be an experienced occupational psychologist (based on the description of specialist test user, EFPA), who has specialized in the use of psychological assessment tools and will have completed a number of training courses related to a variety of different types of assessment tools.

The specialist in occupational psychological assessment has the responsibility (or can delegate this responsibility) for the evaluation decision, and can delegate particular tasks to trained and/or supervised practitioners in a clearly defined frame.

According to the rules and practices of the country in which the railway undertaking or infrastructure manager is licensed or registered, these practitioners may come from related professions, provided that they have acquired the necessary additional psychological knowledge and skills through their professional practice in railway assessment. They must be able to provide expert evidence in court cases.

4 Evaluation process of safety related psychological criteria

4.1 Definition and decision of aptitude

Psychological aptitude or “fitness” bears upon the domains of psychomotor and cognitive capabilities and of behaviour in stress situations (see below - the definition of criteria 4.2). **The requirements in each of these domains must be met.**

The limit values between “fit” and “unfit” / able-unable / are so defined that, if the minimum requirements for one or more of the required domains are not met, the safety of trains in traffic is no longer sufficiently guaranteed and the **applicant is considered unfit**. Thus,

- **Fit** means that the minimum psychological requirements are met, namely in the three domains – psychomotor skills, cognitive capabilities and stress behaviour – which are determinative of safety and detectable by a psychological diagnosis.
- **Unfit** means that the minimum requirements are not met.

Restrictions or conditions could be used.

4.2 Definition of criteria

According to chapter 2.2 of Annex II of the Directive 2007/59/EC, “the examination must assess that the applicant driver has no established occupational psychological deficiencies, particularly in operational aptitudes or any relevant personality factors”.

Therefore, the CER Psychologists’ Subgroup recommends that evaluators have to assess behaviour and personality factors, psychomotor, and cognitive criteria. This evaluation will lead to an interpretation and become an integrated whole, the end product being an integrated assessment of the individual in an occupational evaluation setting. This evaluation is used to determine the candidate’s capability (performance in the train driver role) and to avoid established psychological deficiencies which are likely to interfere with safe performance and occupational psychological fitness.

Relevant factors and criteria required to assess train driver applicants are defined below (in reference to the relevant TSI, 2006/920/EC) :

Behaviour and Personality

- Self control (the ability to keep the same level of performance when exposed to stressful events);
- Behavioral reliability (enforcement of safety procedures and rules);
- Conscientiousness (care for one’s own safety performance);
- Autonomy (the ability to work in an independent manner).

Psychomotor

- Speed of reaction (quick and adequate response to simple and complex visual and acoustic stimuli) and the associated quality of performance;
- Gestured coordination (appropriate and controlled movements in response to any complex stimuli).

Cognitive

- Attention (active perception and acknowledgment of stimuli and information)
- Concentration (the ability to receive and manage selected stimuli under time pressure)

- Perceptive capability (to be able to maintain in memory a flash presentation of visual complex stimuli);
- Reasoning (the ability to manage perceptive and verbal information to deduce conclusions);
- Memory (ability to stock numerical and verbal information during a short time and after a distraction);
- Communication (the ability to produce a clear and precise message aimed at a well defined goal).

If the evaluator omits any of the above, the respective decision must be justified and documented.

4.3 Required performance level

The CER Psychologists' Subgroup recommends that the required performance levels adapted for categories A and B of train drivers (Directive 2007/59/EC, chapter II, Article 4, paragraph 3) have to be defined in a transparent system which includes:

- a) defining factors and criteria as indicated in points 4.1 and 4.2.
- b) defining performance levels for each psychomotor, cognitive and behavioural criteria as well as personality factors to avoid established psychological deficiencies which are likely to interfere with safe performance and occupational psychological fitness.

According to psychological scientific literature, thresholds of performance levels have to be established depending on the chosen methods and procedures, because evaluation score depends on the chosen tools (e.g. test or interview), the contents evaluated, the sample used in standardised tools, etc.

4.4 Selection of tools

The CER Psychologists' Subgroup recommends that the evaluation must only include assessment tools that are based on psychological and scientific principles (objectivity, reliability, validity). These must be designed to assess the necessary selection criteria and factors mentioned in point 4.1.

For example, the CER Psychologists' Subgroup can recommend the following methods used to assess train drivers, providing they meet scientifically-based standards :

- Computer-based (or other) intelligence tests and specific aptitude tests;
- Structured interviews;
- Personality Inventories;
- Simulations of job-related tasks.

