Peer-assisted learning: a novel approach to clinical skills learning for medical students

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OBJECTIVE This study aimed to determine whether peer-assisted learning (PAL) can enhance clinical examination skills training.

METHODS Three student trainers studied small-group theory and clinical examination and provided PAL as extra tuition for 86 trainees. Trainees watched an examination video, were videotaped practising the examination and, after constructive feedback, repeated the examination. Responses to PAL were evaluated to attain an overview of trainee and trainer performance using visual analogue and Likert scale analyses. Year-group review was undertaken using questionnaires.

RESULTS Trainees evaluated all aspects of PAL highly, including their post-training confidence in examination skills (mean > 7.7 on a 10-cm scale), indicating that the PAL was effective. Written comments confirmed the students perceived the sessions as well structured and of high quality. Compared with trainees in the first groups, those from later groups gave all parameters similar or higher gradings. Those for interest ($P = 0.03$) and appropriateness ($P = 0.01$) were significantly higher, suggesting that trainers may improve their technique with time. Students with previous degrees gave similar or lower gradings than standard entry students, with answers about post-training confidence and recommendation to friends being statistically lower ($P < 0.006$). Six months later, year-group analysis showed that 90% of trainees rated PAL highly, and 86% wished to become trainers. Of the trainers' year group, 79% perceived that PAL training could improve examination skills.

CONCLUSIONS In the context of clinical skills training, PAL was highly evaluated across many parameters, including confidence after training. Student interest and enthusiasm supports suggestions that PAL could be a useful adjunct to clinical skills training.

KEYWORDS *education, medical, undergraduate; *peer group; *teaching/ *methods; clinical competence/ *standards; Scotland; students, medical/ *psychology; attitude of health personnel; humans.

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INTRODUCTION

Peer-assisted learning (PAL) allows senior students (trainers) to assist their junior colleagues (trainees) with teaching and learning support and is implemented in many undergraduate and postgraduate programmes.[1,2] The recognised advantages are that peers are deemed more approachable than faculty staff by the trainees, and student trainers are often more familiar with their courses than some faculty staff and readily integrate new learning experiences into the curricular context.[3,4] Science faculties encourage postgraduate trainers to supervise undergraduate trainees during laboratory sessions[5] as it enhances understanding of learning, increases the knowledge base of the trainers and trainees benefit from their peers' experience.[6,7]

Medical student training has only incorporated PAL in limited ways. Students have acted as tutors in lecture-based courses[8] and have been recruited as student facilitators in problem-based (PBL) curricula.[9] Qualitative analysis of these 'theoretical' sessions has shown that both trainers and trainees

Overview

What is already known on this subject

Peer-assisted learning (PAL) helps students develop theoretical knowledge and skills by interaction with colleagues, and improves communication skills, enhances personal development and boosts performance. However, it has not been evaluated in the context of clinical skills training.

What this study adds

Peer-assisted learning increases opportunities for learning about examination skills. Trainees evaluated the quality of the training session highly, including the confidence gained in examination skills. Trainer experience improves trainee evaluation of PAL. Students are keen to take part in PAL as an adjunct to clinical skills training.

Suggestions for further research

Larger, controlled, objective, qualitative and quantitative studies are required to evaluate the benefits of PAL for student trainers. Differences between undergraduate and postgraduate entry students require more detailed analysis.

benefited[10,11] and that there was a positive correlation with examination performance.[12,13] However, to our knowledge PAL has not been used in the context of 'practical' clinical skills training.

The University of Glasgow recruits about 250 medical students annually. Approximately two-thirds are female (62%), and 10% have a previous degree prior to entry. Students start to learn clinical skills from Year 2 by watching a video explaining the method for examining each system, followed by practice sessions supervised by trained clinical tutors. In subsequent years this progressively extends to observed patient examination as students move into a more ward- and outpatient-based training environment.

The Glasgow course was designed to contain 5-week student-selected modules (SSMs) to encourage the students to extend their knowledge in areas of interest. At the students' request, and complying with the General Medical Council (GMC) theme of developing students' teaching skills,[14] an SSM was developed to investigate whether PAL techniques could be used to increase trainees' exposure to clinical examination skills using the cardiovascular, respiratory and gastrointestinal systems.[15] This study shows, for the first time, that using PAL to complement clinical skills training can be beneficial for trainees. Student enthusiasm supports the suggestion that PAL might usefully be integrated into the core curriculum as an adjunct to clinical skills training.

