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ORIGINAL ARTICLE

Self-confidence and clinical skills: the case of students who study medicine in English in a non-English speaking setting

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Abstract

Background An increasing number of international students has been enrolling in medical studies in the English language offered by the countries of Eastern Europe. Development of practical skills is likely more challenging when students learn in the English language, while their patients are non-English speaking persons.

Aims To evaluate self-perception of practical skills of medical students in the English language program.

Methods From December 2016 to December 2017, a total of 52 students from the Studies in English program of two universities in Serbia were included in the study. Data were obtained by a previously validated questionnaire.

Results Participants were most confident when measuring blood pressure, checking the arterial pulse, and taking history. Students were the least confident when placing urinary catheters, performing rectal examinations, and suturing wounds. Male students reported higher confidence in "Major interventions" compared to females ($p = 0.004$), and no difference between male and female students was found in the total skill score of "knowledge of Serbian language" ($p = 0.339$). Adjusted analysis showed that a higher grade point average remains associated with a more confident perception of one's practical skills (B 26.48, 95% confidence interval 8.98–43.98). Rasch analysis showed that because the scores were distributed around the mean value between "not confident at all" and "quite confident," the majority of students had similar perceptions of their skills.

Conclusion Active supervision by teaching staff is also recommended in an attempt to rectify the lack of confidence at performing a range of clinical procedures which is present among international students.

Keywords International · Medical students · Self-perception · Skills

Introduction

Assessment of clinical skills among senior medical students and junior doctors has always been an important, yet challenging task. The ability to adequately perform a physical examination, correctly diagnose a certain condition and prescribe appropriate therapy represent a set of competencies that are crucial among medical undergraduates in their final years of study. To increase their competence in performing various medical procedures, medical students are required to have self-confidence [1]. In fact, it has been suggested that the ability to adequately perform medical tasks is not only influenced by the possession of a corresponding set of knowledge and skills, but also by having self-perceived confidence [2]. Therefore, to be able to put their knowledge into practice, medical students are required to independently assess their own capabilities, in addition to having opportunities to exercise their clinical skills.

It has been emphasized that self-assessment is an important aspect of medical practice because it allows for the reconsideration of strengths and limitations of personal competencies [3, 4]. This, in turn, allows for a rise in the individual's motivation to expand their level of knowledge and enhance their performance [3]. For this reason, self-assessment is an integral part of the learning process and is fundamental in the

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continuation of medical education [5]. Furthermore, the self-assessment of skills is an invaluable tool for teaching institutions, because the results can be used to further develop, adjust, and refine medical curricula [6, 7].

Previous studies have noted that students who have low self-confidence and self-efficacy in clinical tasks are less likely to persevere in difficult real-time situations [8]. This issue is especially relevant to international students. Aside from the fact that international students face challenges related to social adjustment as well as social and cultural alienation [9, 10], it has also been suggested that this cohort experiences psychological distress during the course of their medical education abroad [8]. More specifically, poor academic performance is one of the most prominent issues strongly related to psychological distress [8] and educational and social experiences among international students compared to their domestic peers [11]. Additionally, the development and formation of clinical skills over the course of undergraduate training is likely more challenging when students learn in the English language while their patients are, for the most part, non-English speaking persons.

Some reports indicated that a growing number of international students [12, 13] enroll in medical studies in English, which is offered by some Eastern European countries after attempting to enter domestic medical schools. Over the past few decades, universities of Central and Eastern Europe have been offering undergraduate and postgraduate programs in medicine and related sciences which are conducted in the English language [14, 15]. The choice of undergraduate program and country most commonly depends on the tuition fees and cost of living, although certain practical reasons may also influence the selection of schools [12]. While the number of admitted international students per school may vary annually, this cohort of undergraduates is considerably smaller compared to the cohort of domestic students at the same level of study. As a result, studies involving international medical students enrolled in English programs are sparse. Furthermore, there is very little research that examines the practical skills of international students who study medicine in a non-English speaking setting.

We previously evaluated the self-perception of practical skills among students who studied medicine in the Serbian language program [16]. In that cross-sectional study, we questioned 390 students from the 6th year (i.e., final year of undergraduate medical studies) at the largest medical school in the country, and asked them to rate their confidence in performing a set of 22 skills. The results showed that Serbian students had indicated that the measurement of arterial pulse and blood pressure and taking patients' history are skills they were most confident in. Students also reported the lowest level of confidence when they were required to place a urinary catheter and suture a wound. A higher grade point average did not correlate with higher levels of self-perceived confidence among students in the Serbian language program [16]. This study explores how medical students studying in the English language program in Serbia perceive their practical skills, in an attempt to bridge the gap in understanding the needs and clinical competencies of medical students across different study groups.

