

Please cite the Published Version

Lackenbauer, W, Janssen, J, Roddam, H and Selfe, J  (2018) Keep/refer decision making abilities of European final year undergraduate physiotherapy students: a cross-sectional survey using clinical vignettes. *European Journal of Physiotherapy*, 20 (3). pp. 128-134. ISSN 2167-9169

DOI: <https://doi.org/10.1080/21679169.2017.1408682>

Publisher: Taylor & Francis

Version: Accepted Version

Downloaded from: <https://e-space.mmu.ac.uk/619813/>

Additional Information: This is an Author Accepted Manuscript of a paper accepted for publication in *European Journal of Physiotherapy*, published by and copyright Taylor & Francis.

Enquiries:

If you have questions about this document, contact openresearch@mmu.ac.uk. Please include the URL of the record in e-space. If you believe that your, or a third party's rights have been compromised through this document please see our Take Down policy (available from <https://www.mmu.ac.uk/library/using-the-library/policies-and-guidelines>)

Keep/refer decision making abilities of European final year undergraduate physiotherapy students: A cross-sectional survey using clinical vignettes.

Abstract

Keywords

Keep/refer decision, clinical vignettes, red flags, physiotherapy, medical referral.

Main text introduction

The recognition of serious pathologies which mimic more benign conditions of the musculoskeletal system is a challenging task for all health care professionals [1]. Despite several reports which emphasized the generally low prevalence of sinister conditions affecting the vertebral column (with a special focus on the lumbar region) [2-4], there are an abundance of case reports and case series within the current literature where physiotherapists recognised the presence of a wide range of different pathologies where medical attention was essential [5-10]. These cases and case series of serious pathology highlight the need for physiotherapists to be able to determine if movement based, physiotherapy intervention is indicated (keep), or not (refer) [8].

Acknowledging the importance for physiotherapists to independently screen patients for the presence of serious medical diseases, the World Confederation of Physical Therapists (WCPT) Guidelines for Standards of Physical Therapy Practice [11] and the WCPT guideline for physical therapist professional entry level education [12] both require physiotherapists to know when a referral to another professional is warranted. Moreover, the WCPT guideline for physical therapist professional entry level education [12] specifically demand that a comprehensive review of various body systems (cardiovascular, pulmonary, musculoskeletal, neuromuscular, integumentary) has to be carried out as part of the patient's assessment. In addition, the WCPT policy statement for education expects that 'that any programme, irrespective of its length and mode of delivery, should deliver a curriculum that will enable physical therapists to attain the knowledge, skills and attributes described in the guidelines for physical therapist professional entry level education' [13, p. 1].

Despite the requirements of the WCPT [11-13], a recent review by Lackenbauer et al. [14] revealed that there is a lack of overall consensus among various European countries to which extent (or even if) keep/refer decision making abilities are included in individual national educational and professional guidelines.

Over the past 13 years, there have been several studies investigating the clinical keep/refer decision making abilities (based on hypothetical vignettes) of qualified physiotherapists in the United States [15-17] of students who completed a professional doctorate (DPT) [18] in the United States and of qualified physiotherapists in Germany [19] and Switzerland [20]. Results of these studies make it obvious that participants found it difficult to accurately detect the presence of conditions requiring medical attention [15-20]. Unsurprisingly, results also indicated that variables such as more years of work experience [18-20], additional/higher and specialized postgraduate education [16] and working in an outpatient setting [17] seem to improve the physiotherapist's ability to identify severe medical conditions (within vignettes) which require a referral for further medical check-up.

To the present day, however, there is no data if undergraduate physiotherapy programmes sufficiently prepare novice physiotherapists to make such important clinical (keep/refer) judgements when working with patients. In order to fill this knowledge gap, a cross-sectional study using (previously published) hypothetical vignettes was carried out to gain a better understanding about the keep/refer decision making competencies of final year undergraduate physiotherapy students across Europe.

Materials and Methods

Ethical approval (Ethics Application 1390) was obtained from the Manchester Metropolitan University Ethics Committee (Faculty of Health, Psychology and Social Care).

