EUROPEAN LEGISLATION AND OCCUPATIONAL PSYCHOLOGICAL EVALUATION OF TRAIN DRIVERS AND OTHER SAFETY RELATED PERSONNEL

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The CER Psychologists' Subgroup is composed of psychologists from: SNCF, RFI/FS, RSSB, OBB, Deutsche Bahn, SBB, CFL, BHTNSB, DVI, Serbian Railways, BDZ-EAD, CPS, VR Group.

“Evidence shows that driver performance largely depends on psychological occupational aptitudes and personality/behavioural skills. It is important to produce some guidance on assessment in this area to facilitate interoperability, to support safe working, and ensure consistent standards within and between European states.

The aim of the Community of the European Railway (CER) Psychologists' Subgroup is to produce a common frame of reference and clearly defined psychological criteria for the assessment of train drivers and other safety related personnel.

The work started from a job analysis published in a CER document in 1999 which defined a list of occupational psychological aptitudes and personality traits and medical requirements. When the Technical Specifications of Interoperability (TSI) Operations and Traffic Management (2006/920/EC) was produced in consultation with the social partners, it took into account this information. In 2004 an agreement was signed between the CER and ETF (European Transport Worker’s Federation) concerning certain working conditions of mobile workers in cross-border services and sets out best practices for this domain, including occupational psychological criteria to be evaluated. The role of the European Association for Railway Interoperability (AEIF) was also important here as it produced points 4.6 and 4.7 of the TSI and the related Annexes of the OPE TSI (AEIF Ex-Per Group). There are some differences between the TSI and the European Directive on the Train Driver Licence (2007/59/EC) concerning Occupational psychological evaluation which should soon be resolved.

On this basis the CER subgroup of psychologists, experts in railway traffic and representatives of European railway companies, through several meetings have followed, proposed and given their support to reach common standards, taking into account best practices and avoiding additional costs. This goal has been achieved through the exchange of professional experiences, comparison of process models and targets, and by considering the future development of the selection process”.

The Psychologists of the CER Subgroup

Keywords: occupational psychological assessment; safety-critical psychological occupational criteria; Driver Licence Directive 2007/59/EC; Community of the European Railway (CER) Psychologists’ Subgroup.

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1 The reader is referred to Annex 2 for details concerning the contributors to this paper and authors of the Guidelines for the Psychological Assessment of Train Drivers and other safety related personnel.
1. Presentation of the CER Psychologists’ Subgroup:

In 1999 a group was formed to work on the interoperability of personnel, which refers to technical aspects of railway functioning across European State borders, where applicable, and to generally harmonise railway practices across the different Railway Undertakings and Infrastructure Managers of the Community. A Working Group from the CCFE-CER-GEB produced recommendations on medical and psychological requirements to do with interoperability. In August 2000 a document was produced (“Competences of staff taking part in interoperability”) by the CCFE-CER-GEB which outlines job profiles of safety critical roles within the rail industry. In this document, basic psychological requirements are defined for each type of safety critical role (train driver, train crew, train preparation staff). This document was a contribution to the question of interoperability. On the other hand, the Technical Specifications of Interoperability within the subsection “Traffic Operation and Management” (2006/920/EC) were approved by the Commission, on the basis of EU legislation, in 2006. This text contains the shared position between European railway psychologists concerning the basic occupational psychological requirements of certain safety-related personnel, as well as all other technical recommendations to do with harmonisation of cross-border traffic.

In 2002 the Community of the European Railway (CER) convened medical doctors and psychologists, experts in their respective fields and working within the railway industry, to form independent subgroups and partake in regular meetings on professional topics.

In 2008 the objectives of the CER Psychologists’ Subgroup were:
- To maintain an active group capable of responding to all queries from the CER. In order to achieve this goal, meetings between the member railway psychologists are organised throughout the year where specific psychological themes are discussed on railway issues. Networking with other European railway entities is encouraged;
- Participate in the implementation of the Driver Licence Directive at the national level;
- Develop Guidelines on the occupational psychological evaluation of train drivers and other safety related personnel;
- Provide expert contribution to the field of railway psychology through reflection on certain themes, for example, the development of specific psychometric tests for evaluating specific safety-related criteria (e.g., attentional capacity).

