



IO 1: Stocktaking Report

Desk Research

State of the Art: P & O Education

Project Manager: PFH Private Hochschule Göttingen

prepared by

Dr. Nadine Hugill, PFH Göttingen

Mehmed Latifagic, Human Study

Current State: 25/11/2021

Table of Contents

I.	List of abbreviations	4
II.	List of figures	6
1.	Introduction	7
2.	Descriptive analysis of the main group: address section	8
2.1	Geographical dispersion of the programmemes	9
2.2	Geographical Analytics	10
2.3	Conclusion	14
3.	Descriptive analysis of the main data group: Education programme section	15
3.1	Qualification Level	15
3.2	Recognition	16
3.3	Programme duration	18
3.4	Fees and costs	21
3.5	Teaching method	23
3.6	Performance recording and graduation degree (ECTS)	25
3.7	Medium of instruction	27
3.8	Maximal number of participants, number and qualification of teaching staff	28
4.	Descriptive analysis of the main data group: section “prerequisites”	29
4.1	ECTS (European Credit Transfer System)	29
4.2	Entry test/exam	30
4.3	Experience	30
4.4	Numerous clauses (NC)/Performance	31
4.5	Schematic flowchart of prerequisites conditions in a logical order	31
5.	Illustration of permeability between the individual forms of training in the sector	33
5.1	Permeability of VET to B.Sc.	33
5.2	Permeability of B.Sc. to M.Sc.	34
5.3	Permeability of M.Sc. to PhD	36
6.	Survey	38
6.1	Survey structure	38
6.2	Survey analysis	39
6.2.1	Location	39
6.2.2	Characteristics of education programmes	39

PROMOTE – Stocktaking Report Output

6.2.3	Applicants' problems	41
6.2.4	Cooperation with PROMOTE (ERASMUS+)	42
6.2.5	Bridging course scope	42
6.3	Final interpretation of the survey results	43
7.	Interview	43
7.1	Short presentation of the industrial companies that participated in the interviews	44
7.2	Interview structure & analytics	46
8.	Resume	66

I. List of abbreviations

Accreditation – a validation process whereby prosthetic and orthotic training programmes or pathways are measured and assessed against the ISPO Education Standards.

Associate Prosthetist/Orthotist (APO) – original category II certification (CAT II) by ISPO Education Standards; a healthcare professional who uses evidence-based practice to provide clinical assessment, technical design, fabrication of prosthetic/orthotic devices and implement the clinical treatment plan. Associate Prosthetists/Orthotists work as part of the healthcare team under the supervision of the Prosthetist/Orthotist. The healthcare team sets goals for the use of prosthetic/orthotic devices and delivers services to achieve desired outcomes. This occupation aims to enable service recipients to have equal opportunities to participate in society fully.

Prosthetist/Orthotist – original category I certification (CAT I) by ISPO Education Standards; a healthcare professional who uses evidence-based practice to provide clinical assessment, prescription, technical design, and fabricate prosthetic and/or orthotic devices. Prosthetists/Orthotists work independently or as part of the health professional team. The healthcare team sets goals and establishes rehabilitation plans, including prosthetic/orthotic services and clinical outcome measures. The profession aims to enable service recipients to have equal opportunities to participate in society fully.

Prosthetic/Orthotic Technicians – original category III certification (CAT III) by ISPO Education Standards; non-clinical service providers that support the technical design of prosthetic/orthotic devices and are competent in the fabrication of prosthetic/orthotic devices. Prosthetic/Orthotic Technicians work as part of the healthcare team. This occupation aims to enable service recipients to have equal opportunities to participate in society fully.

ISPO – International Society of Prosthetics and Orthotics is a multidisciplinary organization that PROMOTES access to appropriate and equitable rehabilitation, mobility devices, and other assistive technology to improve the quality of life for people with reduced mobility. As a global, multidisciplinary, non-governmental organization aiming to improve the quality of life for persons who may benefit from prosthetic, orthotic, mobility and assistive devices, ISPO provides an effective platform for the exchange and communication on all aspects of the science, practice, and education associated with the provision of prosthetic and orthotic care, rehabilitation engineering, and related areas. (<https://www.ispoint.org/page/intro>)

PhD – *Doctor of Philosophy*, the academic degree of a PhD is a designation for doctoral degrees in all scientific disciplines, which are acquired as a result of an independently written scientific research achievement (dissertation).

B.Sc. a Bachelor of Science (B.Sc. or B.SC.) is a first degree in a science subject. The recipient of a bachelor's degree usually signifies that the recipient has done the more significant part of their course work in the sciences with some specialization in a particular science.

M.Sc. is a master's degree in the field of science awarded by universities in many countries or a person holding such a degree. In contrast to the Master of Arts degree, the Master of Science degree is typically granted for studies in sciences, engineering and medicine and is usually for programmes that are more focused on scientific and mathematical subjects¹.

¹ *"Master of Science". Oxford Living Dictionaries. [Oxford University Press](#).*

PROMOTE – Stocktaking Report Output

VET – vocational education is education that prepares people to work as a technician or to take up employment in a skilled craft or trade as a tradesperson or artisan. Vocational education is sometimes referred to as *career and technical education*.²

CPO Certified Prosthetist/Orthotist - A Certified Prosthetist/Orthotist (CPO) is specifically educated and trained to manage comprehensive orthotic and prosthetic patient care, including patient assessment, development and implementation of a treatment plan, follow-up and practice management. Certification is awarded through The American Board for Certification (ABC) in Prosthetics, Orthotics and Pedorthics or the ISPO International Society of Prosthetics and Orthotics.

² ["Career and Technical Education"](#). [edglossary.org](#). 15 May 2013. [Archived](#) from the original on 2019-08-07. Retrieved 2019-08-07.

II. List of figures

Figure 1 Division of the EU into sub-areas	9
Figure 2 Distribution of O & P Training Programmes in the EU	10
Figure 3 Regional Distribution of Training Programmes	11
Figure 4 Regional Distribution of different kind of Training Programmes	12
Figure 5 Number of Training Programmes in Non-EU countries	12
Figure 6 Non-EU Regional Distribution of Training Programmes	13
Figure 7 Non-EU Regional Distribution of different kind of Training Programmes	13
Figure 8 Overview of Qualification Levels of various O & P Training Programmes	16
Figure 9 Recognition of Training Programmes in the EU	17
Figure 10 Recognition of Training Programmes in Non-EU countries	17
Figure 11 ISPO certification of O & P Training Programmes in EU and Non-EU countries	18
Figure 12 Duration of the full-time Training Programmes in EU countries (in months) (n/d=no data)	19
Figure 13 Duration of the full-time Training Programmes in Non-EU countries (in months) (n/d= no data)	19
Figure 14 Duration of the part-time Training Programmes in Non-EU countries (in months)	20
Figure 15 Fee Ranges for Training Programmes in EU countries (complete fees) (n/d=no data)	22
Figure 16 Fee Ranges for Training Programmes in Non-EU countries (n/d= no data)	22
Figure 17 Study Methods of Training Programmes in the EU	24
Figure 18 Study Methods of Training Programmes in Non-EU countries	25
Figure 19 Number of ECTS points for B.Sc. graduation	26
Figure 20 Number of ECTS points for M.Sc. graduation	26
Figure 21 Overview of teaching languages in EU countries (local languages, bilingual and multilingual), (n/d=no data available)	27
Figure 22 Overview of teaching languages in Non-EU countries (local languages and multilingual) (n/d=no data available)	28

1. Introduction

Objectives:

To get a general overview of the current training programmes in P&O in the EU, the PROMOTE working group decided what information/outcome they would need and expect from their desk research. A generic spreadsheet was prepared in which all programme partners entered the data they collected during their desk research. This general table serves as a basis for further analysis. What special conditions did we find in the training opportunities within the sector to be able to assess? How can the project goals, e.g., an increased permeability between the different training programmes for P&Os, be achieved? How can more highly qualified P&Os for the European market be trained? After completing the desk research, it is planned to obtain a clear and structured data table to make it available to all training institutions in the EU via our PROMOTE website (<https://PROMOTE-po.eu>). The project team creates a homepage about the project with essential information to PROMOTE a common exchange. For the generic spreadsheet, the team members have been concentrated on the data that enables to make serious analysis - like general data about the educational institution and the training programmes offered (country, name of the organization, contact details, type of training, duration, ECTS credits, costs, teaching method, access criteria, language, special competences PROMOTEd by the training programme, further information about the curricula).

These data were collected through various methods:

- Websites research
- Interviews with representatives of the economy (potential employers)
- Email & phone communication
- Survey for training institutions
- External information sources – ISPO, WHO ...

This stocktaking analysis examines the numerical and descriptive analysis of collected data. Before stepping into the analysis of particular data, it seems reasonable to allocate the data into logical groups. Afterwards, the analysis will be done by the group and individually.

Generally, all criteria of the analysis can be summarized in terms of content for the evaluation into 2-3 logical main groups:

- Address section
- Prerequisites section – this is the smaller group, and the content will depend on the type of education (VET, B.SC., M.SC., PhD)
- Programme section – We also have some programme data that is on the level of comments – like curricula and competencies, which were analyzed separately and compared with some official standards (WHO, ISPO, AOPA ...). An initial analysis of the available information on the training content of various training programmes and related possible technical suitability for further training opportunities in the industry are discussed in Chapter 5.

2. Descriptive analysis of the main group: address section

This section covers general address data that was collected. Due to the uncertainty of whether the data collected in the future survey is 100% accurate, stakeholders were asked by the surveys to confirm or update this information. This group consists of the following items:

Name of organization/provider
Abbreviation
Address
Country
EU member?
EU Region
Email (no private!)
Web address
Contact person

This information can be further used to make a catalogue of education programmes for the EU, offers freely accessible for all on our web page. In this way, each educational institution in the EU gets an overview of further training opportunities for its graduates, of possible cooperation partners, for example, for student exchange possibilities or professional exchange on teaching materials. Furthermore, the training institutions are called upon to work together on the overview table in order to complete it. This enables and PROMOTEs mutual exchange between P&O educational institutions in the EU. That is where the project team can also offer future education programmes all around the European Union. Due to the text format of the entries in this main group, they are not analyzed descriptively but left in their original form.

2.1 Geographical dispersion of the programmemes

In order to localize the distribution of the individual training programmemes within the EU geographically and to present them clearly, regions of the EU (Northern Europe, Southern Europe, Western Europe, Eastern Europe) were defined. The figure shows a regional representation of the EU in sub-areas to localize the training programmemes. With the help of a regional classification of the EU, an assessment of the distribution of the training programmemes and an assessment of which regions of the EU already have sufficient or insufficient training opportunities in P&O is possible.



Figure 1 Division of the EU into sub-areas

North-west (NW) region covers the following EU countries:

- Ireland, Sweden, Denmark, Germany, Netherlands, Belgium, Luxemburg

And following no-EU countries:

- Iceland, United Kingdom, Norway

North-East (NE) region covers the following EU countries:

- Finland, Estonia, Latvia, Lithuania, Poland, Czech Republic, Slovakia, Austria, Hungary, Romania

And Non-EU countries:

- Russia, Belarus, Ukraine, Moldova, Georgia

PROMOTE – Stocktaking Report Output

South-West (SW) region covers the following EU countries:

- France, Spain, Portugal, Italy

And Non-EU countries:

- Switzerland

South-East (SE) region covers the following EU countries:

- Slovenia, Croatia, Bulgaria, Malta, Greece, Cyprus

And Non-EU countries:

- Bosnia & Herzegovina, Serbia, Montenegro, Kosovo, North Macedonia, Albania, Turkey

2.2 Geographical Analytics

These analytics show how many programmemes we have in the different EU and Non-EU countries. The following chart shows the distribution of educational programmemes in the EU countries:

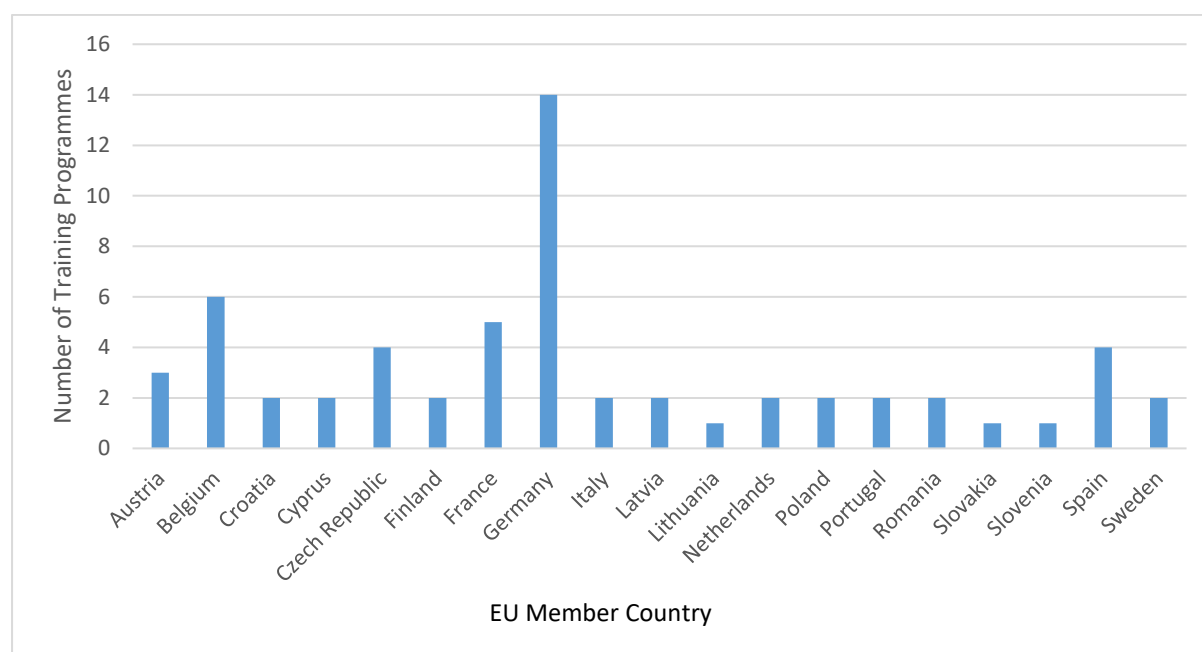


Figure 2 Distribution of O & P Training Programmes in the EU

The table shows that some EU countries do not have their own training programmemes for P&O professionals, like Bulgaria, Estonia, Denmark, Hungary, Greece, Ireland, Luxembourg, Malta.

Two programmemes in Croatia are Human Study blended learning programmemes (one APO and one B.Sc. course) – no local institution was engaged, but the local industry defined the requirements. The following figure shows the regional distribution of these training programmemes:

PROMOTE – Stocktaking Report Output

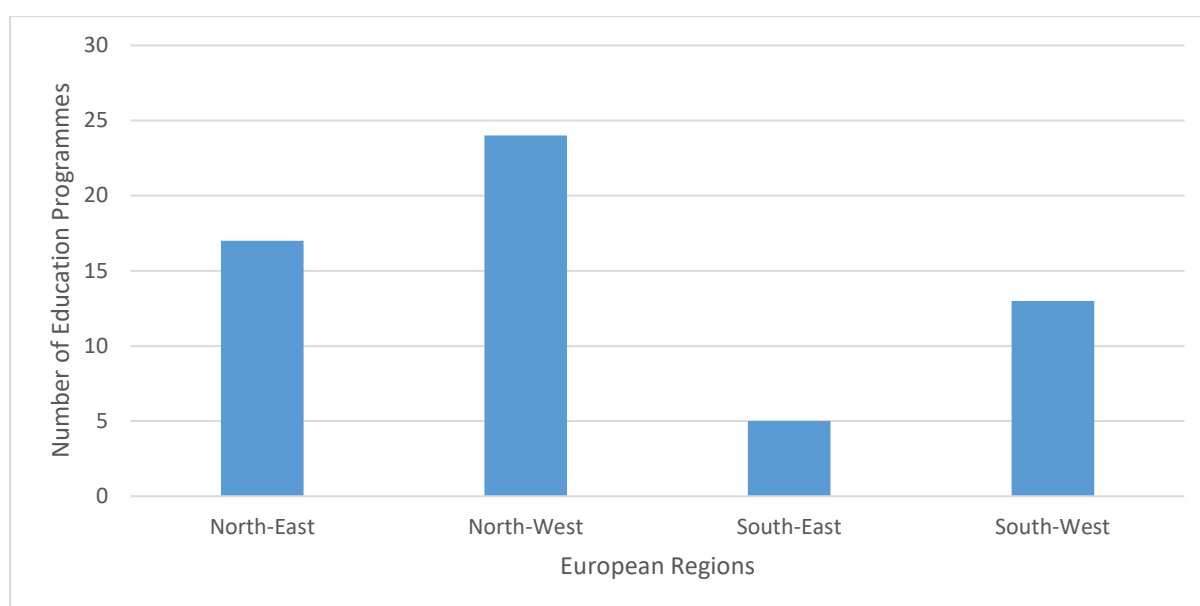


Figure 3 Regional Distribution of Training Programmes

The regional distribution seems to be important because some countries do not have an economic interest to start such programmes, and they lean on the closest countries by distance and language. The best example is Denmark that educates its P&O professionals in Sweden. For some countries, it is much more affordable to use distance learning programmes to train professionals for patient care, as they only have a need every 5 to 10 years.

In order to further classify the training programmes of the individual regions of the EU, it is useful to extend the analysis by the point of qualification level.

Within the EU, we have different qualification levels of training programmes for Technical Orthopedics (P&O). These are traditional vocational trainings in the individual countries, taught in special schools (VET) or Bachelor's- (B.Sc.), Master's- (M.Sc.) degree courses or PhD programmes at universities. In most EU countries, Bachelor's degree courses qualify for independent patient care with prostheses and orthoses (except in Switzerland, Austria and Germany - here, the traditional vocational training with master craftsman's degree applies). Other university degrees such as Master and PhD lead to the further scientific development of the profession. There are also international education standards for P&O training programmes defined and reviewed by the International Society of Prosthetics and Orthotics (ISPO). During an accreditation process, the pathways of individual training programmes are evaluated according to the ISPO education standards¹. Through this accreditation, graduates of traditional training programmes can obtain the additional international certificate "Associate Prosthetist/Orthotist (APO)".

The regional distribution of these different training programmes is shown in the following chart:

PROMOTE – Stocktaking Report Output

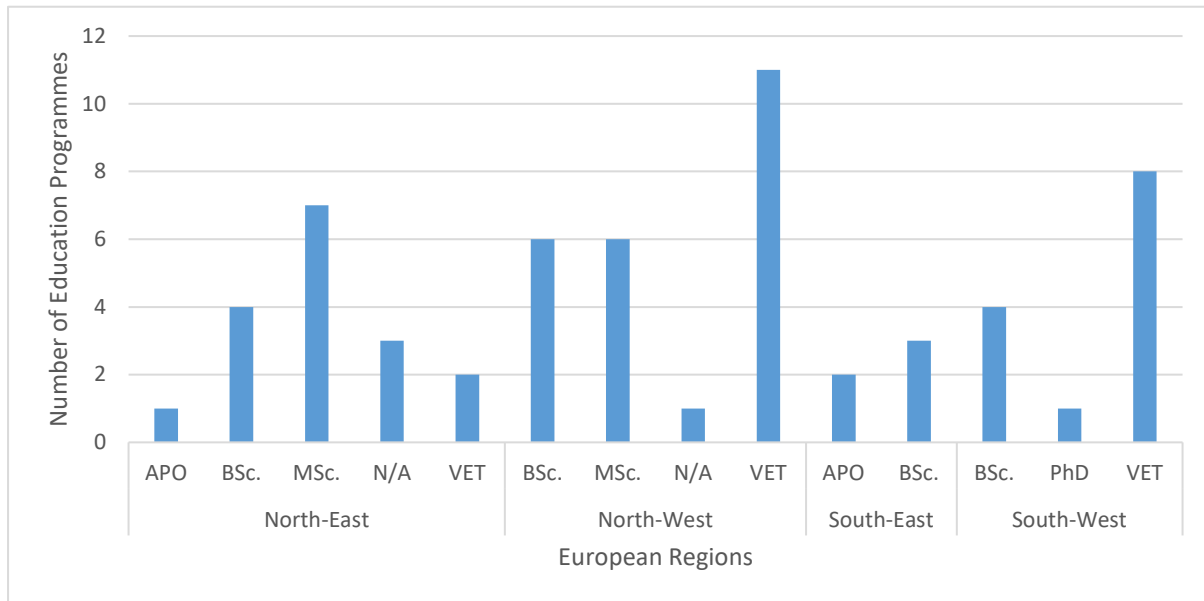


Figure 4 Regional Distribution of different Training Programmes

An Interpretation of the data shows that the South-East region of the EU has a lack of educational programmes. Generally, high variability of training programmes can be found rather in the Northern countries than in the Southern countries.