Methods

Setting

The Studies in English program in Serbia has been offered to international medical students since 1995. Applicants are selected by the Committee on Admissions. Qualifications required for admission are the following: an evidence of intellectual ability and achievement, which is indicated by performance in high school courses and evaluation examinations in chemistry and biology as well as suitable personal qualities as to character, attitude, and interest assessed during personal interviews with the Committee.

Since 2005, medical education in Serbia has been reformed according to the Bologna Process Principles [17]. The aim of the reform was to improve medical curriculum and include students as active participants in patient health care. Undergraduate medical studies last for 6 years (a total of 12 semesters) and are divided into preclinical (the first 3 years) and clinical (the last 3 years) training. Students are introduced to patient care from their first year, whereas actual involvement with patients occurs during the clinical years of training, when students practice taking medical histories and performing clinical examinations which are later discussed with teaching assistants. Skills such as wound suturing, blood sampling, placing of urinary catheters, cardio-pulmonary resuscitation, and patient immobilization are also included, but mostly observed.

Participants

A total of 16 students were enrolled in 5th year and 29 students were enrolled in 6th year in Belgrade, while a total of 8 students were enrolled in 5th year and 11 students were enrolled in 6th year in Novi Sad. Thus, the total number of eligible students was 45 in Belgrade and 19 in Novi Sad (altogether 64). Selection of students was based on convenience. Students were recruited in compulsory classroom seminars. On that occasion, we found 10 students in 5th year and 26 students in 6th year in Belgrade University; and 6 students in 5th year and 10 students in 6th year in Novi Sad. Therefore, we were able to identify 52 out of 64 students (response rate 52/64 = 81.25%). A questionnaire was distributed at the University of Belgrade from December 2016 to January 2017 and at the University of Novi Sad from October to

December 2017. All the students who were invited to partake also agreed to participate in the survey. Study participation was anonymous and students provided informed consent for participation in the study. Ethical approval for conducting this study in both Belgrade and Novi Sad was obtained from the Institutional Review Board from the Faculty of Medicine, University of Belgrade.

Data collection

Data were collected by the means of a questionnaire, which was previously developed and validated on a sample of medical students in the Serbian language program [16]. The psychometric analysis of the questionnaire showed excellent internal consistency as indicated by a Chronbach's alpha coefficient of 0.891. Regarding factor analysis, items in the questionnaire were segregated into five separate domains. The first domain labeled "Major interventions" was deemed to be a set of physically demanding skills including performing the Heimlich maneuver, performing cardio-pulmonary resuscitation (CPR), immobilizing a patient, and managing wound. The second domain required the use of fine manual skills and was entitled "Minor interventions." It comprised the following five skills: taking a venous blood sample, wound suturing, bandaging of wounds, administering an intramuscular injection, and placing an urinary catheter. "Results interpretation" was the third domain and included skills such as differentiation of heart sounds, interpretation of a Röntgen (RTG), interpretation of an electrocardiogram (ECG, and interpretation of blood test results. "Basic patient assessment" was the fourth domain which consisted of skills such as taking a patient history and performing a physical examination, arterial pulse measurement, and blood pressure measurement. The fifth and final domain was listed as "Other skills" and consisted of questions about the students' confidence in skills like reflex examination, digital rectal examination, exploring evidence-based medical data, and the student's overall readiness to begin working with patients [16].

Every item was registered on a scale of 1 to 10, where 1 corresponded with "I am not confident about performing this skill at all" and 10 coincided with "I am quite confident about performing this skill". The total score was the sum of scores for all 22 questions, and ranged from 22 to 220. Finally, the questionnaire collected the following demographic data: age, sex, grade point average (GPA), previous knowledge of the Serbian language, and residence in Serbia prior to the commencement of medical studies.

Data analysis

We used the statistical software SPSS 17.0 (SPSS INC, Chicago, IL, USA) for data analysis. The differences in scores between the sexes were assessed using the non-parametric Mann-Whitney test for two independent samples, given that distribution of skills scores was not normal. Spearman's correlation test was used to investigate the correlations between their GPA and domain scores as well as with the total skill score. To examine factors associated with a better perception of clinical skills, we performed multiple linear regression analyses. The dependent variable was the total skill score. The independent variables were the following: gender, age, GPA, parental marital status, parental education level, household monthly income, residence prior to studying at the University, age of first internet use, frequency of internet use, and extent to which online health information influences students' decision making. A probability level of $p < 0.05$ was considered statistically significant.

