









REVIEW ARTICLE

10-year anniversary of the European Somnologist examination – A historic overview and critical appraisal

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Summary

The European Somnologist certification programme was developed by the European Sleep Research Society to improve patient care in sleep medicine by providing an independent evaluation of theoretical and practical knowledge. The examination of eligible experts plays a key role in this procedure. A process was started more than 15 years ago to create the European sleep medicine curriculum, eligibility criteria for certification, and sleep centre accreditation criteria. The process was characterised by interdisciplinary collaboration, consensus, and achieving new solutions. During the past 10 years, experience has been gained by the examination and certification of more than 1000 sleep medicine experts from more than 50 countries. The process has continuously been improved. However, as the programme was designed and administered mainly by medical experts in the field, systematic influence from teaching and pedagogic experts was partially underrepresented. The current critical

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appraisal pinpoints several missing links in the process – mainly as a missing constructive alignment between learning objectives, learning and teaching activities, and the final assessment. A series of suggestions has been made to further improve the ESRS certification programme.

KEYWORDS

constructive alignment, curriculum, education, learning objectives, sleep medicine specialists

1 | INTRODUCTION

Sleep medicine is a broad and interdisciplinary field including several highly prevalent diseases such as insomnia, sleep related breathing disorders, and sleep related movement disorders. Despite its important clinical relevance, structured education and certification has been implemented only in a few countries around the world and clinical practice is performed by many health care professionals without formalised education. In order to improve knowledge and quality of care based on internationally accepted criteria, the European Sleep Research Society (ESRS) launched an examination and certification programme for sleep medicine experts – called the “European Somnologist” certification programme. Preparations started 15 years ago, and the first examination took place in 2012. The examination is performed using multiple choice (MC) questions (single best answer [SBA]-type). In addition, a practically oriented, paper-based test procedure has been added in recent years.

Thereby the ESRS certification programme is one of three international certification programmes next to those organised by the American Academy of Sleep Medicine and the World Sleep Society. Our paper describes the development of the examination programme, the milestones achieved by running the programme during the past 10 years and – by performing a critical appraisal – we would like to illustrate our vision on how this programme can be further developed during the upcoming decade.

2 | THE DEVELOPMENT OF LEARNING CONTENT AND EXAMINATION PROCEDURES FOR SLEEP MEDICINE EDUCATION IN EUROPE

As the field of clinical sleep medicine rapidly expanded after the turn of the previous century, a framework for education and certification of sleep medicine professionals became mandatory. In the light of this evolution, the ESRS commissioned its sleep medicine and educational committees to create a comprehensive plan for professional credentialing in concert with the assembly of European national sleep societies. The envisaged educational construction required several building blocks that yet had to be supplied. A series of statement papers was published to provide the context for the certification process, the development of which has been summarised in Figure 1.

The first step was to define an outline for the accreditation of Sleep Medicine Centres (SMCs). SMCs are the core facilities for multidisciplinary sleep healthcare (Pevernagie, 2006). They also serve for practical education and training in the skills of the future workforce in clinical sleep medicine. In this paper, the structural and operational requirements for SMCs are defined. As a subsequent step, the certification of sleep healthcare practitioners was addressed. In a separate guideline, the principles for the formation and credentialing of sleep professionals were described, considering education in the science of sleep, achievement of technical and practical skills, and acquiring sufficient expertise in sleep medicine (Pevernagie et al., 2009). In this paper, it is also stipulated that a sleep medicine specialist in charge of a sleep medicine centre needs to work full time in this area and that trainees must perform a specific number of diagnostic and treatment procedures during their curriculum. It was recommended that certification should be implemented at the national level by sleep societies or healthcare authorities, rather than to be organised centrally by a European expert society such as the ESRS. No specifications regarding assessment or examination procedures were issued at that time.

