

Clinical N-PAL Preferentially Benefits International Students

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Abstract

The aim of this study was to investigate the extent to which Near Peer Assisted Learning influences the final practical examination results of Year 3 medical students at the University of Malta.

Twenty-five Year 4 students received 10 hours of training using standardized clinical histories and corresponding checklists. Fifty-three Year 3 students in a 1:2 tutor:learner ratio attended ten prepared sessions covering history taking and examination skills in each of the body systems.

Results: EU participants had significantly higher mean scores than non-EU students (78 vs 66%, $p = 0.02$). EU and non-EU N-PAL participants had higher mean clinical examination scores than EU and non-EU non-participants (77.3 vs 70.5%, $p=0.1$; 66.3 vs 47.8%, $p=0.07$, respectively). The mean pre/post test score for doing a clinical examination increased by 29%.

Discussion: Perhaps because peer assisted tutoring is perceived to be less formidable than clinician-led teaching, N-PAL participating students from non-EU countries scored almost one fifth higher than their non-participating peers in the final clinical skills examination. Perceived pre/post test scores improved dramatically in doing a clinical examination, indicating that participants felt that they benefited from attending these sessions.

Conclusion: If used as an adjunct to formal teaching, Near Peer Assisted Learning is particularly beneficial to non-EU students studying within the EU, probably because it improves communication skills, instills self-confidence as well as helps students to practice practical skills in an informal setting.

Take home messages: Near Peer Assisted Learning boosts the confidence of non-EU students allowing them to perform better in clinical exam situations. However, *all* participants reported the sessions as being very helpful in improving their history-taking and clinical examination skills.

Keywords: Near-Peer Assisted Learning

Introduction

In recent years, Near Peer Assisted Learning (N-PAL) has increasingly gained popularity in tertiary education including medical and dental disciplines (Topping, 1996). First described by Whitman and Fife in 1988, N-PAL involves undergraduate students tutoring other students, the former being at least one year senior to their peers.

Cognitive congruence and/or social congruence hypotheses have been described to explain how N-PAL benefits both the near peer tutor as well as the learner. The former, first described by Cornwall *et al.* (1980), refers to the fact that near peer students have a similar network of thinking to learners (due to being closer in age), and as such they can tailor better their tutoring to the students' needs. Moreover, since they have only recently been through the same phase of learning, they can foresee issues with understanding and can target their tutoring to address them (Lockspeiser, 2008). They may also point out particular studying strategies they had found useful themselves. In addition, near peer tutors and learners share similarities in social roles and background, resulting in increased student motivation and self-confidence (Cornwall *et al.*, 1980; Lockspeiser, 2008). As near peer tutors are considered to be role models and friends, learners feel more at ease and

are less anxious to ask questions than they might be asking a recognised tutor, thus creating a more informal and safe learning environment (Ten Cate *et al.*, 2007).

Near peer tutoring also fosters students' intrinsic motivation, communication and leadership skills, which are important in the long term, as teaching plays an essential role in clinical practice (Ten Cate & Durning, 2007; Naeger *et al.*, 2013; Andrew *et al.*, 2013). Students acting as near peer tutors report a greater understanding of the subject matter because as they prepare for the sessions, they study in a goal-centred way leading to better recall (Bruner, 1961). This phenomenon could be explained by the Bales' Learning Pyramid which argues for a wide variety of teaching models depending on the context (Ten Cate and Durning, 2007).

One of the principal reasons N-PAL is becoming widely used in many medical universities is the increasing number of students and the resulting limitations imposed on available clinician-led teaching time (Rodrigues *et al.*, 2009). N-PAL sessions are usually conducted in small groups with a low tutor to tutee ratio, thus allowing for more active student participation and interaction (Lockspeiser *et al.*, 2008; Duran *et al.*, 2012). Several medical curricula have incorporated N-PAL with problem based learning and teaching of clinical skills (Barrows & Tamblyn, 1980; Blank *et al.*, 2013; Burke *et al.*, 2007). Although near peer tutors are not experts, there is some evidence that this does not negatively impact students' examination performance (Ten Cate *et al.*, 2012). Nevertheless, near peer tutoring is not intended to replace standard teaching; rather it could be used as an adjunct, to increase students' contribution towards their own medical education and further enhance collaboration between students and the university that prepares them (Furmedge *et al.*, 2014).