The following chart shows the situation in the Non-EU Countries

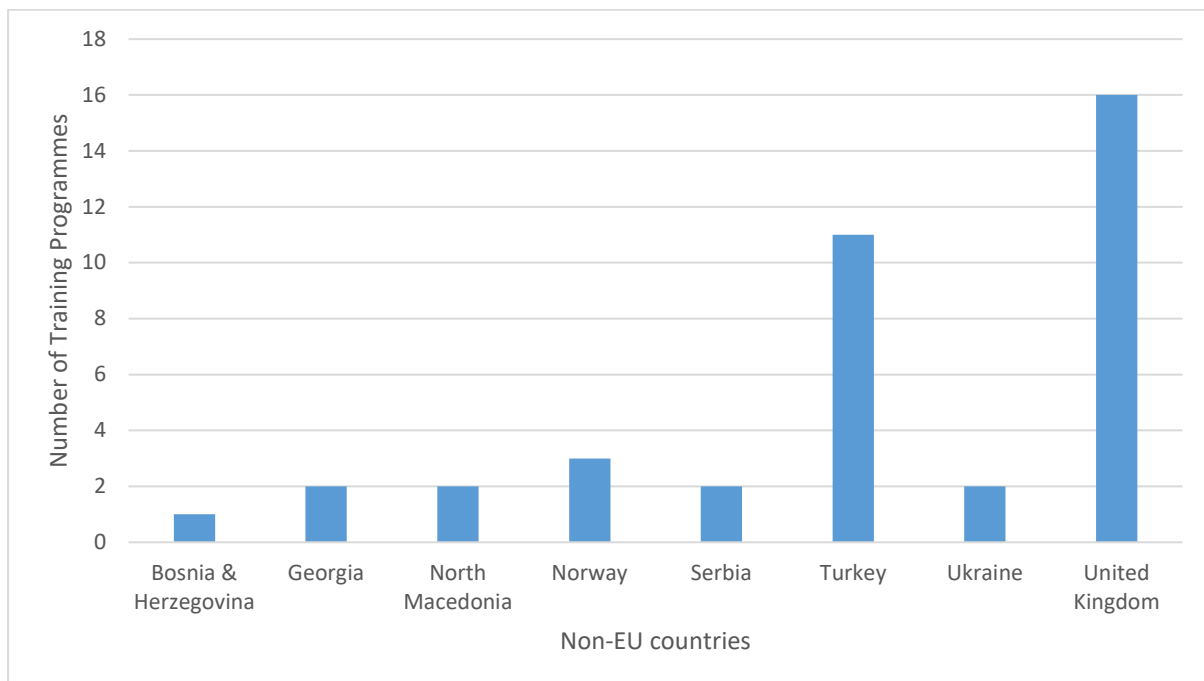


Figure 5 Number of Training Programmes in Non-EU countries

The programmes in Bosnia & Herzegovina (APO), North Macedonia (APO + B.SC.), Serbia (APO + B.SC.) and one from Ukraine (APO) are Human Study Blended learning programmes – there is no local educational institution that officially takes care of these P&O educations. It is more than evident that Turkey and the United Kingdom have the majority of the programmes, especially when the

PROMOTE – Stocktaking Report Output

other programmes are blended programmes by Human Study. Taking this into consideration, there are only six other programmes left and which are -except from those in Turkey and UK - connected with local providers (Georgia, Norway and one Ukraine programme).

Regional distribution:

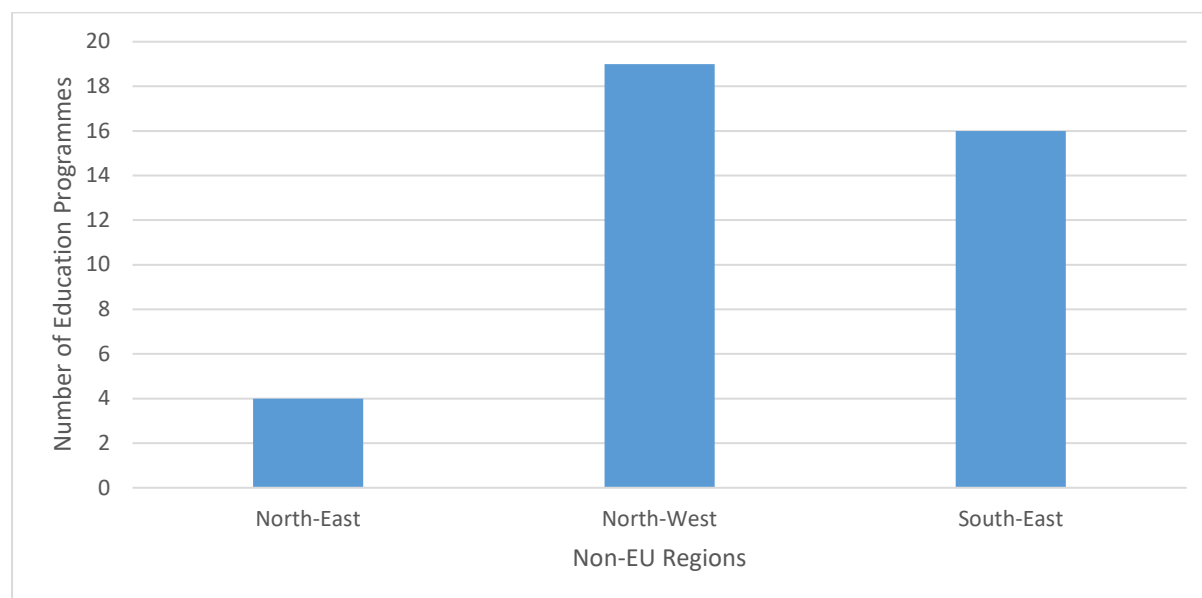


Figure 6 Non-EU Regional Distribution of Training Programmes

As with the European countries, a regional breakdown was also made for the Non-European countries. The regional distribution of different kinds of programmes is shown in the following chart

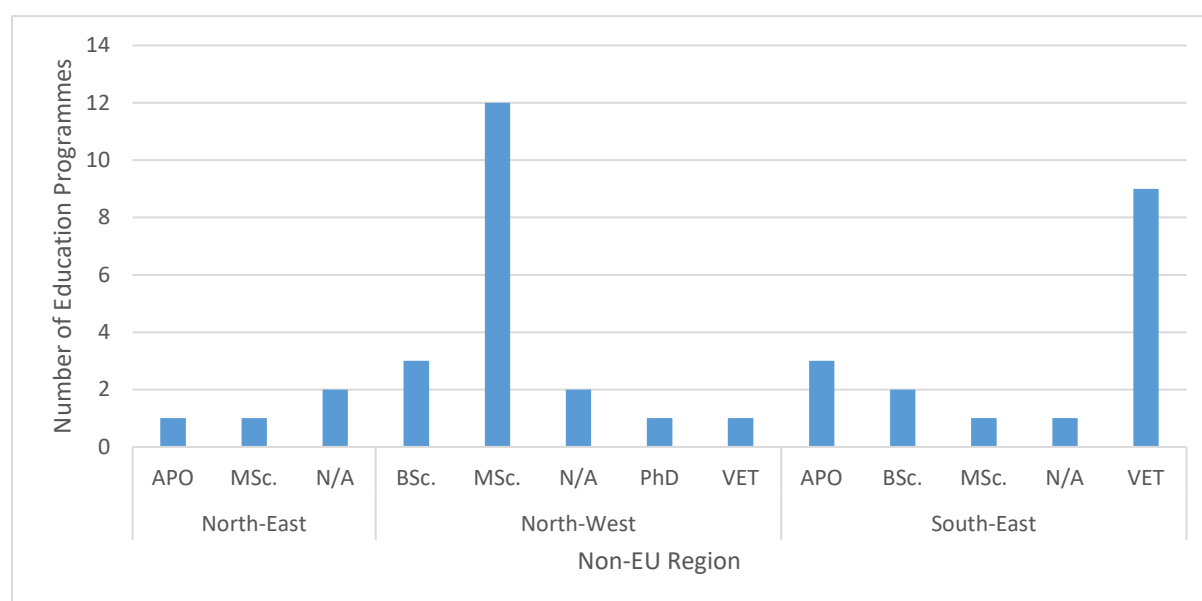


Figure 7 Non-EU Regional Distribution of different kinds of Training Programmes

This figure shows that Master's study courses and vocational education & training programmes are most represented in general. Most of the VETs are in Turkey, and almost all Master's study courses are in the UK.

2.3 Conclusion

In total, this report finds 59 different P&O training programmes in the EU. Regionally, the distribution of training programmes is as follows: 24 in the North-West region of the EU, 17 in the North East, 13 in South-West and 5 in the South East. The research shows that in 8 EU countries (Bulgaria, Denmark, Estonia, Greece, Hungary, Ireland, Luxembourg, Malta), there are no fundamental or higher education offers in technical orthopaedics (or they cannot be found online). Denmark does not offer own training programmes, but works in an educational alliance with Sweden. As a country that is no longer in the EU, the UK has 16 different training programmes, all academic programmes. And Turkey shows one of the second-highest shares of training programmes within the non-EU.

Of the 59 different training programmes in the EU, only six training programmes are ISPO certified (five programmes as Prosthetist/Orthotist, one programme as Associate Prosthetist/Orthotist). Therefore, there are training programmes in the following countries, but none of them is certified (Austria, Finland (B.Sc.), France, Georgia, Italy (B.Sc.), Latvia, Lithuania (B.Sc.), Norway, Portugal (B.Sc.), Romania, Slovenia, Sweden (B.Sc.), Spain). In summary, in these EU countries where this report did not reveal any training programmes, it is necessary to investigate further. The individual state governments or the European Training Alliance of the Federal Institute for Vocational Education and Training (<https://www.bibb.de/de/25377.php>) would have to be contacted about this.

There are 18 vocational training programmes (VET) for Technical Orthopedics in the EU, of which only five programmes are ISPO certified so far: two master craftsman schools in Germany (on Prosthetist/Orthotist level), Otto Bock training programme (Associate Prosthetist/Orthotist), Human Study blended learning education programme P&O (Prosthetist/Orthotist and Associate Prosthetist/Orthotist).

In the future, it should be observed whether the EU countries in which no vocational training programmes were found really do not offer any programmes. If not, these countries should be supported to develop adequate patient-oriented training programmes (led by trained personnel at university level in their countries – Prosthetist/Orthotist). The distance learning programme (by Human Study) could be an integral part of these training programmes, as this would automatically standardize the training programmes according to the ISPO quality level.

In the EU, this report currently finds 17 Bachelor's programmes in Technical Orthopedics, three of which are certified by the ISPO at Prosthetist/Orthotist level: Fontys University (Netherlands), PFH Private Hochschule Göttingen (Germany), Thomas More University (Belgium). In the UK, now a Non-EU country, there is another Bachelor's degree programme at Strathclyde University that is certified at this level, too. In general, this research found two Bachelor's programmes in Belgium, one in Finland, three in Germany, one in Italy, one in Lithuania, one in the Netherlands, two in Portugal, one in Sweden, one in Cyprus, one in Latvia, one in France and one in the Czech Republic.

3. Descriptive analysis of the main data group: Education programme section

This section of the report shows an immense amount of data. The initial desk research revealed no exact information to be analyzed. This is also due to the open-ended nature of answering the criteria without a predetermined structure of possible answers. The following table represents the categories for the main group “education programme section”. The order is slightly changed to enable better logic of the data list:

Name of programme
B.SC./M.SC./PhD/VET1/VET2/another certificate (dropdown)
Specific notes on VET levels
Recognition (ISPO cat I, ISPO cat II, ISPO cat III, internal)
Programme duration (months)
Fees/costs
Method (on-campus, face-to-face, distance, blended, theory, practice)
ECTS (degree)
Mol (medium of instruction) - local
Max. no. of participants
Number of teaching staff
Qualification of teaching staff
Link to curricula
Competence1 (subject/research/techniques/innovation)
Competence2 (subject/research/techniques/innovation)
Competence3 (subject/research/techniques/innovation)
Competence4 (subject/research/techniques/innovation)
Good to know / notes

3.1 Qualification Level

Based on the experience during the desk research, suggestions for improvements in data collection emerged for the subsequent survey: Here, it is planned to choose just one answer from the prepared dropdown list. If one name of the programme has more than one qualification level, the survey should have a separate entry for every single one – to escape to use checkboxes that will enable to choose more than one type and to define prerequisites more precisely.

In order to be able to analyze the existing data, the entries had to be standardized in form. For those schools which offer more than one training programme and thus, also more than one qualification level, more entries were created. The following criteria were standardized for the analysis:

APO
B.Sc.
M.Sc.
N/A
PhD
VET

N/A = we do not have information about qualification level

PROMOTE – Stocktaking Report Output

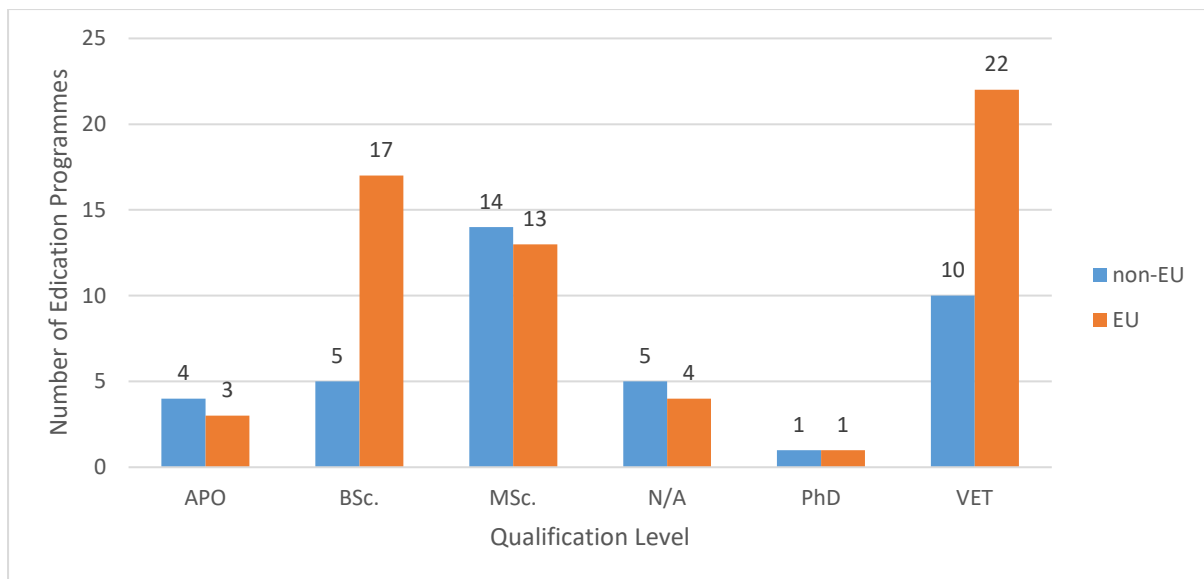


Figure 8: Overview of qualification levels of various P&O training programmes

Overall, the analysis of the desk research data shows 32 vocational training programmes: 22 in the EU and 10 in non-EU countries. Seven training courses with the certification Associate Prosthetist/Orthotist (3 in the EU and 4 in non-EU countries), 22 Bachelor degree courses (B.Sc.; 17 in the EU and 5 in non-EU countries), 27 Master degree courses (13 in the EU and 14 in non-EU countries) and 2 PhD courses (1 in the EU and 1 in a non-EU country).

3.2 Recognition

In the field of Technical Orthopedics, there are national as well as international certifications that can be acquired additionally or automatically with the completion of a training programme. “The Education Committee of the ISPO (International Society of Prosthetics and Orthotics) developed Education Standards to ensure that prosthetic/orthotic education programmes around the world have the appropriate infrastructure and resources to develop students into entry-level practitioners that will provide quality to prosthetic/orthotic services” (<https://www.ispoint.org/page/EducationStandards2>).

P&O training programmes can achieve three different ISPO certifications: Prosthetist/Orthotist, Associate Prosthetist/Orthotist, Prosthetic/Orthotic Technician. The highest ISPO certification as a Prosthetist/Orthotist is more likely to be achieved in the EU through an academic programme of study. It qualifies for independent care with sophisticated technology on patients, teaching in the industry, as well as scientific working. An Associate Prosthetist/Orthotist (APO) is qualified to provide hands-on patient care with prosthetics and orthotics and works as part of the health care team under the supervision of the Prosthetist/Orthotist. A Prosthetic /Orthotic Technician is a non-clinical healthcare provider who supports the whole health care team. Furthermore, there are “country-specific recognitions” that means recognition by health institutions, professional associations and/or university admissions authorities.

This results in the following valuable criteria for data collection:

- Prosthetist/Orthotist (ISPO),
- Associate Prosthetist/Orthotist (ISPO),
- Prosthetic and Orthotic Technician (ISPO),

PROMOTE – Stocktaking Report Output

- Internal (country or industry)
- No recognition

In the next figure (see figure 9), a general overview of the share of certified and non-certified training programmes in the EU and Non-EU is given. Thereafter, an overview of the type of certification is presented (see figure 10).

