

Abdomen and chest examinations in peer physical examination: Variation in participation by gender

K. Reid¹, R. Sutherland¹, A. Dodds¹, R. McNair² & D. Pierce³

Abstract

Aims: To compare participation in peer physical examination (PPE) for male and female students when learning abdomen and chest examinations; to compare attitudes towards PPE for male and female students; and to determine if self-reported participation as examinees in PPE was related to attitudes towards PPE.

Background: The opportunity to learn physical examination skills through practising with peers in formal tutorials is an important part of many medical curricula.

Method: Students voluntarily completed a self-report questionnaire at the end of their third semester of medical training in which they rated their attitudes towards PPE and indicated how often they had been examined while practising abdomen and chest examinations.

Results: Students volunteered to be examined less frequently in PPE when learning chest examination compared with abdominal examination; female students volunteered less frequently than male students for chest examinations but volunteered with similar frequency for abdomen examinations. Attitudes towards PPE were not related to student gender, but students who never volunteered for abdomen examinations tended to have higher average ratings for the perceived difficulty of PPE and lower ratings for the perceived value of PPE. Most students supplemented PPE with informal practice, although a majority practised exclusively with male volunteers.

Conclusions: There is clear variation in participation rates for learning examinations for PPE of the abdomen and chest, but this variation is only partly explained by student gender and attitudes.

Keywords: peer physical examination, medical students, clinical skills, student attitudes.

1 Medical Education Unit, Melbourne Medical School, University of Melbourne, Australia

2 Department of General Practice and Primary Health Care Academic Centre, Melbourne Medical School, University of Melbourne, Australia

3 Rural Health Academic Centre, Melbourne Medical School, University of Melbourne, Australia

Correspondence:

Dr Katharine Reid
Medical Education Unit, Melbourne Medical School
University of Melbourne
Parkville, VIC 3010
Australia
Email: kjreid@unimelb.edu.au

ABDOMEN AND CHEST EXAMINATIONS IN PPE

Introduction

Learning physical examination skills by participating in formal tutorials with peers is an important feature of preclinical education in many medical courses. Practising with peers in a tutorial environment with supervision from an experienced practitioner encourages students to hone physical examination skills and learn about normal anatomy (Braunack-Mayer, 2001; Rees, Bradley, Collett, & McLachlan, 2005). Concerns have been raised that peer physical examinations (PPE) might be unacceptable to some students on cultural or religious grounds (Outram & Nair, 2008) because of concern about body embarrassment or as a result of the need to examine opposite sex peers (Rees, 2007). In general, however, these fears appear unfounded. Students generally report high levels of willingness to examine and to be examined in PPE, provided PPE is restricted to low sensitivity examinations (Chang & Power, 2000; Rees, Wearn, Vnuk, & Sato, 2009; Reid, Kgakololo, Sutherland, Elliott, & Dodds, 2012).

Most PPE research has focused on student attitudes towards PPE and willingness to participate (to examine or to be examined) when practising different types of examination (Chang & Power, 2000; O'Neill, Larcombe, Duffy, & Dorman, 1998; Power & Center, 2005; Rees, Wearn, Vnuk, & Sato, 2009; Wearn, Rees, Bradley, & Vnuk, 2008). Students' willingness to participate is usually assessed through asking students to rate their willingness to examine or to be examined for specific body regions of varying sensitivity (e.g., head, hands, hips, groin). In some studies, student willingness to examine or to be examined during PPE are described as student attitudes (see for instance, Rees, Bradley, & McLachlan, 2004). In the current study, a broader range of opinions about participating in PPE were assessed to determine student attitudes towards PPE. For instance, student attitudes encompassed views on the perceived value of PPE for learning examination skills, their views on potential difficulties encountered (such as body embarrassment or cultural constraints) and their degree of comfort with being examined or examining others.

Early attitudes towards PPE are considered important, primarily because unwillingness to participate or negative attitudes are viewed as risk factors for reduced participation in PPE (Reid et al., 2012). It is important to explore whether attitudes predict participation in PPE; however, it is uncommon to measure how often students are examined in formal PPE. A recent study by Chen, Yip, Lam and Patil (2011) was the first to investigate the relationship between willingness to participate in PPE and reported participation. Chen et al.'s study showed high willingness to participate in PPE before and after participating in a clinical skills program, yet during the program, far fewer students actually volunteered to participate in PPE. These data suggest a lack of correlation between self-reported willingness to participate in PPE and actual participation. Students in Chen et al.'s study tended to be more reluctant to be examined than to examine another student, and fewer female students volunteered to be examined than male students.