The target population for the current study involved final year undergraduate physiotherapy students from the 183 member Universities, in 28 European countries, listed on the European Network of Physiotherapy in Higher Education (ENPHE) website. A convenience sample of volunteering students was used for the analysis. ENPHE member institutions were chosen as, on its homepage, the European Network of Physiotherapy in Higher Education advocates participation in European wide research projects which intend to compare and improve educational standards. Therefore, it was assumed that ENPHE member institutions (and

students) were more likely to participate in the study than non ENPHE member Universities in Europe.

In order to assess the keep/refer decision making abilities of European final year undergraduate physiotherapy students, an online survey containing 12 vignettes was created. These vignettes have already been successfully used in previous studies on qualified physiotherapists in Switzerland [20], Germany [19] the United States [16] and on DPT students in the United States [18]. The vignettes used (with permission) for the current project have already been validated on two separate occasions by expert physiotherapists [16] and a panel of medical doctors [18]. For more detailed information about case contents and case justification, the reader is referred to the original source by Jette et al. [16].

ENPHE member Universities were initially informed about the upcoming project during an ENPHE conference in autumn 2015. Concurrently, ENPHE University e-mail addresses were obtained from the official ENPHE homepage. Individual Universities were then contacted in written form in December 2015 (via e-mail) explaining the purpose of the project and inviting them to take part in the study. Those Universities that did not respond to the first e-mail received a second, identical invitation (via e-mail) at the end of January 2016. Responding Universities were asked to indicate their graduation date(s) to ensure that the distribution of the vignettes would take place as close as possible to the day of their graduation. There was no follow up and students received the link for the survey only once. Depending on the individual academic calendar of participating Universities, an e-mail containing full description of the study and the link for the survey was sent over the course of ten months between May 2016 and February 2017. To protect individual student's identity, this e-mail was initially sent to an official contact person from each University and then subsequently distributed among the final year undergraduate physiotherapy students. The complete survey was online and password protected using the Bristol Online Survey Tool (BOS). Participating students were first asked to indicate the country where they completed their undergraduate degree. In line with earlier methodology [16-20] participating students were instructed to individually decide (based on the clinical situation described) either to start physiotherapy without additional medical evaluation (keep), treat the patient but also refer him/her for medical examination (keep and refer) or refer the patient for medical check-up without giving any physiotherapeutic intervention (refer). In accordance with Beyerlein [19], students were asked to complete the survey within 15 minutes. Only one answer option per question was possible. Individual case contents of the 12 vignettes were classified as:

- Musculoskeletal
- Medical non-critical
- Medical critical.

Also replicating previously used methodology [16-20], a correct answer for the musculoskeletal cases was to treat the patient without the need for medical referral (keep) or to treat the patient with additional medical check-up (keep and refer). A correct answer for the medical non-critical cases was defined if the student(s) chose to start physiotherapy with additional medical evaluation (keep and refer) or refer the patient without physiotherapeutic management (refer). The sole correct answer for medical critical cases was the decision to send the patient for medical evaluation without physiotherapeutic management (refer).

In accordance with earlier methodology [16,18-20], vignettes number 3, 4, 6, 8, 10 were regarded as musculoskeletal, vignettes number 1, 2, 7, 11 were categorized as medical non-critical and vignettes 5, 9, 12 formed the medical critical category.

Data analysis was carried out using the Statistical Package for Social Sciences (SPSS) for windows version 22.0.0.2 (IBM, USA) and only students who completed all 12 vignettes were included in the final analysis.

Descriptive statistics were utilized to portray demographic characteristics of participating ENPHE member countries. Replicating previous methodology, descriptive statistics were also used to obtain the mean percentages (plus standard deviation) of correct keep/refer decisions and actual numbers as well as percentages of students who managed to accurately answer all vignettes from a specific category [16-20]. As small sample sizes for (especially) singular countries were expected beforehand, the decision was made to also look at the median (25 and 75 percentiles) percentages of correct responses. Participating countries were additionally divided into three groups depending on whether they either have a direct access system (to physiotherapy), non-direct access system (to physiotherapy), or direct access system (to physiotherapy) but only for the private health care sector.