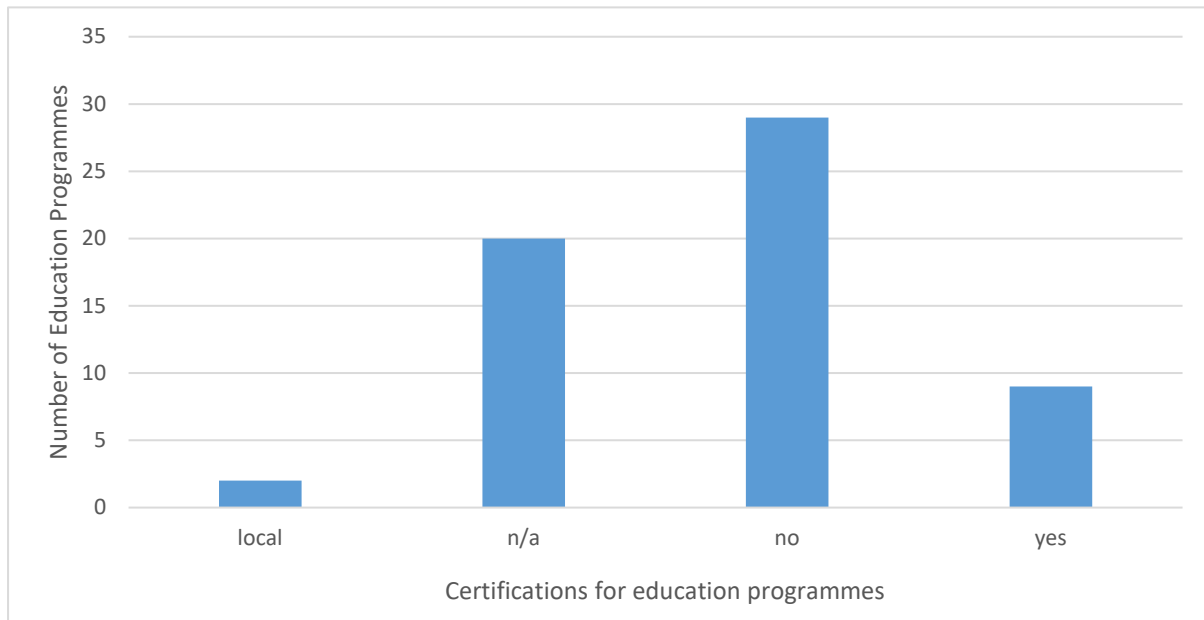


Figure 9 Recognition of Training Programmes in the EU

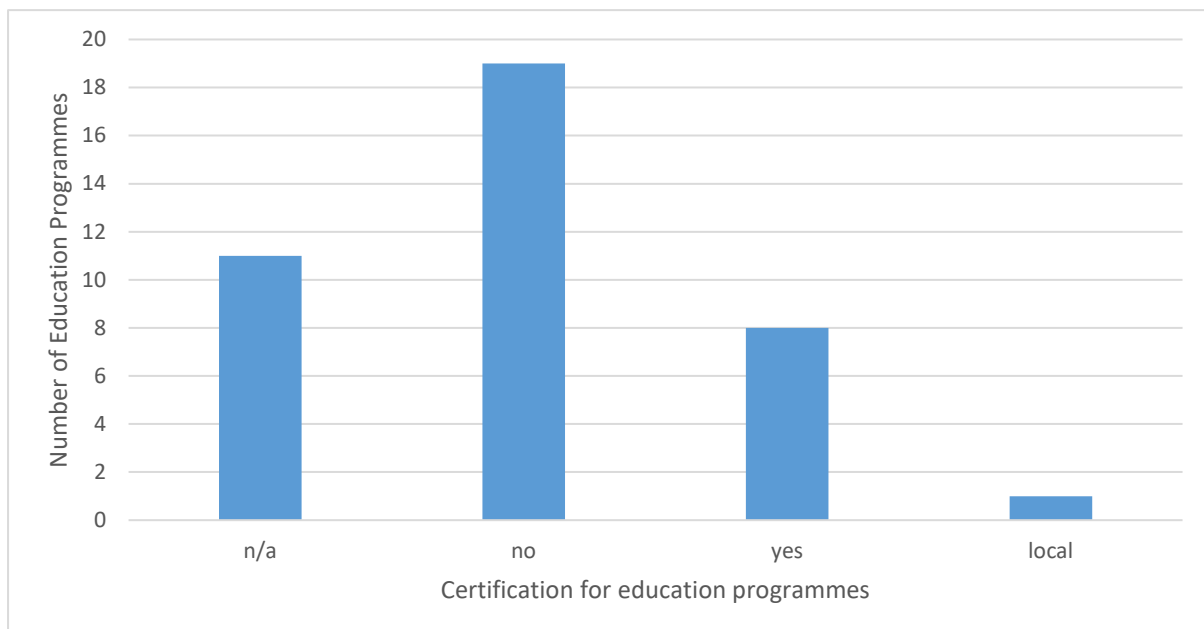


Figure 10 Recognition of Training Programmes in non-EU countries

PROMOTE – Stocktaking Report Output

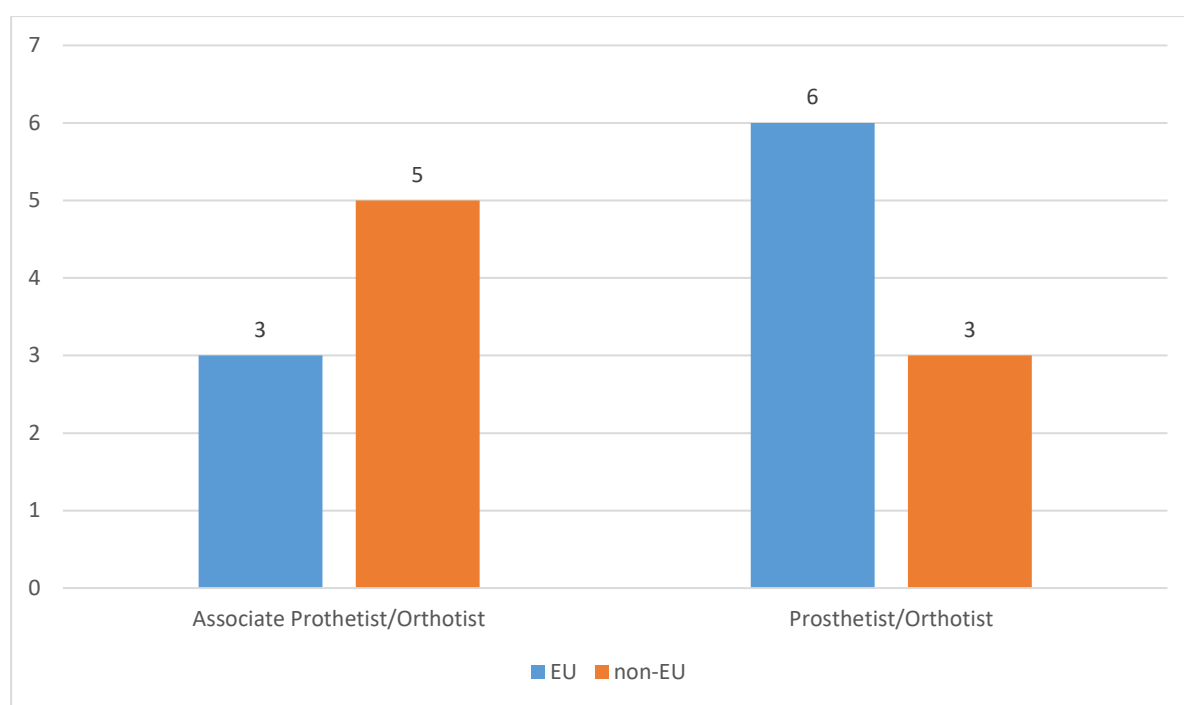


Figure 11 ISPO certification of P&O Training Programmes in EU and non-EU countries

The data analysis in figure 9 shows that the EU countries offer more non-recognized than recognized P&O training programmes. Overall, the project reveals three ISPO certified training programmes on the level of Associate Prosthetist/Orthotist (APO) and six ISPO certified training programmes on the highest level “Prosthetist/Orthotist”. There is, however, the need to consider that the number of Prosthetist/Orthotist educational programmes do not show the real picture since one of the programmes (BDLE by Human Study) is applied in three countries (Croatia, North Macedonia & Serbia). The same applies to the Associate Prosthetist/Orthotist programmes. There are five APO programmes for different countries offered by the same institution (Human Study) – Bosnia & Herzegovina, Croatia, North Macedonia, Serbia and Ukraine.

3.3 Programme duration

The initial desk research shows that the entries for this criterion are listed too generally (simple indication of duration in months without structured approach). In the following survey, there are more exact values to choose in ranges:

- Less than 1 month (mostly for the VET)
- 1 – 3 months (mostly for the VET)
- 4 – 6 months (mostly for the VET)
- 7 – 12 months
- 13 – 24 months
- 25 – 36 months
- More than 36 months

Furthermore, the collected data shows that a further subdivision of the training programmes into part-time and full-time programmes is meaningful.

PROMOTE – Stocktaking Report Output

Full-time studies

The generic data table shows 57 full-time programmes. For 14 of them, there is no indication about the overall duration of the course. The other 43 full-time programmes show a range of duration from 10 to 48 months, as shown in the following figure (Figure 12).

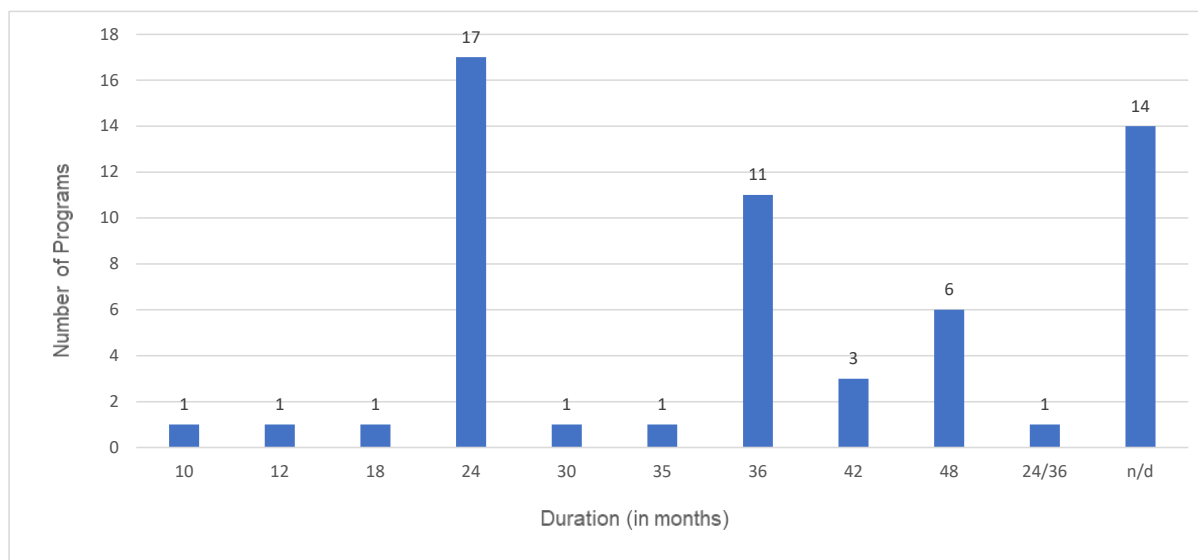


Figure 12 Duration of the full-time training programmes in EU countries (in months) (n/d=no data)

The situation in non-EU countries reveals 33 full-time education programmes, of which 18 of them don't provide information about specific course duration. The duration range for the other 15 programmes is between 12 and 48 months (see Figure 13).

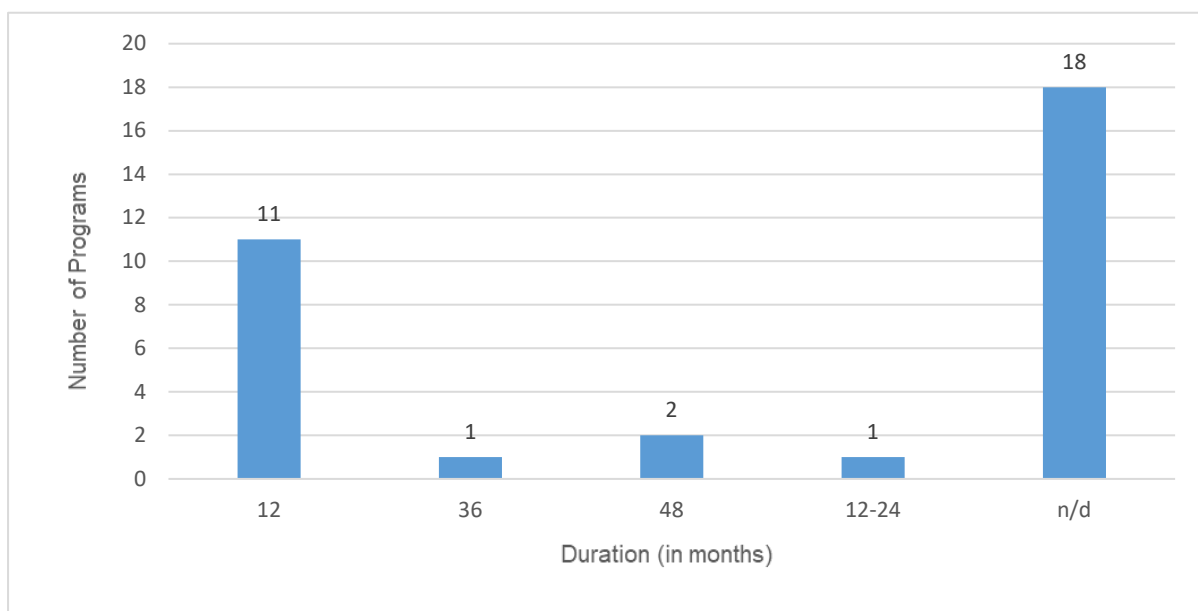


Figure 13 Duration of the full-time training programmes in non-EU countries (in months) (n/d= no data)

Part-time studies

The collected data shows only two part-time training programmes in the EU, which comprise a duration of 30 and 36 months. This shows that more flexible training programmes are rather rare in this branch of industry.

The situation in non-EU countries is different and more flexible. There are 12 part-time study programmes and 26 with no information. The duration of these part-time programmes ranges from 24 to 60 months (see figure 14).

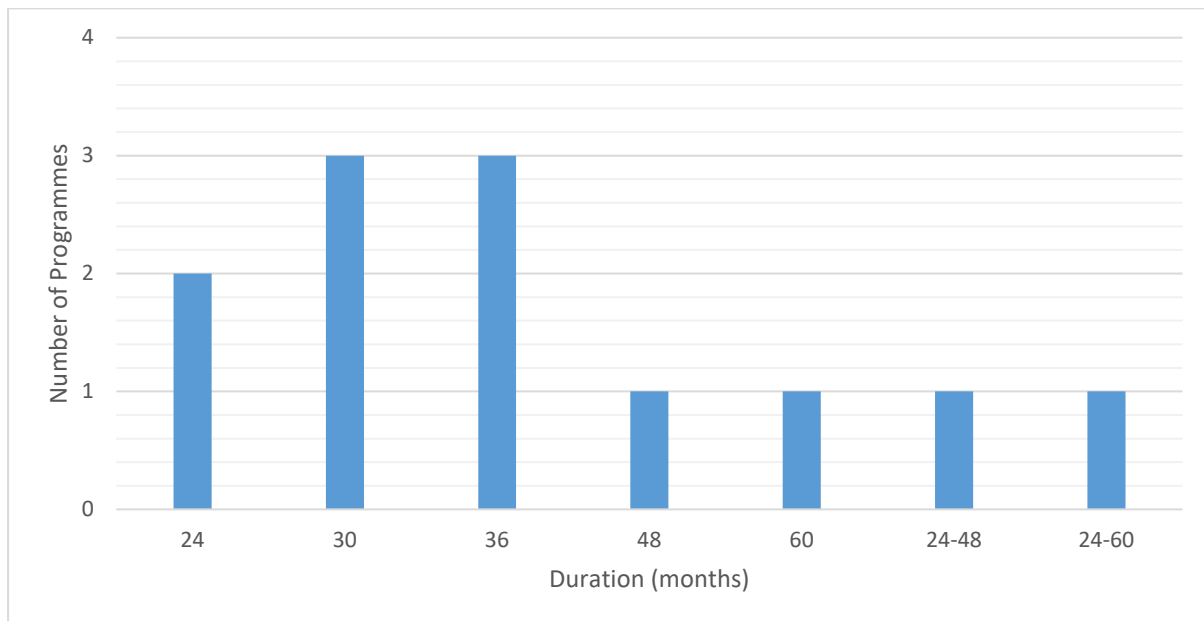


Figure 14 Duration of the part-time training programmes in non-EU countries (in months)

PROMOTE – Stocktaking Report Output

3.4 Fees and costs

The information must be presented more precisely: fees per month/student, per year/student or per semester/student. In order to further eliminate the dependence on the duration of the training programmes here, the total costs for the respective training programme are determined.

for international students £21,500
\$14.858,50 annual fee (without scholarship) for newly registered international students
£11,570
£23,400 for international students; £10,200 for british students
£28,500 (FT) £14,250 (PT) application processing fee for this programmeme of £90 for online applications and £115 for paper applications
€ 363.36per month
12.125 pound per year, graduation fee, studio fee and field study fee
1st Course 5.186 EUR + 2nd Course 5.186 EUR
1st year 2951Euros; 2nd/3rd year 2933 euros per year
2435 € per year
3000€ per semester/student
400 to 5.865,26 USD annual fee (depending on scholarship %)
5000€ per semester/student
5500 € per year
70000 SEK
9900 € complete programme
Bachelor: 700,-€ per month, 420,- Euro admin fee (one-time), 1.000,- Euro examination fee (one time), Master: 990,- euro a month, 520 euro admin fee (waived for EU citizens), 420,- euro registration fee (non-recurring), 1.000,- euro examination fee (once per course of study)
EU £ 12,125 per year of study
Master Biomedical Engineering: €301,34 / semester (summer term)
Master Course Prosthetics & Orthotics: Scotland £8,850; England, Wales & Northern Ireland £9,250; International £22,500
Master:8200€
PER YEAR External - 2220 Euros Half Internal - 3111 Euros Internal - 6446 Euros
UK students pay £9,250; EU and international students pay £24,400.
Yearly fee: 140€ (paid to Regione Toscana)

However, this approach also yields different fee values, so that an analysis of the data is not expedient. Only by defining fee ranges into which all programme fees can be meaningfully classified does an analysis of the data become possible.

PROMOTE – Stocktaking Report Output

The fee ranges were defined as follows by the project team:

- Less than 1.000,00 €
- 1.001,00 € - 2.000,00 €
- 2.001,00 € - 3.000,00 €
- 3.001,00 € - 5.000,00 €
- 5.001,00 € - 8.000,00 €
- 8.001,00 € - 10.000,00 €
- 10.001,00 € +

The following figures provide an overview of the fees for training programmes in Europe and outside Europe.