Winsteps software (version 4.0.1) was used to perform the Rasch analysis. The Rasch analysis assesses an individual's ability relative to item difficulty, and the results are presented in log-odds units (logits). "Person ability" and "item difficulty" are presented on an interval scale with logits indicating measurement units. The positive (upper) part of the scale indicates items of greater difficulty and a person with higher ability, while negative (lower) part indicates a person with lower ability and items of lesser difficulty. "Person separation" describes questionnaire precision and suggests the number of strata of "person ability" the scale may differentiate. Item separation indicates the reproducibility of the questionnaire and the number of item groups based on the level of difficulty. The coefficient of reliability 0.8 and above for these two separation indices is considered adequate [18]. Unidimesionality describes the questionnaire's power to measure a single construct and it is best determined by fit statistics (infit and outfit). Infit and outfit statistics suggest how well each item conforms to the underlying construct, with the infit statistics being a more revealing indicator since it is less sensitive to the effect of outliers. Mean square standardized residuals (MNSQ) are commonly used to describe fit statistics, and values between 0.5 and 1.5 are considered acceptable [18].

Results

A total of 52 students comprised our study sample. Basic sociodemographic characteristics are presented in Table 1. Less than one half of students (20, 41.7%) rated their Serbian language skills as excellent (Table 1). There were no differences in the total skill scores between results obtained from the University in Belgrade and Novi Sad (Mann-Whitney U 235.000, $p = 0.770$). As a result, students' skills were analyzed as one uniform set of data and not separately analyzed according to their university.

Table 2 describes the average practical skill scores for the entire study sample and also denotes the scores according to gender. The participants felt most confident about measuring

Table 1 Characteristics of the study sample ($N = 52$)

Variable	Count	Percentage
Gender		
Male	33	63.5
Female	19	36.5
Study year		
V	16	30.8
VI	36	69.2
Age (years)*	25.8	2.7
University		
Belgrade	36	69.2
Novi Sad	16	30.8
Grade point average*	8.3	0.6
Residing in Serbia prior to university		
Yes	16	67.3
No	33	32.7
Missing	*3*	*5.8*
Serbian language skills		
Poor	11	22.9
Satisfactory	8	16.7
Good	9	18.8
Excellent	20	41.7
Missing	*4*	*7.7*

The italic elements denote count and percentage of missing values

*Presented as mean values with corresponding standard deviations in the cells representing percentage

blood pressure, arterial pulse, and history taking and least confident about placing urinary catheters, rectal examinations, and suturing wounds. Male students were more likely to report higher scores in "Major interpretations" ($p = 0.048$). Overall, the average self-assessment score of male students for most skills was higher than that of their female colleagues. Nonetheless, female students felt slightly more confident in wound bandaging and taking patient history, throat, and reflex examination, albeit without reaching the level of statistical significance. Both sexes reported the same score in arterial pulse measurement (Table 2).

After classifying the students according to their level of knowledge of the Serbian language (excellent vs. other), no difference was observed in terms of total practical skill score (Mann-Whitney U 182.500, $p = 0.339$). The only instances where students with an excellent knowledge of the Serbian language outscored their peers who reported lower levels of spoken Serbian were in their scoring of how confident they feel in suturing a wound and in throat examination (Table 3).

The Supplementary Table S1 describes the average practical skill scores according to study year. Students in the 5th year felt more confident when differentiating heart sounds ($p = 0.022$), while students in the 6th year felt more confident at performing physical examination ($p = 0.015$). Table 4 shows the results of univariate and multiple linear regression analysis. Univariate models showed that associations with female gender and higher GPA correlated with a better perception of the students' practical skills. The multiple model showed that only instances of a higher GPA were independently associated with better perceptions of practical skills (Table 3).

The Rasch analysis showed excellent item reproducibility of 0.95 (Supplementary Table S2). The item separation index of 4.44 suggested that there were more than four groups of items according to their level of difficulty. Person reliability was 0.30 and person separation was 2.60 suggesting that there are more than 2 groups of students. A low standard error of measurement (Model SE) (Table 5) indicated good reliability of scale items. One item (no. 13) had infit mean squares above the accepted range (0.5 to 1.5). Two items (no. 13 and no. 20) had this issue with outfit mean squares. This reveals that students had difficulties in answering their skill level in performing wound management (no. 13) and digital rectal examinations (no. 20), probably due to the lowest confidence in performing these skills. Because of this, outfit means square values were labeled as "extreme."