4.5 Example of suitable assessment tools / methods to evaluate cognitive, psychomotor and personality as well behavioural criteria of train drivers

The selection of assessment tools / methods is made by the contractor, who is responsible for testing. It should be based on current data relating to validity, reliability and objectivity of assessment tools / methods (see annex 6.1 for more details). This responsibility cannot be delegated. Suitable assessment tools / methods are listed below:

| <u>Criteria</u> | <u>Definition</u> | <u>Suitable assessment tools / methods</u> |
|-----------------------|---|--|
| Speed of reaction | quick and adequate response to simple and complex visual and acoustic stimuli | Computer-based motor tests. |
| Gestured coordination | appropriate and controlled movements in response to any complex stimuli situation | Computer-based motor test. |
| Attention | active perception and acknowledgment of stimuli and information | Computer-based sensory test. |
| Concentration | ability to receive and manage selected stimuli under time pressure | Computer-based sensory test. |

| | | |
|------------------------|--|---|
| Perceptive capability | to be able to maintain in memory a speed presentation of visual complex stimuli | Computer-based sensory test. |
| Reasoning | ability to manage perceptive and verbal information in order to deduce or infer | Computer-based or paper and pencil mental test. |
| Memory | ability to mentally maintain, for a short time, numeric and verbal information after a distraction | Computer-based or paper and pencil mental test. |
| Communication | ability to produce a clear and precise message turned to a well defined aim | Computer-based mental test, interview. |
| Self control | capability to keep the same level of performance when exposed to stressful events | Interview, Personality inventory. |
| Behavioral reliability | enforcement of safety procedures and rules | Interview, Personality inventory. |
| Conscientiousness | care for own safety performance | Interview, Personality inventory. |
| Autonomy | ability to work in an independent manner | Interview, Personality inventory. |

On average an occupational psychological assessment lasts 4 hours.

4.6 Innovative tools and methods

In case of use of innovative tools and methods the specialists in psychological assessment must sustain them by scientific psychological principles and studies.

These new tools and methods have congruency with the ethical principles and rules of the country in which they are working.

Assessors and technicians are provided with training on these.

4.7 Evaluation report

The CER Psychologists' Subgroup recommends that the evaluators who manage the assessment have to indicate in a document the criteria and their performance level. This document would contain the following points:

- the setting and personnel involved in psychological assessment;
- the list of the relevant factors and criteria (see 4.1 and 4.2);
- the list of the omitted relevant factors and criteria (see 4.1 and 4.2) and the reasons for the omission;
- the tools used to evaluate the relevant factors and criteria (see 4.3, e.g. tests, structured interview, observation on professional training by trained assessors);
- the rules by which the safety aptitude decision is taken (see 4.3, a/b);
- the followed procedure (e.g. inclusion of results in other reports, data storage, etc.);

4.8 Period of validity of the tests results (Duration of the result's validity)

The results of the occupational psychological evaluation remains valid for 5 years, as long as training is not completed, and as long as the driver keeps his/ her licence.

In other words, it particularly means that when persons begin the training, the latest successful occupational psychological evaluation may not date back to more than 5 years. If, during this period, significant changes have taken place within the train driver role (e.g. job evolution such as

technological change) leading to a significant change in the evaluated factors and criteria or a significant life event occurs, then a re-assessment is recommended.

A train driver applicant who fails an occupational psychological evaluation must wait at least 6 months before undergoing a re-assessment.

4.9 Feedback / reporting of the evaluation conclusions to the applicant and client

The evaluation conclusions are communicated to the applicant and to the requester and the conclusion is expressed clearly by the ratings “fit” or “unfit”.

The conclusion must be presented in a way that gives every guarantee as to non-discrimination and confidentiality.

4.10 Request for a counter-assessment

An assessment may be appealed following delivery of the conclusion (the exact limit must be according to the national law and practices of the companies).

In case of re-evaluation the applicant’s entire assessment file must go to the new examiner.

4.11 Minimum content of the psychological occupational examination after appointment; periodical checks and additional psychological assessment :

As required in Chapter IV of Directive 2007/59/EC, Article 16 periodic checks, “In order for a licence to remain valid, its holder shall undergo periodic examinations and/or tests relating to the requirements referred to in Article 11(2) [physical fitness] and 11(3) [occupational psychological fitness].

With regard to medical requirements, the minimum frequency shall be observed in accordance with the provisions of section 3.1 of Annex II”.

The CER Psychologist’s Subgroup would like to highlight that in the section 3.1 of Annex II, there is no mention of the frequency and the content of the periodical occupational psychological checks.