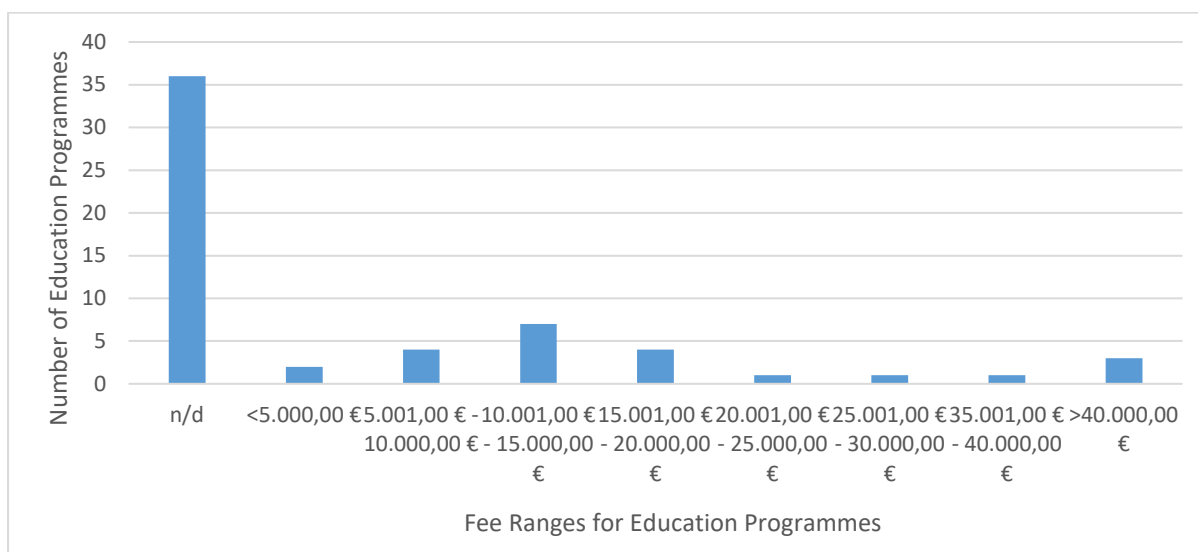


Figure 15 Fee Ranges for Training Programmes in EU countries (complete fees) (n/d=no data)

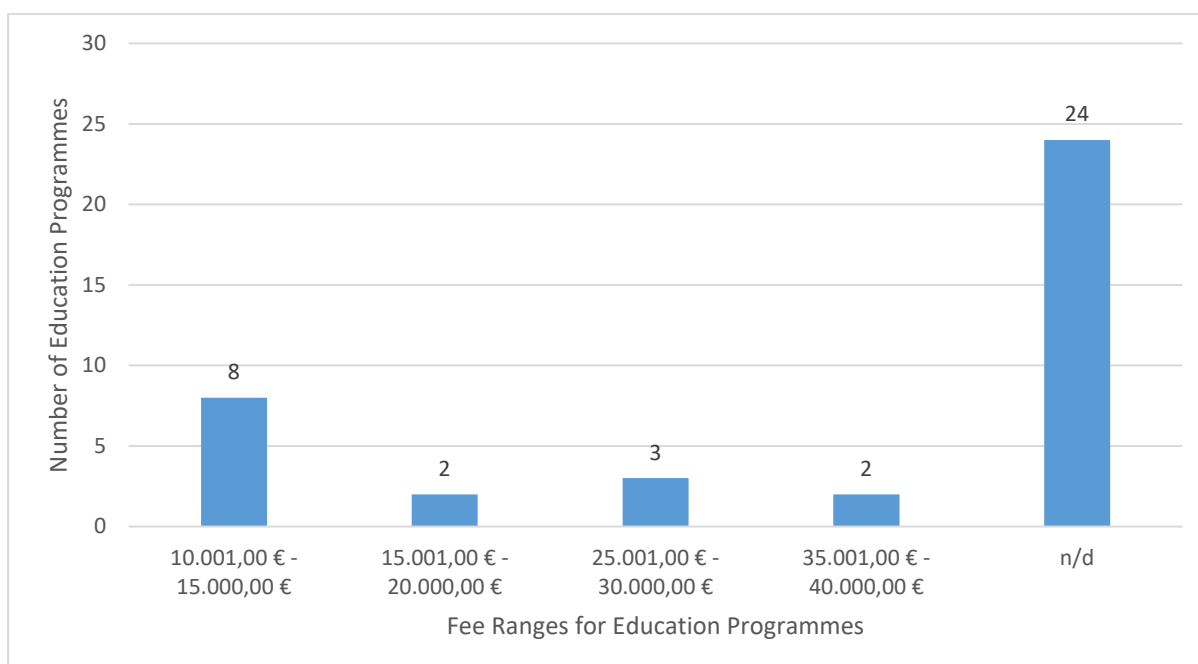


Figure 16 Fee Ranges for Training Programmes in non-EU countries (n/d= no data)

The figures show that for many training programmes the overall costs were not available online (desk research).

3.5 Teaching method

For this criterion, there are the following explicit values:

- on-campus
- face-to-face
- distance
- blended
- theory
- practice

The desk research results show that there is no clear distinction between the criteria face-to-face and on-campus. Perhaps face-to-face is more tutoring than teaching. Therefore, further analysis of the data evaluates the two criteria under on-campus, suggesting that on-campus and face-to-face is the same – since there are no tutoring education programmes. Single teachers inside the education programmes do tutoring.

The distinction between theory and practice is also irrelevant when surveying teaching methods since teaching generally always consists of theory and practice components. For P&O education, a training programme must use both – theory and practice.

An excerpt from the data table illustrates this in detail:

2000 €/per course/per student
Blended
campus-based, full time
Classroom taught (face to face and remotely) + internship 1500 hours
did not say but think onsite / no mention of online
face to face
full or part-time, on-campus
full time on-campus
full time, campus
full time, face-to-face
full time, face-to-face, on-campus
full time, on-campus
full time, on-campus, also part-time
in person
Mainly full-time contact teaching
Master Course Prosthetics & Orthotics: on-campus, distance & visits to local clinical centres
Master: on-campus & e-study system with online lectures and seminars
Master: on-campus, face-to-face
mix
On-campus
on-campus and 11 weeks of work placement, spread over the two years
on-campus and 27 weeks of training

PROMOTE – Stocktaking Report Output

on-campus or by 36 months apprenticeship
on-campus, face-to-face
On-campus, face-to-face
On-campus, face-to-face, laboratories
on-campus, face-to-face, practise
On-campus, face-to-face, theory, practise
on-campus, full-time
on-campus, inclusive and accessible teaching
on-campus, industrial placements in years 3 & 4

After reducing the criteria for the analysis, blended-learning and on-campus remain as differentiation criteria of the data. Graham (2006) defines blended learning as follows: “Blended learning systems combine face-to-face instruction with computer-mediated instruction, thus online instruction or learning. ” (p.5)³. The term combines fully online training programmes and partly on-campus and partly online teaching methods.

This yields the following results for the desk research, shown as figures:

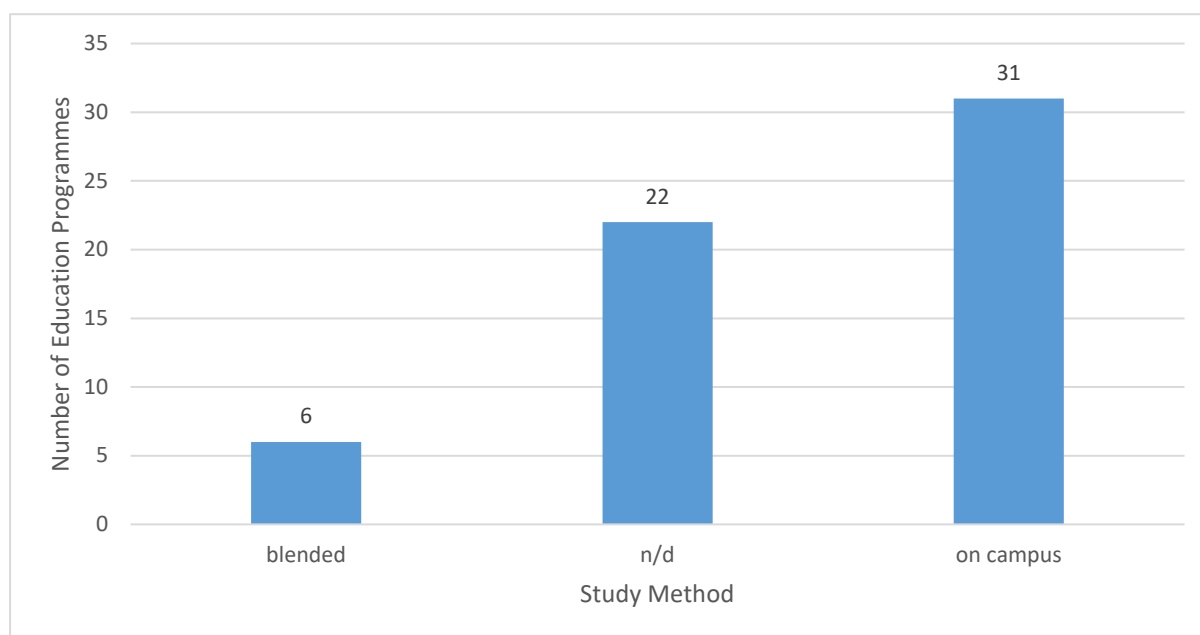


Figure 17 Study Methods of Training Programmes in the EU

³ Graham, C. R. (2009). Blended learning models. In *Encyclopedia of Information Science and Technology* (Second Edition ed., pp. 375–382): IGI Global.

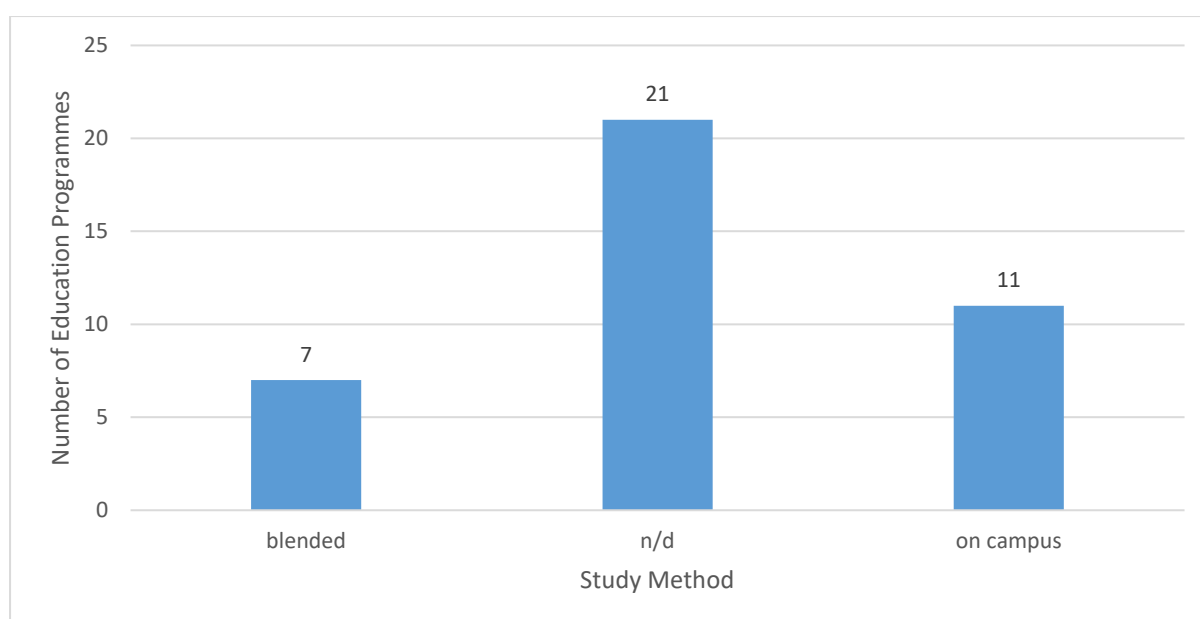


Figure 18 Study Methods of Training Programmes in non-EU countries

3.6 Performance recording and graduation degree (ECTS)

Within Europe, the award of so-called ECTS credits enables an assessment of the required amount of learning (based on defined learning objectives) and the associated workload (measured in hours). This rewarding of the services rendered, mainly used by universities in the European Higher Education Area, make the students' services comparable. For the Graduation Degrees, this research project uses European university degrees such as B.Sc., M.Sc. and PhD as well as the APO (Associate Prosthetist/Orthotist) certificate of the International Society of Prosthetics and Orthotics (ISPO).

The following data covers EU and non-EU countries. This research covers 60 EU countries and 39 non-EU countries.

No ECTS credits are issued for the completion of traditional craft training courses; there are no values available. The analysis of the APO category of education shows that we have one training programme equivalent to 90 ECTS (Human Study e.V. BDLE programme with Bangkok Mahidol University) and two programmes that don't provide data about ECTS.

The following chart shows the number of ECTS credits for B.Sc. graduation in the EU:

PROMOTE – Stocktaking Report Output

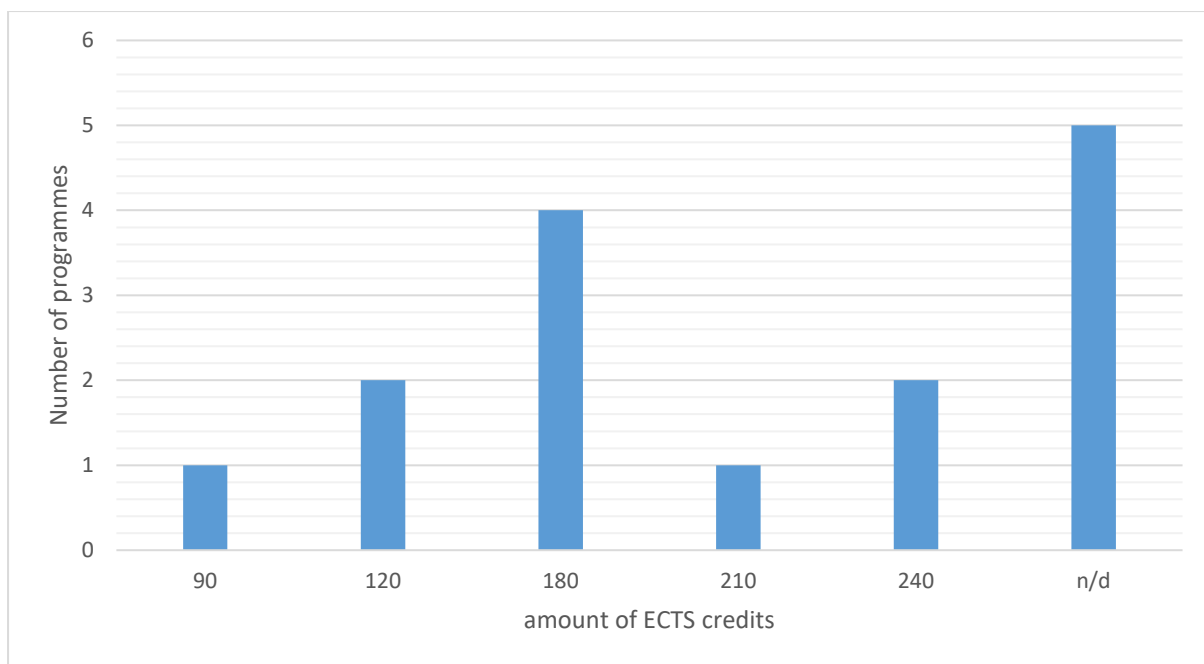


Figure 19 Number of ECTS credits for B.Sc. graduation

In accordance with the Bologna Process (the Europe-wide standardization of study programmes and degrees), higher education programmes at level 1- Bachelor qualification are generally designed with 180-240 ECTS credits, the further qualifying Master's programmes with 60-120 ECTS credits. For the Master's degree programmes, the data analysis yields the following values:

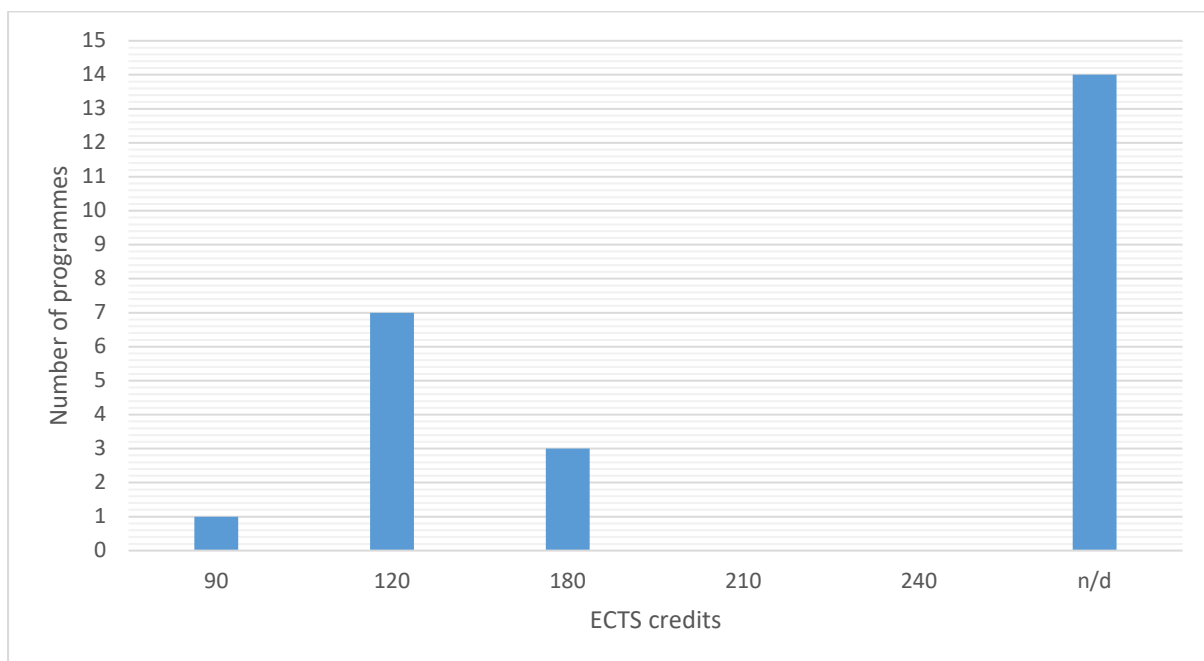


Figure 20 Number of ECTS credits for M.Sc. graduation

The research shows only one EU and one non-EU programme for the PhD. The PhD study programme in the EU is offered at the University Sant'Anna in Pisa (Italy), and provides graduated students with 180 ECTS. In the UK, there is one PhD programme – Centre for Doctoral Training in prosthetics and orthotics, including four institutions: Salford University; Imperial College London; Strathclyde University; Southampton University.

It is impossible to find out all the information about ECTS credits of training programmes based on desk research alone. Thus, the aim is to obtain more detailed information for academic training programmes in orthopaedic technology through further investigation using surveys, interviews or similar.

3.7 Medium of instruction

In Europe, P&O training programmes use different teaching languages. The following figures show the proportion of training programmes that, firstly, use the local language for teaching as well as secondly, programmes that use English as a global language of communication and thus provide international education and thirdly, programmes that teach multi-lingually. For 37 training programmes, the study doesn't give any information about the teaching language used.

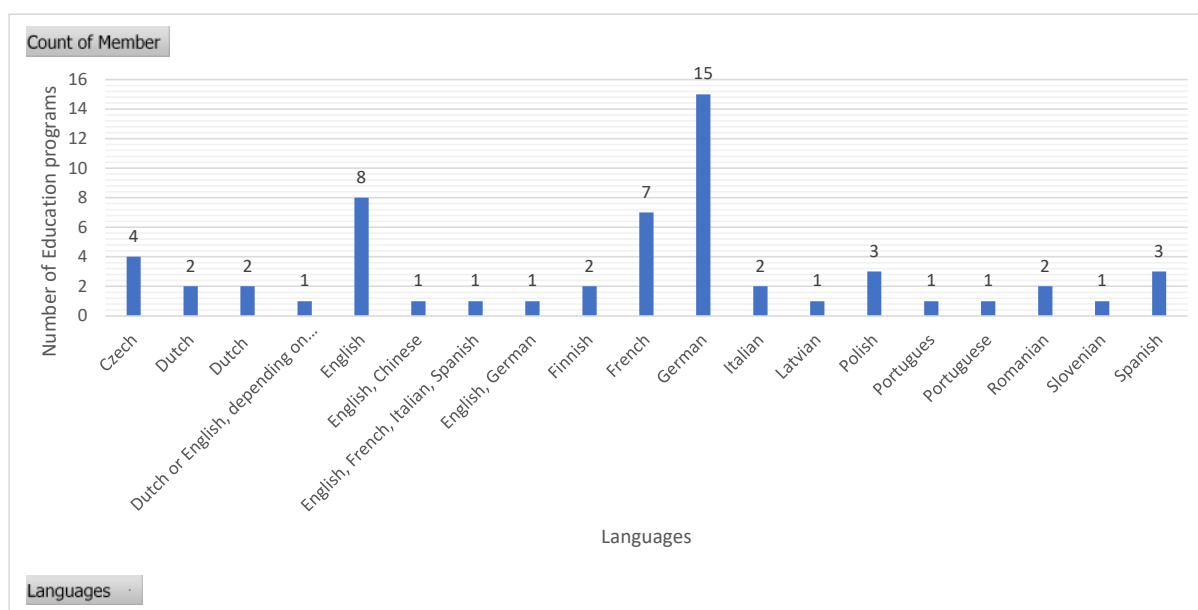


Figure 21 Overview of teaching languages in EU countries (local languages, bilingual and multilingual), (n/d=no data available)

PROMOTE – Stocktaking Report Output

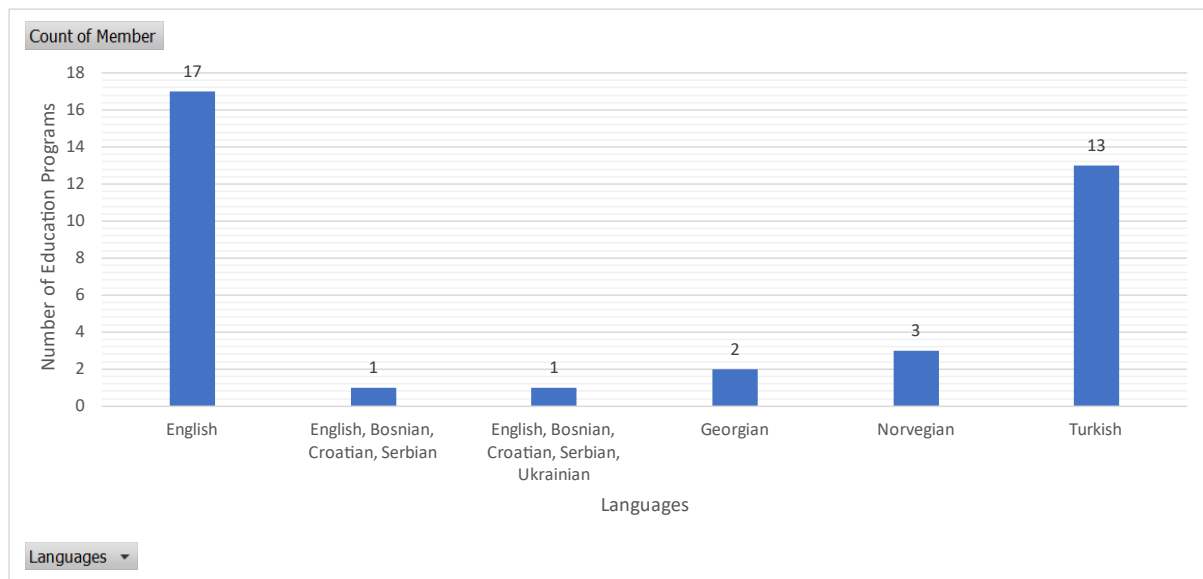


Figure 22 Overview of teaching languages in non-EU countries (local languages and multilingual) (n/d=no data available)

The data revealed that most training programmes take place in their national language, but there are three multilingual qualification programmes within the EU. Here, English is one of the languages.