(Objectives outlined by Ingrid Vernez, former Chairwoman of the CER Psychologists’ Subgroup.)

An important future role for the CER Psychologists’ Subgroup concerns implementation of the Directive at the national level. Article 35 of the Directive 2007/59/EC stipulates that Member States are required to assist one another in implementing the Directive. Competent authorities should cooperate with each other during this implementation phase. The occupational psychology profession could play an important role here.

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2 Directive 2001/16/EC defines interoperability within the Traffic Operation and Management subsystem as follows: “(the subsystem) includes in particular: The procedures and related equipment enabling a coherent operation of the different structural subsystems, both during normal and degraded operation, including in particular train driving, traffic planning and management; – The professional qualifications which may be required for carrying out cross-border services.” (Annex II, section 2.4). More generally, train interoperability means their “ability to run on all parts of the international network”. (in COM(2008) 855 final).

3 This type of role includes rolling stock inspector, train making-up, shunting and booked-stop operation staff.

4 As pertains to implementation, the Directive must be complied with by 4 December 2009 (Article 36 of Directive 2007/59/EC).
This is one reason why the Subgroup undertook work on the “Guidelines for the psychological Assessment of Train Drivers and other safety related personnel”. The aim of these guidelines is to develop a “common frame of reference”, thereby aiming to increase quality of assessment within Railway Undertakings across European States.

Next steps will include convincing national bodies that occupational psychological evaluation, prior to the appointment of staff for safety-critical roles, reduces risk of accidents and incidents due to human error and, therefore, reduces potential cost. Another end-product of occupational psychological assessment is to evaluate a candidate’s capacity to pursue training, which can minimise costs related to training drop-out.


The first and foremost aim of the Directive is to provide a safe railway system using common safety targets and rules. It refers to the safety requirements as defined in the Technical Specifications of Interoperability (TSI). The Directive principally lays down the conditions and procedures for the licensing and certification of train drivers operating locomotives and trains on the railway system in the Community, but is not limited to just cross-border services, as are the TSI s.

The need to harmonise licensing for train drivers is becoming increasingly important. A recent communication from the Commission to the Council, reported on 15 December 2008, highlights that cross-border railway routes will use more high-speed railway systems and that these routes are likely to remain highly frequented by passengers. Mobile workers (drivers and inspectors) implicated in cross-border passenger transport are expected to increase by 8% by 2020. Similarly, the number of European freight drivers is expected to increase by 200% by 2020. This means that the current 10 240 passenger and freight rail transport workers will roughly double in the next 10 or so years. As more rail routes open to cross-border traffic, harmonisation of practices will be the key to a safe and efficient transport system.

The licence will be valid for 10 years (Article 14 of 2007/59/EC) but subject to mandatory periodic checks, both medical and psychological. If, during this 10 year validity period, a periodic examination results in unfitness for driving a train, the licence can be withdrawn or suspended. The licence will apply throughout the whole territory of the Community (Article 7 of 2007/59/EC).

A certificate indicates the infrastructures which the holder is authorised to drive on and the rolling stock he/she is authorised to drive (Article 4 of 2007/59/EC). It is the Railway Undertaking or the Infrastructure Manager that issue and update certificates (Article 15 of 2007/59/EC). A certificate is valid only for the infrastructures and rolling stock identified on it (Article 7 of 2007/59/EC).

A Train Driver Licence, as defined by the Directive, demonstrates that the driver meets the basic requirements in terms of medical requirements, basic education and general professional skills (Article 4 of 2007/59/EC). These basic requirements define:

- The minimum age for driving a train;
- An applicant’s physical and occupational psychological fitness;
- The requirements in terms of previous professional experience;
- The necessary professional knowledge pertaining to the railway industry and train driving in particular;
- The basic requirements in terms of language skills needed in cross-border service.

(2007/59/EC (9); see also Article 9).

2.3 The Train Driver Licence Directive (2007/59/EC) in relation to Occupational Psychological evaluation:

Paragraph 9 of 2007/59/EC specifically mentions the need for occupational psychological evaluation to assess an applicant’s fitness for the train driver role, alongside the need to evaluate, through a medical examination, his/her physical capacity to work as a train driver.