Measures of central tendency (mean and median), measurements of variability (standard deviation and percentiles) and actual numbers plus percentages of students who managed to complete 100% of vignettes within a category were reported for all respondents combined and also for singular countries. Mean (plus standard deviation) and median (25 and 75 percentiles)

percentages of correct keep/refer decisions (for each category) depending on different access systems were calculated.

Results

Participants

Forty-two Universities from 17 European countries replied to the invitation. However, six Universities had to be excluded (Flow diagram 1 near here). As a consequence, 36 Universities from 15 ENPHE member countries (Table 1 near here) were finally included in the study and received (depending on individual graduation dates) an e-mail, which contained full study description together with the link for the survey, between Mai 2016 and February 2017. As seen in Table 1, a total of 76 students from 10 different European countries completed the survey. Three additional students had to be excluded from the final analysis. Two students failed to complete all 12 cases and one student indicated to have completed his undergraduate degree in France (though no University from France took part in the study). In the end, 73 students (3.3%) from 10 ENPHE member countries completed all 12 cases and were therefore included in the final analysis.

Combined results for European final year undergraduate physiotherapy students

More than 70% of European undergraduate physiotherapy students made (on the average) a correct keep/refer judgement for the musculoskeletal and medical non-critical vignettes. Only slightly more than 50% of participating students identified the medical critical cases and correctly chose to refer without providing physiotherapy intervention (Table 2 near here).

Descriptive analysis furthermore revealed that 15.1% (n=11 out of 73) respondents managed to correctly answer 100% of the cases in the musculoskeletal category. Furthermore, 19.2% (n=14 out of 73) and 11% (n=8 out of 73) of respondents made an accurate keep/refer decision for all cases in the medical non-critical and medical critical category, respectively (Table 3 near here).

Results of individual ENPHE member countries

The results from individual ENPHE member countries demonstrate that participants from the Czech Republic (n=4, mean: 67%, median: 67%), the Netherlands (n=14, mean: 62%, median: 67%) and Estonia (n=10, mean: 60%, median: 67%) achieved the highest scores for the medical critical category (Table 4 near here).

The actual number and percentages of students (of single countries) who managed to correctly answer all cases from a category was limited. The Netherlands were the sole country who had more than one student (n=3) who could properly answer all three medical critical vignettes (Table 5 near here).

Results in relation to divergent access systems to physiotherapy within Europe

Comparison of the mean and median percentages of accurate keep/refer decisions for the musculoskeletal and medical non-critical vignettes demonstrate only marginal differences between students from either a direct or non-direct access system. The only more obvious divergence is the median percentage within the medical critical category which indicates a convincing tendency towards a higher accuracy of students who were trained in a country with direct access (to physiotherapy) only for the private health sector. (Table 6 near here)

Discussion

This is the first study to give an overview in how far final year undergraduate physiotherapy students from different European countries are capable of making correct keep/refer decisions when being given concise, clinical vignettes.

The outcome data demonstrated that the majority of study participants found it difficult to accurately distinguish between serious and less critical medical conditions (within clinical vignettes). This is consistent with earlier reports on already qualified physiotherapists and DPT students which revealed a lack of knowledge to highly accurately detect severe pathological conditions which are not amendable by movement based (physiotherapy) intervention [15-20]. In the current project, an alarmingly low number of eight European study participants (11%) managed to identify all three medical critical vignettes and correctly chose to refer the patient without giving any physiotherapy intervention.

It is beyond the capacity of this paper to analyse varying teaching contents of European countries and Universities alike. Results from the Netherlands, the Czech Republic and Estonia, however, demonstrate an apparent trend towards a higher proportion of students who are capable of making an accurate keep/refer decision for the medical critical cases. A recent review by Lackenbauer et al. [14] revealed that especially the Dutch national guidelines for the physiotherapy profession very clearly demand their (qualified) physiotherapists to be capable of identifying pathologies which are not suitable for physiotherapy and therefore

require a referral to another health care professional (e.g. a physician) [14]. Unfortunately, no similar data exists for educational or professional guidelines from Estonia.