3.8 Maximal number of participants, number and qualification of teaching staff

The desk research doesn't provide enough data to analyse all three criteria. However, based on the data collected, it was possible to develop a meaningful pre-structuring of the requirements for a subsequent survey to facilitate the data analysis.

The desk research shows proper ranges for the criteria "Maximal Number of Participants":

- less than 10
- 10 – 20
- 20 – 30
- 30+

For the criteria "Number of teaching staff" has been noticed through an initial review of the existing data that particularly in the case of training programmes in Technical Orthopedics, where a large proportion of the teaching is practical, it is important to make a distinction between lecturers for the practical teaching content (responsible lecturers or support staff), lecturers for the theoretical teaching, and professors for the scientific orientation of the training programme. For this purpose, the following criteria can be defined, which will be used for a subsequent survey:

- responsible teachers for practice- Orthopedic technician with qualification (for example ISPO Prosthetist/Orthotist)
- supporting teachers for practical teaching
- Professors
- Lecturers for the theoretical subjects

4. Descriptive analysis of the main data group: section “prerequisites”

This group of programme criteria deals with important prerequisites for successful enrollment or admission to a training programme, i.e. how many ECTS credits from a bachelor's or master's degree programme are required for further qualification or what previous individual experience must an interested party bring with him/her. These are essential criteria for evaluating permeability between different training programmes in P&O.

This section has the following fields:

ECTS
Test/exam
Experience
N.C./performance

4.1 ECTS (European Credit Transfer System)

This should be the field that will represent ECTS credits that potential applicants need to have to be admitted to a specific training programme. After the research, it turned out that the collected data could only be analyzed by reformatting it.

This field makes sense for certified programmes that enable the upgrade of the current level of education. This means from level APO up to B.Sc. level, from B.Sc. level to M.Sc. level and from M.Sc. level to PhD. When analyzing the data, it is important to bear in mind that the ECTS currency is used as validity for academic education programmes or industry upgrade courses, but not for entry into traditional education and training (VET), where individual skills and grades from school-leaving certificates apply.

To analyze the data, we checked the numeric values present. Here is an example of how this should be organized:

- Regular B.Sc. – 240 (for non-VET upgrade programmes)
- APO >> B.Sc. – 120 (for VET upgrades from APO to B.Sc.)
- B.Sc. >> M.Sc. – 120 (for non-VET and VET upgrade programmes)
- M.Sc. >> PHD – 120+ (for both groups)

In short, this field will depend on the level of education offered for the participants and in the previous example, we should have three ranges to provide in the survey:

- 80 – 120
- 120 – 180
- 180 – 240
- 240+

It must be considered what is acceptable under Bologna rules or other rules that apply. Current data was analyzed here even though only 20% of programmes fill it in, giving us some guidelines for further research. Here is a general overview of the distribution of ECTS credits in the desk research collected data.

Table 1: Overview of ECTS credits required to start an education programme in the EU

Level	90	120	180	210	240	n/d	Total
VET						18	18
APO						2	2
BSc.		2	5	1	2	5	15
MSc.	1	7	3			14	25
PhD			1			1	2
N/A			1			34	35
Total	1	9	10	1	2	74	97
	Non-Academic Programs						

The preceding table for a total of 97 training programmes does not contain any information on the ECTS credits an applicant needs for successful admission to the programme for 74 programmes. The Bologna guidelines only apply to academic training programmes, so it makes sense that no data on required ECTS credits can be found for 20 VET and APO training programmes. In the total of 42 academic programmes found, 35 programmes do not have any information about required ECTS credits. With 50% of missing data on this criterion, the aim is to achieve a better quality of data through closer cooperation of training providers in the EU.

4.2 Entry test/exam

This field can be applied for all kinds of education, and it should be a very simple field that will be checked or unchecked –to clarify if there are any pre-evaluation tests or pre-evaluation exams. The current table shows some programmes that have “X” as field content, but also a lot of other entries that are descriptive ones. We take descriptive ones and make checks that were obvious from descriptive entries. Even we do so, we still have a vast amount of missing data about this criterion. Here is the ratio between education programmes with entry test/exam and those without/or without any information.

Responds	Education programs
Have exam	28
No data	66

The analysis shows that the data does not allow a distinction in this criterion between "there was no apparent information about an entrance test during the research based on information from homepages alone" or "the schools do not conduct entrance tests". In this case, the data so far does not yield any evaluable results and a collection of more detailed data through surveys or interviews is necessary.

4.3 Experience

The criterion “experience” aims at entry prerequisites in terms of practical experience. It is essential for all education and training programmes, be it traditional training programmes or academic degree programmes. Depending on the level of education and training, the requirements for the individual applicant can be particular.

The analysis reports a vast amount of different descriptive and specific answers to this question. In chapter 5, on the assessment of permeabilities between different levels of education, this criterion plays an important role. For further statistical evaluation of this criterion, the project group needs further data as well as a meaningful structuring of the same. The following possibilities would arise: Depending on the requirement for this query criterion, new subcategories must be added to the query so that the criterion can be evaluated in a meaningful way.

- If we just want to have information if there are any prerequisites, then a simple check-box is enough.
- If we want to know the specific prerequisites, then we should make check-box lists for the most frequently mentioned experiences, and we have to do that for every level of education. Here is an example for upgrading the VET course (APO >> B.Sc.):

☐ ISPO Cat II Certificate ☐ High school diploma ☐ five years of practical experience

☐ Other _____

Thus, a restructuring of the data table with the help of checkboxes would be necessary for every single level of education (VET, B.Sc., M.Sc., PhD). Furthermore, it is conceivable that a data collection through previously structured criteria nevertheless does not show a uniform picture for the subsequent permeability assessment. A look into the industry sector reveals different handlings between schools.

4.4 Numerous clauses (NC)/Performance

This criterion is rather applicable to those persons starting to study P&O and whom we ask for the level of their previous education. For example, the NC is a popular entry criterion for academic programmes (bachelor's degree). Performance can be another prerequisite criterion. In some VET programmes, the schools check the manual skills of potential candidates in advance. Here, additionally achieved industry certificates (e.g. regarding specific products or production processes) can also be helpful. Also, for academic training programmes, there are often performance-related criteria in addition to the NC, like evidence of scientific working in forms of publications, congress presentations and posters or presentations about own research questions for the Master or PhD level. There is not yet enough data available for a meaningful statistical evaluation. If other data sets could be collected, it is necessary to enter this criterion in the two different checkboxes: NC and Performance, to achieve meaningful results. Furthermore, we could also subdivide the item "Performance" into more descriptive categories.

4.5 Schematic flowchart of prerequisites conditions in a logical order

Based on the initial acquired data from the desk research, our project members created an initial flowchart of the formal requirements for permeability between P&O training programmes in the EU. This presentation is to be confirmed and, if necessary, expanded in the further course of the project by collecting additional data on access requirements for individual training programmes.

PROMOTE – Stocktaking Report Output

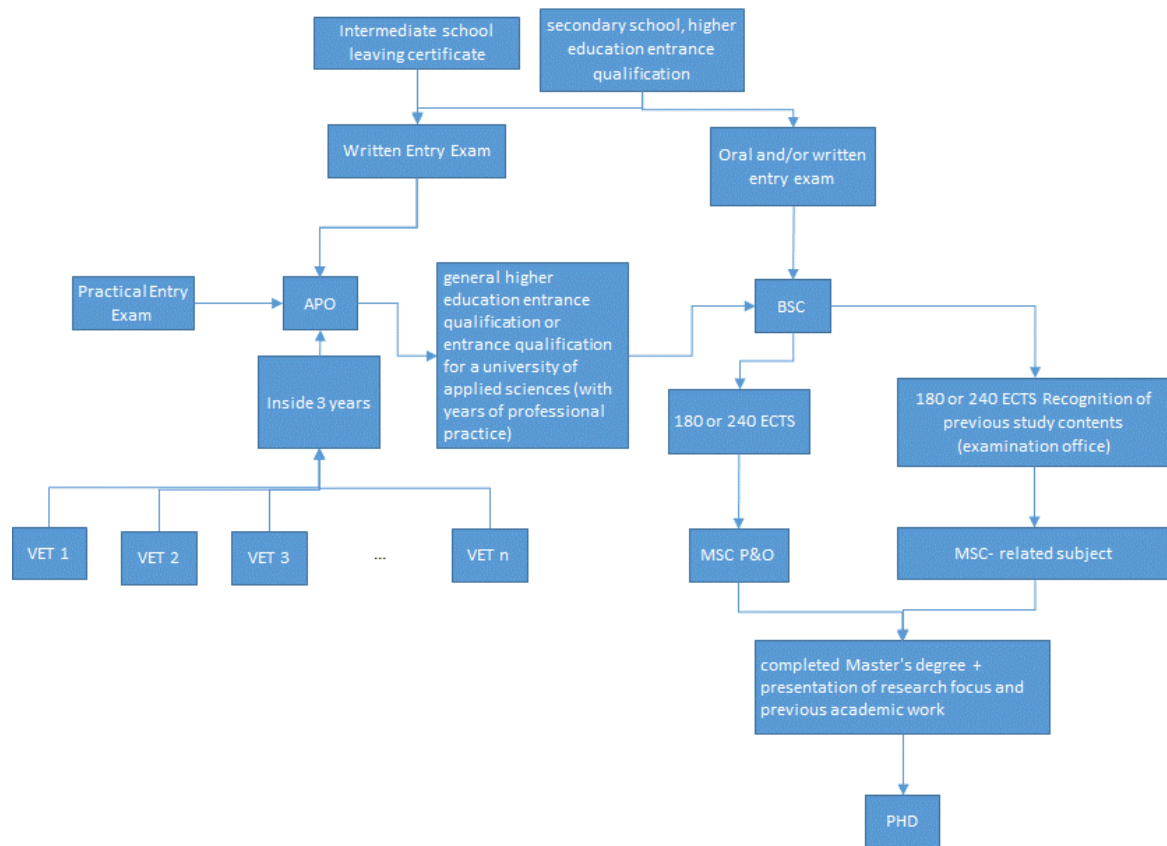


Figure 34 Schematic flowchart of prerequisites conditions in a logical order (state 2021/04)

The following table shows how this schematic overview is transferred into check-boxes, which can be used in further surveys and interviews.

- | |
|--|
| <input type="checkbox"/> High school N.C./performance |
| <input type="checkbox"/> Entry Exam |
| <input type="checkbox"/> Written |
| <input type="checkbox"/> Oral |
| <input type="checkbox"/> Practice |
| <input type="checkbox"/> VETs – up to 3 months training with proof of clinical experience (completed in 3-5 years) |
| <input type="checkbox"/> VET I (name of specific training – for example, “theory and practice of TT prosthetics”) |
| <input type="checkbox"/> VET II |
| <input type="checkbox"/> VET III |
| <input type="checkbox"/> ... |
| <input type="checkbox"/> VET N |
| <input type="checkbox"/> Associate Prosthetist/Orthotist (APO) |
| <input type="checkbox"/> General higher education entrance qualification |
| <input type="checkbox"/> Entrance qualification for a university of applied science |
| <input type="checkbox"/> X years of professional practice |
| <input type="checkbox"/> P&O Bachelor in Science (B.Sc.) |
| <input type="checkbox"/> ECTS >= 180 and <=240 |
| <input type="checkbox"/> M.Sc. related subjects |
| <input type="checkbox"/> P&O Master of Science (M.Sc.) |
| <input type="checkbox"/> ECTS >= 240 |
| <input type="checkbox"/> Presentation of research focus |

- ☐ Previous academic work
 - ☐ Doctoral degree in P&O (PhD)
-

So, to become an APO, future students should satisfy one or more conditions depending on their current status. If they just finished high school, they will need to have satisfactory high school grades/performance to pass a written entrance exam and potentially an interview that is called an oral entry exam in the table.

If they already work and want to upgrade to the APO level, they will have to present credits of the particular VET courses they passed and do both a written exam and a practical exam.

After completing the APO educational programme, conditions for the B.Sc. will again be the entry exam and APO degree with a certain minimum number of ECTS credits. For the regular students coming from high school, it should also be possible to qualify for B.Sc. directly after having cleared the entry exams.

Similar conditions can be defined for M.Sc. and PhD too, which is also present in the schema and table.

5. Illustration of permeability between the individual forms of training in the sector

5.1 Permeability of VET to B.Sc.

General entry requirements for the Bachelor's degree programmes are the High School Diploma after 12 years of schooling, the higher education entrance qualification after 13 years (Germany) or university of applied sciences entrance qualification plus vocational training in P&O (specifically for Germany). Just by collecting the data from the individual homepages of the universities, based on the reported entry requirements, it is impossible to see whether graduates of the VET programmes also meet the entry requirements - unless the graduates of VET programmes already fulfil the general higher education entrance qualification. For instance, in Germany, orthopaedic technicians have to prove three years of professional experience to be admitted to the Orhtobionics study programme. The experience of PFH Göttingen shows that these students have to catch up on the subject matter of general school subjects: mathematics, physics, biology, chemistry, especially in the first semesters, but have an advantage in practical teaching. Here, however, graduates of vocational training programmes without the general higher education entrance qualification can be well integrated. In summary, the permeability of the VET programmes (upgrade to Associate Prosthetist/Orthotist) can be achieved through distance learning programmes via Human Study, for which the traditional training programmes of the individual EU countries would have to be standardized and assessed in terms of level. To evaluate further access for working Associate Prosthetists/Orthotists to existing university bachelor's degree programmes, the individual universities must be asked about country-specific university entrance qualifications.

In addition to the entry criteria, it can be stated that the majority of Bachelor's degree programmes at the EU are full-time programmes. In order to give Associate Prosthetists & Orthotists the opportunity to study and thereby further qualify as a Prosthetist/Orthotist without interrupting their work career for at least three years, a coupled study programme consisting of distance learning modules, recognition of practical patient care fittings in the on-site orthopaedic workshops as well as practical teaching modules at the universities (divided into full-time attendance time blocks) would be necessary. Metropolia University of Applied Sciences in Finland offers a hybrid Bachelor's degree programme. The curriculum shows that all theoretical subject-related and preparatory study contents for practice are completed through online learning. Human Study also offers a blended learning

programme for the Professional Prosthetist/Orthotist level. Here a pure distance learning programme does not appear to be effective in meeting the general professional qualifications of a Prosthetist/Orthotist. Individual patient fittings of the highest scientific standard must be learned and implemented in practice. In order to improve the functional understanding of modern prosthetics and orthotics, the learning content of classical scientific subjects such as biomechanics, medicine and engineering should be applied in parallel to the practical subjects of patient care. Specifically, for Germany, it can be seen that here are two master crafts training programmes which are ISPO certified on the level Prosthetist/Orthotist (Bundesinnungsverband für Orthopädietechnik, Meisterschule München). To offer to the German masters the opportunity for further development, an academic bridging programme would have to be developed covering the scientific subject areas as blended learning modules and including independent scientific examination performance (Bachelor's thesis).

The search revealed five international Bachelor's degree programmes with English as the language of instruction (University Strathclyde, University Salford –UK, Thomas More –Belgium, Jönköping – Sweden and Ignatius Loyola College, Lithuania). All others use the country's official languages. In terms of study contents, it would be desirable in the EU for Bachelor's degree programmes to be comparable (EU standardization of programmes). This would allow more student exchanges options and guarantee internship opportunities. Besides a certain equivalence of the different EU Bachelor programmes, the study programmes must be tailored to the individual countries needs due to regulatory requirements and specific conditions in the respective EU countries. The Helsinki Metropolia University is part of the international Socrates exchange programme, so students have to go abroad for study exchange lasting between 3 months and one year. Their partners in Europe are the University of Salford in UK and Escola Superior de Tecnologia da Saúde de Lisboa in Lisbon, Portugal. In addition, they offer a special international semester for incoming exchange students with course material and teaching in English (duration four months - 30 ECTS).

In comparison, the EU Bachelor's degree programmes differ in terms of study content. These differences are mostly related to country-specific circumstances but are also chosen for time, practical or future-oriented reasons. The majority of Bachelor's programmes deal with the entire spectrum of technical orthopaedics (prosthetics and orthotics) in theory and practice; two Bachelor's programmes only deal with orthotics (Thomas More Kempen - Belgium and Eastern Mediterranean University-Cyprus). Due to the increasing complexity of orthopaedic technical aids and the associated necessary scientific knowledge for high-quality patient care with these products, the specialization of the Bachelor's programmes was preferred at the Thomas More University. It can be assumed that in the future, it is becoming increasingly difficult to keep up with the progress in both types of professions, Prosthetics and Orthotics, theoretically as well as practically.

5.2 Permeability of B.Sc. to M.Sc.

Looking at the permeability of the Bachelor's to the Master's programmes in Technical Orthopedics, the Bachelor's programmes also differ in the proportion of independent scientific practice, i.e. the teaching of the first basics of scientific work. As the analysis of the found curricula of the individual study programmes show, some universities have integrated courses on scientific work and initial projects, for example in biomechanics, thus promoting the students' interest in research and development in the industry and in pursuing an academic career (for example Thomas More University Belgium, PFH Göttingen Germany, Metropolitan University Finland, Ignatius Loyola College, Lithuania, University of Strathclyde UK). In addition, some study programmes have included innovative topics of the industry such as Robotic Engineering, Neuroprosthetics and Neuroorthotics, Signal Processing and Analysis (Biomedical Signals), Human-Machine Interface, Public and Global Health, and many more as

part of the curriculum. Business management content, modules on instructor aptitude and psychological study contents (patient management) are also not found in every Bachelor's degree programme. In order to internationalize the academic training programmes, it was checked whether modules of the English language, especially technical and scientific English, are available in the curricula of the Bachelor's programmes that teach in the typical language of the country. Modules in English, Technical English and Scientific English were found in the curricula of two Bachelor's degree programmes (PFH Göttingen, Metropolia University Helsinki).