Subsequently, the ESRS published the “Catalogue of Knowledge and Skills for Sleep Medicine”, which specified the content of the curriculum for clinical sleep medicine in detail (Penzel et al., 2014). Considering the multidisciplinary structure of sleep medicine, the curriculum was divided into 14 subchapters reflecting the basic physiology of sleep, diagnostic methodology, and the different disease categories in line with the International Classification of Sleep Disorders (American Academy of Sleep Medicine, 2014). European Credit Transfer System (ECTS) credits were allocated to the learning content in the different chapters (European Education Area, downloaded, 2022). In total, 15 ECTS points were linked to theoretical matter, whereas 45 ECTS points were associated with practical training, to be performed in teaching centres accredited for sleep medicine, the SMCs. The Catalogue of Knowledge and Skills for Sleep Medicine has recently been revised to keep track of current advances in sleep science and to serve as a backbone for the second edition of the ESRS sleep medicine textbook (Penzel et al., 2021).

Plans for introducing the assessment of professional knowledge and skills, based on formal examination procedures, were made early on. Such an instrument was deemed pivotal to define sleep medicine as a clinical competence area. An authentic certificate would strongly add to improving patient care, harmonising education in Europe, enhancing the competence of practitioners, and increasing professional recognition within Europe. Furthermore, it was considered that

The ESRS pathway to improve quality of sleep medicine practice in Europe

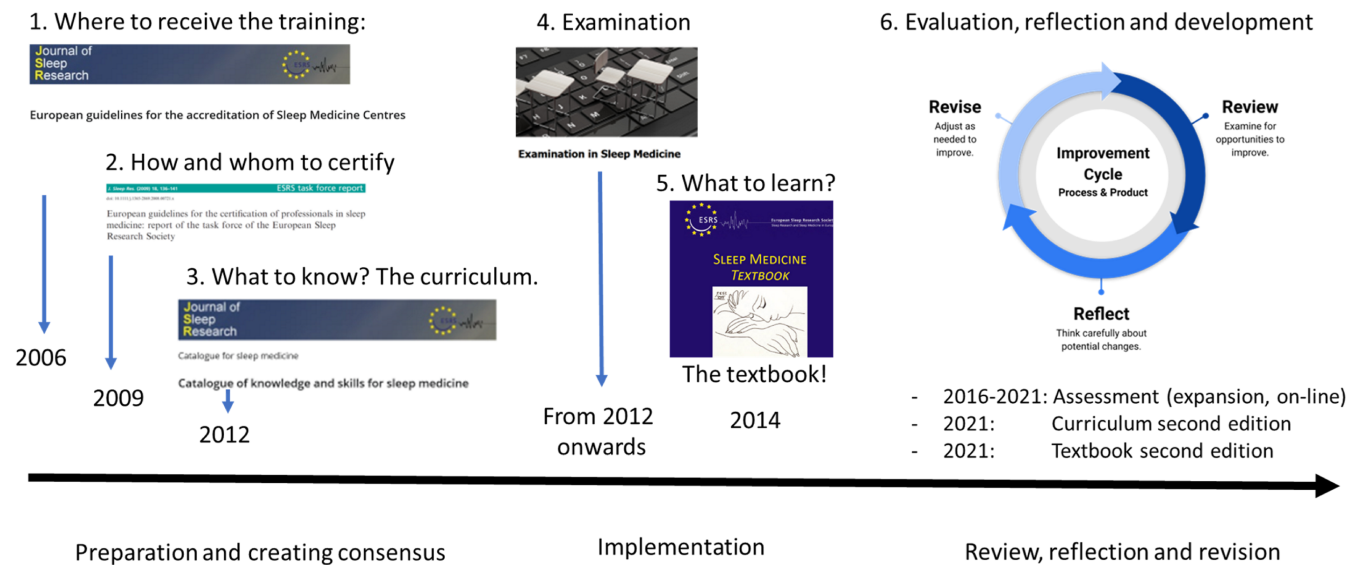


FIGURE 1 Historic overview of the ESRS European Somnologist certification programme from the start in 2006 until today

awardees should receive a certificate with an appealing title: the term “Somnologist – Expert in sleep medicine” was chosen. By now, these goals have been reached, as all over Europe teaching courses have been organised to prepare candidates for the annual examination sessions organised by the ESRS. Furthermore, in many countries the European qualification of “Somnologist”, whilst not a professional title from a legal point of view, has become an obligatory credential for practitioners who want to be acknowledged as specialists in the field of sleep medicine.