ABDOMEN AND CHEST EXAMINATIONS IN PPE

Research has demonstrated that students hold positive attitudes towards PPE and report high levels of willingness to participate in low sensitivity examinations (Chang & Power, 2000); however, it has been suggested that male and female students hold different views of the acceptability of PPE as a learning method (Barnette, Kreiter, & Schuldt, 2000; Reid et al., 2012). Sensitive examinations are most problematic; female students are less willing than males to participate, either as examinee or examiner, in any examinations involving the breast, groin and genitals (Rees, Wearn, Vnuk, & Sato, 2009).

Low or variable willingness to participate for highly sensitive examinations has little consequence for PPE where these examinations are rarely practised; however, female students are also less willing to be examined in several moderately sensitive examinations that are commonly taught as part of PPE (upper body, abdomen and hip) (Barnette et al., 2000; Chen et al., 2011; Rees, Wearn, Vnuk, & Sato, 2009; Reid et al., 2012; Wearn, Rees, Bhoopatkar, et al., 2008). Further research is required to assess whether attitudes towards PPE are related to less frequent participation of female students as examinees compared with male students in PPE. Unbalanced participation in PPE as an examinee by male and female students has potential learning implications. Reluctance of female students to volunteer as examinees may result in fewer opportunities for all students to examine females and fewer opportunities to examine others overall. Yet Chen et al. observed that participation in PPE seemed to co-occur with practice outside the classroom. Informal practice may, therefore, play a role in supplementing opportunities to examine others (Bhoopatkar & Wearn, 2008). Thus, it is worthwhile exploring the degree to which male and female students volunteer to be examined in PPE and whether they undertake informal practice, as well as examining the relationship between student attitudes towards PPE and self-reported participation.

The purpose of the current study was to explore medical students' attitudes towards PPE as part of the medical course and their experiences of PPE in the initial stages of preclinical education. Our study focused on the frequency with which male and female students reported being examined while learning abdomen and chest examinations. These examinations were of particular interest because they are moderately sensitive examinations, with students typically asserting that they are less willing to be examined compared with low sensitivity examinations, such as hands or eyes (Reid et al., 2012).

Method

Participants

Two hundred and forty-three medical students (104 male and 139 female, 91.4% of all enrolled students) participated in the study voluntarily at the end of their third semester of preclinical education. The majority of participants came from metropolitan areas of Australia ($n = 145$, 59.7%), about one-third were international students ($n = 75$, 30.9%) and a smaller number were from rural areas in Australia ($n = 23$, 9.5%). Most international students came from Asian countries ($n = 64$, 85.3%), the majority from Malaysia and Singapore. At the time of this study, students enrolled in the medical course as an undergraduate entrant straight from school ($n = 186$, 77.2%) or as a graduate entrant ($n = 55$, 22.8%) after obtaining another degree.

ABDOMEN AND CHEST EXAMINATIONS IN PPE

Context

Students at this university commenced PPE from the first year of the course. The early clinical skills program introduced students to examinations of non-sensitive body regions (excluding examinations of the groin, breast, genitals and rectum) through PPE. A clinical tutor facilitated Introduction to Clinical Medicine (ICM) classes, which included both male and female students. Students practised examinations and were examined by other students throughout the semester. In the second semester of medical training, students learned abdomen examinations and in the third semester, they learned chest examinations.

PPE experience questionnaire

Students specified how often they had been examined by peers during the semester in PPE when learning to examine the abdomen and the chest on a 4-point Likert scale, where 1 = *never*, 2 = *once*, 3 = *2–3 times*, 4 = *4 or more times*. Students also indicated whether they had practised chest examinations with friends and/or family before their assessments. Students who had undertaken informal practice were asked to indicate whether they had practised with other medical students, family or friends and whether they had practised only with people of the same gender, only with people of the opposite gender or with people of both genders.