The majority of students in this study had a similar perception of their skills. This is evident in their score distribution which did not stray far from the mean value which was located between "not confident at all" and "quite confident." In the cohort, there was one individual who reported being highly confident in all the skills listed and as a result, this participant was considered as an extreme case or outlier (Fig. 1). Also, in Fig. 1, five levels of item difficulty were determined, while the difference was not significant. Supplementary Fig. S1 depicts specific skills relative to the students' own perception of their confidence/ability.

Discussion

This study found that the students in the English language program from two universities in Serbia felt most confident about measuring blood pressure, arterial pulse measuring, and history taking, which have also been previously observed among students studying in the Serbian language program [16]. Although the mean GPA did not correlate with self-perceived readiness to start working with patients nor with the total skill score in the previous study [16], we observed that a higher GPA was predictive of more confidence in performing practical skills. In addition, no differences were identified in students' perception of confidence based on knowledge of Serbian.

Throughout the course of their medical studies, students regularly practice skills such as measuring blood pressure, measuring arterial pulse, and history taking; therefore, this finding was expected. Moreover, practicing arterial pulse measurement and history taking do not require specific

Table 2 Average scores of practical skills for the total sample and according to gender

Domains	All $N = 52$	Males $N = 33$	Females $N = 19$	p value for gender difference
Major interventions (physically demanding) (D1)				
D1.1. Performing Heimlich maneuver	5.7 (3.4)	6.0 (3.2)	5.2 (3.7)	0.550
D1.2. Performing CPR	6.0 (3.1)	6.6 (2.5)	4.9 (3.7)	0.131
D1.3. Immobilizing a patient	5.3 (3.0)	6.0 (2.5)	4.0 (3.4)	*0.035*
D1.4. Wound management	5.6 (2.8)	5.7 (2.7)	5.3 (3.1)	0.691
D1 Subscale score	22.5 (9.3)	24.4 (7.9)	19.2 (10.8)	*0.048*
Minor interventions (fine manual involvement) (D2)				
D2.1. Taking venous blood sample	5.0 (3.4)	5.4 (3.2)	4.2 (3.6)	0.172
D2.2. Suturing a wound	3.9 (3.0)	4.1 (3.1)	3.7 (2.9)	0.669
D2.3. Wound bandaging	5.8 (3.0)	5.8 (2.8)	6.2 (3.2)	0.491
D2.4. Administering intramuscular injection	6.2 (3.3)	6.6 (3.1)	5.4 (3.7)	0.359
D2.5. Placing an urinary catheter	3.4 (2.9)	3.5 (2.9)	3.2 (3.0)	0.563
D2 Subscale score	22.9 (11.5)	24.1 (11.5)	20.8 (11.2)	0.291
Results interpretation (D3)				
D3.1. Differentiation of heart sounds	5.9 (2.5)	6.5 (2.2)	4.7 (2.6)	*0.025*
D3.2. Interpreting a RTG	5.5 (2.8)	5.7 (2.5)	5.0 (3.3)	0.482
D3.3. Interpreting an ECG	5.4 (2.7)	5.7 (2.5)	5.0 (3.1)	0.410
D3.4. Interpretation of blood test	6.9 (2.4)	7.2 (1.7)	6.2 (3.3)	0.424
D3 Subscale score	24.7 (9.6)	26.1 (7.9)	22.3 (11.9)	0.114
Basic patient assessment (D4)				
D4.1. Taking patient's history	9.0 (1.6)	9.0 (1.5)	8.9 (1.8)	0.811
D4.2. Performing physical examination	8.1 (1.7)	8.2 (1.5)	7.8 (1.6)	0.361
D4.3. Arterial pulse measurement	8.7 (1.9)	8.7 (1.8)	8.7 (2.2)	0.672
D4.4. Blood pressure measurement	9.0 (1.7)	9.1 (1.5)	8.8 (2.0)	0.749
D4 Subscale score	34.8 (5.5)	35.1 (5.2)	34.2 (6.0)	0.789
Other skills (D5)				
D5.1. Throat examination	6.7 (2.6)	6.4 (2.5)	7.1 (2.6)	0.250
D5.2. Reflexes examination	7.6 (2.4)	7.5 (2.3)	7.9 (2.7)	0.335
D5.3. Digital rectal examination	4.2 (3.4)	4.5 (3.5)	3.6 (3.3)	0.418
D5.4. Exploring EBM data	6.1 (3.3)	6.7 (3.1)	5.0 (3.4)	0.098
D5.5. Readiness to start working with patients	6.5 (2.7)	6.8 (2.5)	5.9 (2.9)	0.296
D5 Subscale score	30.9 (9.1)	32.0 (8.1)	28.9 (10.4)	0.278