In 2012, the first examination and certification of somnologists took place at the ESRS congress in Paris. An examination subcommittee had been appointed to prepare this first “grandparenting” examination. The committee decided to have two rounds of grandparenting, corresponding a 2-year transition, for all somnologists. The examination consisted of 50 multiple choice questions. Candidates eligible for the examination process were experienced sleep medicine experts with proven track records in the field. A second grandparenting examination for somnologists was organised in 2013 in Berlin, on the occasion of the Sleep and Breathing meeting. In the following year, a grandparenting examination for somnologist-technologists was implemented. It took place together with the first regular examination for somnologists at the ESRS congress in Tallinn. Afterwards, regular examinations for both professional categories were repeated on an annual basis. Figure 2 shows the number of somnologists and somnologist-technologists who passed the examination in consecutive years. The format of the examination was adapted over time, the most important changes of which are presented in Table 1.

Initially, the examination procedure had not been backed up by a systematic educational programme. Questions were collected from senior sleep experts across Europe and reviewed by this group. The

ESRS did not have the capacity to offer a comprehensive training course for a sizeable number of examinees. Also, European reading material to prepare for this specific examination was lacking. Only American and national language textbooks on sleep medicine were available. Therefore, a new textbook was compiled to provide suitable learning content, addressing all chapters of the catalogue of knowledge and skills (Bassetti et al., 2014). To meet the growing body of scientific knowledge, and to compensate for missing information in the previous version, a second edition of this reference book was published (Bassetti et al., 2021). More specifically, content related to major medical disciplines was added, including pulmonary medicine, neurology, psychiatry, paediatrics, geriatrics, as well as internal medicine. The new edition now specifies the learning objectives (LO), thereby orienting candidates who want to study the vast domains of basic sleep science and sleep medicine.

The integration of paediatric sleep in the second edition of the Sleep Medicine textbook gives proof of the relevance of this domain. Accordingly, paediatric sleep questions have been incorporated into the examination process, and now comprise 6% of all questions. Basic knowledge of paediatric sleep disorders is mandatory, not only for paediatricians but also for adult sleep medicine specialists.

3 | PERFORMANCE OF THE EXAMINATION AND CERTIFICATION PROCESS

Between 2012 and 2021, 1046 European Somnologists have successfully passed the examination (Figure 2). Of them 821 are physicians, psychologists, or researchers with at least a master's degree and