Students also provided ratings on a 5-point Likert scale, where 1 = *strongly disagree* and 5 = *strongly agree* for 17 items assessing attitudes towards PPE. These items were developed through a literature search and through consultation with clinical tutors about their views of the importance of PPE and common difficulties encountered in teaching physical examination skills. The items reflected beliefs about the importance of PPE for training as a doctor (e.g., understanding patient perspectives, contributing to learning), positive attitudes towards participation, common difficulties encountered in PPE (e.g., body embarrassment, cultural and religious beliefs) and preferences for practice with students of the same gender.

Finally, we further explored students' experiences of PPE by asking them to provide open-ended responses about suggested improvements to PPE. Students were asked to respond to the question: *Given that PPE is an integral part of learning physical examination techniques, from your experience, have you any suggestions as to how it may be improved?* Our aim was to identify themes related to gender and participation in PPE and to determine how often they occurred in students' comments.

Procedure

Permission to conduct the study was obtained from the University of Melbourne Human Research Ethics Committee. Students completed the PPE questionnaire in approximately 20 minutes during their last tutorial of the semester. All questionnaires were anonymous, and students were informed that their participation was voluntary and unrelated to assessment.

ABDOMEN AND CHEST EXAMINATIONS IN PPE

Analytic methods

Data on frequency of examination in PPE and reported informal practice were categorical and did not meet the assumptions for parametric analyses, and therefore were analysed using non-parametric techniques. We analysed variation in the frequency of chest and abdomen examinations for male and female students using chi-square tests. Comparisons between male and female students on the frequency of informal practice outside tutorials with other students, family and friends, and with partners of the same or opposite gender, were also conducted using chi-square tests. Effect size for the chi-square analyses was reported as Cramer's V (V), which is a measure of association between categorical variables analogous to a correlation coefficient. Cramer's V takes values from 0 to 1, with higher values reflecting a larger effect. The 17 PPE attitude items were factor analysed using Maximum Likelihood extraction method with Promax rotation. We used multivariate analyses of variance (MANOVA) to explore the relationships between gender, participation in abdomen and chest examinations and attitudes toward PPE. All quantitative analyses were conducted using IBM SPSS Statistics 19.0.

The qualitative analysis was primarily exploratory, partly due to the small number of responses and also because students were not cued to provide comments specifically about issues of gender in PPE. An initial coding of the data by the first author identified the proportion of respondents who made a comment. These comments were then categorised by the first author into three major themes related to gender and participation: *equal student participation*, *student preparation and autonomy* and *gender segregation*. Additional comments unrelated to gender and participation (e.g., a desire for more practice, better facilities for practising) accounted for approximately one third of the qualitative responses and were coded into *other responses*. The third author reviewed the description of themes and classified a random 25% of the comments using the identified themes. The concordance in coding was very high, with more than 85% of the comments classified in the same coding category. Authors reviewed and provided feedback on the quotations chosen as illustrative of the three themes.

Results***How often do students volunteer to be examined in PPE?***

The percentage frequency with which male and female students volunteered to be examined during PPE is shown in Table 1. Overall, students volunteered to be examined by their peers for abdomen examinations more frequently than for chest examinations. Female students were more likely than male students to never volunteer to have their chest examined, whereas male students were more likely than female students to have their chest examined four or more times during the semester, $\chi^2_{(3)} = 31.54, p < .001$, Cramer's $V = .36$. The frequency of abdomen examinations was not related to student gender, $\chi^2_{(3)} = 3.85, p = .278$. Male and female students volunteered for abdomen examinations four or more times during the semester with similar frequency.

ABDOMEN AND CHEST EXAMINATIONS IN PPE

Table 1
 Percentage Frequency of Examination by Peers for Abdomen and Chest Examinations

Examination type	Frequency of examination per semester (%)			
	Never	Once	2-3	4 or more
Abdomen (Semester 2)				
Male (n = 104)	1.9	8.7	41.3	48.1
Female (n = 139)	7.2	7.2	36.7	48.9
Total (n = 243)	4.9	7.8	38.7	48.6
Chest (Semester 3)				
Male (n = 104)	2.9	7.7	41.3	48.1
Female (n = 139)	22.3	13.7	43.2	20.9
Total (n = 243)	14.0	11.1	42.4	32.5

Do students practise with family and friends outside tutorials?