The search revealed 14 Master's programmes in the EU and 12 additional master's degree programmes in the UK. Bachelor's graduates in Technical Orthopedics can choose from various Master's programmes within the EU and can inquire about their personal suitability to study at these universities. Furthermore, the research revealed that it is not easy for bachelor graduates to find possible Master's programmes in the EU. Adequate google research requires various keywords such as Biomechanics, Biomedical Engineering, Health Care, Rehabilitation, Human Motion Analysis, Physical Activity, Performance Science, Health Science. The research so far already shows a colourful bouquet of different EU Master's degree programmes with different emphases. It is evident that it will be difficult to compile an all-encompassing list. Within the EU, there are many seemingly good and advanced master's programmes that, despite different study focuses, directly relate to modern patient care in Technical Orthopedics- here, especially to the science and further development of orthopaedic devices. According to individual wishes and needs, Master's programmes offer either more theoretical study content, which is very progressive and scientifically oriented or rather practically oriented programmes, that work scientifically to generate applications and solutions to clinically relevant problems with real patient cases (Uni Strathclyde, UCL, Uni Dundee & Uni South Hampton-United Kingdom, PFH Göttingen Germany, FH Dortmund Germany, Uni Riga-Latvia, Fontys University-Netherlands, Jönköping Uni Sweden). Thematically, however, it seems difficult to find a Master's degree programme in the sector that combines advanced theoretical study contents with practical ones and thus always teaches at the interface to practice patient care. Or the international orientation of the Master's degree programme is missing in the language of instruction (the study programme takes place in the country-specific language only). For example, the PFH's Master's programme in "Medical Orthobionics" already teaches advanced study content at the interface of orthopaedic technology, medicine and patient care but takes place exclusively in German. However, such an internationally and in terms of content targeted Master's programme would be essential for a subsequent professional activity of the graduates in the field of research and development in Technical Orthopedics. The entry requirements of the individual Master's degree programmes result in at least a Bachelor's degree with 180 ECTS credits. The entry requirements for the Master's programme in "Medical Orthobionics" at the PFH Göttingen are 240 ECTS credits. Thus, bachelor's graduates in the EU, who want to pursue this advanced master course with a practical and scientific focus on direct patient care with modern prostheses and orthoses, often have problems regarding the admission criteria. In terms of content, there are also deficits for a smooth transition from the bachelor's degree to the master's degree programmes offered, especially for external applicants from other universities, due to the different content focuses of the bachelor's degree programmes.

There is a flexible Master's programme at UCL London (120 or 180 or 240 ETSC). For practically oriented Master's programmes (close to patient care in Technical Orthopedics), a Bachelor Prosthetics & Orthotics or a Bachelor of Motor Rehabilitation to be found in the entry requirements, sometimes with employment in a supply company as an additional prerequisite (Netherlands, Fontys University). Otherwise, the majority of courses must be equivalent in terms of subject matter (for example a recognition procedure for courses from movement science - crucial here is a good basic knowledge of biomechanics). Here, individual admission takes place via the examination offices of the universities.

Due to the different focus of the Bachelor's and Master's degree programmes in the EU, this is common practice for admission. For Bachelor's graduates with 240 ECTS points, there is sometimes the possibility of having some course content from the Bachelor's formally recognized for the Master's in addition to admission to a Master's programme (PFH Göttingen: Biomechanics study courses were recognized upon admission to a Master's programme in Biomechanics, Biomedical Engineering). Particularly in the case of the rather engineering-based but very innovative Master's degree programmes with a clear connection to Technical Orthopedics, it would make sense to ask the individual universities for a general assessment of the admission eligibility for Bachelor's graduates from Technical Orthopedics. Furthermore, the research makes it clear that advanced, practice-oriented Master's programmes often do not admit Bachelor's graduates from related health professions or cannot create the appropriate conditions to prepare these professional groups for a successful start to their studies. To promote interdisciplinary patient care in orthotics and prosthetics for the benefit of the patient, a joint Master's programme for all disciplines involved in care would be necessary. In addition, by admitting Bachelor's graduates from other health care professions, but with adequate preparation in terms of content through bridge courses held beforehand, more specialists can be recruited for the technical orthopaedics sector and thus the shortage of specialists can be counteracted.

The Master degree programmes in the EU that we have listed also show differences in the degree of scientificity. There are mainly scientifically oriented Master's programmes where students work on an actual medical-engineering project in the departments. These projects are driven by real clinical needs, and students are given the opportunity to publish their results. These projects are accompanied by courses in advanced research methodology (PFH Göttingen Germany, University Strathclyde, Riga Stradins University Latvia, UCL London).

5.3 Permeability of M.Sc. to PhD

A previous scientific experience like publications, special awards, scientific collaboration on the project is particularly welcome when taking up a PhD programme. The Master's programmes are mainly in English, except in Austria and Germany, so the internationality is given. Internationally oriented Master's programmes offer compulsory study semesters at other EU universities (through cooperations) as well as multicultural designed teaching content and lecturers (KU Leuven, Uni Strathclyde, Uni Riga-Latvia, Fontys University-Netherlands). A major problem with Master's programmes is their design as full-time courses with a duration of one to two years. Bachelor's graduates in the sector should have the opportunity to go seamlessly into clinical patient care and still be able to gain further qualifications by studying at the same time. This is especially important in countries with a shortage of skilled workers in medical professions such as orthopaedic technology.

Furthermore, it ensures the practical relevance of research projects directly on patients. Such a progressive Master's programme should therefore create the opportunity to work and study. The University of Riga in Latvia offers the flexibility to study on-campus with distance learning courses via an e-study system (online lectures and seminars) or to study part-time. Part-time study opportunities are also available at the University of Dundee, UCL London, Strathclyde University and the University of South Hampton. Some universities offer an interesting possibility since they provide students with a large selection of modules from which students can flexibly compile their own curriculum (according to need and interest). However, in order to make it practically possible to study alongside one's job, a Master's degree programme is necessary that deals with the theoretical study content exclusively via distance learning modules and provides practical content such as presentations of scientific projects,

handling of special software, presentation of innovative products or technologies in blocked in-class courses.

In order to pursue a scientific career to develop the sector scientifically, the survey also included a search for possible PhD programmes. Two PhD programmes were found, one at the BioRobotics Institute, Scuola Superiore Sant'Anna in Italy and one at the Centre for Doctoral Training in Prosthetics and Orthotics in the UK. The PhD programme BioRobotics has a duration of 3 years, the PhD programme of the EPSRC Centre for Doctoral Training in Prosthetics & Orthotics has a duration of 4 years. The PhD programme BioRobotics is a multidisciplinary study programme and has therefore not limited its entry requirements to mathematical-engineering master's graduates. Especially for Master graduates focusing on technical orthopaedics, there are working groups on prosthetics and therapeutic robotics at the institute. When applying, the selection procedure takes place according to terms of Master's degree score and curriculum (any previous experience is valuable, especially publications, awards, summer schools, internships, etc.). In addition, applicants are requested to present a plan of research that is evaluated in terms of novelty and scientific soundness. The EPSRC Centre for Doctoral Training in Prosthetics and Orthotics combines leading experts from the University of Salford, Imperial College London, the University of Strathclyde and the Uni Southampton and, in addition, 25 global industry partners. In the first year, students undergo a training that includes a series of taught modules, a short project and a clinical and/or industry placement. For the first six months, all students are based at the University of Salford; then they move to their individual host institution. This PhD programme also brings together students from diverse scientific backgrounds. The EPSRC offers a wide range of research topics in the fields of prosthetics and orthotics. As part of the selection process, the strength of the whole application is taken into account, including academic qualifications, personal statement, CV and references.

This first summary of the individual permeabilities raises the following questions for further data research.

- Are there really no training programmes in P&O in some EU countries where the table does not yet show anything? A possible enquiry with the state governments, health organizations of the individual states or the BiBB could provide certainty here.
- What opportunities are there for APO staff (qualified VET personnel) to be admitted to a Bachelor's degree programme? In order to be able to make an assessment here, it is necessary to enquire at the individual universities whether there are possibilities for university admission. The conditions for possible enrolment could also be enquired about in more detail.
- For Master's degree programmes without direct designation of the Bachelor's in Technical Orthopedics in their entry requirements, a general assessment of the entrance qualification for Bachelor's graduates from Technical Orthopedics could be requested (to complete our list). Further, you could also ask whether the universities would include the Bachelor's degree courses in Technical Orthopedics directly in their formal entry requirements
- In order to better assess the competencies taught in the individual Bachelor's and Master's programmes, curricula, as well as module contents, should be requested from those programmes where they are missing
- Furthermore, it would be helpful to get a better overview of the student numbers. Do the universities receive sufficient applications for their individual degree programmes? Or are there too few suitable applicants due to the entry requirements of the degree programmes? For

example, with the Master's degree programmes: We have no idea whether the universities are filling their courses here and if not, what the reason is.

6. Survey

When the desktop research was finished, the PROMOTE team prepared a survey. This was distributed to educational institutions all around Europe to collect some additional data and to improve the quality of the desktop research data.

The first survey requires an introduction of the whole project with an explanation of the goals in order to generate a basic willingness of the schools to cooperate. Therefore, the first survey is only about asking general questions—for instance, basic information about educational programmes and problems that educational institutions have in their activities. The following subchapter describes the general structure of the survey as a list.

6.1 Survey structure

The online survey tool LimeSurvey from LimeSurvey GmbH (www.limesurvey.org/de/) was used to create the survey. Once the survey was online, we sent an invitation to each educational institution on our list, which was the result of our desk research. The survey contains the following formulated questions:

- Name of institution
- Department
- Country
- What kind of education programmes do you offer? (VET, B.Sc., M.Sc., PhD, CPD, Other)
- Details of all educational programmes they have
 - Title of the course
 - ECTS
 - Language
 - Duration (semesters)
 - Students per year
 - Website URL
- Do your applicants face any problems regarding enrolment? (Multiple answers possible)
 - Admission criteria (e.g. lack of ECTS)
 - Lack of specific knowledge (medical, technical, ...)
 - High tuition fee
 - A limited number of study spots
 - Language
 - No enrolment problems
 - Other _____
- Would you like your programme to be included on the PROMOTE Data list?
 - Yes
 - No
- Would your (prospective) students benefit from our PROMOTE bridging courses to overcome knowledge/competence or ECTS gaps?
 - No, we ourselves offer bridging courses in accordance with our needs
 - Yes, this would help us (e.g. to recruit more students)
 - Not applicable

- Comment _____
- What topics & skills should be covered/taught in the scope of our bridging courses? (Multiple answers possible)
 - manufacturing skills
 - digital skills (digital measurement, 3D printing, sensor technologies, ...)
 - evidence-based practice
 - Business administration
 - Material science
 - Biomechanics
 - Practical patient care
 - Public health system (MDR)
 - product regulations & law
 - Soft (social) skills (communication, presentation, knowledge transferring, active listening ...)
 - Other _____

At the end, the survey asked them if they want to be informed about our activity updates.

6.2 Survey analysis

6.2.1 Location

We received only nine responses on the survey from four EU countries. Three surveys come from Germany, two from Italy, and one from Latvia, Spain, Slovenia and Sweden. Institutions that send surveys back are:

- PFH Private Hochschule Göttingen – Germany – B.Sc. Orthobionics
- Riga Stradins university – Latvia – B.Sc. Orthotics & Prosthetics
- University of Bologna – Italy – Health profession education
- OttoBock International P&O School – Germany – APO training course
- University of Bologna (Delta of Orthopedics department) – Italy – B.Sc. Orthopaedics Techniques
- Jönköping University – Sweden – B.Sc. Prosthetics and Orthotics
- Human Study School of Rehabilitation Sciences – Germany – VET
- University Rehabilitation Institute Republic of Slovenia - Center for orthotics and prosthetics – Slovenia – B.Sc. Orthotics & Prosthetics
- CIPFP AUSIAS MARCH – HEALTH – Spain – VET

6.2.2 Characteristics of education programmes

Most training programmes offer practically oriented teaching/training in Technical Orthopedics (Prosthetics and Orthotics) for patient care (7 of them), and one programme is a single discipline programme of Lower Limb Prosthetics (OttoBock International P&O School). Spain VET is about the design of the functional prosthesis.

Two training programmes bear 240 ECTS (PFH and Riga Standins University), three of them bear 180 ECTS (Bologna University and its Department Delta of Orthotics, and Jönköping University). OttoBock International P&O School is an ISPO certified continuing education programme without ECTS conception. The Human Study VET and APO certified programme bear an equivalent of 74 ECTS.

Slovenian rehabilitation institute put a question mark in the field for ECTS, and CIPFP AUSIAS MARCH indicated eight ECTS points.

There are two multi-lingual schools: Human Study School of Rehabilitation Sciences (English, French, Ukrainian, Bosnian/Croatian/Serbian) and University Rehabilitation Institute Republic of Slovenia (Slovenian/English). Furthermore, there are two more schools in English language (OttoBock and Jönköping University). Meanwhile the Italian, Latvian and German (Private Hochschule Göttingen) schools use their local languages (Italian, Latvian, German).

Schools with the most ECTS (PFH and Riga Standins University) have eight-semester programmes, Bologna and Jönköping University programmes have six semesters. The Human Study VET programme has five semesters, and OttoBock International has 11 months of education. The Slovenian programme is three months, and the Spanish last two semesters. The data of the Spanish school do not show any conformity with the EU guidelines by Bologna, which state that one ECTS point requires a temporal extent of 30 hours. Therefore, these data must be treated as unrealistic.

The PFH enrolls 23 students in their bachelor's degree course per year, the Riga Standins University between five and 18 students, Bologna University and its Delta department enrol 15 students, the Otto Bock P&O school enrolls 12 students, the Jönköping University 38, Human Study between 10 – 20 students, the University Rehabilitation Institute Republic of Slovenia only two students, and CIPFP AUSIAS MARCH a total of 21 students per year.

Only four institutions have more than one studying programme. The PFH and Jönköping University offer M.Sc. programmes too, the Spanish School offers one more VET programme for "Restorations and Metal Structures in Fixed Protheses", and Human Study offers a B.Sc. study programme additionally. Others do not offer any other programmes. The PFH awards for its additional master's degree programme 60 ECTS, the Jönköping University offers an M.Sc. with 120 ECTS, and Human Study has a B.Sc. programme with 126 ECTS, CIPFP AUSIAS MARCH awards 13 ECTS to their additional VET programme.

The Master's programme "Medical Orthobionics" of the PFH has a duration of two semesters and takes place in the national language German. The Jönköping University M.Sc. programme is in English and is finished after four semesters, and the Human Study B.Sc. programme is also in English and has a duration of six semesters. The CIPFP AUSIAS MARCH education programme lasts only one semester. As for the intake capacity of the training courses, the PFH accepts ten candidates in their Master's study programme, the Jönköping University accepts 20 students, the CIPFP AUSIAS MARCH accepts 22 students, and Human Study accepts seven – 20 students.

Only two survey participants mentioned the third programme, too (PFH and Human Study). PFH offers an additional M.Sc. programme for Sports- and Reha-Engineering, which bears 60 ECTS. It is taught exclusively in German language and lasts two semesters. The University can enrol max. ten students. Human Study offers CPD courses named "Specialized Course in P&O" (SCOPE), which is a set of different courses, and participants receive four to six ECTS depending on the course complexity and its duration. It is possible that these courses accept 10 – 15 students. Human Study courses are available in English and Chinese languages.

6.2.3 Applicants' problems

In this section, more than one answer was offered, and it was possible to choose more than one. All answers are given and chosen here. The question was: "Do your applicants face any problems regarding enrolment? (Multiple answers possible.)"

*1st answer was – **Admission criteria (e.g., Lack of ECTS)***

PFH claims such problems since their applicants often lack 60 ECTS to access their Master programmes. Jönköping University expresses the same kind of problem. Bologna University has problems with the entrance examination. Other programme providers do not report any problems with admission criteria.

*2nd answer was – **Lack of specific knowledge (medical, technical, ...)***

Three institutions confirmed having such problems: PFH, University of Bologna and Human Study.

For PFH, the problem is explained with the following observation: "For the seamless transition from B.Sc. to M.Sc. "Medical Orthobionics", applicants often lack a good basic knowledge of business administration, sound scientific biomechanical knowledge, and applied engineering knowledge to understand the operation and research on modern fitting parts as well as modern manufacturing techniques."

The University of Bologna did not give any explanation; they simply claimed facing problems regarding a lack of specific knowledge.

Human Study sees different explanations for each of their three programmes. Firstly, regarding the upgrade programme, a minimum of two years of working experience and an APO certificate are required. Secondly, for APO a minimum of three years of work experience is required. Thirdly, regarding SCOPes, a minimum years of experience is required.

*3rd answer was – **High tuition fee***

PFH and University of Bologna confirmed that high tuition fee is one of their recruitment problems. PFH explains that not every applicant can afford tuition fees of 990 € per month for the Master's course. The rest of the institution did not claim such problems.

*4th answer was – **Limited number of study spots***

Only the University of Bologna confirmed this since they have only 15 study spots.

*5th answer was – **Language***

PFH offers the programmes only in the German language. For Riga Stradiņš University, the problem is similar: the courses are in Latvian, but there is no problem for international students to join in semesters 7 and 8 when clinical practice takes place. And the University of Bologna offers programmes only in the Italian language. In Slovenia, international students are free to attend, but it is usually difficult to follow the course. In Spain, they just claim that they have language problems. Other institutions do not have any problems with language.

*6th answer was – **No enrolment problems***

Only the University of Bologna and OttoBock International P&O School claim to not have enrollment problems.

7th answer gives them the possibility to mention any other reasoning behind problems

Riga Standins University mentioned motivation here as their problem. Mostly poorly motivated students apply, because P&O programme is only their 2nd or 3rd choice.

6.2.4 Cooperation with PROMOTE (ERASMUS+)

In the run-up to the survey, the PROMOTE team created its own homepage for the project with the aim of making the project known in the international industry and exchanging information with other training institutes via this homepage (<https://PROMOTE-po.eu/>).

Nearly all institutions who filled out the survey want to be listed in our publication/web presentation connected with PROMOTE project. Riga Standins even shared their logo with us. The only exception is the Slovenian Institute that does not want to be listed.

When we ask them about – *Would your (prospective) students benefit from our PROMOTE bridging courses to overcome knowledge/competence or ECTS gaps?*

We received the answer “Yes, this would help us (e.g., to recruit more students)” from PFH, Riga Standins University, CIPFP AUSIAS MARCH, and University of Bologna. OttoBock said that “*It is not applicable*”. Jönköping University did not respond on this question, and Human Study and University Rehabilitation Institute Republic of Slovenia claimed that they already offer bridging courses when needed. PFH comments on this question with the following observation: “Our potential students for a Master's degree would benefit greatly from a bridging course, both by achieving the necessary ECTS credits for enrolment and by acquiring necessary competencies to ensure successful study.”

6.2.5 Bridging course scope

- The need for manufacturing skills in bridging courses was shown by three institutions: Riga Standins University, University Rehabilitation Institute Republic of Slovenia, and University of Bologna
- The need for digital skills is even higher (digital measurement, 3D printing, sensor technologies, ...). This was confirmed by PFH, Riga Standins University and the University of Bologna with its department for P&O, and CIPFP AUSIAS MARCH.
- The need for evidence-based practice is confirmed by the Riga Standins University, CIPFP AUSIAS MARCH and University of Bologna
- PFH and the University of Bologna asked for more Business administration topics.
- Needs for material sciences is claimed by Riga Standins University and the University of Bologna.
- Needs for more biomechanics topics are claimed by PFH (not only basic but applied knowledge of experimental biomechanics), Riga Standins University and the University of Bologna
- Practical patient care topics are needed at Riga Standins, University Rehabilitation Institute Republic of Slovenia and University of Bologna
- Product regulation & law topics are important for PFH, University Rehabilitation Institute Republic of Slovenia, and the University of Bologna. (European medical law on the marketing of innovative products as well as custom-made products for patients), and the University of Bologna looks for more study content on the public health system (MDR)
- Soft (social) skills (e.g. communication, presentation, knowledge transferring, active listening ...) have been expressed as a need for PFH, University Rehabilitation Institute Republic of Slovenia, and for University of Bologna

- A need for English-language proficiency in Technical Orthopedics and basic knowledge of scientific work (writing scientific papers, presentations, self-confident appearance) was reported by PFH, University Rehabilitation Institute Republic of Slovenia, and the University of Bologna.