METHODS

Training the trainers

Three students from Years 4 and 5 approached staff members hoping to improve their understanding of teaching and learning techniques in the area of clinical examination. In order to accommodate this request, an SSM was designed to allow these senior students (trainers) to study the principles underpinning small-group teaching and PAL.[16] This included a literature review, watching training videos describing examination techniques and practising these skills on each other under appropriate consultant supervision. Subjects covered included examination of the cardiovascular, respiratory and gastrointestinal systems.

Training the trainees

Trainees were recruited from Years 1 and 2, using poster and e-mail advertisements. Thirty two groups of up to 5 trainees (median 3) volunteered to participate in the PAL training sessions. In the Glasgow curriculum, 50% of students' time is allocated to self-directed learning, so each trainee had ample time to undergo this additional training. Trainees were shown a clinical examination video, and trainers explained the relevant techniques, using additional resources including posters and models to explain the relevant anatomy. Trainees were videotaped practising their examination, and, after feedback, repeated the procedure with guidance from their trainers until their performance matched the standard of that in the training video.

Trainee evaluation

Trainers devised a questionnaire to establish trainees' views. This was piloted on colleagues to check for

clarity and distributed upon completion of PAL training. Students from each of the 10 groups of trainees were asked to complete the questionnaire anonymously but to indicate the date of their training, their year group, gender and, when appropriate, any previous degrees. This facilitated a comparison between early groups of trainees and later groups in order to investigate the effect of trainer experience on trainee responses.

The questions used a 10-cm visual analogue scale (VAS) to assess whether the training session had been interesting, how appropriate the session had been to the trainee's experience, whether the trainer had seemed informed, and the degree of clarity of explanations provided. Other questions assessed the usefulness of the trainer's feedback, how easy it had been to ask questions, trainee confidence in examination after the session, and whether the trainee would recommend PAL training. Space was provided for free text responses to the questions:

- What was done well in the course?
- What could be improved?
- What was it like to be taught by a student?

The year group from which most trainees originated were surveyed at a lecture 6 months after the training sessions using questions evaluated by Likert scale or yes/no answers. The 204 students who attended the lecture completed the questionnaire, representing 80% of the total year group. Three questions were included about PAL for trainees:

- If you attended the extra clinical skills session as a trainee student, please grade how helpful you found them (on a scale of 1–5, from little help to very helpful).
- Do you think that taking part as a trainer would help your understanding of the relevant structure and function of the appropriate system?
- Would you be willing to take part in these sessions as a trainer in Year 4 or 5?

Trainer evaluation

Trainers were assessed in 3 ways. Firstly, the trainer's approach to teaching was observed and evaluated by his or her SSM supervisor using videos of each trainee session. Secondly, each trainer completed a written reflective commentary, and undertook an audit of his or her trainees' views. Finally, an informal group discussion was carried out after the SSM.

Six months after the training sessions, 231 students from the year group from which most trainers came were surveyed at a lecture, using questions that asked for yes/no answers. This represented 88% of that year group. After a brief written resumé on PAL, the following questions were included:

- Do you think that being a trainer for junior students would help your understanding of the structure and function of the appropriate system?
- Do you think it would be useful to set up these PAL sessions for Year 4 students?

Statistical analysis

Results of trainee questionnaires were calculated as percentages and recorded in Microsoft EXCEL. Comparisons of trainees' views were performed using Mann–Whitney tests. Results from responses to each of the questions in the end-of-year questionnaires were calculated as percentages of those who answered the questions rather than the group as a whole.

RESULTS

Trainees

A total of 86 trainees volunteered (Table 1). Two trainees did not specify their year or gender, but 62% ($n = 53$) were from Year 1 and 36% ($n = 31$) from Year 2. Overall, 59 (69%) were female, slightly more than the course average of 62%, and 14% (8 female, 4 male) had undertaken an undergraduate degree prior to commencing medical school, which was slightly higher than the 10% course average. These postgraduate entry students were slightly older (median 22 years) than the standard entrants (median 18 years).

Having confirmed the clarity of the questionnaire, trainees completed these at the end of the PAL session. Mean values of all responses evaluated PAL training sessions for clinical skills tuition as ≥ 7.7 on a 10-cm VAS (Table 2). The sessions were deemed interesting and appropriate. The trainers were perceived as well informed; they provided clear, useful feedback, and the trainees found it easy to ask questions. Importantly, trainees perceived that their confidence in examining the relevant system was high after the session and all would recommend the training to friends. There were no significant differences in any parameters between the 3 trainers.