Most students (n = 224, 92.2%) practised chest examinations on other medical students, family and friends outside of regular tutorials. The majority practised with other medical students (n = 137, 56.4%). More than 40% of students also practised with family (n = 99, 40.7%) or friends (n = 115, 47.3%).

Male students (n = 48, 46.2%) were more likely than female students (n = 36, 25.9%) to practise only with others of the same gender, $\chi^2_{(1)} = 10.79, p = .001$, Cramer's $V = .21$, whereas female students (n = 29, 20.9%) practised more often than male students (n = 4, 3.8%) only with the opposite gender, $\chi^2_{(1)} = 14.68, p < .001$, Cramer's $V = .25$. The proportion of male (n = 42, 40.4%) and female students (n = 71, 51.1%) who practised with both genders was similar, $\chi^2_{(1)} = 2.74, p = .098$.

Student attitudes towards PPE

The analyses in this section explored student attitudes towards PPE and examined variation in the attitudes of male and female students. Table 2 shows the means, standard deviations and 95% confidence intervals on each of the 17 PPE attitude items, ordered from highest to lowest average rating.

An exploratory factor analysis using Maximum Likelihood method with Promax rotation extracted five factors with Eigenvalues above one and explained 51.7% of the variation in scores. In this analysis, two factors were defined by only two items, so the analysis was repeated with extraction of four factors specified. The items: *My experience of peer abdominal examination prepared me for peer chest examination*, *I feel more uncomfortable about PPE of the abdomen than about PPE of the chest*, and *I believe you can examine the chest just as well through a tee shirt than with it off* did not load on any factors in this solution and so were excluded from the analysis. The resulting four-factor solution explained 56.2% of the variation in scores. All factors were defined by at least three items, and there was no significant cross loading. The four factors defined by the analysis were defined as

ABDOMEN AND CHEST EXAMINATIONS IN PPE

Table 2

Means, Standard Deviations and 95% Confidence Intervals (CI) for Student Attitudes Towards PPE after Three Semesters of Medical Training

PPE Attitude Items	M	SD	95% CI
I can see that PPE is valuable for my learning as a future doctor	4.26	.61	4.20 – 4.36
I feel that PPE is valuable for OSCE preparation	4.24	.63	4.18 – 4.34
Being examined this way helps me understand what it is like to be a patient	3.98	.77	3.87 – 4.07
My experience of peer abdominal examination prepared me for peer chest examination	3.72	.69	3.63 – 3.81
I feel OK about PPE of my chest if it is with my friends, not in a tutorial	3.51	.88	3.39 – 3.62
I feel OK about PPE of my chest if it is in a tutorial with a tutor present	3.33	.85	3.23 – 3.46
I feel OK about PPE of my chest if it is in a tutorial with students I may not know	3.20	1.02	3.07 – 3.34
I feel more uncomfortable about PPE of the abdomen than about PPE of the chest	2.59	.92	2.47 – 2.71
I am uncomfortable about PPE of the chest	2.52	.91	2.38 – 2.62
I believe you can examine the chest just as well through a tee shirt than with it off	2.43	1.05	2.30 – 2.57
I would prefer to practise PPE only with students of my own gender	2.40	1.09	2.25 – 2.53
PPE is difficult for me because I feel embarrassed about my body	2.30	1.00	2.16 – 2.42
I felt pressured to take off my top for PPE of the chest	2.24	.99	2.08 – 2.34
I would prefer all PPE tutorials to be single-gender groups	2.20	.94	2.06 – 2.30
I would prefer all PPE tutorials to be single-gender groups, including the tutor	2.10	.89	1.96 – 2.19
PPE is difficult for me because of my cultural background	2.02	1.00	1.87 – 2.13
PPE is difficult for me because of my religious or philosophical beliefs	1.81	.82	1.69 – 1.91

Note: 1 = *strongly disagree*, 2 = *disagree*, 3 = *neutral*, 4 = *agree*, 5 = *strongly agree*

Factor 1: *Potential difficulties with PPE* (Cronbach's alpha = .81), Factor 2: *Single gender preference* (Cronbach's alpha = .77), Factor 3: *Perceived value of PPE* (Cronbach's alpha = .70) and Factor 4: *Comfortable with PPE of the chest* (Cronbach's alpha = .65). The pattern matrix for the four-factor solution is shown in Table 3. PPE factor scores were created by averaging the scores for the items comprising the factor.

