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Peer assessment/feedback is clearly occurring in athletic training education programs. However, it remains unclear whether students would improve their ability to assess their peers and provide corrective feedback if they received formal training in how to do so. The purpose of this study was to determine the following: 1) if a peer assessment/feedback (PAF) training program affected the quality of feedback students provided to their peers and if feedback improves over time, 2) if students' perceptions of and preferences for PAF changed over time and as a result of a PAF training program, and 3) if PAF training affected skill performance. Two sections of an introductory sports medicine class were used to examine the effects of a PAF training program and time on different aspects of PAF. The subjects had three sets of laboratory skills with two days of lab practice for each set. One section received the PAF training after the first set of labs ($n = 33$); the control section received not training ($n = 36$). Two groups of four students from each section were videotaped in order to observe the feedback they provided. Surveys were completed at the beginning of the semester and the end of the semester to examine perceptions and preferences of all subjects. The videotaped data analysis suggests that PAF training potentially shaped the consistency of descriptive feedback, use of strategic questioning, staying on task and the amount of reaffirming feedback provided. Findings also suggest that other factors shaped the peer feedback, such as baseline ability to provide quality feedback, difficulty of the skill and the number of errors performed while executing the skills. Some of the strategies discussed in the PAF

training were used by the control groups even though they did not receive training. The training could be beneficial for all students to either reinforce what they already do or to teach new strategies. Subjects in the PAF training found it beneficial, which may improve the acceptance of feedback and their willingness to provide feedback. The subjects, regardless of group, overwhelmingly had positive perceptions of the benefits of peer learning, benefits of PAF and the PAF process. Students preferred peers for the activities related to practicing and refining skills while preferring instructors for initial learning and grading. Preferences for PAF increased for six of the 11 items with no differences between the experimental and control groups. Finally, there were no significant differences in exam grades thus the PAF training did not affect skill performance.

OUTCOMES OF A PEER ASSESSMENT/FEEDBACK TRAINING
PROGRAM IN AN UNDERGRADUATE
SPORTS MEDICINE COURSE

by

Melissa Catherine Marty

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Approved by

Committee Co-Chair

Committee Co-Chair

To my parents,

You always encouraged me to be my best and pushed me to the limits

To David,

Your love and support helped me accomplish my goals

APPROVAL PAGE

This dissertation has been approved by the following committee of the Faculty of
The Graduate School at The University of North Carolina at Greensboro.

Committee Co-Chair _____

Committee Co-Chair _____

Committee Members _____

March 30, 2010
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CHAPTER I

INTRODUCTION

Athletic training educators and researchers have suggested that peer assisted learning (PAL) be implemented as a means for students to practice and reinforce clinical skills.^{1,2} Current research indicates that students benefit from multiple types of PAL including peer assessment and peer feedback.³ Peer assessment/feedback (PAF) is an active learning technique that assists in student learning as well as prepares students to be proficient practitioners.⁴⁻⁶ Furthermore, PAF of psychomotor skills is important for allied health students because they will likely have to assess their peers in the future as well as provide their patients with corrective feedback while performing skills like rehabilitation exercises. PAF has been implemented into sports medicine related educational programs such as athletic training,^{1-3, 7-12} nursing,¹³⁻¹⁵ physical therapy,¹⁶ and medicine.^{5, 17-28}

PAL is an umbrella term describing various collaborative educational strategies including peer assessment, peer learning, peer teaching, peer mentoring and peer leadership.^{1, 29-37} Specifically, peer assessment is defined as a student judging the level or quality of a fellow student's understanding throughout the learning process.³⁸ In other words, peers can identify when a skill is performed correctly or incorrectly. In conjunction, peer feedback often accompanies assessment when students provide corrective comments to their peers to improve the execution of a task.³⁹ Therefore, PAF can be interpreted as a learning activity rather than just a scoring or ranking tool.^{4, 40, 41}

Previous research indicates that athletic training students participate in PAL activities.^{3,9,10} A national survey of athletic training clinical instructors found that unplanned peer assessment occurred frequently in the clinical education setting.⁹ Likewise, a national survey of athletic training students established that peer assessment occurred in the clinical education and laboratory settings.³ Similarly, a different survey of athletic training students found that 66 percent (n=91) of participants practiced a moderate to large amount of clinical skills with other students.¹⁰ It is feasible to assume that during this practice time students are assessing each other's skills and providing feedback on their performance. However, the quality of the feedback provided remains unknown.