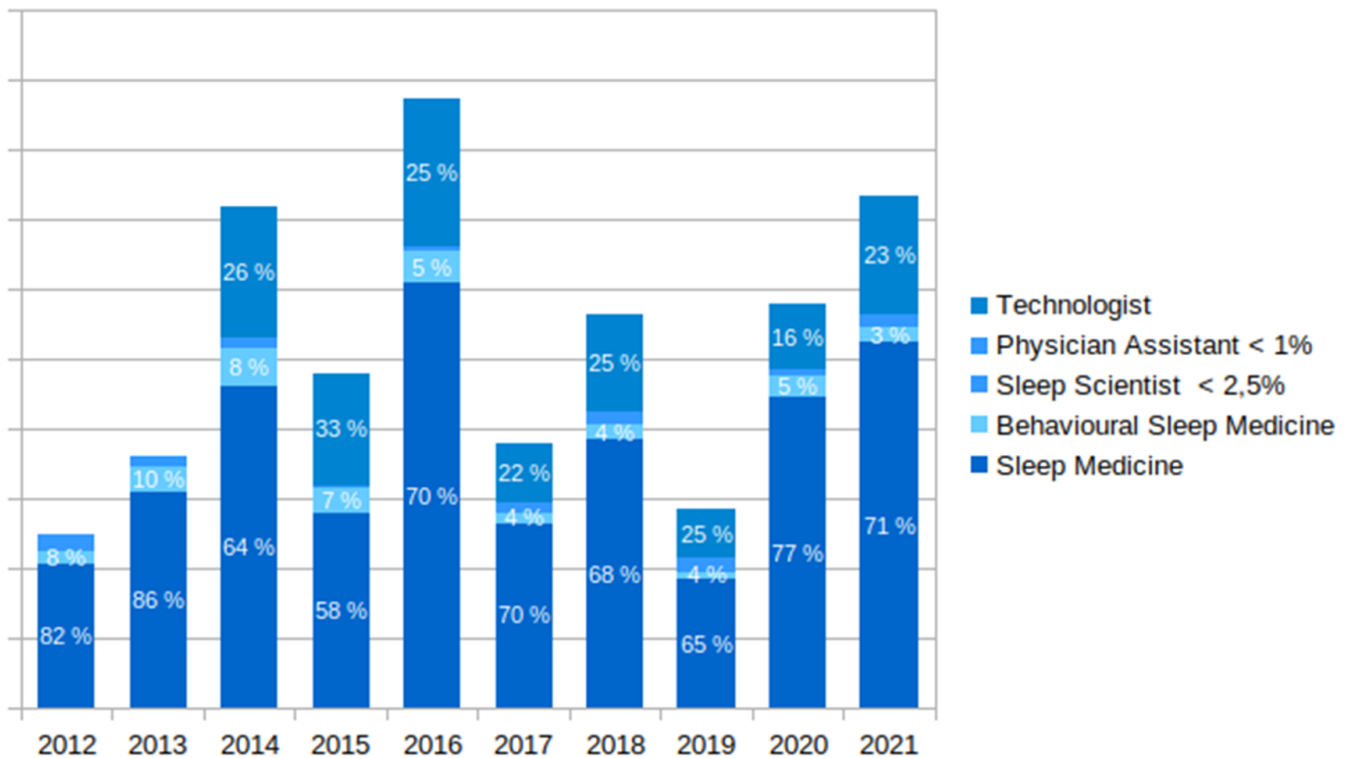


FIGURE 2 Number of certified European Somnologists by year and profession

TABLE 1 Changes in the format of the examination

Year	Somnologist examination	Somnologist-technologist examination
2012	Grandparenting examination 50 Theoretical questions	
2014	Regular examination applying eligibility criteria 50 Theoretical questions	Grandparenting examination 50 Theoretical questions Practical part: Sleep scoring, MSLT, respiratory and cardiac event interpretation, PSG limb movement event interpretation
2017	75 Theoretical questions	
2018	100 Theoretical questions 30 Practical questions	
2020	On-line examination	On-line examination
2021		70 Theoretical questions
2022	Hybrid (on-site and on-line) format	Hybrid (on-site and on-line) format

225 certified somnologists are sleep technologists or nurses. In the latter group, education and examination followed a slightly different path with higher emphasis on the practical aspects of diagnosing sleep disorders and treating sleep disordered breathing with ventilatory support devices.

The candidates come from 55 different countries and the distribution of examinees per countries varied substantially (Figure 3).

Smaller European countries do not provide their own certification process, and the European Somnologist examination and certification is used to certify health care professionals with proven knowledge and skills in sleep medicine. Larger countries such as Germany, France, Spain, and Italy maintained their national certification process, but several sleep medicine experts even from those countries decided to aim for certification as a European Somnologist.

Eligibility for the examination and certification requires prior theoretical and practical training as outlined in the publications stated above (Penzel et al., 2021; Pevernagie, 2006) (Appendix S1). Over time, 88% of the applicants in the group of physicians/psychologists/scientists have fulfilled the eligibility criteria. For technologists, the criteria were fulfilled even to a slightly higher degree (93%). The number of participants and finally certified somnologists varied between the years and the higher numbers are associated with the examinations performed prior to the ESRS bi-annual congresses (2012, 2014, 2016, and 2018) (Figure 2). In 2020 and 2021 the examinations were performed online as a direct consequence of the COVID-19 pandemic and participation was high on both occasions.

The overall examination failure rate was slightly higher in the examination for technologists (11%) when compared with the somnologists (7%). Overall, the failure rate increased after 2016, when the number of questions was increased from 50 over 75 to 100 (Table 2) and today is around 10% for somnologists.