Performances from the diverging access systems to physiotherapeutic service, demonstrate a clear tendency that students from a direct access system to physiotherapy for the private health sector were generally more accurate in the identification of the medical critical vignettes. Interestingly and also surprisingly, those differences were absent when comparing correct keep/refer decisions for medical critical cases between students from countries with direct access (for the public and private sector) and those from countries without direct access to physiotherapy.

In the end, the meagre return rate (3.3%) makes a generalizability of the results (even for ENPHE member Universities) problematic. Having said this, the overall return rate in the current study is still in accordance with Vaughn et al. [18] (whose response rate was also below 5%) who used a similar approach to examine keep/refer decision making abilities of final year DPT students in the United States. As opposed to Riddle et al. [15], Jette et al. [16], Beyerlein [19], Schämamm et al. [20] and Mount [17], Vaughn et al. [18] were not able to directly distribute their survey among their study sample (final year DPT students). As in the current study, Vaughn et al. [18] had to rely on individual Universities to subsequently distribute the survey among the physiotherapy students.

Although this is the first study which provides a preliminary and cautious overview of keep/refer decision making competencies of final year undergraduate physiotherapy students from ten different European countries there are several limitations which need to be discussed:

Veloski et al. [21] highlighted the issue of social desirability bias. The authors argue that since study participants are usually quite aware of the fact of being under investigation, their response might represent a more idealistic decision which can substantially differ from what they would actually do during their daily routine.

The application of clinical vignettes is generally accepted as a valid method to investigate clinical decision making competencies within health care related research (especially in situations where the gold standard, real life patients, is infeasible) [22-25]. In addition, the 12 vignettes used in the current study have already been validated on two different occasions by expert physiotherapists [16] and a panel of medical doctors [18]. Yet, not all vignettes could reach 100% consensus during the validation process [18]. This issue became especially

obvious in vignette number ten. While this case was originally thought to describe a rather benign musculoskeletal health problem (costochondritis) [16], the emergency physician in Vaughn et al. [18] vehemently argued that the signs and symptoms described in vignette number 10 were also very typical for a myocardial infarct. Interestingly and perhaps reassuringly based on the report of Vaughn et al. [18], the bulk of students in the current study also deemed this case to be highly suspicious and chose to refer the patient without giving any physiotherapy intervention.

First of all, the target population of final year undergraduate physiotherapy students was limited to students from ENPHE member Universities only. ENPHE member institutions do not represent all Universities within Europe which offer an undergraduate degree in physiotherapy. As a direct consequence, the results cannot be used to make a generalized statement about keep/refer decision making abilities of European undergraduate physiotherapy students. Secondly, it was neither possible to obtain e-mail addresses from all 183 ENPHE member Universities, nor

was it feasible to convince all remaining ENPHE Universities to participate in the research study. The ENPHE webpage provides two different pages/pathways where the 28 member countries together with their various member institutions can be found. However, the content of these two pages differs sometimes fundamentally: While some Universities are presented (as member institutions of a particular country) on one page, the same institutions (or at least some of them) cannot be found on the alternative page (and vice versa). It is therefore not always clear which Universities actually are current ENPHE members. Moreover, not all Universities listed detailed information such as the actual student number, graduation date(s), contact names and (e-mail) addresses. Another issue was the English translation and general organisation of several University homepages. It is therefore sometimes impossible to even find the correct (health or physiotherapy) department or the proper contact person.

Another important issue applies to non response bias. Vaughn et al. [18], who examined keep/refer decision making abilities of DPT students, even hypothesized that individual Universities, who knew about a possible lack of knowledge/training of their students, might have been reluctant to distribute the survey. In addition, it is quite likely that only those students completed the survey who felt comfortable of making an accurate keep/refer decision based on clinical vignettes. Moreover, it can be hypothesized that some students had doubts about their ability to complete a survey which was entirely in English.

Some results of individual countries (as seen in Table 4) also give rise to doubt if students really completed the survey alone. Students were explicitly asked to finish the survey on an individual basis but there is no way of telling if they complied with this request.