Table 1 Number of student trainees undertaking the sessions with each student trainer, by year, sex and graduate status

		Year of course		Trainee gender		Graduate status	
Trainer	*Number of Trainees*	*Year 1*	*Year 2*	*Female*	*Male*	*Postgraduate*	*Undergraduate*
Student 1	23	15	8	16	7	4	19
Student 2	29	19*	8*	19*	8*	1	28
Student 3	34	19	15	24	10	7	27
Total	86	53*	31*	59*	25*	12	74

* Two trainees attached to student trainer 2 did not disclose their gender or year of course

Table 2 Results of trainee student evaluation of the training sessions delivered by 3 trainers. Each statement was answered using a 10-cm visual analogue scale. Results are expressed as mean values and standard deviations

Item	*Student 1*	*Student 2*	*Student 3*
Was the training session interesting?	8.5 ± 1.4	8.5 ± 1.2	8.7 ± 1.1
How appropriate was the session?	8.9 ± 1.4	7.7 ± 2.3	8.1 ± 1.7
The tutor seemed informed	9.4 ± 0.8	9.5 ± 0.6	9.2 ± 0.8
Clarity of the explanations	9.2 ± 1.2	9.2 ± 1.0	9.2 ± 0.7
Usefulness of feedback from the tutor	9.2 ± 1.2	9.2 ± 0.9	8.9 ± 0.8
Comfort in asking questions	9.2 ± 1.3	9.0 ± 1.4	9.2 ± 1.0
Confidence after training session	9.0 ± 1.0	8.8 ± 1.3	8.6 ± 1.7
Would I recommend this to a friend?	9.0 ± 2.0	9.4 ± 1.1	9.1 ± 1.7

Table 3 Comparison of responses from trainees who received the peer-assisted learning clinical skills sessions early (groups 1–3) and late (groups 8–10) during the student-selected module

Item	*Groups 1–3 (n = 23)*	*Groups 8–10 (n = 23)*	*P-value*
Was the training session interesting?	8.2 (7.6–8.9)	9.3 (8.3–9.7)	0.03
How appropriate was the session?	7.4 (6.3–9.1)	8.6 (7.9–9.9)	0.01
The tutor seemed informed	9.2 (8.8–9.5)	9.5 (8.8–9.9)	NS
Clarity of the explanations	9.0 (8.6–9.5)	9.4 (8.7–9.9)	NS
Usefulness of feedback from the tutor	9.0 (8.4–9.7)	9.0 (8.0–9.8)	NS
Comfort in asking questions	9.5 (8.7–9.8)	9.5 (8.9–9.9)	NS
Confidence after training session	8.0 (6.6–9.4)	9.0 (7.9–9.7)	NS
Would I recommend this to a friend?	9.2 (8.6–9.7)	9.5 (9.0–10.0)	NS

Results are expressed as medians and interquartile ranges
Mann–Whitney test was used to perform the statistical analysis
NS = not significant

Comparison of results from trainees who attended sessions 1–3 with those who attended sessions 8–10 (Table 3), suggested that the trainers became more efficient during their SSM. The latter groups of trainees graded their experiences at a similar or higher level than those from groups 1–3. There were statistically significant differences found in 2 parameters (using Mann–Whitney tests), namely, that later trainees found the experience more interesting (9.3 versus 8.2; $P = 0.03$, 95% confidence interval [CI] 0.1–1.2) and more appropriate to their level of expertise (8.6 versus 7.4; $P = 0.01$, 95% CI 0.2–2.3). This implies that trainees perceived that the trainers had adapted their sessions to the benefit of the training during their 5-week SSM.

There were no differences in responses from male and female trainees. However, those with a degree before entry to medical school (Table 4) appeared less certain about PAL. Although their responses suggested a similar level of interest, they consistently graded answers lower than undergraduate entrants.