The finally certified European Somnologists are most frequently physicians with a background as specialists in pneumology (23%),

Number of European Somnologists per country (minimum of 3 per country)

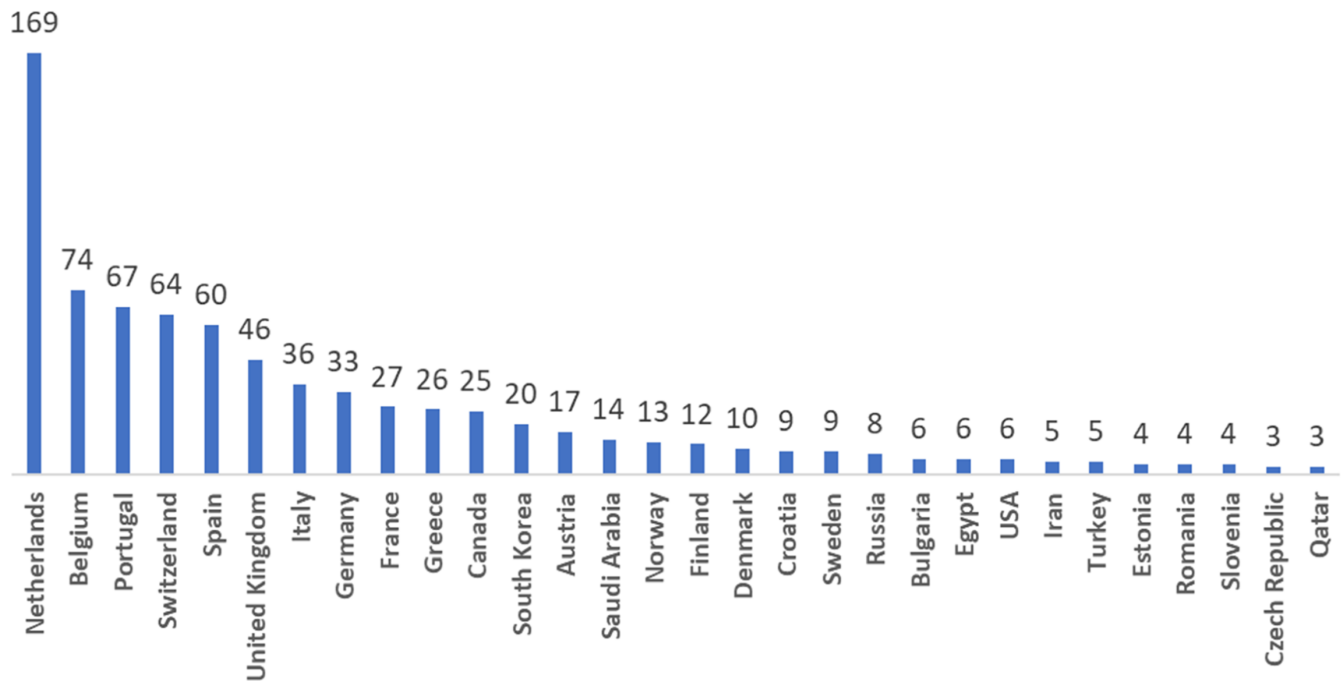


FIGURE 3 Distribution of European Somnologists across countries ($n = 30$) including the examinations from 2012–2021. Only countries with at least three certified specialists are listed

neurology (14%), and ear nose throat surgery (8%) underlining the multidisciplinary character of the field. Technologists were the second most frequent profession followed by behavioural therapists and sleep scientists.

4 | CRITICAL APPRAISAL AND FUTURE PERSPECTIVES

4.1 | Question 1: Does the ESRS education and certification programme follow the principles of “constructive alignment”?

The concept of “constructive alignment” (CA) has been adopted in the Bologna process for European wide higher education (Bologna Declaration, 1999). Constructive alignment describes the interaction between the learning objectives outlined in the course curriculum, the actual teaching and learning activities (LTA) and the final assessment which should be all aligned to each other (Biggs, 2003; Biggs, 2014; Tyler, 1940). In short, can the assessment reflect that the student really learned what he/she was supposed to learn? It is essential, that the course plan a priori designs the learning objectives, the LTA, and the final assessment in order to achieve the optimal learning outcome for the student. As outlined in Figure 4, some critical issues about the current ESRS certification and assessment practice for sleep medicine can be raised.

First, the learning objectives were not predefined from the beginning. The curriculum describes subject headings in the different areas of sleep medicine without defining what kind of knowledge and practical skills are necessary to achieve the level of an expert in the field (Penzel et al., 2014; Penzel et al., 2021).