In conclusion, novice physiotherapists are not expected to be as accurate as qualified and more experienced physiotherapists when it comes to clinical keep/refer decision making competencies. Novice physiotherapists, however, also work with patients (without supervision and, depending on the health care system, even without prior medical referral) and are therefore continuously challenged to independently determine if a patient is suitable for physiotherapy (as part of a professional and/or ethical obligation). And although the response rate was extremely low and therefore generalizability of the results is definitely problematic, outcome data of the current project gives the clear impression that, in general, European final year undergraduate physiotherapy students are not sufficiently equipped with enough knowledge and skills to make very precise keep/refer decisions (based on clinical vignettes) and, most importantly, seem insufficiently trained to accurately identify more severe medical conditions which require a timely referral to another health care professional (e.g. a physician).

Acknowledgements

The authors would like to thank Dr Michael Weber for his statistical advice during the preparation of this manuscript. The authors are also grateful to Dr Ursula Eckler for her efforts to advertise the project during an ENPHE conference in 2015.

Disclosure statement

The authors report no conflicts of interest.

Reference list

1. Greenhalgh S, Selfe J. Margaret: a tragic case of spinal Red Flags and Red Herrings. *Physiother.* 2004;90(2):73-76.
2. De Schepper EIT, Koes BW, Veldhuizen EFH, et al. Prevalence of spinal pathology in patients presenting for lumbar MRI as referred from general practice. *Fam Pract.* 2016;33(1):51-56.
3. Enthoven WTM, Geuze J, Scheele J, et al. Prevalence and „Red Flags“ Regarding Specific Causes of Back Pain in Older Adults Presenting in General Practice. *Phys Ther.* 2016;96(3):305-312.
4. Henschke N, Maher CG, Refshauge KM, et al. Prevalence of and Screening for Serious Spinal Pathology in Patients Presenting to Primary Spine Settings With Acute Low Back Pain. *Arthritis Rheum.* 2009;60(10):3072-3080.
5. Boissonnault WG, Ross MD. Physical therapists referring patients to physicians: a review of case reports and series. *J Orthop Sports Phys Ther.* 2012;42(5):446-454.
6. Rodeghero JR, Denninger TR, Ross MD. Abdominal pain in physical therapy practice: 3 patient cases. *J Orthop Sports Phys Ther.* 2013;43(2):44-53.
7. VanWyngaarden JJ, Ross MD, Hando BR. Abdominal aortic aneurysm in a patient with low back pain. *J Orthop Sports Phys Ther.* 2014;44(7):500-507.
8. Lackenbauer W, Janssen J. Lyme Disease as a Source of Chronic Cervical Spine Complaints Radiating into the Upper Extremity: Case Report. *Manuelle Therapie.* 2017;21:43-46.
9. Lackenbauer W, Janssen J. Gallstones as a Source of Muscular Thoracic Pain: Case Report. *Manuelle Therapie.* 2016;20:233-236.
10. Hawkins AP, Sum JC, Kirages D, et al. Pelvic osteomyelitis presenting as groin and medial thigh pain: a resident's case problem. *J Orthop Sports Phys Ther.* 2015;45(4):306-315.
11. World Confederation for Physical Therapy. Standards of physical therapy practice. London, UK: WCPT; 2011. Available from: <http://www.wcpt.org/guidelines/standards>
12. World Confederation for Physical Therapy. WCPT guideline for physical therapist professional entry level education. London, UK: WCPT; 2011. Available from: <http://www.wcpt.org/guidelines/entry-level-education>
13. World Confederation for Physical Therapy. Policy Statement: Education. London, UK: WCPT; 2011. Available from: <http://www.wcpt.org/policy/ps-education>
14. Lackenbauer W, Janssen J, Roddam H, et al. Is keep/refer decision making an integral part of national guidelines for the physiotherapy profession within Europe? A review. *Physiother.* 2016 [cited 2017 Jul 1]; [22 p]. DOI: <https://doi.org/10.1016/j.physio.2016.11.005>
15. Riddle LD, Hillner BE, Wells PS, et al. Diagnosis of Lower- Extremity Deep Vein Thrombosis in Outpatients with Musculoskeletal Disorders: A National Survey Study of Physical Therapists. *Phys Ther.* 2004;84(8):717-728.