We conducted an analysis to investigate the relationship between attitudes towards PPE, participation in PPE examinations and student gender. A MANOVA was conducted with the four PPE attitude factors as dependent measures, and gender and frequency of abdomen examination as the independent factors. Attitudes of male and female students towards PPE did not vary, Wilks' lambda = .97, $F(4, 233) = 1.63$, $p = .169$. Attitudes towards PPE varied according to how often students volunteered to be examined, Wilks' lambda = .96, $F(4, 233) = 2.53$, $p = .041$, $\eta_p^2 = .04$. Students who

ABDOMEN AND CHEST EXAMINATIONS IN PPE

Table 3
 Pattern Matrix for the Maximum Likelihood Factor Analysis of PPE Attitude Items

	F1 Potential difficulties with PPE	F2 Single-gender preference	F3 Perceived value of PPE	F4 Comfortable with PPE of the chest
PPE is difficult for me because of my cultural background	.954	.027	.077	.058
PPE is difficult for me because of my religious or philosophical beliefs	.908	-.057	-.030	.029
PPE is difficult for me because I feel embarrassed about my body	.546	.026	-.004	-.087
I felt pressured to take off my top for PPE of the chest	.397	.141	.034	.021
I am uncomfortable about PPE of the chest	.328	.093	-.116	-.244
I would prefer all PPE tutorials to be single-gender groups, including the tutor	.034	.925	-.014	.091
I would prefer all PPE tutorials to be single-gender groups	.022	.900	.002	.021
I would prefer to practise PPE only with students of my own gender	.030	.668	-.037	-.134
I can see that PPE is valuable for my learning as a future doctor	-.003	.055	.881	-.042
I feel that PPE is valuable for OSCE preparation	.032	-.107	.792	-.045
Being examined this way helps me understand what it is like to be a patient	.032	-.027	.414	.120
I feel OK about PPE of my chest if it is in a tutorial with a tutor present	.049	.010	-.071	.875
I feel OK about PPE of my chest if it is in a tutorial with students I may not know	-.004	-.100	.009	.723
I feel OK about PPE of my chest if it is with my friends, not in a tutorial	-.119	.222	.199	.331

never or rarely volunteered to be examined had higher average ratings for the difficulty of PPE ($M = 2.55$, $SD = .89$) than students who volunteered to be examined often ($M = 2.13$, $SD = .68$). Students who never or rarely volunteered to be examined were less comfortable, on average, with PPE of the chest ($M = 3.08$, $SD = .66$) compared with students who volunteered to be examined often ($M = 3.39$, $SD = .71$). A second MANOVA explored the relationship between attitudes towards PPE, participation in chest examinations and student gender. Once again, attitudes did not vary for male and female students, Wilks' lambda = .96, $F(4, 233) = 2.36$, $p = .054$. In the case of chest examinations, attitudes also did not vary for different levels of participation, Wilks' lambda = .96, $F(4, 233) = 2.13$, $p = .078$.

ABDOMEN AND CHEST EXAMINATIONS IN PPE

Qualitative comments on gender and participation

An exploratory analysis of students' suggested improvements to PPE was conducted to identify themes related to student gender and participation in PPE. Eighty-eight students (36.2%) provided suggestions for how PPE could be improved. The most frequently occurring theme related to ensuring students participated equally in the tutorials. Non-participation was identified as both a general and a gender-specific problem. Student volunteers tended to be the same students, and some students found PPE less useful because some tutors routinely divided students into male and female groups, and this meant that they rarely practised with a partner of the opposite gender.