Second, teaching activities are not performed by the examiner, the ESRS. The current structure creates a potential problem in the attempt to follow the widely accepted concept of constructive alignment. However, this problem is evident in several other educational programmes in medicine. For example, specialist education programmes have developed the concept of entrustable professional activities (EPA) to define a priori what kind of clinical skills are necessary for a physician to perform in a patient safe manner (Ten Cate, 2005). For sleep medicine, the publication of Pevernagie describes that sleep medicine experts should have performed a number of activities (“Practical skills”) (Pevernagie, 2006). This includes specialised evaluation and clinical care of at least 100 patients from the different disciplines of sleep medicine (including sleep-breathing disorder, insomnia disorder, hypersomnia, movement disorder, circadian disorder). However, a systematic and detailed definition of, for instance, EPAs in the practice of sleep medicine have not been provided in the rules for eligibility of certification candidates (Appendix S1).

Third, the ESRS Textbook is suggested as the main source of knowledge necessary to pass the examination. The book had more than 500 pages in the first edition, now more than 1000 pages in the

Room for improvement in the current ESRS certification procedure?

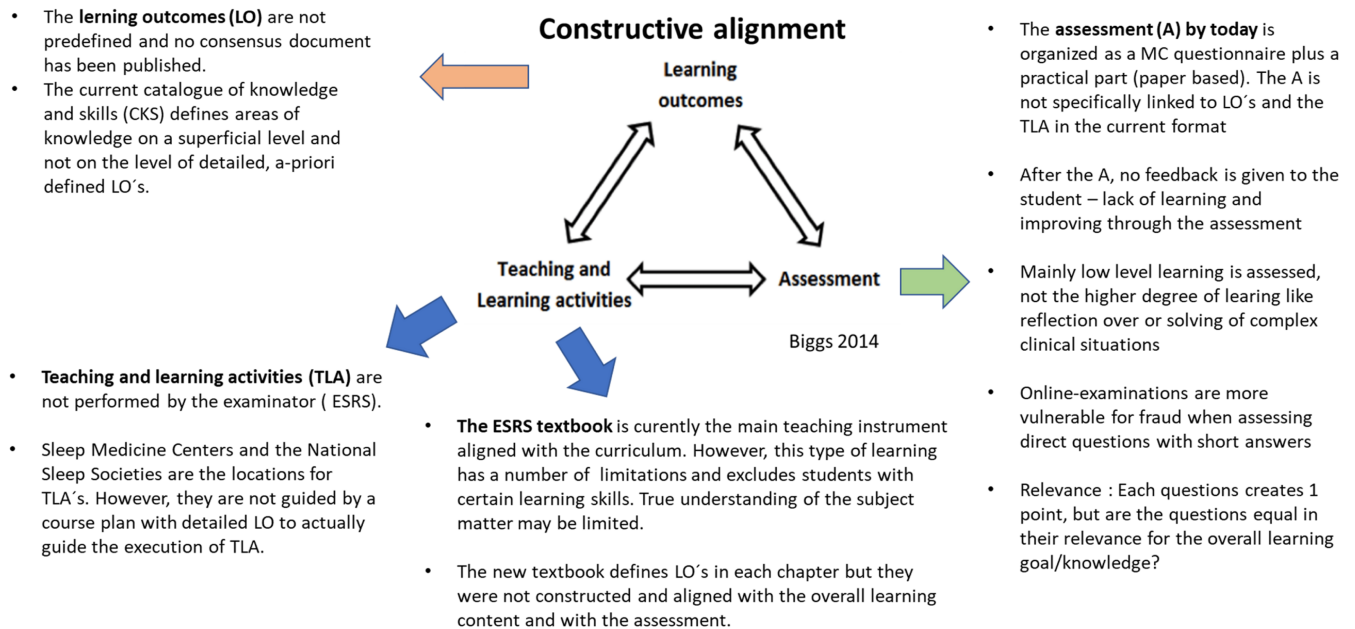


FIGURE 4 Critical appraisal: Alignment between components of learning, teaching and assessment

second edition (Bassetti et al., 2014; Bassetti et al., 2021). The chapters of the book are aligned with the chapter number and headings of the curriculum (Penzel et al., 2014; Penzel et al., 2021). Further, in the second edition, each author of the chapter was asked to define learning objectives. However, as learning objectives were not drafted a priori to define the most important content that the student should know as a future sleep medicine expert, they might not be constructed in an optimal, systematic way.