16. Jette DU, Ardleigh K, Chandler K, et al. Decision-Making Ability of Physical Therapists: Physical Therapy Intervention or Medical Referral. *Phys Ther.* 2006;86(12):1619-1629.
17. Mount HE. *SCREENING FOR MEDICAL REFERRAL: DETERMINING VARIABLES THAT INFLUENCE ACCURACY [dissertation]*. Birmingham (Alabama). University of Alabama; 2012.
18. Vaughn DW, Shoemaker MJ, DaPrato D, et al. The Ability of Final-Year Doctor of Physical Therapy Students to Make Keep/Refer Decisions. *J Phys Ther Educ;* 2011;25(3):60-67.
19. Beyerlein C. *Direktzugang in der Physiotherapie – Wie entscheiden sich Physiotherapeuten im Management ihrer Patienten [dissertation]*. Ulm (Baden-Württemberg). Universitätsklinikum Ulm; 2010.
20. Schämamm A, Scheermesser M, Stegen C, et al. *Direktzugang zur Physiotherapie in der Schweiz.* Paper presented at: Bildungs- und Unternehmerforum; 2011 September 30; Bern.
21. Veloski J, Tai S, Evans A, et al. Clinical Vignette-Based Surveys: A Tool for Assessing Physician Practice Variations. *Am J Med Qual.* 2005;20(3);151-157.
22. Peabody JW, Luck J, Glassman P, et al. Comparison of Vignettes, Standardized Patients, and Chart Abstraction: A Prospective Validation Study of 3 Methods for Measuring Quality. *JAMA.* 2000;283(13):1715-1722.
23. Peabody JW, Luck J, Glassman P, et al. Measuring the Quality of Physician Practice by Using Clinical Vignettes: A Prospective Validation Study. *Ann Intern Med.* 2004;141(10):771-780.
24. Converse L, Barrett K, Rich E, et al. Methods of Observing Variations in Physicians' Decisions: The Opportunities of Clinical Vignettes. *J Gen Intern Med.* 2015 [cited 2017 Jul 2]; [9 p.]. DOI: 10.1007/s11606-015-3365-8
25. Rousseau A, Rozenberg P, Ravaud P. Assessing Complex Emergency Management with Clinical Case-Vignettes: A Validation Study. *PLoS ONE.* 2015 [cited 2017 Jul 3]; [12 p.]. DOI:10.1371/journal.pone.0138663

Table 1: Demographic characteristics of participating ENPHE member countries.

Add here access system?

ENPHE country	Number of participating Universities	Total number of students	Student participants (n)	Response rate (%)
Austria	4	284	13	4.6
Belgium	1	250	0	0
Czech Republic	1	38	4	10.5
Denmark	4	211	16	7.5
Estonia	1	30	10	33.3
Finland	4	151	6	4
Germany	3	71	2	2.8
Latvia	1	10	0	0
Lithuania	3	196	1	0.5
Netherlands	4	410	14	3.4
Norway	1	40	0	0
Spain	3	223	4	1.8
Sweden	3	123	3	2.4
Switzerland	1	111	0	0
United Kingdom	2	90	0	0

Table 2: Mean and median percentages of correct keep/refer decisions of European undergraduate physiotherapy students (combined) for each category.

		Musculoskeletal	Medical non critital	Medical critital
N		73	73	73
Mean		75%	72%	52%
Median		80%	75%	67%
Standarddeviation		17%	20%	28%
Percentiles	25	60%	50%	33%
	75	80%	75%	67%

Table 3: Number and percentages of European undergraduate physiotherapy students (combined) who made a correct (YES) or incorrect (NO) keep/refer decision for **100% of cases** within a category.

	Musculoskeletal 100% correct		Medical non critical 100% correct		Medical critical 100% correct	
	No	Yes	No	Yes	No	Yes
N	62	11	59	14	65	8
%	84.9%	15.1%	80.8%	19.2%	89.0%	11.0%

Table 4: Mean and median percentages of correct keep/refer decisions for each category (per country).