From an occupational psychology point of view, Article 11 of 2007/59/EC is particularly noteworthy as it defines the basic requirements mentioned above. Article 11.3 of 2007/59/EC stipulates that applicants must be assessed for their occupational psychological fitness for the train driver role, as part of the basic requirements of obtaining the licence. Applicants must pass an examination conducted by (or under the supervision of, to be decided by the Member State) an accredited psychologist or medical doctor: “The examination shall cover at least the criteria indicated in section 2.2 of Annex II”.

Article 11.3 of 2007/59/EC therefore states that a psychologist is not the only professional capable of carrying out an occupational psychological examination, which could potentially redefine the role of the occupational psychologist within railway undertakings in countries where the psychologist’s title is not legally protected. This could mean that the occupational psychologist will assess applicants’ fitness for the role under the supervision of a medical doctor, in countries where this is not already the case.
Furthermore, article 2.2 in Annex II does not stipulate specific criteria to be evaluated in an occupational psychological examination:

“The purpose of occupational psychological examinations is to assist in the appointment and management of staff. In determining the content of the psychological evaluation, the examination must assess that the applicant driver has no established occupational psychological deficiencies, particularly in operational aptitudes or any relevant personality factor, which are likely to interfere with the safe exercise of the duties”.

(Annex II/2.2, 2007/59/EC)

However, some Occupational Psychological criteria are subsumed under the basic medical requirements section\(^5\) in the Directive 2007/59/EC. This implies that medical doctors could carry out the occupational psychological assessment of applicants for those criteria mentioned.

In the appointment of Medical doctors and Occupational Psychologists, it is up to the Member State to decide who can be a Medical Doctor and who can be an Occupational Psychologist and these professionals must be accredited by a professional accreditation body appointed by the Member state (Article 20 of Directive 2007/59/EC).

Precision is somewhat lacking concerning occupational psychological criteria and occupational assessment. The TSI states that assessment must only “include assessment tools that are based on psychological-scientific principles” (4.7.3.3). In this domain, the Guidelines produced by the CER Psychologists’ Subgroup can be of great utility, as the TSI does not further develop the notion of assessment tools. The TSI also outlines the role of psychological assessment, which is to support the appointment of “staff who have the cognitive, psychomotor, behavioural and personality capabilities to perform their roles safely. In determining the content of the psychological assessment the psychologist must, as a minimum, take the following criteria into account relevant to the requirements of each safety function:

- Cognitive (attention, concentration, memory, perceptive capability, reasoning, communication);
- Psychomotor (speed of reaction, gestured co-ordination);
- Behaviour and personality (emotional self-control, behavioural reliability, autonomy, conscientiousness).” (4.7.4.1.2 of 2006/920/EC)

These criteria were largely adopted in the CER Psychologists’ Subgroup Guidelines described below.

3. Presentation of the Guidelines for the Psychological Assessment of Train Drivers and other safety related personnel:

The Guidelines produced by the CER Psychologists’ Subgroup\(^6\) was created with the intention of improving an already existing “common frame of reference” in

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\(^5\) Namely,
- cognitive: attention and concentration; memory; perception; reasoning“
- communication”
- psychomotor: reaction time, hand coordination”.

(Annex II/2.1 of Directive 2007/59/EC:
In MINIMUM CONTENT OF THE EXAMINATION BEFORE APPOINTMENT, under 2.1 Medical examinations)

\(^6\) Guidelines for the Psychological Assessment of Train Drivers and other safety related personnel.
occupational psychological assessment for the selection of train drivers and other personnel involved in safety related tasks. This document argues the case that occupational psychological assessment is important as part of Risk Management “related to human factors and safety tasks”. Moreover, occupational psychological evaluation is cost effective as employing someone that does not meet the required minimum standards for safety can be very costly in the long run (accident/ incident, person does not complete training, etc.). However, the Subgroup recognises that psychological assessment must be economically viable. Chapters 1 and 2 of the Guidelines outline with more precision the reasons for carrying out psychological assessment, the scope and the role of this type of assessment within the recruitment and selection of train drivers.