The reliability and accuracy of peer assessment has begun to be established in the athletic training literature. One study indicated that athletic training students were highly accurate and reliable when assessing their peers in groups of two or more and on more than one occasion.¹² This indicates that peer assessment may be implemented into laboratory classes in order for students to practice and refine psychomotor skills. In a separate study it was found that athletic training students provide accurate, but not always corrective feedback.⁴² The students did not receive any training on how to provide feedback; therefore suggesting that students are capable of providing feedback but may need guidance on the most effective means to do so.

PAF is clearly occurring in athletic training education programs. However, it remains unclear whether students would improve their ability to assess their peers and provide corrective feedback if they received formal training in how to do so. Several

researchers exploring PAF in higher education have stated that some type of training or guidelines would be beneficial and may enhance the quality of feedback, improve students' acceptance of feedback, as well as increase the accuracy and/or reliability of that feedback.^{2, 4, 6, 8, 38, 41, 43-51} However, there are few studies that trained students how to properly assess the peer's performance and provide feedback.

Research in various disciplines illustrates that students can benefit from the PAF process in additional ways. The use of PAF in courses that have large student enrollment numbers allows students to receive feedback at a faster rate in situations where faculty cannot provide detailed feedback to all students.⁴⁴ Research also indicates that engagement in the assessment process requires students to reflect on course material which enhances their understanding.^{24, 52} Other documented benefits of PAF include self assessment and reflection,^{13, 24, 46, 47, 52} increased accountability,^{14, 23} enhanced problem solving skills,¹⁴ and increased confidence.^{14, 52} In contrast research in physical therapy suggests that students perceive that the feedback received from their peers was inadequate and lacked detail therefore indicating that they did not benefit from the process and preferred feedback provided by their clinical supervisors.⁴⁷ It is unknown whether students would benefit more from the PAF process if they received formal training. It is also unknown whether students who receive formal training would have a stronger preference for peer feedback.

Athletic training educators and researchers have also begun to explore the benefits of PAF in laboratory settings. Recent research in athletic training indicates that PAF may be most appropriate relative to individual psychomotor skills rather than to

complex clinical proficiencies.² In addition, athletic training students appear to benefit from peer feedback received in tutoring sessions as demonstrated by improved scores on orthopedic clinical skills tests.² It is unknown if PAF training can potentially affect skill acquisition and lab exam grades.

Purpose

Determining the best practices for incorporating PAF into athletic training education programs remains a long term goal of athletic training researchers. In contribution, the purpose of this study was to determine the following: 1) if a PAF training program affected the quality of feedback students provided to their peers and if feedback improved over time, 2) if students' perceptions of and preferences for PAF changed over time and as a result of a PAF training program, and 3) if PAF training affected laboratory exam grades. This study was conducted with students enrolled in KIN 391: Athletic Training Clinical Education I course at the University of North Carolina at Greensboro. Although the subjects were mainly sports medicine students (i.e., pre-allied health majors), implications can be made for athletic training and other allied health education programs because the psychomotor skills are basic and common to a majority of allied health fields.

Research Questions and Hypotheses

The study focused on the following research questions (a schematic representation is presented in Appendix A, page 117):

Research Question 1: In what ways did the quality and type of feedback students provide to their peers improve over time and after a peer assessment/feedback training program?

Hypothesis 1.1: Students will improve the quality of the feedback they provide across time regardless of group (control vs. experimental).

Hypothesis 1.2: Students who receive peer assessment/feedback training will provide higher quality feedback than the students who do not.

Hypothesis 1.3: Students who received peer assessment/feedback training will provide more reaffirming feedback on items performed correctly than students who do not.

Hypothesis 1.4: Students who received peer assessment/feedback training will provide more corrective feedback on items performed incorrectly than students who do not

Research Question 2: Did the perceptions of and preferences for peer assessment/feedback of undergraduate pre-allied health students change over time and after a peer assessment/feedback training program?

Hypothesis 2.1: Students will have increased positive perceptions and preferences for peer assessment/feedback across time regardless of group (control vs. experimental).

Hypothesis 2.2: Students who received the peer assessment/feedback training will have greater positive perceptions and preferences for peer assessment.

Research Question 3: Did peer assessment/feedback training affect skill performance?

Hypothesis 3: Students who received the peer assessment/feedback training will have higher grades than students who do not.