Countries		Musculoskeletal	Medical non critical	Medical critical	
Austria	Mean	77%	73%	46%	
	Median	80%	75%	33%	
	Standard Deviation	16%	12%	26%	
	Percentiles	25	70%	75%	33%
		75	80%	75%	67%
Czech Republic	Mean	50%	94%	67%	
	Median	50%	100%	67%	
	Standard Deviation	12%	13%	0%	
	Percentiles	25	40%	81%	67%
		75	60%	100%	67%
Denmark	Mean	81%	64%	46%	
	Median	80%	75%	33%	
	Standard Deviation	11%	22%	21%	
	Percentiles	25	80%	50%	33%
		75	80%	75%	67%
Estonia	Mean	66%	75%	60%	
	Median	60%	75%	67%	
	Standard Deviation	13%	20%	21%	
	Percentiles	25	60%	50%	33%
		75	80%	100%	67%
Finland	Mean	67%	67%	56%	
	Median	70%	75%	50%	
	Standard Deviation	27%	13%	27%	
	Percentiles	25	50%	50%	33%
		75	85%	75%	75%
Germany	Mean	80%	88%	50%	
	Median	80%	88%	50%	
	Standard Deviation	28%	18%	24%	
	Percentiles	25	60%	75%	33%
		75	.	.	.
Lithuania	Mean	100%	100%	0%	
	Median	100%	100%	0%	
	Percentiles	25	100%	100%	0%

		75	100%	100%	0%	
Netherlands	Mean		77%	73%	62%	
	Median		80%	75%	67%	
	Standard Deviation		13%	21%	32%	
	Percentiles	25		60%	69%	58%
		75		80%	81%	75%
Spain	Mean		85%	63%	50%	
	Median		80%	75%	50%	
	Standard Deviation		10%	25%	43%	
	Percentiles	25		80%	38%	10%
		75		95%	75%	92%
Sweden	Mean		80%	67%	33%	
	Median		80%	75%	0%	
	Standard Deviation		0%	14%	58%	
	Percentiles	25		80%	50%	0%
		75		.	.	.

Table 5: Percentage and actual number of students (per country) who made a correct (Yes) or incorrect (No) keep/refer decision for **100% of cases** within a category.

Countries	Percentages (%) Actual Numbers (N)	Musculoskeletal 100% correct		Medical non critical 100% correct		Medical critical 100% correct	
		No	Yes	No	Yes	No	Yes
Austria	N	11	2	12	1	12	1
	%	84.6%	15.4%	92.3%	7.7%	92.3%	7.7%
Czech Republic	N	4	0	1	3	4	0
	%	100.0%	0.0%	25.0%	75.0%	100.0%	0.0%
Denmark	N	13	3	14	2	16	0
	%	81.3%	18.8%	87.5%	12.5%	100.0%	0.0%
Estonia	N	10	0	7	3	9	1
	%	100.0%	0.0%	70.0%	30.0%	90.0%	10.0%
Finland	N	5	1	6	0	5	1
	%	83.3%	16.7%	100.0%	0.0%	83.3%	16.7%
Germany	N	1	1	1	1	2	0
	%	50.0%	50.0%	50.0%	50.0%	100.0%	0.0%
Lithuania	N	0	1	0	1	1	0
	%	0.0%	100.0%	0.0%	100.0%	100.0%	0.0%
Netherlands	N	12	2	11	3	11	3
	%	85.7%	14.3%	78.6%	21.4%	78.6%	21.4%
Spain	N	3	1	4	0	3	1
	%	75.0%	25.0%	100.0%	0.0%	75.0%	25.0%
Sweden	N	3	0	3	0	2	1
	%	100.0%	0.0%	100.0%	0.0%	66.7%	33.3%

Table 6: Mean and median percentages of correct keep/refer decisions (depending on access system to physiotherapy) for each category.