Values are presented as means with corresponding standard deviations; italic p values denote statistical significance. *CPR*, cardiopulmonary resuscitation; *EBM*, evidence-based medicine

Scale responses: 1, I am not able to perform the given skill at all; 10, I am confident at performing the given skill

Score range for factors 1, 3, and 4 was 4–40; score range for factors 2 and 5 was 5–50

instruments and can thus be practiced ubiquitously. Students at other medical schools, in Brazil for instance, reported being most confident when performing a physical examination [19]. Previous studies have that self-perceived confidence in performing basic clinical skills depends on how frequently the individual had performed the relevant procedures [20]. Similarly, the results of this study also showed that a higher level of self-confidence likely resulted from repeated practice of a skill during clinical rounds.

By contrast, the participants in this study reported being least confident in placing urinary catheters, conducting rectal examinations, and suturing wounds. These results were similar to the results of students in the Serbian program who considered themselves least confident in suturing wounds and placing urinary catheters [16]. Lack of confidence in these skills could be explained by the fact that students in general do not routinely practice these procedures which are also not required in final examinations and assessment. Inclusion and active participation in clinical rounds were reported previously to be key factors in structuring clinical skills [21]. A study of skills among Canadian medical students suggested that, before taking an international elective over the course of

Table 3 Average scores of practical skills of students in the English language program according to knowledge of Serbian language

Domains	Serbian language skills		*p* value for difference
	Excellent *N* = 20	Good/satisfactory/poor *N* = 28	
Major interventions (physically demanding) (D1)			
D1.1. Performing Heimlich maneuver	5.3 (3.4)	5.9 (3.5)	0.204
D1.2. Performing CPR	5.7 (3.0)	6.2 (2.9)	0.154
D1.3. Immobilizing a patient	4.5 (2.8)	5.4 (2.8)	0.259
D1.4. Wound management	6.0 (2.4)	5.6 (2.8)	0.735
D1 Subscale score	21.5 (9.5)	23.1 (8.8)	0.241
Minor interventions (fine manual involvement) (D2)			
D2.1. Taking venous blood sample	5.2 (3.5)	4.7 (3.4)	0.941
D2.2. Suturing a wound	5.2 (3.1)	1.8 (2.9)	*0.007*
D2.3. Wound bandaging	6.8 (2.5)	4.9 (2.8)	0.185
D2.4. Administering intramuscular injection	6.3 (2.9)	6.2 (3.5)	0.609
D2.5. Placing an urinary catheter	3.7 (2.9)	3.3 (3.0)	0.369
D2 Subscale score	26.2 (11.6)	20.8 (11.2)	0.124
Results interpretation (D3)			
D3.1. Differentiation of heart sounds	5.8 (2.3)	5.7 (2.8)	0.686
D3.2. Interpreting a RTG	5.6 (2.7)	5.4 (2.7)	0.840
D3.3. Interpreting an ECG	5.2 (2.8)	5.6 (2.8)	0.548
D3.4. Interpretation of blood test	6.7 (2.7)	6.6 (2.4)	0.743
D3 Subscale score	25.5 (11.7)	24.7 (9.5)	0.777
Basic patient assessment (D4)			
D4.1. Taking patient's history	9.5 (0.9)	8.6 (1.8)	0.145
D4.2. Performing physical examination	8.4 (1.3)	7.8 (1.6)	0.136
D4.3. Arterial pulse measurement	9.0 (1.8)	8.5 (2.2)	0.731
D4.4. Blood pressure measurement	9.1 (1.8)	8.8 (1.9)	0.516
D4 Subscale score	36.0 (5.2)	33.8 (6.2)	0.081
Other skills (D5)			
D5.1. Throat examination	8.0 (1.6)	6.1 (2.6)	*0.020*
D5.2. Reflexes examination	7.8 (2.0)	7.7 (2.4)	0.621
D5.3. Digital rectal examination	4.0 (3.2)	3.9 (3.5)	0.360
D5.4. Exploring EBM data	5.7 (3.4)	6.2 (3.4)	0.776
D5.5. Readiness to start working with patients	6.5 (2.9)	6.0 (2.7)	0.217
D5 Subscale score	32.2 (8.1)	29.9 (7.7)	0.180