Definition of Terms

Peer assisted learning (PAL)- an umbrella term that describes various collaborative educational strategies including peer assessment, peer learning, peer teaching, peer mentoring and peer leadership.^{1, 29-37}

Peer assessment (PA)- a student judging the level or quality of a fellow student's understanding throughout the learning process.³⁸

Peer feedback (PF)- a student provides corrective comments to his/her peers to improve the execution of a task.³⁹

Peer assessment/feedback (PAF) - a combination of peer assessment and peer feedback where a student judges the quality of a peer's understanding and then provides corrective comments in order to improve future performances.

Peer- a student that is in the same class.⁵³

Limitations

1. Students did not know that research conducted would be in their class during class enrollment. Thus, section selection was not based on whether or not they wanted to participate in PAF training.
2. Subjects had various academic backgrounds and experiences with PAF that could not be controlled by the researcher. Examples included previous use of planned

PAF, previous use of unplanned PAF, learning style differences and documented learning disabilities. Students answered questions in the initial survey regarding past use of PAF and there were no significant differences between the experimental and control groups.

3. A semester long class may not be a sufficient amount of time to develop peer assessment skills.^{26, 28, 40, 54}
4. Students knew they were participating in a study. Thus, the Hawthorne effect may have occurred. The Hawthorne effect is when the changes are due to the fact that students are participating in a study and not due to the treatment.⁵⁵
5. Another threat to validity is the novelty effect where interest, motivation and engagement of the students increased because they were doing something different.⁵⁵
6. The classroom is not a sterile environment. Thus, students in different sections may have exchanged ideas and experiences. The final survey asked if students practiced laboratory skills outside of class with classmates or students from the other 391 section in order to see if there was any collaboration between sections.
7. As a teacher who believes in the use of PAF, my biases could have affected the scoring of the feedback and interpretation of the videos and open ended survey questions. Member checks and peer debriefing helped minimize biases.

Delimitations

1. Only students enrolled in an undergraduate sports medicine class were subjects in this study.
2. The subjects participated in PAF of laboratory skills for the purposes of this study. Thus, generalizability to other items (such as written work or professionalism) is limited.
3. The subjects were pre-allied health students and thus, the results of this study cannot be generalized to the general student body. The purpose of this study was to examine the affect of a PAF training with allied health skills. Implications can be made for athletic training and other allied health education programs because the psychomotor skills involved in this study are basic and common to a majority of allied health fields.

Assumptions

1. The researcher assumed the subjects were honest and made a consistent effort when completing all of the items.
2. The researcher assumed the presence of a video camera had minimal interference for the subjects being videotaped. There is evidence that students were not aware of the camera because they discussed items that they would not normally discuss in front of an instructor (i.e., how to cheat on an exam, using a previous paper for an assignment in this class). However, there was also evidence that they may have been affected (e.g., making comments to the instructor through the audio recorder).

Independent Variables

1. Participation in the PAF Training Program

Dependent Variables

1. Quality and type of feedback the students provide to their peers
 - a. Frequency counts of feedback behaviors and associated scores generated from Peer Feedback Data Form
 - b. Qualitative analysis of feedback behaviors captured on videotape
2. Perceptions of PAF
 - a. Mean scores from Sections 3 and 4 of the Sports Medicine Peer Assessment/Feedback Survey
 - b. Qualitative analysis of Section 5 of the Sports Medicine Peer Assessment/Feedback Survey
3. Skill performance
 - a. Grades from exams two and three

CHAPTER II

REVIEW OF LITERATURE

Purpose of Review

The purpose of this literature review is to provide the theoretical background that supports peer assessment/feedback (PAF) as an educational technique. Furthermore, literature explaining the use, benefits and issues of PAF in allied health and medical education were investigated.

Theoretical Background

PAF has its background in several learning theories. Roots can be found in andragogy, social learning theory and constructivism. Furthermore, PAF follows Chickering and Gamson's *Seven Principles of Undergraduate Education* which has encouraged college instructor's to reflect on best practices of higher education.⁵⁶

Andragogy

There are several theories that examine how people acquire knowledge. No one theory explains precisely how adults learn.⁵⁷ Andragogy is a set of assumptions that describe the characteristics of adult learning and focuses on the learner and his/her life situations.⁵⁷ Initially, andragogy was based on the following four assumptions: 1) adults prefer to be self directed learners, 2) experiences enhance learning, 3) readiness to learn is based on developmental tasks of social role, and 4) adults like to see immediate application and problem centered education.^{57, 58} Later two more assumptions were

added: 5) internal motivation is more potent than external motivation, and 6) adults like to know why the material is important.^{57, 59}