Table 4 Responses from trainees who had undertaken an undergraduate degree before coming to medical school compared with those who had not

Item	*Undergraduates (n = 74)*	*Postgraduates (n = 12)*	*P-value*
Was the training session interesting?	8.8 (8.1–9.6)	8.8 (7.9–9.4)	NS
How appropriate was the session?	8.8 (7.2–9.8)	8.2 (6.5–9.3)	NS
The tutor seemed informed	9.7 (8.8–10.0)	9.4 (8.8–9.6)	NS
Clarity of the explanations	9.5 (8.7–9.9)	9.3 (8.9–9.6)	NS
Usefulness of feedback from the tutor	9.4 (8.7–9.9)	8.9 (8.8–9.2)	NS
Comfort in asking questions	9.7 (8.9–10.0)	9.2 (8.8–9.7)	NS
Confidence after training session	9.3 (8.5–9.8)	7.8 (7.0–9.0)	0.006
Would I recommend this to a friend?	9.7 (9.2–10.0)	9.2 (7.0–9.5)	0.006

Results are expressed as medians and interquartile ranges
Mann–Whitney test was used to perform the statistical analysis
NS = not significant

Table 5 Summary of the most common free text responses from 86 student trainees categorised by question. Some students may have commented on > 1 parameter

What was done well?	86 responses
Good explanations	55
Well structured sessions	15
Small group work	11
What could be improved?	57 responses
Nothing	25
Provision of handouts	15
More on clinical relevance	6
What was it like to be taught by a student?	47 responses
Less stressful/more comfortable	33
Able to place subject in relevant context	15
Made it easy to ask questions	8

In particular, confidence after training was significantly lower (7.8 versus 9.3; $P < 0.006$, 95% CI 0.6–2.1), and they were less likely to recommend the experience (9.2 versus 9.7; $P < 0.006$, 95% CI 0.3–0.8).

In free text comments, all 86 students provided positive feedback about what had been done well. Table 5 shows a summary of the most common responses, with some students commenting on more than 1 category. A total of 55 (64%) mentioned that the student trainers provided good explanations, 15 (17%) pointed out that the sessions were well structured and 11 (13%) commented positively about the benefits of student-led, small-group work. When asked what could be improved, of the 57 trainees who responded, 25 (46%) specifically stated that nothing should be changed. However, 15 (26%) suggested that handouts and summaries would be valuable and 6 (11%) thought that the use of clinical examples would support the rationale underpinning the techniques. A total of 47 students (55%) responded to the question: 'What was it like to be taught by a student?' Of these, 33 (70%) felt more comfortable, 15 (32%) considered that the student-tutor was more able to place the learning in context and 8 (17%) commented that it was easier to ask questions. However, by contrast with the questionnaire responses, there were no detectable differences in free text comments between undergraduate entrants and those with a postgraduate degree prior to entry.

Six months after the training sessions, an end-of-year survey included questions about students' views. Trainees were asked to grade the value of their PAL sessions. A total of 92% graded them as 4 or 5 on a Likert scale where 1 = of little help and 5 = very helpful. Furthermore, in the group as a whole, of the 198 who answered the question, 92% ($n = 182$) believed that participating as a trainer would help their understanding of the structure and function of the system examined, and 86% ($n = 170$) said they would volunteer as a trainer when they reached Years 4 and 5.

Trainers

The SSM was assessed by the module supervisor. Two trainers were awarded a merit, indicating an excellent performance, and the third a pass, indicating a satisfactory result. In informal discussion and written reports, all 3 reported having more confidence in examination skills and better understanding of teaching techniques and all valued the experience highly.

In an end-of-year survey of the student cohort ($n = 231$) from which the trainers were recruited, 165 (71%) answered the question: 'Would taking part

in PAL as a trainer help your understanding of the structure and function of the appropriate system?' Of these, 130 (79%) concluded that partaking in PAL would be helpful, and 105 (64%) considered it would be useful to set up PAL sessions for Year 4 students.

DISCUSSION

Clinical staff are generally enthusiastic about teaching medical students, but usually have only limited training in teaching methods.[17] It is therefore important to find innovative ways of enhancing student learning, such as PAL. In summary, this study extends previous experience of this technique in undergraduate programmes[18,19] in 3 ways.

Firstly, in the new context of clinical skills training, all trainee responses to PAL were highly evaluated (Table 2), indicating that students perceived a benefit in participation, an observation supported by data from free text comments (Table 5). In addition, these responses suggest that trainees perceived that trainers' teaching, learning and communication skills may have improved during the SSM (Table 3). Secondly, the usual initial fervour for most new teaching experiences[10,11] lasted, in the case of this PAL training programme, for at least 6 months after the original responses were given. Thirdly, analysis of postgraduate and undergraduate entrants' responses (Table 4) shows that not all student groups had similar views about the PAL teaching programme.

Student-selected modules are designed to encourage students to extend their knowledge in areas of interest.[14] This SSM allowed students to select a programme that encouraged their learning about the techniques that underpin clinical skills and small-group work. However, by contrast with other studies that have used PAL,[9,19] academic ability was not considered prior to recruitment and self-selection was a prerequisite for both student groups.