I actually believe it is important for everyone to participate. I actually thought boys were too frequently used because it was just assumed girls would be too embarrassed. It's not necessarily true. [Female, graduate medical student]

The only time I feel uncomfortable with the situation is when the person who is examining me or who I am examining makes it clear by their behaviour that they are uncomfortable. Many people in my groups have been unwilling to volunteer which is unfair for those who are willing—especially in those situations where it may be easier for a male to volunteer. I have sometimes volunteered but then other members of the group are uncomfortable because I am a female. That being said, I think it is important to have experience examining both genders. [Female, graduate medical student]

PPE's were fine in my experience but what I did find was that the same people were asked constantly to be the "patient", thus limiting their practice. I found that quite often females never volunteered, not even with each other, thus taking up valuable time (though my tutor addressed this in the last two tutes). [Male, undergraduate medical student]

Some students identified a need for greater preparation for PPE, including increasing student awareness of cultural and religious sensitivities and encouraging respect for student autonomy in PPE. Some comments within this theme advocated respect and sensitivity towards peoples' decisions about participation in PPE, in contrast to suggestions by other students that participation be mandatory.

Just checking that students of all cultures/religions do in fact feel comfortable and not pressuring anybody to do it—being hyper sensitive if you like. [Female, undergraduate medical student]

Do not force those to undertake PPE if they are uncomfortable with it. Others were quite happy to have PPE performed on them, as it could just be restricted to those happy/comfortable with it. [Female, graduate medical student]

So far it's been alright because tutors ask for volunteers, so no one is pressured to be a "patient", however, if participation as a PPE is marked for assessment, it would be extremely unfair, as some cultures are more conservative and have different beliefs. [Female, undergraduate medical student]

ABDOMEN AND CHEST EXAMINATIONS IN PPE

Only five students suggested that having tutorials with students of the same gender was a desirable modification for PPE; instead, many students recognised the importance of PPE as a context for gaining examination skills by practising with both male and female peers.

I think it is very important to examine females and males as we will have to do it in the future, and this should be encouraged. [Male, graduate medical student]

It must be mixed gender to retain any authenticity and relevance. If people are unwilling for any reason to be subjects of PPE, then they should be excluded from observing the procedure (it's not fair that some people never volunteer). [Male, undergraduate medical student]

Discussion

To date, the primary focus of PPE research has been student attitudes towards PPE and their willingness to examine or to be examined (Chang & Power, 2000; Fagan, Lucero, Wu, Diaz, & Reinert, 2006; McLachlan, White, Donnelly, & Patten, 2010; Rees, Wearn, Vnuk, & Bradley, 2009; Rees, Wearn, Vnuk, & Sato, 2009; Reid et al., 2012). In this study, we assessed attitudes more broadly than willingness to participate in PPE, describing students' attitudes in terms of *potential difficulties with PPE*, *single gender preference*, *perceived value of PPE*, and being *comfortable with PPE of the chest*. Often attitudes towards PPE are used to infer the likelihood that students will participate in PPE. However, in order to accept attitudinal measures as reliable indices of student participation in PPE, it is necessary to understand how attitudes towards PPE vary with self-reported participation.

We focused on learning abdomen and chest examinations in the early stages of preclinical education. These examinations are moderately sensitive, and we were interested in relationships between participation, student gender and student attitudes towards PPE. In the initial stages of medical training, female students volunteered to be examined less frequently than male students when learning chest examinations in PPE, whereas patterns of participation in abdomen examinations were similar. Thus, all students had fewer opportunities to examine females during PPE of the chest. In line with the findings of Chen et al. (2011), almost all students supplemented practice in formal PPE with informal practice of chest examinations with other medical students, friends and family. In this context, however, high proportions of male and female students only practised with male volunteers, thus reflecting the pattern evident in PPE for chest examinations, where fewer female volunteers were available. Informal practice clearly has a role in supplementing opportunities for practice in PPE, but for students in this study, access to female examinees remained limited.

In our study, there was no evidence that attitudes towards PPE varied for male and female students. This finding contrasts with a number of studies using willingness to participate in PPE as an attitudinal measure, which suggested that female students are less willing to participate in PPE even for moderately sensitive examinations (Rees, Wearn, Vnuk, & Sato, 2009; Reid et al., 2012; Wearn, Rees, Bhoopatkhar, et al., 2008). Our study showed that attitudes were related to participation in PPE for abdomen

ABDOMEN AND CHEST EXAMINATIONS IN PPE

examinations but not for chest examination. Students who volunteered to be examined more frequently tended to have more positive attitudes towards PPE (perceiving fewer difficulties and being more comfortable with chest examinations).