Some of the assumptions are more applicable to PAF than others. First, PAF is a self-directed learning task. Being self-directed means the students assess themselves and have motivation to learn.⁵⁷ In order to promote self-directed learning the students must feel in charge and that they can make an impact on their own learning.⁶⁰ PAF is learner centered and forces students to be a key stakeholder⁶¹ in the learning process and has also been shown to increase self-assessment.^{13, 52, 62} Additionally, PAF can take into account students' previous experiences when they provide feedback. Students may have previous professional and personal experiences with the material. This will allow them to provide feedback based on how they have seen the material used in the real world. This is also related to the assumption that students like to see how the material important and applicable to their future career. Students can discuss how they can use the skills in the clinical setting during PAF and the variations that they may see.

Social Learning Theory

Social learning theory attempts to explain learning through interactions of the learner, the individual's behavior and environment.^{57, 63, 64} The social environment is central to learning; knowledge can be acquired by observing others' skills, strategies, beliefs and attitudes. Group members bring various experiences to solve a problem and social learning is generated through interaction, participation and collaboration.⁶⁵ This learning theory states that learners incorporate new knowledge through observation, modeling and rehearsal.⁶⁶ Observational learning is regulated by attentional, retention,

motor reproduction and motivational processes.⁶⁴ Attentional processes determine what the student will pay attention to, which can be determined by a variety of factors such as usefulness and complexity.⁶⁴ Retention refers to students remembering what they observed through symbolic representation.⁶⁴ The motor reproduction processes are when students convert symbolic representation into performance. This may rely on formative feedback from another person because students are not able to observe themselves,⁶⁴ which can be accomplished through PAF. Finally, motivational processes determine what the students decide to change and can include rewards, punishment and consequences.⁶⁴ Social learning theory supports the use of PAF in athletic training and allied health education because students learn in a group so they are able to observe and model in order to become proficient in laboratory skills. PAF training that includes videos that can be modeled and group learning activities with reflection and discussion could enhance the PAF process.

Constructivist Theory

Another theory of learning related to PAF is the constructivist orientation. Constructivist theory states that learning is not just the process of acquiring knowledge⁶⁷ but rather it is constructed by incorporating past experiences and current knowledge into new learning situations.⁵⁷ Constructivist theory states learning is an active process and encourages self reflection.⁵⁷ Social interaction is important in constructivist theory because students can brainstorm to help each other find appropriate solutions based on previous knowledge and experiences.⁶⁷ Students will have different experiences and perspectives that can spur discussion during PAF, which can lead to internalization and

new learning.⁶⁷ PAF has been shown in the literature to facilitate self assessment and reflection,^{13, 52, 62} indicating that the students constructed further understanding of their practices through their experiences with assessing others and providing feedback. PAF training is supported by constructivist theory because students can use the information, observation and role playing during training to understand what defines corrective and positive PAF.

Seven Principles of Undergraduate Education

In 1987, Chickering and Gamson published the *Seven Principles for Good Practice in Undergraduate Education*⁶⁸ that is based on 50 years of research on student learning.⁶⁸ The purpose of the *Seven Principles* was to provide faculty with research-based recommendations on ways to improve undergraduate education.⁶⁸ PAF follows four of the seven recommendations.

First, PAF develops *reciprocity and cooperation* among students because PAF uses group work and encourages collaborative learning. Formative feedback that is provided through PAF should be more collaborative than competitive because it is meant to provide corrective feedback and does not contribute to a grade. Second, PAF uses *active learning techniques* because students must be involved in their learning through discussion and collaboration during PAF. PAF is an active learning tool where students think critically to assess and provide accurate corrective feedback. Students can discuss, collaborate, and relate to their previous experiences during PAF activities. Third, PAF gives *prompt feedback* because students can receive immediate formative feedback from peers. Chickering and Gamson state, “No feedback can occur without assessment, But

assessment without timely feedback contributes little to learning.”⁶⁸ PAF allows for prompt assessment and feedback at a more frequent rate than instructor assessment alone. Finally, PAF *communicates high expectations* because students will be expected to come to class having reviewed the material and ready to assess and provide corrective feedback.