Study Design

The study was conducted in 2015/16 and designed to assist students in their preparation for the Year 3 practical final examination which included history taking and clinical examination. Our hypothesis was that those students who self-selected to join the N-PAL sessions would perform better in this examination.

N-PAL was provided as an adjunct to the formal teaching offered by the university. The tutoring programme was based on the module curriculum as well as the Year 4 students' own experiences of the Year 3 assessment.

Under the supervision of an academic member of staff, the "Together We Learn" student organising team prepared teaching material (in the form of original case studies covering common presenting complaints within the cardiovascular, respiratory, gastrointestinal, endocrine, renal and musculoskeletal systems), together with specific checklists, which also served as simplified mark schemes to allow the near peer tutors (NPTs) to serve as both "patient" and "assessor". N-PAL clinical sessions also covered cardiovascular, respiratory, abdominal, upper and lower limb neurological and cranial nerve examinations. YouTube videos were used as a guide for teaching clinical examination skills and appropriate checklists were developed.

All Year 3 (tutees) and Year 4 (tutors) medical students were invited to participate in the study via e mail. Previous teaching experience was taken into consideration in the NPT selection process. The target tutor:learner ratio was 2:1. All NPTs attended a two-hour long training session which allowed them to develop their teaching skills by going through practice cases and acting as patients as well as learning how to assess students with the use of case-specific checklists. All NPTs were offered the opportunity to ask for further training sessions if they felt inadequately prepared.

Ten hour-long N-PAL sessions were planned, although many over-ran. A total of 13 cases and seven clinical examinations were provided by the NPTs. The performance of Year 3 students on history taking, case presentations, differential diagnosis and clinical examination skills was assessed by the NPTs using carefully designed checklists.

Data Collection

Both qualitative and quantitative data was collected. Each participating student completed a questionnaire before and after each teaching session using an anonymous personal identification number. They were asked to rate how comfortable they were with taking a detailed history, presenting the case and carrying out a physical examination. They were also asked to rate their expectations of developing key skills such as teamwork and communication and to identify strengths and weaknesses of the sessions. Apart from repeating the above questions, the post-session surveys also asked whether the tutoring was well planned and organised, if it was valuable to them and if they received constructive feedback aimed at the appropriate level. Finally, both students and NPTs were given the opportunity to provide feedback regarding suggested changes.

After ethics approval, the official exam results of the practical examination of all Year 3 students were provided to the project supervisor who anonymized the data prior to analysis by the research team. The study was approved by the University of Malta Research Ethics Committee (Protocol 67).

Data Analysis

Exam results were categorised by nationality into local, other-EU (mostly British) and non-EU (mostly from the Gulf). Mean exam scores were analysed statistically using the t-test assuming equal variances; pre-post test scores were analysed with ANOVA, both using Excel.

Content analysis was used to analyse open-ended questions systematically. Results were then tabulated according to the categories identified.

Results

Quantitative Data

A total of 25 near peer tutors were trained and 53 third year students (32 females and 21 males) participated in the N-PAL sessions. Almost two thirds of the NPTs completed more than seven of the ten scheduled sessions, and 20% voluntarily committed even more hours. Table 1 shows the distribution of Year 3 students. Other-EU students were all British, while Non-EU students were all from the Gulf.

Table 1: Number of Year 3 Students in each Group

	Participants	Non-Participants
Local	26	83
Other-EU	19	35
Non-EU	8	5
Total	53	123

Figure 1 shows the mean marks for all study group participants in the Year 3 final clinical examination that tested history taking and examination skills. There was no statistically significant difference between the overall mean scores of N-PAL participants and non-participants ($p=0.2$). However, both other-EU and non-EU participants had higher mean clinical exam scores than non-participants ($p=0.1$; $p=0.07$ respectively).

