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### What requirements do future train drivers need to fulfill? A comparison of job profiles

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Technological changes enable higher automation in the transport sector including train operation. Thus, job environments for train drivers will change prospectively. In the nearer future, high-speed train drivers might still operate a train in the cabin, but with an intermediate level of automation. This would represent the grade of automation level two (GoA2) with a technological automatic train operation (ATO) functionality responsible for automatic speed adjustment. Train drivers' key tasks would be continuous visual monitoring of instruments and the track ahead (Brandenburger & Naumann, 2019). In the further future, job holders will even potentially operate trains from a control center with the highest grades of automation (GoA3 and GoA4), characterized by complete absence of staff on board (GoA4), while the train ride is completely executed by automation technology. Therefore, the responsibilities of train operators will change significantly. Their tasks will probably include supervising multiple trains at once during routine operations and remotely intervening in particular train rides if necessary.

This study aimed at comparing the requirements of actual train drivers (TD) with requirements for future high-speed train drivers (HSTD) and remote train operators for automated trains (RTO). Three different expert samples evaluated job requirements for TD, HSTD or RTO, respectively. An expert sample of  $N = 28$  train drivers rated their actual job profile (TD). Another group of experts ( $N = 21$  train drivers) were asked to immerse into the profile of HSTDs (Brandenburger et al., 2017). Finally, a third expert sample of  $N = 36$  train drivers was instructed to immerse into future of job activities of RTOs by a written job description and two videos describing future tasks. All three expert samples were asked to assess job requirements by rating 75 abilities of the Fleishman Job Analysis Survey (Kleinmann et al., 2010) regarding their importance for the successful accomplishment of the actual or future work tasks, respectively.

Within all three job profiles, the domain of sensory/perceptual abilities was rated the highest followed by the domain of interactive/social and cognitive abilities. While psychomotor abilities were rated lower but still important, only the domain of physical abilities was evaluated as unimportant within all three job profiles. The most important abilities in the domain of social/interactive abilities (each in the top five ranking list) were "dependability", "perseverance" and "emotional control" with similar high ratings in all three job profiles. Concerning the cognitive abilities, "operational monitoring" was in the top five ranking for RTO and HSTD, whereas "selective attention" was the only cognitive ability in the top five job requirements of TD.

Comparing the three groups on a descriptive level, the requirements in the domain of cognitive abilities seem to be the highest for RTO, followed by HSTD and TD. Concerning sensory/perceptual abilities and social/interactive abilities, the requirements are rated the highest for HSTD, followed by RTO and TD. These results indicate that the job profiles with a higher grade of automation are associated with higher job requirements in the domain of cognitive, sensory/perceptual and social/interactive abilities.