Albeit providing an uniform and transparent framework, a textbook as a main learning resource has also several limitations. It is restricted to individuals with English language skills. It might also favour students with a learning style based on theoretical learning compared with those more capable of learning, understanding, and reflecting through practical tasks (see also discussion under question 3). According to Kolb's theory of different learning styles, students with a proneness to "abstract conceptualisation" and "reflective observation" may have better chances in the final assessment compared with students with a proneness to learning styles favouring "concrete experience" and "active experimentation". (Kolb, 1984).

Fourth, the assessment uses mainly multiple choice (SBA-style) questions ($N = 100$), with an additional paper-based part where more practical skills are assessed, for example by performing sleep diagnostic procedures or classification of sleep stages or breathing events from patient practice. The overall success rate should be at least 60% for the SBA-questions and 80% for the practical part. As outlined above, the current ESRS somnologist examination does not fully comply with the principle of constructive alignment as the SBA questions are not comprehensively designed to align with the learning objectives. Further,

providing feedback to the students after the examination would be important to combine the examination with a strong learning event. The feedback may guide the student to a better achievement and to pinpoint areas for future studies and/or practice.

4.2 | Question 2: What learning skills and type of knowledge is assessed in the current examination?

Bloom's taxonomy describes six different learning skills: "Remembering and Understanding" as low level, "Analysing and Applying" as intermediate level and "Evaluating and Creating" as high level learning skills (Bloom, 1956). To achieve broad knowledge in sleep medicine, all types of learning skills are necessary during the learning process. As emphasised by Pereira (Pereira et al., 2016), examination using mainly multiple choice questions encourages surface rather than deep learning corresponding to low level learning. It has been shown that students with poor learning skills may prefer multiple-choice question examinations rather than other examination forms, such as those based on essays or oral interviews. Students in general rate multiple choice question-based examinations very low due to its potential negative impact on the overall learning process as deep learning or critical thinking are not examined. There is a clear risk that the student learns what is in the examination and not what is necessary to practise as a sleep medicine expert. This would of course significantly affect the *content validity of the examination*.

In this line of argumentation, examination of the practical aspects in sleep medicine needs some consideration. In the current

examination, practical skills are tested mainly by the sleep scoring performance. This may not be an ideal test, as the inter-scorer variability is rather high (only 60–80% agreement between scorers). Further, the profession (physician, psychologist, technician, nurse, researcher) of the sleep scorer could have an influence on performance during the examination. Another aspect, which is also unexplored, is whether the knowledge tested is relevant for the final clinical decision making, the diagnostic accuracy. However, one study performed in students of three Swedish sleep scoring courses showed that the student's self-assessment of their increase in knowledge and satisfaction with the scoring course did not differ between the professions or the level of experience at the start of the course (Grote, 2019). From this indirect evidence it can be hypothesised that the current practice in the ESRS examination may be a valid approach to use at least similar cases for sleep medicine experts from various academic backgrounds.

4.3 | Question 3: Are there any considerations to new online-examination?

The COVID-19 pandemic resulted in the need to change the “in real life” examination procedure performed during 2012–2019 to an online-examination event. In general, the content of the multiple choice questionnaire and the practical session were easy to adapt to a web-based format. In contrast, online examinations need preventive measures against fraud. This was in part ensured by external cameras to be installed by the student. In addition, the answer alternatives of the multiple choice questions were also presented in a random order. This technical procedure may prevent systematic fraud. However, questions in the MC-SBA format with short answers potentially increase the risk for fraud and thereby reduce the *reliability of the examination*. More open questions with answers in short essays could be a more reliable examination tool when compared with multiple choice questions.

As shown in Figure 2, during the pandemic years 2020 and 2021, more than 270 students passed the examinations. This is the highest pass-through on a 2-year basis, but the failure rates tended also to be higher (9.8% and 15.5%, respectively). After balancing the advantages and disadvantages, the examination committee decided to offer even in the future both an off-line and an on-line examination in 2022 and onwards.