Local and EU participant scores were very similar, but non-EU students scored significantly lower than the other two groups ($p=0.02$). Moreover, non-EU participants scored 18.5% higher than their non-participating peers.

Overall, local students scored approximately 5% higher than other-EU ($p=0.01$) and 19% higher than non-EU students ($p=0.00000004$) in the Year 3 clinical examination. This difference between subgroups was even greater among non-participants, which was highest (30% greater) between local and non-EU students ($p=0.01$), although that between local and other EU students was also statistically significant ($p=0.01$).

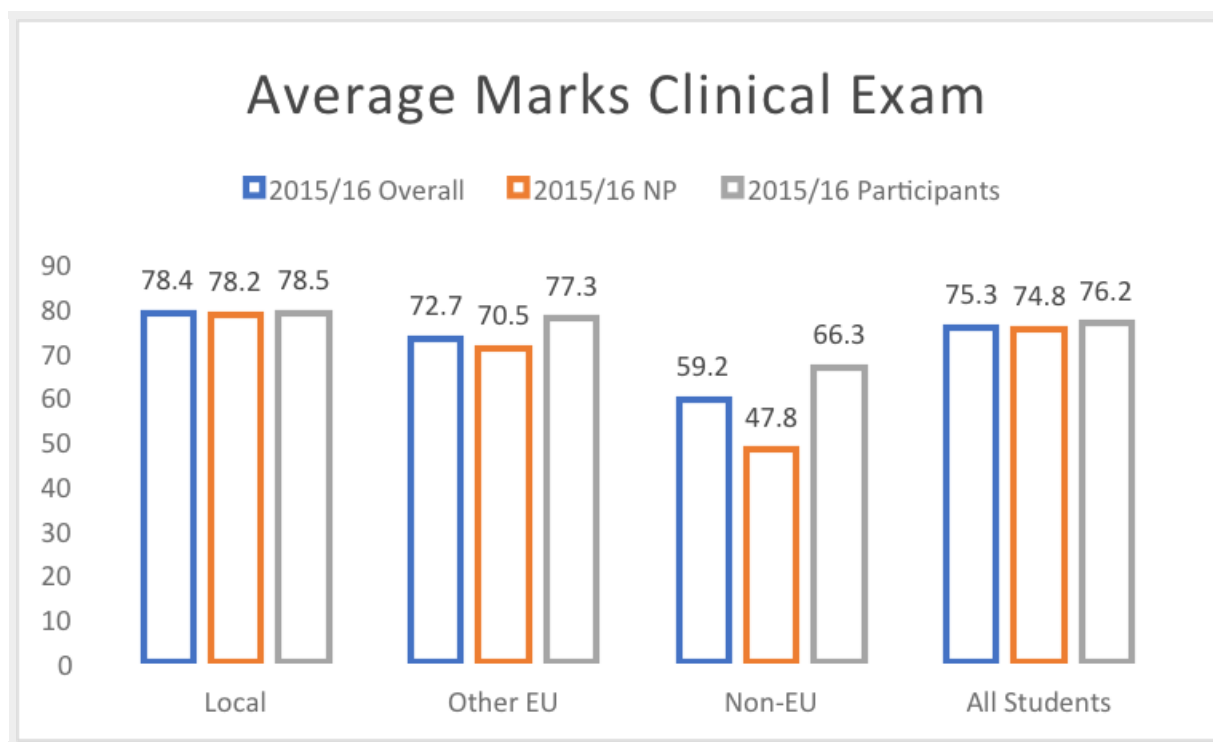


Figure 1

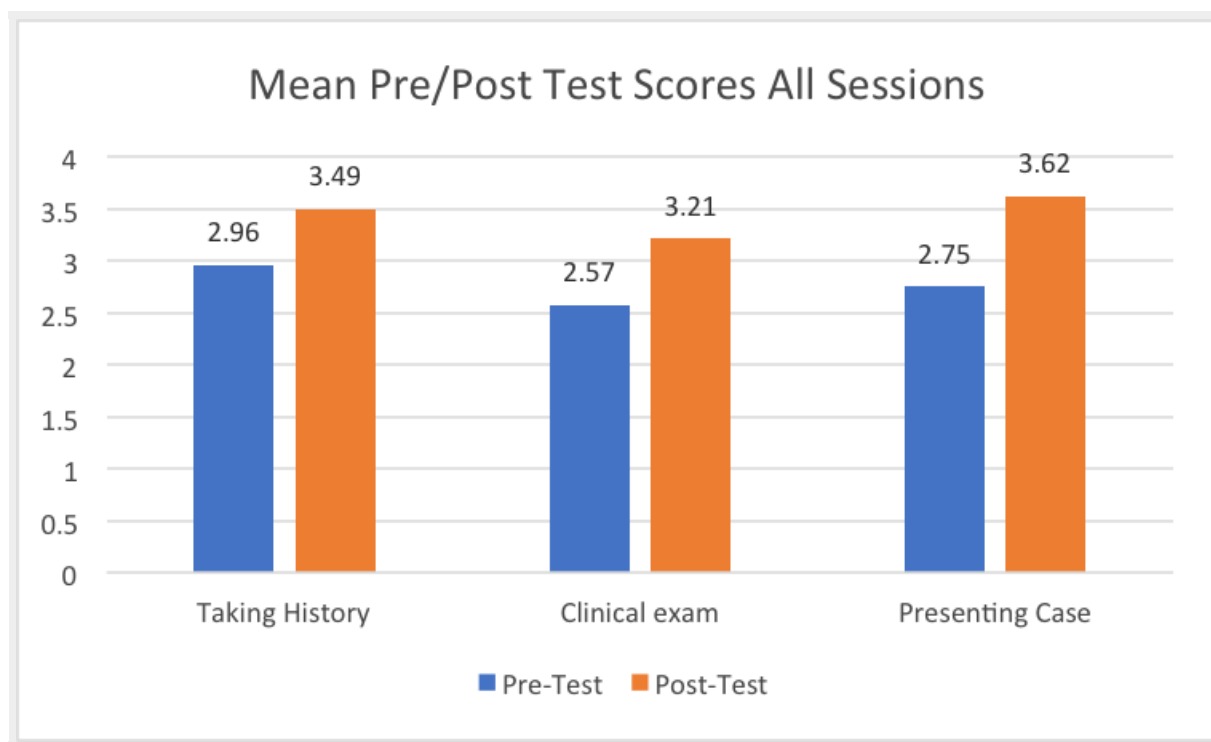
Table 2 shows that the mean scores in the female subgroup was approximately 5-6% higher than males, both among participants and non-participants (p=0.3).

Table 2: Average Marks (%) for MDS 3010 by Gender

	Males	Females
Overall	72.9	77.8
Participants	72.3	78.9
Non-Participants	73.1	77.3

Figure 2 shows that among N-PAL participants, the mean self-reported pre/post test score increased by 16% for taking a history, 29% for doing a clinical examination, and by 24% for presenting a case (p=0.01).

Figure 2: Mean Self-Reported Pre/Post Test Scores Among all N-PAL Participants



Qualitative Feedback

Almost all NPTs who did not complete all the planned sessions reported that “no consensus could be reached on available time” especially during the second semester (n=6). One other NPT claimed that “it was hard to find a place”. The other reasons given by the near peer teachers were “lack of student enthusiasm” (n=1) and “students lost interest in the sessions” (n=1). Almost two thirds of NPTs completed 7-10 sessions, with 20% holding more than 10 sessions; 12% however did not complete all ten planned sessions.

Feedback about the Training Workshop

At the end of the training workshop, 16 of the 25 participating NPTs provided feedback. Table 3 presents the main categories that emerged from content analysis together with the direct quotes given by the NPTs. ‘The importance of setting out expectations prior commencing training’, ‘ameliorating near peer tutors skills through further training’ and ‘gaining confidence by sharing knowledge and skills’ were the most common content categories identified. Overall, the NPTs found the training workshop highly useful as it clearly set out the objectives of the sessions and helped them to focus on the skills they were expected to teach.