- For economical reasons, and on the basis of the practice and experience of the European railway undertakings’ specialists, the CER Psychologist’s Subgroup recommends that, if there are no reasonable grounds for doubting the psychological fitness of a train driver, then there is no need for a periodical occupational psychological examination. On the contrary, especially after an incident or accident caused by human error on the part of the individual, an additional psychological assessment is recommended. In addition, the CER Psychologists’ Subgroup recommends, in the particular case of staff who, while performing the task of driving a train, are affected by traumatising accidents having caused death or serious injuries of persons, shall be subject to appropriate care by the employer. (TSI, 4.7.6.6 Trauma counselling).

5 Assessment of Applicants

5.1 General Standards

Actors in the psychological assessment field should behave according to the ethical principles of the European Federation of Psychologists' Association (see references).

5.2 Duties of test giver

Ensure equitable treatment of all examinees in the testing process

All examinees must be given the same opportunity to demonstrate their competence on the construct(s) the test is intended to measure, which implies:

- I. Standardized testing conditions (test administration, scoring and reporting) and use of (semi-)structured interviews;
- II. Equal opportunity to become familiar with the tests.

Ensure equality of testing outcomes for examinee subgroups defined by race, ethnicity, gender, disability or other characteristics

In testing applications where the level of linguistic or reading ability is not part of the construct of interest, the linguistic or reading demands of the test should be kept to the minimum necessary for the valid assessment of the intended construct.

Where effective job performance requires the ability to communicate in the language of the test, persons who do not have adequate proficiency in that language may perform poorly on the test, on the job, or both. In that case, the tests, used for prediction of future job performance appropriately would be administered in the language of the job, as long as the language level needed for the test did not exceed the level needed to meet requirements of the job of a train driver.

In case of clear evidence, that a tested person has serious difficulties with handling the computer, the goal is still to view, if the tested person has the wanted competencies, thus use of other additional tools or alternative psychological methods is possible (eg. Paper and pencil test, qualitative assessment of the performance).

Ensure confidential treatment of test results

Specify who will have access to results and define levels of confidentiality and limit access to results to those with a right to know.

Explain levels of confidentiality to individuals before tests are administered and obtain the relevant consents before releasing results to others.

If results are used for research use, development of norms or other statistical purposes, remove names and other personal identifiers from databases of results that are archived.

Ensure secured storage of test materials

Ensure secure storage of, and control access to, test materials.

Respect copyright law and agreements that exist with respect to a test including any prohibitions on the copying or transmission of materials in electronic or other forms to other people, whether qualified or otherwise.

Establish clear guidelines as to how long test data are to be kept on file.

Ensure announcing test results respectfully and in time

Test results should be announced in a defined time limit. When these are expected to be delayed, the test taker should be notified and the reason given.

The results and its implication must be announced in a respectful way and in such a language that it is comprehensible to the test taker.

5.3 Rights and responsibilities of test takers

All tested persons have the right to be informed properly and uniformly about the place, date and exact time of the examination, and what to take with them (glasses, calculator,...).

In advance of testing, the test taker is informed about test's content and purposes, helpful materials, ethical principles, his/ her rights and the confidentiality of the results. The test taker is invited to ask questions in case of any obscurities.

All participants are requested to follow the instructions of the test administrator. They are informed about the consequences of possible unfair working, which can result in sanctions (e.g. exclusion from testing or other).

Test takers need to represent themselves honestly in the test and inform appropriate persons if they believe the test results do not adequately reflect them.

Test takers may not interfere with the performance of other test takers.

Before testing, participants need to fill out a statement form, where he/ she declares that he/ she is fully able to undergo psychological examination (not psychically and mentally exhausted, not under the influence of alcohol, medicines or of any other substance affecting cognition, not extremely distempered, not ill or diseased, ...). If the test taker is not able to sign this declaration for any reason from the list above, another time of examination will be agreed.

The complete assessment results should be provided to the selection decision makers on a confidential basis, consistent with legal and ethical considerations. In this case test takers or the legal representative have the right to obtain copies of all these documents. The participants have to be informed who will access the results. If another third party makes a request for information the test taker must give their consent.

If the test taker was found to be unfit, there is a right to make an appeal and he/ she may be permitted to undergo a new psychological examination.

6 Annexes

6.1 Annex I: Psychological-scientific quality factors of assessment tools

- **Objectivity:** The decision that has to be made by the assessor should be based on several, weighted, objective criteria that are defined in terms of measurements or quantifiable, observable, verifiable actions. Each assessor needs to be aware of, and try to avoid, possible perceptive biases (for instance: stereotypes, first impressions, halo effect, self-fulfilling prophecy). (APA, 1999.)
- **Reliability:** Reliability refers to the consistency of measurements, e.g., when the testing procedure is repeated on a population of individuals or groups under similar conditions. Reliability data should be provided for the different relevant populations (APA, 1999). Based on the current scientific standards that rely on the acquired knowledge in psychology, a good-quality assessment method must have a degree of reliability greater than 0.80 or better, 0.9, which means an explained variance of 64% and 81% respectively.
- **Validity:** Does the test measure what it is intended to measure? Validity could be defined as “the quality of an assessment procedure in meeting its measurement objectives” (Lieury, 1997). Based on the current scientific standards that rely on the acquired knowledge in psychology, a good-quality assessment method must have a degree of validity greater than 0.30.