Values are presented as means with corresponding standard deviations; italic *p* values denote statistical significance. *CPR*, cardiopulmonary resuscitation; *EBM*, evidence-based medicine

Scale responses: 1, I am not able to perform the given skill at all; 10, I am confident at performing the given skill

Score range for factors 1, 3, and 4 was 4–40; score range for factors 2 and 5 was 5–50

undergraduate medical training, insertion of intravenous lines, suturing of wounds, assistance in surgeries, and postoperative care of wounds should be highlighted before leaving abroad [22]. Interestingly, North American medical students reported the highest level of confidence when placing a urinary catheter [23], which clearly illustrates differences in the clinical approach across medical programs worldwide. In order to improve clinical skills such as placing urinary catheters and suturing wounds, it would be beneficial that these procedures are made mandatory during regular clinical rounds. In fact, obtaining greater confidence in their own skills would enable students to participate in activities requiring those specific skills as opposed to avoiding participation due to lack of skill competence [24]. A recent study suggested that an improvement of surgical skills can be achieved through training, regardless of the student's previous educational experience [25].

Overall, clinical skills were similar between students who had different levels of Serbian language fluency. The findings highlight that involvement in practical work with patients is not likely to be a result of the interaction with a patient per se,

Table 4 Factors associated with higher confidence in practical skills: results of univariate and multiple linear regression analysis

Variable	Univariate linear regression B (95% CI)	Multiple linear regression B (95% CI)
Gender		
Male vs. female	− 22.57 (− 42.42, − 2.71)*	− 13.95 (− 36.53, 8.63)
Age	1.90 (− 1.86, 5.67)	0.24 (− 3.68, 4.15)
Grade point average	30.22 (14.23, 46.21)**	26.48 (8.98, 43.98)**
Residing in Serbia prior to university		
Yes vs. no	− 0.94 (− 23.05, 21.16)	− 5.92 (− 29.26, 17.42)
Serbian language skills	4.30 (− 4.25, 12.85)	5.35 (− 4.36, 15.07)

*$p < 0.05$; **$p < 0.01$; *B*, unstandardized coefficient; *CI*, confidence interval

but rather appraisal of objective requirements in patient management. We observed certain differences between the sexes in their reports of confidence in "Major interpretations," which stands in contrast with reports of students in the Serbian program where females scored higher in "Basic patient assessment" [16]. Previous studies suggested certain differences between sexes when performing medical procedures [26, 27]. For example, in the UK, clinical examinations were better conducted by women than men [26], whereas male students were found to perform better in surgical procedures