6.3 Final interpretation of the survey results

Overall, sending out the surveys to all training institutions from the desk research table resulted in only a few responses (N=9). Also, the announcement of the survey with direct participation via the PROMOTE homepage did not result in an increase in participants. The reasons could be the low level of awareness of the project in the industry, which could be increased in the future through participation in the international OT World Congress 2022 or the ISPO Educators Meeting 2022, as well as through the support of the ISPO International Society for Prosthetics and Orthotics. A willingness and an interest in the PROMOTE project was indicated by all participants, so it can be assumed that the participants would like to be supported by the PROMOTE project. Five universities offering bachelor's degree programmes in the industry, have responded as well as four schools that offer traditional training programmes (VET). Of the four VET schools, the Otto Bock International School should be viewed separately as an APO training programme for employees of international Otto Bock service centres, since the training standard there is also based on the specifications of the industrial company Otto Bock. There are only two participating universities with their own master's programmes, making it difficult to assess the criteria necessary to increase permeability from B.Sc. to M.Sc. There are statements about possible desired bridge course contents for an easier transition, but it was not declared whether these are statements for the transition VET to B.Sc. or B.Sc. to M.Sc. The two universities (PFH and Jönköping University) have master's degree programmes for the industry with different subject orientations, so the desired subject content for a bridge course differs here. Jönköping University has a practically oriented master's degree programme with little scientific study content. PFH completes practical teaching in prosthetics and orthotics with a bachelor's degree after four years. Their master's course qualifies students for subsequent work in research and development.

7. Interview

After the collection of additional data due to the surveys, the project team wants to hear about status, requirements and needs from the industry perspective in several countries. In this way, the project team asks the industry's view of potential applicants. The focus is on the following questions: What kind of workers do you prefer to hire? What knowledge and skills do potential applicants need to have? Is there a shortage of adequate workers? The project team prepares some interview questions, and then project team members contact industrial contacts in different countries. The next table shows the interview plan and realization:

PROMOTE – Stocktaking Report Output

aim: 5-10 interviews			
interview questions	https://docs.google.com/document/d/1A3G2wMU7YPDkgtXeu7PMHR85EmVo7nvS/edit		
Company	country	done? when?	Interviewee
Ottobock	Germany	01.09.2021	Gordon Siewert, Head of Orthopaedic Technology, Ottobock,
Bauerfeind	Germany	01.07.2021	Daniel Wagner, Head of Recruiting
	Greece	no	
	Portugal	08.09.2021	Nicole Bartolomeu, Rehabilitation Center Lisbon
	Croatia	24.08.2021	Tomislav Švigir, OttoBock Adria, Sv. Nedjelja
Theranova	Romania	yes	Jaco du Plessis, CEO of Theranova
	Spain	24.08.2021	Marcelo Alvarez, Human Study Head of Education
Össur	Germany	21.07.2021	Till Blickwede, Director Academy DACH
Neoprot	Slovakia	no, try again	
inail	Italy	yes	Angelo Davalli, of INAIL centro protesi
Vigo	Poland	yes	Wojciech Budacz, CEO of Vigo Poland
	Slovenia	28.08.2021	Boštjan Boltežar, Company Owner and CEO

The table shows that the team performed ten interviews dispersed over different EU countries to cover all the regions we defined at the beginning of this document.

Even we made initial contact with people from Slovakia and Greece, they did not respond to our interview demands. Generally, the team interviewed people from Germany (3), Portugal, Croatia, Romania, Spain, Italy, Poland and Slovenia. The interviewees are professionals with different backgrounds (from managers to experienced P&O technicians), so we can say that we cover almost all perspectives of the P&O profession in those European countries.

7.1 Short presentation of the industrial companies that participated in the interviews

In this subchapter, the industrial companies participating in the interviews are briefly introduced.



Germany:

Otto Bock SE & Co. KG aA

For more than 100 years, Ottobock has been developing innovative products such as prostheses, orthoses, wheelchairs and exoskeletons. Otto Bock is the world market leader in prosthetics and has sales and service locations in almost 60 countries worldwide. The constant will to create more quality of life makes them the global technology leader in "Wearable Human Bionics" - wearable human bionics that augment or replace parts of the human body.

Bauerfeind AG

Bauerfeind AG is a German manufacturer of medical devices such as bandages, orthoses, compression stockings and orthopaedic insoles. Since 2009, Bauerfeind has continued to produce at its second location in ReM.Sc.heid (North Rhine-Westphalia) in addition to its headquarters in Zeulenroda. The medical aids are thus "Made in Germany" and are partly manufactured by hand. Bauerfeind also has 20 foreign subsidiaries in Austria, Croatia, France, Great Britain, Switzerland and the USA.

Össur Germany GmbH

Founded in 1971, Össur has wide-ranging expertise in the development, production, and sale of non-invasive orthopaedics. Headquartered in Iceland and employing a staff of around 3000 located in 25 countries, Össur has extensive operations in the Americas, Europe, and Asia, with numerous

distributors in other markets. True advocates of “Life Without Limitations”, their focus is on Prosthetic, Osteoarthritis and Injury Solutions.



Portugal:

Rehabilitation Center Lisbon:

REHABILITATION CENTER OF LISBON located in Lisbon, IA, in Linn County, offers a variety of therapies and care services.



Croatia

Otto Bock service centre in Croatia

(see above Otto Bock SE & Co. KG aA)



Romania

Theranova Protezare Srl

Theranova is an experienced medical device developer with a track record of creating innovative and practical solutions to large markets with unmet needs. THERANOVA PROTEZARE SRL is located in Oradea, Romania and is part of the Medical Equipment and Supplies Manufacturing Industry. THERANOVA PROTEZARE SRL has 19 employees at this location and generates \$1.18 million in sales (USD). There are two companies in the THERANOVA PROTEZARE SRL corporate family. Theranova Prosthetic and Orthotic Center in Oradea, Romania helps challenged children and adults lead productive lives by manufacturing and fitting them with orthotics or prosthetics and providing the support they need to rebuild the self-confidence they may lack due to their disability. Assist International proudly partners with Theranova to restore hope and improve the quality of life for many disabled Romanians.



Spain

Human Study

Human Study e.V. is a German NGO with educational departments in Spain, Bosnia and Herzegovina and Croatia. Human Study dedicates to blended learning education in the field of ortho prosthetic in non-developed countries and the countries in crisis. The Human Study head of education, Mr Marcelo Alvarez, is a former OttoBock employee and lives in Barcelona. Together with Mr Nicolas Munoz (located in Madrid), he has a very good overview of the situation in the Spanish P&O industry. He is relevant to talking about problems and possible solutions for the Spanish orthoptists and prosthetists.



Italy

Centro Protesi Inail : Vigorso di Budrio Prosthetics Centre

The Centro Protesi Inail, founded in 1961, is an ISO 9001-2015 certified company and is an articulated and complex structure in which the most up-to-date knowledge in the field of technical orthopedics is applied. Here, unique in Italy, the functional and psycho-social framework of the injured person is reconstructed, for complete reintegration in the world of work, in the family and more widely in society. With Presidential Decree no. 782/1984, the Centro Protesi became a 'Centre for the experimentation and application of orthopaedic prostheses and devices' and operates essentially in

three areas: research of new technologies for production, production and supply of orthopaedic prostheses and devices, rehabilitation and training in the use of prostheses. Since 2013, it has been an accredited facility for "Rehabilitation activities as a non-hospital inpatient pursuant to art. 26 of Law 833/1978 for 90 beds and outpatient functions carried out under authorisation", det. no. 3328/2013 Emilia Romagna Region.



Poland

VIGO

VIGO plays an important role in the field of technical orthopaedics. Thanks to many years of expertise and attention to innovation and renewal, they offer everyone, with or without physical limitations, regardless of situation or age, a tailored solution. Vigo offers a very wide range of products and aids for a variety of conditions. In their own workshops, they make orthoses, prostheses and orthopaedic shoes to measure, but you can also come to them for wheelchairs and walking frames, braces, orthotics, etc. The company Vigo, with its headquarters in Belgium, has several supply locations in Belgium as well as in Poland.



Slovenia

MOOR Orthotics and Prosthetics

MOOR Orthotics and Prosthetics is a family company established in 2006. The main activity is manufacturing and adjusting demanding medical devices that are individually produced prostheses for the upper and lower limbs and orthoses of the spine and head. They regularly attend professional trainings, seminars and fairs. Throughout the year, they strive to develop the professional field in cooperation with the University of Ljubljana - Faculty of Medicine, where they perform clinical practice for students. They are developing new types of aids and technologies - their own brand MOOR, which is respected in professional circles. Their employees are active members of various world professional associations.

7.2 Interview structure & analytics

In this chapter, we will present the questions and answers country by country, and after every question, we'll summarize the answers.

Question 1: What is the general employment situation for P&O professionals in your country? Are there many open vacancies or, in contrast, is there a saturated market?



Germany

Three big industry players gave their answers (Otto Bock SE & Co. KG aA, Bauerfeind AG, Össur Germany GmbH). Here is how they responded to this question:

- OttoBock: has extreme problems finding qualified personnel, especially in the R&D area
- Bauerfeind :
 - quite balanced
 - as many applications as vacancies
 - little cancellations
- Össur:
 - quite balanced

- not many open vacancies
- but it is complicated to get good staff (regarding the competencies)



Portugal

It's a little saturated. It is not very easy to get your first job. In former times, finding a job was easier. Some professionals moved to Spain or other countries because it is not easy to find an adequate job as a recent graduate in Portugal.



Croatia

We are a relatively small country with 4 million inhabitants. Hence, the need for P&O professionals is decent. In Croatia, there are 1,000-1,200 amputations per year. Approximately 15 companies produce P&O devices. They mostly employ people without formal P&O education since there was no official government education institution. For P&O education, neither VET nor University education exists. So, companies employ any kind of working force, and almost all workplaces are occupied with not particularly trained personnel.



Romania

Similar to Croatia, a lot of patients need help, but there is hardly any reimbursement, and most people can't afford to pay for a prosthesis themselves.



Spain

In Spain, there is a need for qualified professionals. Some people studied the 2000 hours course but after completion, they are not qualified enough. So, well-experienced practitioners are always required around the country.



Italy

There are quite a few graduates from B.Sc. programmes. But these programmes all have entrance exams and a limitation of the number of students, and many students go to a M.Sc. diploma afterwards and leave the profession.



Poland

There is no B.Sc. level orthopaedics programme. PT and bioengineers can become P&O professionals by working in a company for a year in a scheduled, supervised training programme.



Slovenia

If we are speaking about P&O profession, we can say that Institute has a monopoly in Slovenia. In the whole country, there are only two medical doctors that can prescribe prosthetic/orthotic devices. These MDs are employed by Institute, and it is very difficult for private P&O companies to survive, since only two persons from Institute decide about the need of devices. That is the reason why today we have only one private company (that I work for) and Institute for Rehabilitation. Both companies need additional workforce.

Conclusions:

It is evident that some countries have elementary problems in finding qualified personnel. The reasons are diverse. One finding is a general lack of educational offers or the education offered is insufficient and does not meet the requirements of job profiles. As a result, these countries claim a lack of adequate (quality) patient treatment. In other countries, a corresponding education is offered, but the job market for graduates is not easy. In general, most countries need skilled P&O professionals.

Question 2: Which education level do you expect from recent graduates/ new staff that you hire?



Germany

Otto Bock

- Ideal: OT training in advance
- Fundamentals of Mechanical Engineering
- Design Techniques
- Physical Engineering
- Competence in concept development: Patient-Technician-Engineer Interface
- Most important characteristic: Personality must fit into our team

Bauerfeind

- 70 % of the employees are candidates with Master's level qualifications
- only 30% of the employees are candidates with Bachelor's level qualifications
- The employees with master's level qualification have better soft skills (methods) + personally further developed
- the Master's degree is a must-have
- If they (Bauerfeind) have the choice, they would always prefer to employ a Master's graduate

Össur

- education level is secondary
- it depends on the competencies
- Bachelors or Masters are more or less equivalent



Portugal

I work for rehabilitation center and we are looking for all kinds of professional rehabilitation profiles (PT, OT, PO), everything needed to form a professional rehabilitation team.



Croatia

My company currently hires more physiotherapists. In former times, rather technical personnel was hired.



Romania

Good orthotists-prosthetists would be welcomed, but they won't make much money as the patients can't afford much.



Spain

Prosthetics and Orthotics centres are constantly looking for P&O qualified personnel, and wheelchair specialists are also required. I do not have enough information about other professions. I know that there are certain medical specialists (e.g. psychiatrists) that are difficult to be found.



Mostly clinical P&Os but also people with a M.Sc. (any type) and a B.Sc. in orthopaedics.



Mostly clinical P&Os



We are looking for orthotists and prosthetists, any kind of such professional profile. Mostly orthotist. I am the only one carrying out prosthetic care (approximately 100 per year). So, we obviously need one more prosthetist. We also have some other professionals, but most of them migrate to Slovenia. We have the intention to set up small rehabilitation centres in our company, and we will need much more staff – physios, MDs, nurses and many more. We are open to different kinds of employee profiles. Recently, we even had problems in finding administrative personnel. In such a situation it is very difficult to find proper personnel with another, very particular, professional profile.

Conclusions:

Professional profiles needed in the industry vary from country to country. More P&O developed countries with long P&O traditions ask for more highly educated professionals meanwhile, less P&O-wise developed countries have a high demand for skilled practitioners. In some countries, even a completed B.Sc. education does not produce qualified staff because they lack practical skills. Companies report, that they cannot afford to wait for these candidates to develop their practical skills. Schools with practice either do not exist in their countries, or they do not have good enough clinical practice.

Question 3: Is there a formal qualification level for P&Os to perform the profession?



No answer.



They have to finish four years of bachelor education which is ISPO accredited.



We require some medical pre-knowledge and foreign language knowledge, and that is it.



No.



In Spain, there is vocational/professional training in P&O. The entry-level is equivalent to the University entry-level, which requires a finished high school (12 years of previous mandatory education). This training is called “Ciclo Formativo Ortoprótisis y Productos de Apoyo” (in English

“Orthotics, Prosthetics and Assistive Products Training Programme”). It is not managed by the universities but by the professional/vocational training system. The course is completed after 2,000 hours. (In my opinion, not enough to qualify a competent P&O). A pharmacist (a professional with a university degree in Pharmacy) can get the same competencies as a P&O professional with only 200 (two hundred!) hours of training.



Not officially, but normally companies hire the graduates from the schools.



Their background is usually physiotherapy or bioengineering.



Yes, they need to have 1st level of Bologna university level in P&O, and the national Slovenian certification for the particular job. The government did not recognize my Human Study graduation. Only 100 points were recognized, so to meet the requirements, I had to study at a Slovenian University. I am fighting not to do the national exam, since the examiner is the person that does not have at least 5 % of the knowledge about the P&O profession. In any case, I cannot work alone with the patient, but I have to be supervised. My supervisors are engineers that have national certification as my employees. To work with a patient, you need to have either the national certification exam or medical high school and then again you have to pass the exam that covers medical first aid and law regulation for medical professions. Only then, P&O exam and quality assurance are given.

Conclusions:

There is a vast of different demands for qualification all around Europe. Some ask at least for B.Sc., but some take whatever they can afford. It is evident that there is no European regulation for employment in such a profession. This is based on the diverse educational offers of every country.

Question 4: Is there any kind of quality control on P&O services?



No answer



No, there is no quality control. Our quality control is our patients. I know that in Spain, there is an official quality control institution, but in Portugal there isn't.



Unfortunately, not. This is a huge problem in my country. Anyone from the street can come to work in the field of P&O, and after a couple of days, they receive a “visit card”, stating that he/she is an orthopaedic technician. That person does not have deep knowledge or experience, and no organization checks if that person is qualified to work with patients.



No.



All P&O devices & appliances supplied through the public health system must be validated by the MD who prescribed the device/appliance.



Yes, government-controlled.



This question was not posed to them.



Yes, our company recently applied ISO standard 13458, so we are the first company in Slovenia using the P&O standards. But meeting these standards is not obligated by law. However, we stick to the above mentioned ISO, so business relations with other EU companies is easier for us. This gives us an advantage in the market. In general, it is a huge problem for small start-ups since it is an expensive procedure. This leads to further monopolization of big companies. My company does not have any problems, but if I look back and if I had to start from the beginning, it would be extremely difficult.

Conclusion:

In most countries, there is no quality control or it depends on the applicant of the P&O treatment. In Spain and Italy, there are governmental institutions checking the standards.

Question 5: Do orthopaedic companies in your country have problems finding the staff they need? If yes: why? Which job/profession faces which problems? (Workshop staff, trained P&O, the leadership of companies, research development, specialists in CAD/CAM/3D ...)



No answer.



Finding adequate staff is difficult. Universities provide the students with good courses and knowledge, but graduates lack work experience. We, as graduates, do not feel like experts yet. You are gathering experience while you are working. But P&O facilities want to employ people with experience. Because the system is not well organized, they do not want to lose the time to format a recently graduated person. They want someone who can work self-sustainable and efficiently. They ask for the employee's autonomy, but it does not make things easy for the fresh bachelor degree holders. That can also be the cause of the companies' mentality because if you have a good system, you will count on the time for forming the future professionals. It is not easy to find a leader. At this moment, we are looking for CAD/CAM and 3D printing specialists. Currently, we are CPO, and we have one leader - and

that is all. All the job is done by CPO; they do not have bench workers or other employees who support the patient treatments.



Croatia

They do not have problems because they do not choose anyone who has a core P&O background. And there are a lot of physiotherapists on the market that can be trained for P&Os.



Romania

Good orthotists-prosthetists would be welcomed, but they won't make much money as the patients can't afford it.



Spain

All professionals mentioned are missing in Spain. Training programmes are not enough to qualify the participants. The qualification is not even equivalent to an ISPO Associate P&O professional (former Cat II).



Italy

We usually find enough people, but the right diploma level is not always easy, and we always have to teach them a lot in the beginning.



Poland

It is not easy since we have to find a way to contact the people interested in P&O out of the many graduates of PT and bioengineering. Often we find staff through offering places.



Slovenia

We have a lot of problems finding adequately educated personnel. We have a school that is a 1st degree Bologna school. But unfortunately, the school does not produce the proper quality of employees. So, we hire new personnel and teach and train them to do the job correctly. At the mentioned school, 40 students enrol every year, and the need is one or two of the graduates per year. Even that one or two graduates are not good enough to take responsibility for the technical and human aspect of our business. Recently, there were rumours that they will completely change the educational programme at the Institute for Rehabilitation. But we will see what will happen since we have been listening the same story for the last ten years.

Conclusions:

It is more than evident that companies have a lot of problems finding proper and effective staff that is ready to take responsibility to take care of patient treatment.

Question 6: Which educational programmes are available in your country? Are there any competencies that these graduates would benefit from but don't have yet? (E.g. extra training in dealing with patients, background in modern technology, practical experience, business insights, etc.) Do you have contact data for these programmes?



Germany

No answer.