Given these findings, there is some doubt as to whether student attitudes can be used to infer the likelihood of participating in PPE as a volunteer examinee, because the relationship varies according to the type of examination. Student ratings of attitudes towards PPE and willingness to participate could be influenced by their perception that PPE participation is desirable or expected behaviour and, for this reason, may tend to be inflated. Attitudes may then relate inconsistently to behaviour in PPE, because a general perception that PPE is valuable may not be sufficient to overcome personal inhibitions about participating. A similar conclusion could be drawn from the Chen et al. (2011) study, where student self-reported willingness to participate in PPE was very high, with actual participation significantly lower for most types of examination. In Chen et al.'s (2011) study, female students were more likely than male students to exhibit such "attitude-behaviour inconsistency" for upper body and abdomen examinations. Such a finding differs from the current study, where the relationship between attitudes towards PPE and being examined in PPE did not depend on student gender.

Examination of the qualitative data provides a context for understanding the implications of variable participation by some students. Students noted the obvious consequence of variable participation was fewer opportunities to examine female students, which limited the authenticity and relevance of the activity, in particular, learning about the normal female chest examination. Another implication for students examined frequently was that they were less able to practise performing examinations than students who volunteered to be examined less frequently. A third implication is student discomfort during PPE could limit the thoroughness of the examination technique and therefore limit a student's preparation for the clinical experience. It is important for students to practise in order to get used to and manage the discomfort, as part of becoming more competent. These data, in conjunction with the quantitative data, highlight the complexity of the PPE environment. It seems clear that few students regarded a single gender group as an appropriate learning environment for PPE. Yet while some students advocated ongoing sensitivity and respect for student rights in participation in PPE, a competing theme emphasised the need for equitable participation within mixed-gender groups so that all students had opportunities to practise with both male and female students.

Findings from this research may be useful in developing modifications to PPE that ensure the experience maximises learning opportunities for all students. Clinical tutors may wish to explicitly discuss with students the possibility of and the reasons for discomfort and to ask the group to generate solutions for managing the experience. We recommend that to prepare students effectively and to generate sufficient opportunities to examine both males and females that a combination of mixed-gender groupings, occasional optional single-gender groupings and informal practice are encouraged.

ABDOMEN AND CHEST EXAMINATIONS IN PPE

Potential limitations

The study was single institutional and utilised a self-report measure of participation. The single institutional nature of the study limits the degree to which the findings may be generalised more broadly; however, the study contributes iteratively to research on PPE. Self-reported participation rates may be subject to biases leading to inflated estimates or may simply be unreliable, particularly over time (see for instance, McLachlan et al., 2010). It would be useful, in future, to supplement self-report measures with information from clinical tutors on participation rates.

Our exploratory qualitative analysis provided insights into whether students' suggestions for improvements to PPE focused on gender and participation issues. In this research, we chose to ask students a broad question about suggested improvements to PPE to determine whether gender and participation emerged spontaneously as themes. It may be, however, that a greater range of themes would emerge if questions were targeted specifically to consider gender and participation in PPE.

Further research

A number of studies have explored student attitudes towards participating in PPE as a function of student gender and the type of examination (Barnette et al., 2000; McLachlan et al., 2010; O'Neill et al., 1998; Rees et al., 2004; Rees, Wearn, Vnuk, & Sato, 2009; Reid et al., 2012). The current study extended previous work by linking attitude measures with self-reported participation. To our knowledge, however, there is no research which links student attitudes and participation in PPE with measures of competence. Thus, the implications of attitudes towards PPE and participation for developing expertise in physical examination skills are not yet known. A number of researchers have investigated whether students who self-describe as religious and students from different ethnic groups vary in their willingness to participate in PPE (Rees et al., 2005; Rees, Wearn, Vnuk, & Bradley, 2009). It is important to consider whether these groups also participate less frequently in PPE, as there may be other suitable modifications to the PPE experience (e.g., sessions with simulated patients) that maximise learning for all students.

Conclusions

The current study contributes to ongoing investigation of PPE as a context for learning physical examination skills. It is important to further understanding of PPE as a context for learning physical examination skills by considering not only student attitudes and their willingness to participate in PPE, but also by considering actual student participation in tutorials. Future research should explore the implications of PPE participation for competence in developing physical examination skills.