The Guidelines state the importance of psychological assessment for security-related positions and define the criteria to be assessed during an occupational psychological evaluation. Job roles, such as train driver, are psychologically demanding given the cognitive load: the train driver continuously interacts with incoming information, at different sensory levels (auditory and visual) and from different spatial points (inside and outside the train cabin). In addition, the train driver must remain on the alert in case of perturbed situations, where he/she will be expected to take decisions within the constraints of the set procedures.

Human reliability is therefore one of the safety critical aspects within the railways and the Occupational Psychologist has a major role in this area, alongside other professionals. Psychological assessment evaluates, with more or less precision, depending on the tools and methods used, if an applicant can be considered fit – and sufficiently reliable in terms of safety – for the safety-critical role. Evaluating fitness for the role requires that a range of factors be taken into account. These criteria include adequate cognitive, psychomotor and behavioural abilities and should be checked during the recruitment process. In other words, “safety related psychological assessment tries to find out if the psychological criteria required for the position of train driver are satisfied.” (p.4).

These criteria are determined through job analysis and become requirements only if the capability is recognised as being relevant to job demands. The data gathered during the assessment, through the use of scientifically-based tools and methods, should be the object of analysis in order to produce an integrated and comprehensive picture of the assessed individual. In this way, psychological assessment can be “a good indicator of the train driver’s future behaviour in real traffic service” (p.4). For psychological assessment to be pertinent and have predictive value of this sort, it must make use of a range of scientifically sound assessment tools (objectivity, reliability, validity; see Annex 1 for a definition of these terms) and employ evaluators who have expertise and experience in the assessment of individuals.

If the individual meets the requirements – that is, the capabilities recognised as necessary in order to carry out the tasks of the job – then he/ she is said to be fit for the role. Psychological fitness, for train drivers, encompasses three domains: psychomotor skills, cognitive capabilities and behaviour/ personality and indicates that the individual is likely to act in a safe manner whilst carrying out safety-critical tasks. If an individual is said to be unfit then the minimum requirements have not been met.

The following criteria are recommended in the Guidelines as important factors to assess. Chapter 4 of the Guidelines provides a definition of the decision of
aptitude and reporting, defines criteria, required performance level, and the selection of tools.

These criteria can be assessed in the following ways, using the pertinent methods and tools (taken from the *Guidelines for the Psychological Assessment of Train Drivers and other safety related personnel*, p.8-9):

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Definition</th>
<th>Suitable assessment tools / methods</th>
</tr>
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<tbody>
<tr>
<td>Speed of reaction(^a)</td>
<td>quick and adequate response to simple and complex visual and acoustic stimuli</td>
<td>Computer-based motor tests</td>
</tr>
<tr>
<td>Gestured coordination(^a)</td>
<td>appropriate and controlled movements in response to any complex stimuli situation</td>
<td>Computer-based motor test</td>
</tr>
<tr>
<td>Attention(^b)</td>
<td>active perception and acknowledgment of stimuli and information</td>
<td>Computer-based sensory test.</td>
</tr>
<tr>
<td>Concentration(^b)</td>
<td>ability to receive and manage selected stimuli under time pressure</td>
<td>Computer-based sensory test.</td>
</tr>
<tr>
<td>Perceptive capability(^b)</td>
<td>to be able to maintain at memory a speed presentation of visual complex stimuli</td>
<td>Computer-based sensory test.</td>
</tr>
<tr>
<td>Reasoning(^b)</td>
<td>capability to manage perceptive and verbal information to deduce an arrangement</td>
<td>Computer-based or paper and pencil mental test.</td>
</tr>
<tr>
<td>Memory(^b)</td>
<td>capability to maintain for a short time numeric and verbal information after a distraction</td>
<td>Computer-based or paper and pencil mental test.</td>
</tr>
<tr>
<td>Communication(^b)</td>
<td>ability to produce a clear and precise message turned to a well defined aim</td>
<td>Computer-based mental test, interview</td>
</tr>
<tr>
<td>Self control(^c)</td>
<td>capability to keep the same level of performance when exposed to stressful events</td>
<td>Interview Personality inventory</td>
</tr>
<tr>
<td>Behavioral reliability(^c)</td>
<td>enforcement of safety procedures and rules</td>
<td>Interview Personality inventory</td>
</tr>
<tr>
<td>Conscientiousness(^c)</td>
<td>care for own safety performance</td>
<td>Interview Personality inventory</td>
</tr>
<tr>
<td>Autonomy(^c)</td>
<td>capability to work as independent manner</td>
<td>Interview Personality inventory</td>
</tr>
</tbody>
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\(^a\) refers to the psychomotor criteria; \(^b\) refers to the cognitive criteria; \(^c\) refers to the behaviour and personality criteria.