Table 3: Content Analysis of Feedback about the Training Workshop

The importance of setting out expectations prior commencing training	10
“The training workshop served to focus on what I had to do”	2
“The training workshop set out the expectations successfully ... it was very helpful and useful”	5
“The training workshop was well planned and well executed”	3
Improving near peer tutors skills through further training	8
“I feel tutors would benefit from some training regarding how to teach and communicate effectively”	2

“More training on how to carry out examinations ...what is the best way to go about it so that the near peer tutors are able to deliver the best methods possible”	2
“Two short sessions are ideal to train students with no experience of peer education”	1
Gaining confidence by sharing knowledge and skills	2
“Felt that I was helping the students by providing tips that I have learnt throughout the clinical years”	2

Feedback about the N-PAL Programme Overall

Fifteen of the 25 participating NPTs provided feedback on the overall N-PAL programme. Table 4 presents the main categories that emerged from content analysis together with the direct quotes given by the NPTs. Two main themes emerged: ‘*consolidating practical skills through teaching*’ and ‘*need for a better organised schedule to help direct both parties involved*’. Overall, the NPTs reported a very positive experience and highly recommended this method of teaching. They found the sessions beneficial as they served as a revision for the topics that were covered in their previous year. However, they also highlighted the need for a more organised system as they encountered difficulty in scheduling time slots and finding a room to carry out the sessions. Moreover, they also suggested that the sessions should be longer in order for the learners to have more time to practice.

Table 4: Content Analysis of NPT Feedback on Overall Programme

Consolidating practical skills through teaching	15
“Apart from experiencing the teaching side of this programme, it has also given me the opportunity to revise topics which were not part of this year’s curriculum”	5
“Helpful to both parties taking part”	2
“I felt more confident with each session... I also saw the confidence of the third years grow when taking a history, however I hope these sessions will not replace the history-taking from actual patients on the wards”	2
“I felt I was able to reassure and help guide third years...a way of giving something back”	1
“I enjoy teaching and I intend to pursue an academic career later on”	1
“Great opportunity to improve teaching and presentation skills”	1
“If done properly it can be effective”	1
“I wish to see it as part of the education system of the faculty”	1
“Teaching the topic itself helped me more in understanding the topics discussed”	1
Need for a better organised schedule to help direct both parties involved	10
“An organised mock exam would have been very beneficial”	1
“Better organisation in finding a place and scheduled time slots”	1
“Try grouping students according to their assigned clinical groups so it would be easier to find a time when they are free”	1
“Need for better cases, passionate tutors and enthusiastic students”	1
“Highly suggest trying to get more third years involved as I believe it is very valuable for the third years”	1
“I think that half way through the sessions, we should have swapped the students so that they could have different feedback from different tutors”	1
“The neurological exam needs to be split into two sessions, one for the cranial nerves and one for the upper and lower neurological examinations since it is not an easy examination to explain”	1
“Students struggled more with examinations than with histories ... more sessions would have been useful”	2

Longer sessions are required as time allocated to each session was not enough ... for the examinations we spent double the time that was allocated”	1
“It is essential for the students to remain with the same tutor in order to be able to identify their weak areas and train them more thoroughly”	1

Feedback about the Teaching Cases

Sixteen of the 25 participating NPTs provided feedback regarding the cases used during N-PAL. Two main themes emerged: “*Diversity of cases enabled more effective training*” and “*constructing cases to suit realistic scenarios*”. Overall, near peer tutors were very satisfied with the cases provided by the student organisers. Table 5 presents the main categories that emerged from content analysis together with the direct quotes given by the NPTs.