Contribution to authorship

AD, RMc and DP designed the study and collected the data. KR, RS and AD analysed the data. All authors contributed to data interpretation. KR wrote the first draft of the manuscript, and all authors contributed to revising the manuscript and approving the final submitted version.

ABDOMEN AND CHEST EXAMINATIONS IN PPE

References

- Barnette, J. J., Kreiter, C. D., & Schuldt, S. S. (2000). Student attitudes to same gender versus mixed gender partnering in practising physical examination skills. *Evaluation and the Health Professions, 23*, 361–372.
- Bhoopatkar, H., & Wearn, A. (2008). Medical students describe their patterns of practising clinical examination skills outside timetabled sessions. *Medical Teacher 30*(3), 334.
- Braunack-Mayer, A. J. (2001). Should medical students act as surrogate patients for each other? *Medical Education, 35*, 681–686.
- Chang, E. H., & Power, D. V. (2000). Are medical students comfortable with practising physical examinations on each other? *Academic Medicine, 75*, 384–389.
- Chen, J. Y., Yip, A. L. M., Lam, C. L. K., & Patil, N. G. (2011). Does medical student willingness to practice peer physical examination translate into action? *Medical Teacher, 33*, 528–540.
- Fagan, M. J., Lucero, M. L., Wu, E. H., Diaz, J. A., & Reinert, S. E. (2006). Attitudes toward the physical examination: A comparison of US and Dominican medical students. *Teaching and Learning in Medicine, 18*, 287–291.
- McLachlan, J. C., White, P., Donnelly, L., & Patten, D. (2010). Student attitudes to peer physical examination: A qualitative study of changes in expressed willingness to participate. *Medical Teacher, 32*, 101–105.
- O'Neill, P. A., Larcombe, C., Duffy, K., & Dorman, T. L. (1998). Medical students' willingness and reactions to learning basic skills through examining fellow students. *Medical Teacher, 20*, 433–437.
- Outram, S., & Nair, B. R. (2008). Peer physical examination: Time to revisit. *Medical Journal of Australia, 189*, 274–276.
- Power, D. V., & Center, B. A. (2005). Examining the medical student body: Peer physical exams and genital, rectal, or breast exams. *Teaching and Learning in Medicine, 14*, 337–343.
- Rees, C. (2007). The influence of gender on student willingness to engage in peer physical examination: The practical implications of feminist theory of body image. *Medical Education, 41*, 801–807.
- Rees, C., Bradley, P., Collett, T., & McLachlan, J. (2005). Over my dead body? The influence of demographics on students' willingness to participate in peer physical examination. *Medical Teacher, 27*, 599–605.
- Rees, C., Bradley, P., & McLachlan, J. (2004). Exploring medical students' attitudes towards peer physical examination. *Medical Teacher, 26*, 86–88.
- Rees, C., Wearn, A., Vnuk, A., & Bradley, P. (2009). Don't want to show fellow students my naughty bits: Medical students' anxieties about peer examination of intimate body regions at six schools across UK, Australasia and Far-East Asia. *Medical Teacher, 31*, 921–927.

ABDOMEN AND CHEST EXAMINATIONS IN PPE

- Rees, C., Wearn, A., Vnuk, A., & Sato, T. (2009). Medical students' attitudes towards peer physical examination: Findings from an international cross-sectional and longitudinal study. *Advances in Health Sciences Education, 14*, 103–121.
- Reid, K. J., Kgakololo, M., Sutherland, R. M., Elliott, S. L., & Dodds, A. E. (2012). First-year medical students' willingness to participate in peer physical examination. *Teaching and Learning in Medicine, 24*, 55–62.
- Wearn, A., Rees, C., Bhoopatkar, H., Bradley, P., Lam, C., McLachlan, J., . . . Vnuk, A. (2008). What not to touch: Medical students from six schools report on peer physical examination in clinical skills and anatomy learning. *Focus on Health Professional Education: A Multi-disciplinary Journal, 10*(2), 24.
- Wearn, A., Rees, C., Bradley, P., & Vnuk, A. (2008). Understanding student concerns about peer physical examination using an activity theory framework. *Medical Education, 42*, 1218–1226.