* see Annex 1 for a definition of the following terms. These methods should be based on scientific principles.

It is also important to define the required performance level on each of these criteria, as well as detect personality factors which are likely to interfere with safe
performance and occupational psychological fitness. For example, the job analysis carried out in 1999 and published in August 2000 states certain psychological factors that could increase risk whilst performing safety-critical tasks: significant intellectual or cognitive disorders and serious personality disorders.

On average, an occupational psychological assessment lasts 4 hours. An evaluation report should be produced by the assessor and should include information about the assessed criteria and the associated performance level. The evaluation decision should be communicated to the applicant (“fit” or “unfit”). The content and the procedure for interpretation of the psychological assessment must be determined by a person certified according to the requirements above.

4. Presentation of the benchmarking activity undertaken by the CER Psychologists’ Subgroup:

A recent activity of the CER Psychologists’ Subgroup has been undertaking a comparison of the selection procedures of the different countries, as represented by the Subgroup. This work compared the methods and tools used across 10 Railway Undertakings\(^7\), in addition to the UK system (RSSB/ATO), and was led by RSSB. A questionnaire was sent to the psychologists belonging to these railway companies. A report was produced\(^8\) outlining the differences and similarities of our recruitment practices for train drivers.

One finding was that the recruitment procedure is similar across responding countries and mainly differs with respect to the order in which interviews, tests and application forms used are organised.

The responding countries differ considerably, however, in the choice of tools used to assess the occupational psychological criteria, reflecting the large array of psychometric tests available on the market.

There is also considerable difference between countries concerning the validity of test results, this length of time varying from 6 months to indefinitely, providing the applicant/train driver is not involved in an accident.

Despite these differences, all the members of the CER Psychologists’ Subgroup have endorsed the criteria to be evaluated in an occupational psychological assessment of safety-critical roles, as outlined by the Guidelines described above.

\(^7\) Austria (OBB); Belgium (CPS); Czech Republic (TEI); France (SNCF); Italy (RFI); Germany (Deutsche Bahn); Luxembourg (CFL); Norway (BHTNSB); Serbia (Serbian Railways); Switzerland (SBB).

\(^8\) Prepared by Kate Bonsall, Human Factors Specialist, RSSB and Sian Evans, Human Factors Specialist, RSSB.
References

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ANNEX 1

GLOSSARY:

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 impression, halo effect, self-fulfilling prophecy)” (APA, 1999, taken from the Guidelines, Annex 1, p.13)

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, better 0.9, which means a explained variance of 64 %, respectively 81 %” (Guidelines, Annex 1, p.13).

Validity: “Does the test measures 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”. (Guidelines, Annex 1, p.13).

Computer-based (or other) intelligence tests and specific aptitude tests:

“Based on Gangloff’s (1993) classification, we can distinguish three general types of aptitude test: 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 aural and visual, serve to determine the emotive intensity of two sounds, their tonal height, their duration, or yet 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 to compare them with each other, the aptitude to not be disturbed by the orientations in which a spatial structure is represented, or the aptitude 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)”.

(Guidelines, Annex 1, p.14.)
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). This means, the interview can be of relatively high predictive value. The structured interview fits into a scheme which, without being rigid, basically keeps a specific chronology”. (Guidelines, Annex 1, p.14.)

Personality inventories: “Personality questionnaires link a whole range of behaviours to individual’s attributes and personality traits and try to infer how the applicant will behave in a given occupationan situation. The most famous personality questionnaires (based on factor analysis) are Eysenck’s EPI (1979), the Minnesota Multi-Phase Personality Inventory (MMPI) of Hathaway and Mc Kinlay, (1940, 1966, 1989), the Myers-Briggs Typology Inventory (MBTI), the NEO PI of 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”. (Guidelines, Annex 1, p.14.)
ANNEX 2

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