Table 5: Content Analysis of NPT Feedback on Teaching Cases

Diversity of cases enabled more effective training	14
“The cases were very varied, included common scenarios and were ideal for training of year three students”	8
“The cases helped to revise while going through them and thinking about the differential diagnosis”	4
“The cases tackled most of the common conditions that are asked in exams and seen at hospital”	1
“Generally the cases enabled me to branch out and teach effectively”	1
Constructing cases to suit realistic scenarios	13
“Some cases need to be modified slightly to make them more practical and realistic”	3
“Some cases were too difficult and too long for the third year medical students and this discouraged them greatly”	2
“The cases were out of synch with the student attachments... ideally it would make more sense to have all cases at the start to adapt the sessions to the students’ knowledge base”	1
“Maybe more cardiology cases could be provided since they are very commonly asked in the practical exam”	1
“All the cases should have the same template that is the same structure and amount of information after the case”	1
“Some of the cases were a bit ambiguous and far-fetched at times”	1
“More care should be taken in certain cases to make the checklist relevant to the particular case”	1
“More attention should be given to make the cases progressively more difficult towards the end”	1
“I think it would be beneficial to include some take-home points towards the end and to give some learning objectives for each session”	1
“There should be more than one case for each session which deals with the main and most common complaints present in Malta”	1

Discussion

The main aim of the N-PAL sessions was to provide additional support to Year 3 students by offering them the opportunity to practice clinical skills in an informal learning environment in preparation for their final clinical skills examination. This study showed no statistically significant difference in the final practical exam scores of participants and non-participants, most likely due to the relatively small sample size. Why did only approximately a third of the Year 3 student cohort volunteer to participate? First, students might not have clearly understood what the study entailed, as this was the first ever introduction of N-PAL at our medical school; second, they may have

had concerns that the NPTs' clinical inexperience could mislead them; third, they may have been unwilling to make the necessary time commitment. It is also very likely that ten hours of additional practice time was insufficient to significantly impact exam results. However, it is also quite possible, given the local teaching environment, that local students who chose not to participate in the planned N-PAL sessions either practiced a great deal more on their own or ran their own "informal" additional support sessions. Any of the above could explain why the difference in the final practical exam scores of participants was not significantly different from that of non-participants. Notwithstanding all of this, and despite not being able to directly compare faculty-led teaching to N-PAL, this study clearly shows that student learners are not in any way disadvantaged by participating in this extra-curricular student-initiated learning activity.

Although the mark schemes from which the checklists were derived were very similar to those of the final Year 3 clinical examination, the relatively high class average (76%) indicates that examiners may have been lenient in their assessment. The examiners may have had lower expectations of the students' clinical abilities, this being the first ever clinical skills examination that they had ever taken. This relatively high average may have cancelled possible subtle differences between PAL participants and their peers.

Although overall there was no statistically significant difference in the final practical exam scores of participants and non-participants, the non-EU subgroup who participated in N-PAL performed significantly better than their non-participating peers. Our analysis assumed that all participating students came to all N-PAL sessions, which, except for one non-EU student who attended fewer than 20% of the N-PAL sessions, and whose failing exam score brought down the mean for the whole group, was indeed the case.

Further evidence that non-EU students benefited the most from the N-PAL sessions was the observation that while local students scored approximately 5% higher than other-EU ($p=0.01$) and 19% higher than non-EU students ($p=0.00000004$), this difference was even greater among non-participants.

There is scant information in the literature regarding differences between peer learner subgroups and how cultural differences could impact the learning of clinical skills that require a level of confidence and ability to communicate well in a second language. Although small, our study demonstrates that students from non-EU countries who participate in N-PAL sessions scored almost one fifth higher (18.5%) than their non-participating peers in the final clinical skills examination suggesting that this sub-group benefited the most from the N-PAL sessions they attended. One possible reason might be that these students lack confidence in approaching local patients to practice clinical skills and feel much more at ease learning these skills in an informal environment. Language barriers may also have played a part, as hospitalized, often elderly local patients, are generally not fluent in English. It is also possible that this small sub-group of students needs more time to practice, and the N-PAL sessions provided just that.

Looking beyond exam results, this study shows that after only 10 hours of N-PAL, overall, the Year 3 students' perceived clinical skills increased by almost one third. Of the skills practiced during the N-PAL sessions, self-reported clinical examination improved the most, suggesting that students feel they are benefiting because they are given the opportunity to practice outside the formal hospital clinical setting thus improving their self-confidence (Spickard *et al.*, 1996; Graham *et al.*, 2004). These findings support those of Silbert & Larke (2012) who reported that 85% of students participating in student grand rounds increased their perceived self-confidence, together with a three-fold increase in examination performance skills.