Access system		Musculoskeletal	Medical non critical	Medical critical	
no direct access	N	15	15	15	
	Mean	77%	75%	47%	
	Median	80%	75%	33%	
	Std. Deviation	17%	13%	25%	
	Percentiles	25	60%	75%	33%
		75	80%	75%	67%
direct access only Private	N	49	49	49	
	Mean	75%	72%	54%	
	Median	80%	75%	67%	
	Std. Deviation	16%	22%	27%	
	Percentiles	25	60%	50%	33%
		75	80%	88%	67%
direct access	N	9	9	9	
	Mean	71%	67%	48%	
	Median	80%	75%	33%	
	Std. Deviation	23%	13%	38%	
	Percentiles	25	60%	50%	17%
		75	80%	75%	83%

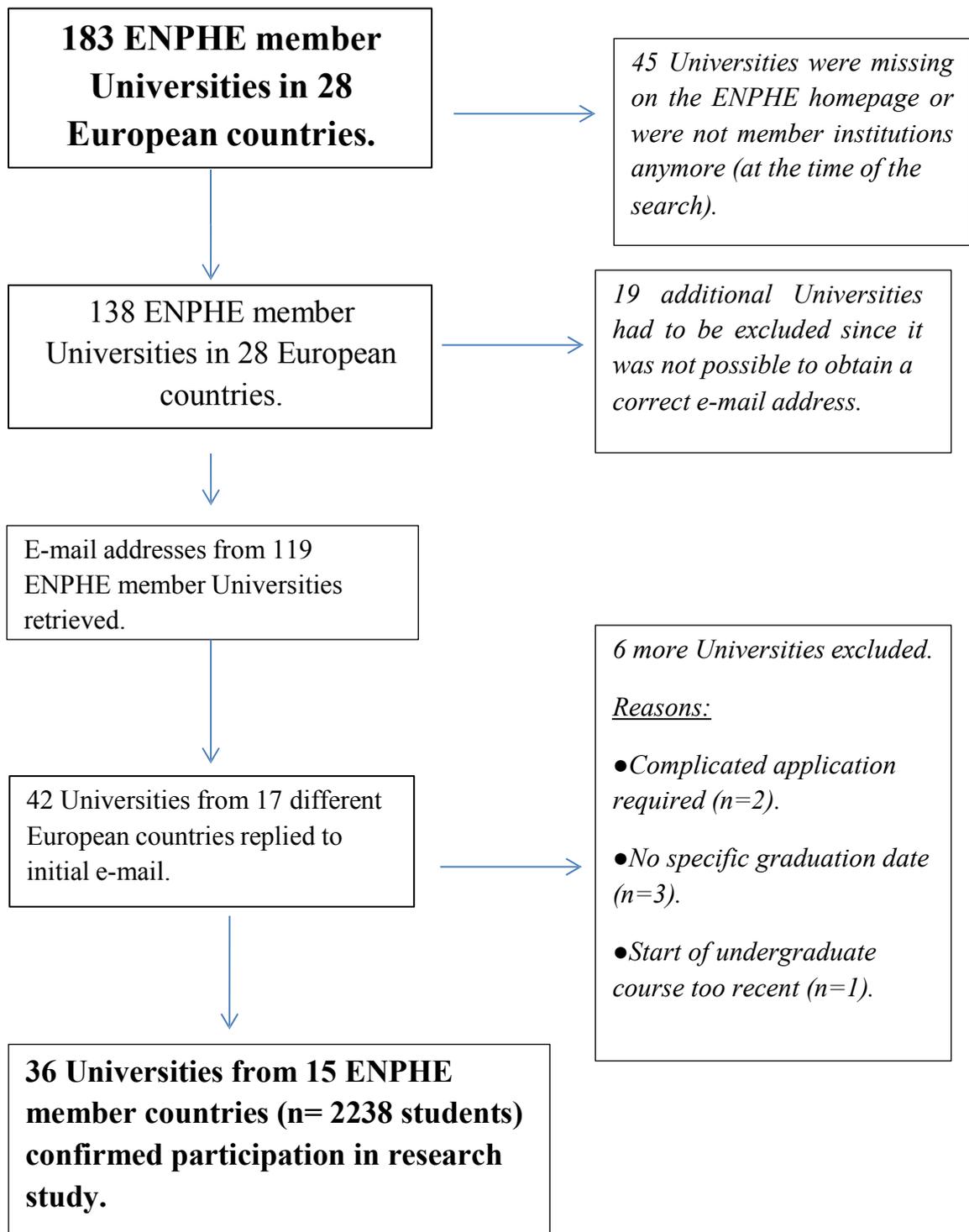


Figure1.

Figure captions

Figure 1: Different stages of recruitment