Further quality standards are: standardization, economy, utility as well as reasonability, possibility to fake and fairness (Lienert & Raatz, 1994; Testkuratorium, 1986).

The most used assessment techniques aren't always those that give the best results. The table below shows the validity of different tests and evaluation methods as judged by their actual occupational success. A validity of 1.00 corresponds to a perfect (100%) prediction of the applicant's professional success.

| <i>Instrument / Method / Source</i> | <i>Predictive Validity</i> |
|---|----------------------------|
| <i>Applicant's age</i> | <i>- 0.01</i> |
| <i>Graphology</i> | <i>0.02</i> |
| <i>Astrology</i> | <i>0.00</i> |
| <i>Marks during training</i> | <i>0.00 – 0.25</i> |
| <i>Time in training</i> | <i>0.10</i> |
| <i>Personal interests</i> | <i>0.03 – 0.15</i> |
| <i>Hiring interview</i> | <i>0.14 – 0.62</i> |
| <i>References (previous experience)</i> | <i>0.17 - 0.26</i> |
| <i>Number of years of previous experience</i> | <i>0.18</i> |
| <i>Analysis of applicant's file</i> | <i>0.18 – 0.26</i> |
| <i>Intelligence tests</i> | <i>0.20 – 0.51</i> |
| <i>Personality inventory</i> | <i>0.08 - 0.41</i> |
| <i>Biographical questionnaires</i> | <i>0.24 - 0.38</i> |
| <i>Assessment Centre</i> | <i>0.24 – 0.63</i> |
| <i>Trial period</i> | <i>0.44</i> |
| <i>Tests of occupational knowledge</i> | <i>0.48</i> |
| <i>Simulations of job-related tasks</i> | <i>0.54</i> |

Table 1: Summary of meta-analyses of the validity of assessment methods (Cook, 1993)

6.2 Annex II: Type of tools

Aptitude and Capability Tests

Based on Gangloff's (1993) classification, we can distinguish three general types of aptitude tests: motor tests, sensory tests and mental tests:

- **Motor tests** are in principle instrumental and serve to measure various aspects of locomotion such as dexterity or speed of movement.
- **Sensory tests**, essentially auditive and visual, serve to determine the perceived intensity of two sounds, their tonal pitch, their duration, or otherwise the visual acuity and colour perception of subjects. During sensory motor tests, the fact that response time is measured pushes the subject to react as quickly as possible to a sensation.
- **Mental tests** call up the perceptual capabilities and higher intellectual functions. For example, in the area of visual perception, they measure the aptitude to accurately perceive spatial configurations and compare them with each other, the aptitude to not be disturbed by the orientations in which a spatial structure is represented, or the aptitude to represent an object to oneself in a three-dimensional space, or yet again to memorise space structures. The measurement of quickness of perception relates to the aptitude to find a given configuration hidden amidst a complex configuration. In the auditory domain, the mental tests measure, for example, the aptitude for auditory resistance (resistance to words' distortion).

Structured Interviews

An interview represents a social situation in which the interviewer and the interviewee try to generate both positive impressions to achieve their own goals (to be deselected / to avoid risk taking personnel).

An interview can be conducted in different ways; unstructured, semi-structured and structured. The validity of the interview is around .37 and may go as high as .56 if a **structured interview** is used (McDaniel, Whetzel, Schmidt and Maurer, 1994 or Huffcut and Arthur, 1994). The structured interview fits into a scheme which, without being rigid, basically keeps a specific chronology.

Personality inventories

Personality questionnaires link a whole range of behaviours to individuals' attributes and personality traits and try to infer how the applicant will behave in a given occupational situation. The most famous personality questionnaires (based on factor analysis) are Eysenck's EPI (1979), the Minnesota Multi-Phase Personality Inventory (MMPI) (Hathaway and Mc Kinlay 1940, 1966, 1989), the Myers-Briggs Typology Inventory (MBTI), the NEO PI (Mc Crae and Costa, 1998) and Catell's 16 PF 5.

The responses obtained with these, which are only valid if they are analysed by specialists trained in their interpretation, aim to know and measure an individual's ways of feeling and reacting, trying to predict his/ her adaptability to the job applied for, his/ her style of interaction and co-operation within the work team.

7 Links/References

Legal texts and other official documents

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