Table 5 Rasch analysis item statistics of clinical skills questionnaire

Item number	Total score	Total count	Measure	Model SE	Infit		Outfit		Pt measure	
					MNSQ	*Z* STD	MNSQ	*Z* STD	Correl.	Expect.
1 (D4.1)	466	52	− 0.69	0.10	1.26	0.9	1.16	0.6	0.32	0.34
2 (D4.2)	420	52	− 0.35	0.07	0.54	− 2.3	0.59	− 1.8	0.49	0.44
3 (D3.1)	301	51	0.08	0.06	0.78	− 1.4	0.74	− 1.4	0.54	0.56
4 (D4.3)	455	52	− 0.58	0.09	1.37	1.3	1.28	1.0	0.37	0.37
5 (D4.4)	469	52	− 0.72	0.10	1.35	1.1	1.00	0.1	0.37	0.33
6 (D2.1)	258	52	0.25	0.06	0.97	− 0.1	0.89	− 0.5	0.69	0.58
7 (D2.2)	204	52	0.42	0.06	0.97	− 0.1	0.87	− 0.6	0.63	0.58
8 (D2.3)	301	52	0.11	0.06	0.73	− 1.7	0.69	− 1.8	0.68	0.57
9 (D1.1)	296	52	0.13	0.06	1.19	1.1	1.13	0.8	0.58	0.57
10 (D2.4)	315	51	0.04	0.06	1.17	1.0	1.12	0.7	0.59	0.55
11 (D1.2)	313	52	0.07	0.06	1.41	2.2	1.33	1.7	0.38	0.56
12 (D1.3)	276	52	0.19	0.06	1.05	0.3	1.04	0.3	0.53	0.58
13 (D1.4)	284	51	0.14	0.06	0.49	− 3.7	0.47	− 3.5	0.76	0.57
14 (D3.2)	275	50	0.16	0.06	0.68	− 2.1	0.64	− 2.2	0.70	0.58
15 (D3.3)	282	52	0.17	0.06	0.85	− 0.9	0.77	− 1.3	0.55	0.57
16 (D3.4)	343	50	− 0.08	0.06	0.92	− 0.4	0.93	− 0.2	0.45	0.53
17 (D2.5)	176	52	0.53	0.06	1.24	1.2	1.14	0.6	0.53	0.57
18 (D5.1)	349	52	− 0.05	0.06	1.02	0.2	1.04	0.2	0.41	0.53
19 (D5.2)	399	52	− 0.25	0.07	1.34	1.5	1.28	1.2	0.24	0.47
20 (D5.3)	209	50	0.39	0.06	1.49	2.4	1.60	2.5	0.50	0.58
21 (D5.4)	318	52	0.05	0.06	1.17	1.0	1.09	0.5	0.60	0.56
22 (D5.5)	331	51	0.00	0.06	0.81	− 1.0	0.84	− 0.8	0.55	0.53
Mean	320.0	51.5	0.00	0.06	1.04	0.0	0.98	− 0.2	/	/
P.SD	79.2	0.7	0.33	0.01	0.28	1.5	0.27	1.4	/	/

P.SD, population standard deviation; *SE*, standard error; *MNSQ*, mean square standardized residuals; *Z*, z standardized scores; *STD*, standard deviation; *Correl*, correlation; *Expect*, expected; For coding of items D*.* see Table 2