It has been suggested that peer tutors volunteer to participate because foundation doctors (FY) are expected to teach and assess (Yu *et al.*, 2011). Indeed, most N-PAL tutors in this study highlighted the benefits of participating by stating that they were "*consolidating practical skills through teaching*". From their responses, it is evident that they found the sessions beneficial as "*the cases helped to revise while going through them and thinking about the differential diagnosis*". Thus, N-PAL is a reciprocal process and tutors have been shown to improve their leadership skills and confidence as well as their perceived ability to provide constructive feedback (Burgess *et al.*, 2014; Weyrich *et al.*, 2012). Moreover, there is also some empirical evidence that despite not being significantly different in terms of age, previous educational experience and nationality, PAL tutors continue to perform better in all summative anatomy spotting exams than their peers, even *after* the PAL experience has concluded (Agius and Stabile, 2016).

Overall, the NPTs found the training workshop highly useful as it clearly set out the objectives of the sessions and helped them to focus on the skills they were expected to teach. Nevertheless, although feedback from the NPTs tutors highlighted the need for more training sessions (especially on how best to teach examination skills), none of them actually requested additional training at the time. This is probably because they did not realise how little they knew until they came to do it themselves. In retrospect, we should have devoted more training time to that aspect.

Almost two thirds of the NPTs completed more than seven of the ten scheduled sessions, and 20% voluntarily committed even more hours. Nevertheless, finding a common time to schedule the sessions proved to be a major barrier, which realistically could only have been overcome by faculty commitment to this student-led initiative. Sadly, this was not to be. It is hoped that the significant positive impact on perceived clinical skills shown in this study will convince faculty leaders to support this programme in the future.

Conclusion

In conclusion, this small study shows that when used as an adjunct to formal teaching, N-PAL is particularly beneficial to non-EU students studying within the EU, as it improves communication skills, instills self-confidence as well as helps students to practice practical skills in an informal setting.

Limitations

As the recruitment of learners proved to be difficult, this small study did not have the power to show differences in examination results between the peer assisted learners and their controls. One participating non-EU student who attended fewer than 20% of the N-PAL sessions failed the examination, and brought down the mean for the whole non-EU cohort. Moreover, other factors outside the control of the study are likely to have impacted the final clinical exam results of all students.

Take Home Messages

When used as an adjunct to formal teaching, N-PAL preferentially benefits non-EU students studying within the EU, as it improves communication skills, instills self-confidence as well as helps students to practice practical skills in an informal setting.

Notes On Contributors

Halima Iqbal & Michela Galea: contributed to the study design, creating the resources needed for the near peer assisted learning to take place as well as data collection, quantitative data analysis as well as the writing of the paper.

Andee Agius: helped with creating the resources needed for N-PAL as well as the analysis of the qualitative data.

Isabel Stabile: oversaw the progress of the project and helped with the writing of the paper.

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Bibliography/References

Agius, Andee and Stabile Isabel. Peer Teachers do better than Peer Learners in Summative Anatomy Examinations. Presentation to the Winter Meeting of the British Anatomical Society, Cambridge, UK., 2016

Andrew Jay E, Starkman SJ, Pawlina W, Lachman N. Developing medical students as teachers: An anatomy-based student-as-teacher program with emphasis on core teaching competencies. *Anat Sci Educ.* 2013;6(6):385-392.

Barrows H, Tamblyn R. *Problem-based learning: An approach to medical education.* New York: Springer. 1980.

Blank WA, Blankenfeld H, Vogelmann R, Linde K, Schneider A. Can near-peer medical students effectively teach a new curriculum in physical examination? *BMC Med Educ.* 2013;13:165-6920-13-165.

Bruner J. The act of discovery. *Harvard Educ Rev.* 1961(31):21-32.