Portugal

Except for Bachelor's study courses (at two universities), there is no other official specialized course. It is not enough what students learn at university. We need much more to reach a master's degree, to specialize in specific areas. We need more specialization since no one can be a specialist in all areas. Current education gives a good basis for improvement. A lot of theory, but they are missing practice, which is essential for the profession. There is no regular possibility to upgrade or have specialized courses except graduation from university. Only big companies like Össur or OttoBock offer specialized short courses for their products. They also offer sockets workshops.



Croatia

Only Human Study, and some stronger companies have their internal educational sessions. (Streifeneder, Otto Bock, Bauerfeind)



Romania

No specific programmes. There are M.Sc. graduates in Bioengineering or PT who pay relatively high attention to P&O, but that is still not enough to hire them as experts.



Spain

There is one official programme which is offered in 7 or 8 schools/centres across Spain. Several competencies are not achieved by the graduated participants, but the system seems not to be really aware of its deficits.



Italy

(Following their instructions, the team members looked this up on the internet, and found this)

<https://www.cestor.it/atenei/snt003.htm>

PROMOTE – Stocktaking Report Output

SIENA	Università degli Studi di Siena
TORINO	Università degli Studi di Torino
UDINE	Università degli Studi di Udine
TECNICO ORTOPEDICO	
BOLOGNA	Università degli Studi di Bologna
CATANZARO	Università degli Studi "Magna Graecia" di Catanzaro
FIRENZE	Università degli Studi di Firenze
GENOVA	Università degli Studi di Genova
NAPOLI	Università degli Studi di Napoli "Federico II"
PAVIA	Università degli Studi di Pavia
ROMA	Università degli Studi di Roma "La Sapienza" Università degli Studi di Roma "Tor Vergata"
TECNICO SANITARIO DI LABORATORIO BIOMEDICO	
ANCONA	Università Politecnica delle Marche
BARI	Università degli Studi di Bari
BOLOGNA	Università degli Studi di Bologna

There are no specific P&O masters. Many P&O go to a M.Sc. programme later, however: one of this list <https://www.cestor.it/atenei/sntlm003.htm>



Poland

There are only low-level programmes, no academic offers.



Slovenia

Except for the Institute of Rehabilitation faculty, there are no additional programmes that treat new business issues.

Conclusion

Italy has most institutions that offer P&O educational programmes. In Spain, there is only one, and in Portugal, there are two P&O education institutions. Other countries either do not have any institutions, or it is of poor clinical practice quality.

Question 7: Which competencies do you expect from the new staff you hire, from recent graduates?



Germany

Otto Bock

- Ideal: OT training in advance
- Fundamentals of mechanical engineering
- Design Techniques
- Physical Engineering
- Competence in concept development: patient-technician-engineer interface
- Most important characteristic: Personality must fit into our team

Degree:

- Basics mechanical engineering
- Orthobionics (only in conjunction with previous training)
- Experienced OT master craftsmen and bandagers
- Experts in technical orthopaedics
- In the future: preferably physiotherapists

Craft skills:

- craft training is the basis for product development

Bauerfeind

- wide range of different knowledge
- example product management
- knowledge about the products (desirable)
- knowledge in medicine, pathology
- business administration

Craft skills:

- not necessary
- only at research and development useful

Össur

- It depends on the job
- Össur uses a qualification evaluation matrix
 - kind of online questionnaire during the application process
 - competence framework out of:
 - 1) collaboration
 - 2) communication
 - 3) results
 - 4) customer focus
 - 5) change process
- evaluation matrix is more detailed than an interview
- not biased by the interviewee

Craft skills

- just an overview of typical processes
- no experts needed (e.g. in product management)



Portugal

They look for professionals that work without supervision. The professionals shall show autonomy in resolving problems, and also be emphatic in the communication with patients (psycho-social skills). Furthermore, they need personnel capable of finding solutions based on the huge repository of patient treatment knowledge. Other requirements: being proactive and teamwork skills.



Croatia

Some basic P&O knowledge and experience will come with time. In the past, we thought that you needed five years of experience to become self-sustainable in this profession. But today, the whole education takes only one year, which is not realistic from my perspective.



Romania

All competencies a clinical P&O needs: dealing with patients, decisionmaking, taking measurements...



Spain

No answer



Italy

All competencies a clinical P&O needs: dealing with patients, decision making, taking measurements... The programmes in Italy don't teach practical aspects/work experience. So, basic practical skills are taught by the companies.



Poland

all competencies a clinical P&O needs: dealing with patients, decision making, taking measurements (also digital)



Slovenia

Some subjects are treated in our University (Institute), but we will appreciate their hand skills more. They can learn anything theoretically, but if they do not understand why that is important, then we have a problem. That is because they did not work with a patient enough during their education. On the other hand, physiotherapists in the same university have ten times more practice than P&Os. Recently, they expelled clinical practice from 2nd and 3rd year. This results into the fact, that students achieve clinical practice only in their first year – this is when they do not have any P&O knowledge at all. This is an absurd situation. You ask for an employee, and if you hire him/her, you know that he/she needs additional training and education. We are mostly missing specialized courses.

Conclusion

Depending on the position, they mostly need P&O practically skilled professionals for a work position in patient care. But they also need all other profiles. For example, for jobs in product management and development, which is necessary for proper company functioning.

Question 8: How and where are most trained P&O that work in your country educated? Is that an easy path, or is it only accessible to certain individuals? Why? Is it easy for the graduates to find a job? Why/Why not?



Germany

No answer.



Portugal

It is Lisbon and Porto Universities. Before the pandemic, it was not possible to do it online. Since the pandemic, they offer almost everything online, and students have lost the possibility to practice. That is why it is not easy for them to find a job. 60% of the graduates find a job. Some of them have to work in the shops where they sell the products.



Croatia

There are the training programmes that Human Study offers. Specialized courses for prosthetics and orthotics (HS SCOPes). Nobody else in my country provides additional education in P&O. The courses are open to everyone. Their courses are not easy, since they ask for a lot of work and learning, but they also offer good conditions for finishing such programmes. It is not easy at all, since most of the students are working at the same time. It is very easy for the educated ones to find a job. Certification (diploma) and experience will be more and more expected and valued by employers.



Romania

If they are trained, they have a foreign diploma.



Spain

Most P&O practitioners were trained at the schools mentioned above. Some professionals are working in Spain but were trained abroad (e.g., Portugal, Argentina where they at least have a University Bachelor degree). Access to P&O studies is not difficult, and even they are not qualified enough, most of them get a job when they look for it.



Italy

In the institutions mentioned in question number 6.



Poland

There is no B.Sc. level orthopaedics programme. PT and bioengineers can become P&O professionals by working in a company for a year in a scheduled, supervised training program.



Slovenia

Mostly on University for Physical rehabilitation that we mentioned in earlier questions.

Conclusion

Most of the employees are educated in universities. But most of them lacks experience in treating patients. So, the companies have to increase their skills during their practical engagement in the company by organizing internal courses for the improvement of their P&O skills.

Question 9: Do you feel options for continuous professional development are needed in your country? Which topics are most needed? Who do you think would be the best party to organize this?



Germany

Otto Bock

Otto Bock has its own academy with a lot of programmes. We are permanently collaborating with the Academy and with companies in the patient care sector.

When we need new topics, such as Design Thinking, we bring in external consultants and then build up the expertise internally.

Other new topics:

- Innovation Management
- Creativity Techniques
- Agile Development Methods

Bauerfeind

- internally 'Bauerfeind Akademie'
- once per year, employee interviews take place
- team leader displays personal knowledge lacks
- furthermore, external trainings
- financial support
- dedicated 'training time'

Össur

- employees use external trainings
- but not that much knowledge/trainings available on the market
- most of them presuppose a certain qualification level (e.g., German 'Meister')
- or they are biased because they 'belong' to one manufacturer or product



Portugal

It is absolutely needed. And it is difficult currently. To get synergy with physio and P&O, to improve rehabilitation of amputees. It is important to update knowledge according to new scientific findings used in other countries. Universities should organize this professional development. Graduation is more medical organized than engineering.



Definitely yes, if you do not follow what's happening in the profession in one or two years, you will be completely out of the profession. The trend is the application of mechatronics in knees and feet. For any of such projects you need an additional specialized course with a duration of one week. Without that, you even cannot order such a knee or feet. Definitely, Human Study can organize such courses.



Of course, but it can be a difficult goal to reach. Due to the situation described above.



There is a real need for continuous professional development in most (if not all) P&O topics. The only national representative organisation is FEDOP, a federation of regional P&O companies association.



Of course, this is always useful.



At this moment, we take care of this ourselves, but this costs time and energy, so we are certainly interested in other options.



This is absolutely the need for any kind of profession. But unfortunately, we do not have such a course in Slovenia; we mostly send our staff abroad. We always talk about prosthetics and orthotics, but I am sure that we should have more people that will know to work with wheelchairs, orthopaedic shoes, insoles. There is a lack of knowledge for those P&O areas. We are a small country (2 million), but we need such profiles of professionals. There are a lot of stores that sell a ready-made product, but they do not have qualified staff. So, their recommendation was that each store shall employ at least one P&O engineer, but they do not do that since they do not believe in the quality of such Institute educated engineers. They will have one more staff on the pay list, but he will not improve the quality of the store service since they are coming with poor knowledge. That's why we need such specialized courses, that are not present even in other neighbouring countries.

Conclusion

All of the interviewees show an extreme need for continuous professional development. Training courses should preferably be offered by industry-independent institutions.

Question 10: Do you think options in blended learning could help to train future or current staff? Which do you estimate could be a problem in this (internet access, enrollment fees, language, going on-site for practical parts?...)



Germany

OttoBock

Hybrid learning has many advantages. Especially for new product development, it is very important to gain experience in patient care on-site and to train the application

Bauerfeind

- yes, imaginable to use PROMOTE modules
- blended learning as a good approach
- Bauerfeind is searching for two employees to establish a new e-learning system, at the moment
- advantages: good mixture of theoretical knowledge and practical examples (videos)

Ossur

- very good opportunity
- desirable are small packages containing one topic
- without any qualification barrier
- mixture out of P&O knowledge and soft skills, methods
- blended learning is the best method to do
- the combination of theoretical background and practical on-site course



Portugal

It is very interesting for P&O professionals in my country. The main problem might be their lack of time.



Croatia

Yes, but we should follow up with the students after he/she finish the exam patient. If you want to be completely sure about his/her knowledge and understanding level. This is because we have to be sure that they apply all the postulates of the high-quality education practices during their studies. The worst problem is leaving their companies to participate in practical workshops. If you are coming from a small facility, then one week of a practical workshop would mean, in most cases, stopping the process of patient treatment (since they have maybe only one P&O technician).



Romania

Yes. Enrolment fees can be problematic.



Spain

There are options to develop blended learning in P&O in Spain. The biggest barrier is the language because most of the P&O practitioners do not speak foreign languages.



Yes. Language can be a problem, and so is going on site.



Certainly: it takes time and effort from the companies to train everyone themselves. All kind of content is appreciated but certainly courses on how to handle a patient how to make correct treatment decisions. These are people that are already on the job, so going onsite is difficult but can be made possible for topics that demand this.



Blended learning is even better when you want to improve your staff. That will be excellent if we can use that to move them to an advanced level in their profession. It is much more affordable for our employees to use the advantages of blended learning than to go to university and study in the classroom, which is logical – since we do not want to lose HR in the facility. It is excellent when you employ someone motivated, and then you have a possibility to send this employee to improve his/her knowledge. In my opinion, blended learning is good for both – beginners and advanced learners. For all of them, motivation is the key. The hugest obstacle in Slovenia is that such blended learning programmes are not recognized. Furthermore, the costs can be problem for small companies. Meanwhile, bigger ones receive much more than they invest in blended education if they have motivated staff. There are also rumours that they will offer a P&O M.Sc., but that does not have sense since 1st level of P&O education is not conducted correctly.

Conclusion

All industry representatives claim that online education is a very good idea, but they also express doubts regarding language barriers and connectivity.

Question 11: Do you know of research centres in your country that work on P&O related issues? Do you have contact data? Same for M.Sc. programmes in related fields: for example, M.Sc. in rehabilitation sciences, if it has particular courses in P&O.



No answer.



I do not know anyone. We have some masters, but I do not know about their focussed topics. I did not find anything that was of my interest. It was related to P&O but going in other relations.



The Centre for Gait analysis is at the University of Zagreb, but I am not sure that they use it. They maybe use it for medical faculty, but it is not used for P&O at all. There are M.Sc. programmes for physiotherapists, but there are only two pages in one book about prosthetics.



No answer .



Spain

There are a few professionals dedicated to P&O related research in Spain. I could get some contact with Dr Lluís Guirao, near Barcelona.



Italy

No answer .



Poland

No answer.



Slovenia

It should be Institute for rehabilitation, but they do not do that at all. Our company has a research department that is funded by the EU. I think that there were no M.Sc. programmes treating P&O topics. There is a M.Sc. of physiotherapy and work therapy where will be possible to set a short course of P&O technology. But not too much since some of the therapists do the job of P&O even, they are not authorized for that. Those M.Sc. are offered at the University of Ljubljana and Koper.

Conclusion

Most of the countries either do not have research centres, or they do not provide us with information (which can mean that they do not know that something like that exists). Only Spain has a few of them for sure.

Question 12: Is there a reimbursement system in place in your country? Where can we find more information about it? Maybe a brief explanation?



Germany

No answer.



Portugal

National health care covers the costs of the prosthesis. They do not cover cheap and expensive parts, but they cover simple parts and devices. You have to wait for a long time for reimbursement.



Croatia

There is only a governmental reimbursement system (HZZO). Outside the country, there are a lot of private reimbursement companies that influence the rules of P&O market in those countries. Because Croatia is part of the EU, they expect that they will have to include insurance companies soon also in their reimbursement system.



Romania

Only a very basic one.



Spain

Yes, there is a reimbursement system in Spain for P&O devices and assistive technology products. It covers basic and advanced products for people in need, with certain limitations (e.g. electronic prosthetics knees are not covered, myoelectric prostheses only for bilateral and extremely needed patients). In certain cases, the participation of the patient is required to cover the costs. There are some differences in the implementation of the system depending on the 17 autonomic regions of Spain. The catalogue for the Catalonia region is available in the next link: https://catsalut.gencat.cat/web/.content/minisite/catsalut/proveidors_professionals/registres_catalogs/catalegs/cataleg-PAO-2020.pdf



Italy

Yes there is, there are different systems for people in the military, people that had an accident while working, etc.



Poland

No answer.



Slovenia

Yes, the institution of public health takes care and covers all costs for P&O devices. I have worked the last two years with them to establish a proper system for prosthetics. The system is pretty good since we can install new technology components so patients receive reimbursement even for expensive ones. Patients can have a very good quality of devices, which means they can easier include themselves in normal life. We do not have the same situation for orthotics, but we are working to improve the status, too.

Conclusion

All of the countries have reimbursement systems. Some cover only basic needs and costs, and other countries have an advanced reimbursement system.

Question 13: Is there any organization around the P&O profession? ISPO or local professional union or union with other allied health professions? Do you have any contact information for them?



Germany

No answer.



Portugal

No official one. It is more friendly associations, but they are not exposed to much. No contact information – there are informal associations.



Croatia

ISPO Croatia and the Association of P&O Technicians inside ISPO are producers of the PO devices. They have conferences regularly every year. Contact of the president of ISPO Croatia: dean@werner.hr



Romania

No answer.



Spain

FEDOP, <https://fedop.org/> is the Spanish Federation of P&O private companies. As public P&O centres are practically not available in Spain, they represent more than 90% of the P&O services in the country. On their website fedop.org all contact information is available.



Italy

No answer.



Poland

The PT organization: 'KIF': Malgorzata.starzycka@kif.info.pl



Slovenia

There is ISPO Slovenia and Association of P&O Engineers.

Conclusion

Some countries have an association of professionals, and others not.

Question 14: Which assistive devices fall under the responsibility of the P&O in your country? (Prosthetics, orthotics, wheelchairs, orthopaedic shoes, immediate fitting, walking aids, ostomy care, compression therapy for burns or lymphoedema care, breast prosthesis,)



Germany

No answer.



Portugal

We have the doctor who approves and stay responsible for the device – prosthesis, orthosis, and all other mentioned in the brackets.



Croatia

There is a relatively small amount of us in the country (4 B.Sc. – Cat I, and around 20 APO – Cat II), and nobody asked us anything about this. In most cases, medical doctors (orthopedists or physiatrists) with only little P&O knowledge are responsible. We, as P&O professionals, do not have any responsibility. Mr Werner, ISPO president now, is the first one from P&O who is at the head of this organization in my county. So far, we have always had medical doctors as presidents of ISPO. We are trying to take some control here in terms of communication, but we have a huge resistance. We think that B.Sc. can make prescriptions of the devices and check the quality of it. So far, it is not possible, and we wonder if it ever will be. There is too much resistance from the medical doctor's side. Our P&O companies do LLP, LLO, TO, and lymphoedema care is not our responsibility. Orthopaedic shoes are produced by regular shoemakers and not by P&O specialists. Some companies also sell wheelchairs,

and most of them do not have anyone who is educated for that area of supportive devices. Ready-made P&O products can be sold in pharmacies so they are mostly a matter of merchandise.



Romania

No answer.



Spain

Practically all mentioned devices are under the responsibility or intervention of P&O practitioners in Spain.



Italy

No answer.



Poland

No answer.



Slovenia

By law, the responsibility is on MDs. We recently tried to change that, and we succeeded for prosthetics, but for orthotics, the MSs still have final word and responsibility. For all other devices, MDs are responsible too. For now, P&Os do not have a huge level of responsibility, but I expect this to be changed soon.

Conclusion

The responsibility for devices varies from country to country. In most cases, it is the responsibility of MDs.

8. Resume

This research was realized by using three different methodologies.

- Chronologically, we started with desk research which included web-based research and personal conversations within the network of our institutions. This enabled us to prepare a generic table of P&O education providers in Europe, including EU and non-EU countries.
- Then, we designed and shared a survey with the P&O training institutions that were recognized in the above-mentioned desk research. The intention was to increase the quality of the data collected so far. Unfortunately, only 10% of the total number of contacted institutions responded to the survey. However, all returned surveys confirm that P&O bridging courses are needed in European countries.
- In the last step, we conducted interviews with relevant P&O industrial representatives who are potential employers for P&O graduates. This third methodology was quite efficient and revealed the particular problems of different European countries regarding their professional development.

This research proves a need for P&O bridging courses in all countries. It is evident that North-West countries need more bridging courses that produce post-graduate professionals. Meanwhile, South-East countries need more under-graduate and hand skilled professionals.

In some countries, P&O education does not exist, and they produce their workforce by recruiting different kinds of professionals and training them in the production process. In other countries, P&O professionals are sent abroad to finish or extend their P&O education. Recently, some blended training programmes (online + onsite) are trying to fill gaps of non-certified professionals in P&O.

A learning outcome of the worldwide Covid-19 pandemic situation is that information communication technologies are developed enough to offer blended learning approaches, which could be a very good solution for our planned PROMOTE P&O bridging courses. Distance learning / Online learning allows workers to continue with their job and concentrate on both: their job and their further education. The theoretical part of education can be organized online and practical in the workshop of the countries with educational institutions.

Our research also shows a high need for improving the network of the different training institutions of P&O (VET, HEI) and potential employers (P&O industry). This could help to improve the P&O education standards within the EU (and beyond). The aim is to respect and recognize all P&O professionals and their education equally across the EU. Developing P&O bridging courses for continuous training of all P&O professionals of all educational levels will, together with an improvement of research and development of orthotics and prosthetics, help patients all around the EU. The main objective is to improve their chances to come back and participate in normal life equally in all the countries. Also, an improvement of the data collected so far in this research, publishing it and creating a network could lead to a better exchange of information and know-how of P&O professionals all around Europe. This would be a great benefit for the development of the P&O profession in Europe.