5 | SUGGESTIONS FOR IMPROVEMENT OF THE CERTIFICATION AND ASSESSMENT PROCESS

The historic overview and the critical appraisal of the current certification and examination process show the strengths but also the limitations of the current approach. Non-conformance with constructive alignment, reduced validity and reliability of the examination and the reduced emphasis on higher learning skills point towards the need for further development in the pedagogical construct of the certification process. Therefore, some suggestions can be formulated to further improve and align the process according to current knowledge and evidence.

- Course curriculum

The first suggestion is to streamline the process towards *the principle of constructive alignment in more detail*. To achieve this, learning objectives need to be defined more precisely. Teaching and learning activities also need to be specified in more detail with the current catalogue of knowledge and skills as the basis. As the ESRS will not be able to perform all teaching and learning under their umbrella, a detailed course programme can be designed which may guide both the teaching bodies for theoretical knowledge (universities, institutes, national sleep societies) as well as for practical knowledge and skills (the accredited SMCs). The current examination will align the questions more tightly to the learning objectives.

- Textbook

The next edition of the *ESRS Textbook* would hence need a reformulation accordingly, with a specific focus on the learning objectives. One needs to consider if the learning objectives are focussed on professional development or more on patient related outcomes: a patient-centred or a profession-centred educational learning content. Thus, Edition 3 may need substantial changes in both the structure and content within each chapter to align with the a priori defined learning objectives. One may even consider pedagogic expert support to improve the content and presentation of knowledge.

- Assessment

Along with these improvements, also the *assessment* may be modified. While students are systematically asked for feedback, they should also be provided with feedback, for example by highlighting their performance in respect to reach chapter A–O in the curriculum. Questions and tasks evaluating the student's high level learning skills should be considered. One alternative would be to elaborate the online examination with practical parts or group seminars in the online environment and even peer- or self-examination tasks could be probed. Nevertheless, along with the aim to improve the examination, one should also bear in mind the time requirements and objectivity for the evaluation of the written examination.

- Structured development towards *competence-based education*

For example, the widely practised EPA evaluation system could be incorporated in practical teaching at the level of accredited sleep centres (SMCs) for the training of future sleep specialists (Ten Cate, 2005). Furthermore, the principle of Objective Structured Clinical Examination (OSCE) may be probed in teaching courses at the national level (Tervo et al., 1997). OSCE are built by a circuit of different stations that evaluate knowledge and skills. It has been used mainly in the assessment of medical students but may also be very helpful to assess medical professionals in the later stage of specialisation.

6 | CONCLUSION

In retrospect, the entire education and certification programme was developed to improve the quality of care and professional competence in European sleep medicine. The model has been built in a step-wise fashion. The procedure of providing annual examinations whilst adapting the format and content has been quite successful.

Eventually, the certification process has turned out to be a long-term initiative of the ESRS with an ever-increasing number of applicants over time. Altogether, the number of certified sleep medicine experts is exceeding 1000 and more than 220 individuals have applied to sit the somnologists' examination in 2022. So far, the examination procedure has been fueled by the know-how of sleep experts with a track record in university-based teaching. However, the expertise of consultants for quality assessment or pedagogic experts has not been integrated yet. These professionals will have to be involved to strengthen the foundations of learning and assessment services offered by the ESRS. Reaching this objective is a challenge for the society in its drive to further improve this already successful programme.

AUTHOR CONTRIBUTION

The first draft of the manuscript was provided by LG, TP, and DP. AW provided statistics and figures illustrating the course of the examinations over the past 10 years. The draft was discussed and further outlined at an ESRS examination subcommittee meeting in Frankfurt on May 6, 2022. All authors contributed with critical discussions and amendments of the first version. The final manuscript was reviewed and approved by all authors.

CONFLICT OF INTEREST

AW is a consultant for the European Sleep Research Society (ESRS) e. V., Regensburg, Germany. None of the remaining authors reported a conflict of interest related to the content of the manuscript. Outside the submitted work, LG reported grants from Bayer AG (ESADA network collaboration), lecturing activities for Resmed, Philips, Lundbeck, Astra Zeneca and a licenced patent related to sleep apnea treatment.

DATA AVAILABILITY STATEMENT

The corresponding data for the presented statistics can be retrieved from Axel Wiechmann and the ESRS office.

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SUPPORTING INFORMATION

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