Burgess, Annette, Deborah McGregor, and Craig Mellis. "Medical Students As Peer Tutors: A Systematic Review". *BMC Medical Education* 14.1 (2014): n. pag. Web.

Burke J, Fayaz S, Graham K, Matthew R, Field M. Peer-assisted learning in the acquisition of clinical skills: A supplementary approach to musculoskeletal system training. *Med Teach.* 2007;29(6):577-582.

<https://doi.org/10.1080/01421590701469867>

Cornwall M. Students as teachers: Peer teaching in higher education. *Centrum Onderzoek Wetenschappelijk Onderwijs.* 1980.

Duran CE, Bahena EN, Rodriguez Mde L, et al. Near-peer teaching in an anatomy course with a low faculty-to-student ratio. *Anat Sci Educ.* 2012;5(3):171-176.

Furmedge DS, Iwata K, Gill D. Peer-assisted learning--beyond teaching: How can medical students contribute to the undergraduate curriculum? *Med Teach*. 2014;36(9):812-817.

<https://doi.org/10.3109/0142159X.2014.917158>

Graham K, Burke JM, Field M. Undergraduate rheumatology: Can peer-assisted learning by medical students deliver equivalent training to that provided by specialist staff? *Rheumatology (Oxford)*. 2008;47(5):652-655.

<https://doi.org/10.1093/rheumatology/ken048>

Lockspeiser TM, O'Sullivan P, Teherani A, Muller J. Understanding the experience of being taught by peers: The value of social and cognitive congruence. *Adv Health Sci Educ Theory Pract*. 2008;13(3):361-372.

<https://doi.org/10.1007/s10459-006-9049-8>

Naeger DM, Conrad M, Nguyen J, Kohi MP, Webb EM. Students teaching students: Evaluation of a "near-peer" teaching experience. *Acad Radiol*. 2013;20(9):1177-1182.

<https://doi.org/10.1016/j.acra.2013.04.004>

Rodrigues J, Sengupta A, Mitchell A, et al. The southeast scotland foundation doctor teaching programme--is "near-peer" teaching feasible, efficacious and sustainable on a regional scale? *Med Teach*. 2009;31(2):e51-7.

<https://doi.org/10.1080/01421590802520915>

Silbert BI, Lake FR. Peer-assisted learning in teaching clinical examination to junior medical students. *Med Teach*. 2012;34(5):392-397.

<https://doi.org/10.3109/0142159X.2012.668240>

Spickard A,3rd, Corbett EC,Jr, Schorling JB. Improving residents' teaching skills and attitudes toward teaching. *J Gen Intern Med*. 1996;11(8):475-480.

<https://doi.org/10.1007/BF02599042>

Ten Cate O, Durning S. Dimensions and psychology of peer teaching in medical education. *Med Teach*. 2007;29(6):546-552.

<https://doi.org/10.1080/01421590701583816>

Ten Cate O, van de Vorst I, van den Broek S. Academic achievement of students tutored by near-peers. *Int J Med Educ*. 2012;3:6-13.

<https://doi.org/10.5116/ijme.4f0c.9ed2>

Topping K. The effectiveness of peer tutoring in further and higher education: A typology and review of the literature. *Higher Education*. 1996;32(3):321-345.

<https://doi.org/10.1007/BF00138870>

Weyrich P, Schrauth M, Kraus B, Habermehl D, Netzhammer N, Zipfel S, Jünger J, Riessen R, Nikendei C: Undergraduate technical skills training by student tutors: Tutees' acceptance and tutors' attitudes. *BMC Med Educ* 2008, 8:18.

<https://doi.org/10.1186/1472-6920-8-18>

Whitman NA. Peer teaching: To teach is to learn twice. Association for the Study of Higher Education; ERIC Clearinghouse on Higher Education, Washington, DC. 1988.

Yu TC, Wilson NC, Singh PP, Lemanu DP, Hawken SJ, Hill AG: Medical students-as-teachers: a systematic review of peer-assisted teaching during medical school. *Adv Med Educ Pract* 2011, 2:157-172.

Appendices

Declaration of Interest

The author has declared that there are no conflicts of interest.

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