Senior student trainers studied examination of the cardiovascular, respiratory and gastrointestinal systems to a standard set by a consultant. Trainers then recruited junior students as trainees, who, upon completion of their training programme, evaluated all aspects of PAL, including trainer performance. The trainees evaluated their level of confidence highly after training, and were provided with a useful resource for revision in the form of a video demonstrating their ability before and after training. In general, responses showed that PAL can be implemented and, when it is, can be popular. If examination performance in clinical skills can be shown to be improved, as it has been in theoretical subject training after using PAL,[12,13] this would provide further support for the use of PAL in this practical context. In addition, identification of the key personal and professional attributes that are enhanced by participating in clinical skills-based PAL would be advantageous, but would require additional qualitative methods such as personal reflective diaries, focus groups and one-to-one interviews.

The trainers' qualitative comments in group discussions and reflective commentaries about the SSM were positive about PAL. In addition, responses to the end-of-year questionnaire in the trainer year group also showed enthusiasm for PAL, but clearly these comments must be interpreted with caution. Although some students may have heard about PAL training, evidently only a small number had been active participants. Clearly, these data could be improved by obtaining quantitative and qualitative information from a larger trainer cohort, but, as trainer numbers in this study were small, the main focus of this area of study involved the responses of trainees.

Analysis of the trainees' questionnaire responses and free text comments suggests that the trainers were capable of organising the sessions well, that the sessions were appropriate for the trainees, and that the trainees found the environment conducive to asking questions. As such, these comments confirm previously published observations on the benefits of PAL in other contexts[3,4] and indicate that participating fulfils the GMC theme of enhancing the trainers' teaching portfolio.[14] Furthermore, comparison of trainees in the first groups with those in later groups showed that all of them graded most of the parameters similarly or more highly (Table 3), and, of the differences, 2 were statistically significant (interest and appropriateness). Although this could be the result of less critical review by students in these later cohorts, a more likely explanation is that participating in PAL allows the trainers' technique to improve as a result. However, it remains to be elucidated whether PAL can produce a significant improvement in the trainers' performance.

Although there were no obvious differences in free text comments between undergraduate and postgraduate entrants, the differences in responses to the questionnaires were unexpected but are of some interest. A more detailed analysis of these differences relating to age and educational background in a larger cohort would help dissect the relevance of

both factors. Nevertheless, postgraduate students have been reported to express different views from undergraduates, exemplified by their differing views on teaching quality in relation to the university's research assessment exercise rating.[20] Interestingly, differences may not simply be a feature of the postgraduate students' previous degrees. A recent questionnaire survey assessed approaches to learning, motivation and personal qualities, and showed that some differences between undergraduates and postgraduates related to student age and not to educational experience[21] and, in general, postgraduate entry students to Glasgow are older than those entering directly from secondary education. Hence, although the numbers of postgraduate trainees were small and results should therefore be interpreted with care, their less favourable responses may imply a more positive evaluation by the younger undergraduates and not a lower assessment by the more qualified postgraduates. Whatever the cause, these differences may have implications for the way novel learning techniques are introduced and evaluated, particularly on curricula that recruit both groups of students.

Apprenticeship methods of undergraduate training are difficult to sustain; the provision of novel, interesting and effective opportunities through which students can enhance their learning is challenging. This study shows that PAL fulfils at least some of these aspirations and, if implemented, could make a valuable contribution to medical training by improving clinical skills exposure. The results also imply that PAL could enhance the trainers' abilities, but a more in-depth analysis of trainer performance is required to prove this directly. In addition, PAL has the potential to provide opportunities for interested undergraduates to participate in tutoring and potentially expand recruitment into medical training programmes in the future.

CONCLUSIONS

Peer-assisted learning is an efficient way of incorporating extra training with which students can reinforce basic learning, which students find enjoyable and assess positively. The confidence of both trainers and trainees in examination technique was evaluated highly after these sessions. This student-led study shows, for the first time to our knowledge, that PAL has the potential to be useful in the context of clinical skills training. It is sufficiently popular that most trainees are keen to act as future trainers; thus a self-perpetuating method of enhancing student learning in the context of clinical skills could be initiated. The challenge remains to provide an evidence base with qualitative and quantitative analysis from a larger group of students which confirms that trainers and trainees can improve their performance in support of this initial assessment.

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