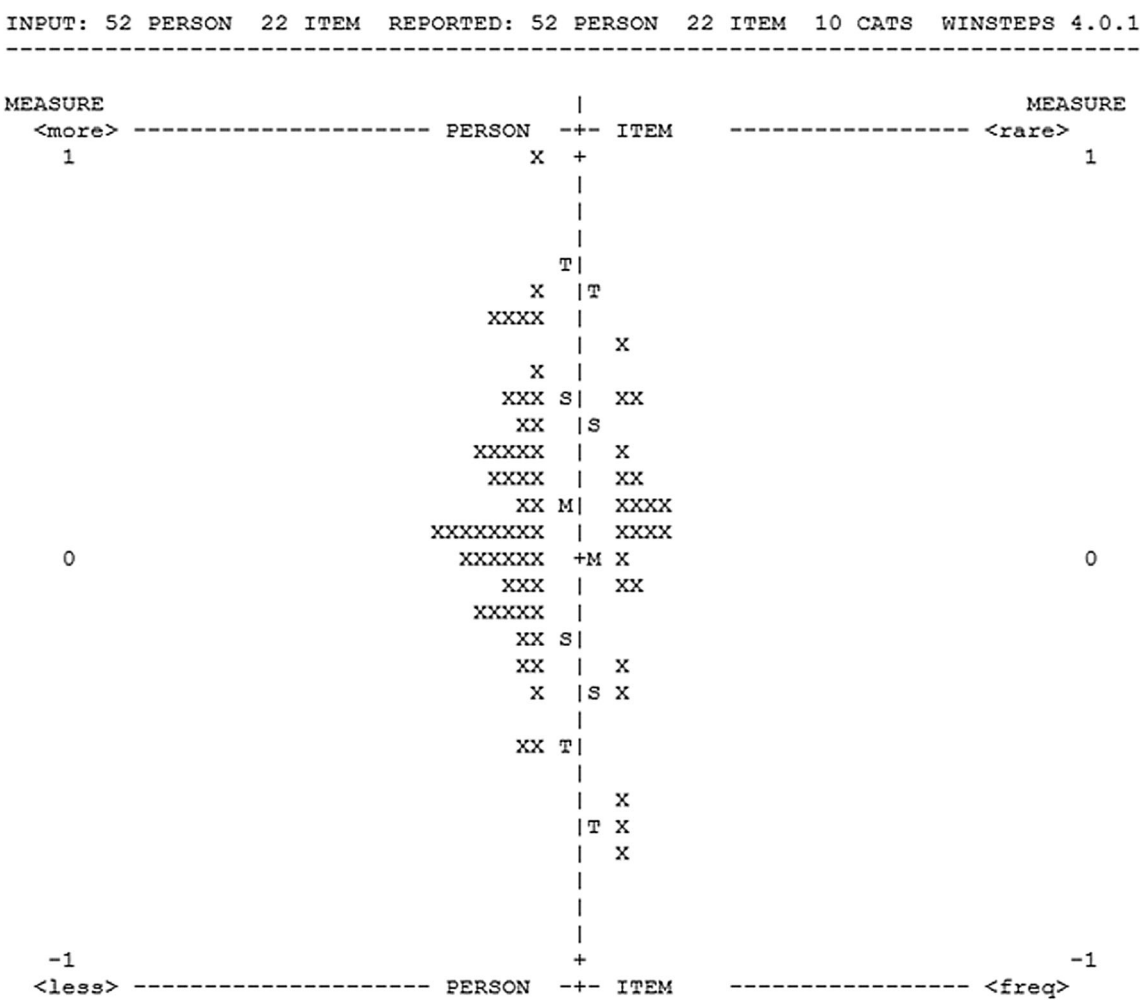

Fig. 1 Rasch analysis person-item chart of practical skills

[27]. Our results coincide with usual gender divisions in the medical profession, where men prefer surgical specialties as opposed to women [28].

Few differences in confidence were found between students in the 5th and 6th year. We assumed that 5th-year students would be overall more confident compared to 6th-year students, because of the structure of the program in the final 2 years of study. Specifically, 5th year subjects are more clinically oriented in terms of practical skills, while 6th-year students would be more occupied with their current subjects, final exams, and post-degree opportunities. Nevertheless, we observed that 6th-year students retain specific knowledge in performing certain skills, especially when the lapse in time was also taken into consideration.

Contrary to the students in the Serbian program [16], we observed that attaining a higher GPA played an important role in having better confidence in clinical skills among students in the English language program. In fact, the adjusted multiple linear regression model identified a higher GPA as the only factor associated with stronger confidence in clinical skills. Similar to our results, a study in New Zealand reported that lower academic achievements among medical undergraduates were associated with poorer professional and clinical skills [29]. While students' theoretical knowledge does not necessarily correspond to their confidence in their actual performance, it seems that in the English language program, students with better academic achievements also have greater confidence in their practical skills. Still, it is suggested that medical students should be challenged during practical rounds and encouraged to openly participate in tasks during their involvement in the wards and the outpatient department. Moreover, it is suggested that medical students are to be involved in situational awareness as early as possible to be able to format their skills and respond appropriately in demanding circumstances [30]. We propose that students address their weaknesses and emphasize a need for assistance in this process alongside the implementation of a positive feedback-based learning style.

The results of the Rasch analysis of clinical skills showed appropriate metric characteristics of the questionnaire used to collect data. Moreover, it was confirmed in a distinctive methodological approach that the structure of the questionnaire

corresponds to the construct previously observed using the exploratory factor analysis [16]. While items no.13 (wound management) and no. 20 (digital rectal examination) were misfits in terms of their infit and outfit mean squares, it does not inherently require the omission of these items from the questionnaire. Item no. 13 can be considered borderline, as it was very close to the cut off of 0.50, while item no. 20 corresponded to the skill yielding least confidence among the cohort. Because there was no difference in item difficulty, it is assumed that the items correspond adequately to students' perception. For this reason, we believe that the list of skills should be maintained in its original form [16].

Some limitations of this study need to be addressed. The study sample was considerably small. However, the sample size was proportionate to the number of students enrolled in the Studies in English program. Consequently, a thorough analysis of the various levels of spoken Serbian (poor vs. satisfactory vs. good vs. excellent) was unable to be performed. It would be beneficial to conduct a similar study in neighboring countries that also offer undergraduate studies in medicine to international students, in order to obtain a larger sample size, but also to compare confidence in practical skills between the different programs. Additionally, to gain a more thorough insight into the students' level of performance of certain skills, independent observers are needed.

Conclusion

In conclusion, our study highlights the lack of confidence in performing a range of clinical procedures among international students studying in the English language program. To tackle this issue, in an effort to improve students' confidence in their practical skills, it is suggested that more hours are dedicated to the development and practice of these skills alongside active supervision by teaching staff. Similarly, an introduction of logbooks with a predetermined set of skills may lead to the enhancement of competence and a boost of confidence ahead of graduation.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Research involving human participants and/or animals All procedures involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments.

Informed consent Informed consent was obtained from all individual participants included in the study.

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