Summary

PAF is a pedagogical tool based on adult learning, social learning and constructivist theories as well as best practices in higher education. These learning theories can assist educators understand how PAF can enhance learning. A common theme among the above theories and recommendations is that learning is student centered. PAF is a method to enhance learning that is theoretically supported and PAF training may enhance the process.

Peer Assessment/Feedback

Peer assessment is defined as “the process whereby individuals or groups of students assess the work of their peers.”⁶⁹ Peer assessment is sometimes also associated with peer feedback that is defined as “a communication process through which learners enter into dialogues related to performance and standards.”³⁹ PAF has been defined for this study as “a combination of peer assessment and peer feedback where a student judges the quality of a peer’s understanding and then provides corrective comments in order to improve future performances.” The purpose of this review is to examine implemented PAF programs in allied health and medical education that focus on psychomotor skills, documented benefits, potential problems, preferences and training programs.

Implemented Programs

PAF of psychomotor skills has been implemented into allied health and medical education programs through a variety of methods. The programs differ based on academic program, structure, and outcomes.

Athletic Training

PAF has been advocated in athletic training as a method to review psychomotor skills.^{2,7,11} A survey of athletic training students indicated that students practiced clinical skills with peers, received feedback from peers and turned to peers for advice. Although PAF was not specifically investigated, it is evident athletic training students practiced skills and provided feedback to augment ACI feedback of psychomotor skills.¹⁰ A different national survey of athletic training students established that PAF occurred in the clinical education and laboratory settings.³ Likewise, a national survey of athletic training clinical instructors found that unplanned PAF occurred frequently in the clinical education setting.⁹

In a separate study, an athletic training student led review session of psychomotor skills for undergraduate students was implemented to improve orthopedic assessment skills.² Students who attended a review session led by a peer tutor had improvements from the pre-test to the post-test. There were no differences in the post-test between the students who attended a review session led by peer tutor and students who attended a review session led by an approved clinical instructor. This study shows that peer tutors assisted in learning psychomotor skills and did not put the students who worked with the peer tutor at a disadvantage. The students reported feeling less anxious and less

embarrassed when learning skills with their peers rather than with instructors. The authors emphasize that the peer activities should not replace initial instruction from an instructor, but should be used to practice, review and reinforce psychomotor skills.²

Furthermore, research examining peer assessment of videotaped psychomotor skill showed that students were reliable when working in groups of two or more and on a more than one occasion; the students were also highly accurate.¹² The students evaluated 10 videos of a peer performing three different psychomotor skills with various intentional errors. A different study performed in athletic training showed that students accurately assessed videotapes of a peer performing a psychomotor skill and provided feedback regarding aspects of the skill that were performed incorrectly. However, the feedback was not always corrective.⁴² Although the two studies discussed above were not in a classroom or clinical education setting, they provide evidence that students can assist in assessing and provide feedback on psychomotor skills performed by their peers to supplement instructor evaluation.

Physical Therapy

Physical therapy students received feedback when a peer assessed an oral presentation of a PBL case during a capstone course. The two year study used a more general rubric the first year in which 95% (336/353) peer assessment contained feedback. The second year had a more detailed scoring rubric. The assessments were more accurate and 75% (321/430) included feedback. Comments were largely reaffirming and covered the method of presentation and the content of presentation.¹⁶

Nursing

Nursing has implemented PAF in the clinical setting to assess psychomotor skills.¹⁴ Second semester juniors and seniors in a baccalaureate nursing program participated in peer review during clinical practice. Initially, the students had a preconference to share a plan of care based on current literature. The students then were given time to work with a client and formulate a plan of action. The students and an instructor had a bedside conference with the patient. During the bedside conference the student providing care introduced the client, discussed desired outcomes and consulted with the client. The peer review of the treatment plan occurred during the bedside conference. A post-conference with the students and the instructor was used to discuss items not appropriate to discuss in front of the patient and clarify bedside discussion. Student and faculty evaluation showed they students had heightened accountability, better problem solving skills and increased confidence. The faculty felt the students were better able to integrate theory into practice.¹⁴

Reciprocal peer evaluations were also implemented in a nursing program for a patient home visit.¹³ A pre-conference between the students was used to discuss client information and treatment plan. The students used a Likert scale to evaluate nursing behaviors during the home visit. A post-conference followed the visit with the instructor to share/discuss the peer evaluation, strengths and areas of improvement, and to collaborate on alternative plans and strategies for future visits. The students felt they were more relaxed with their peers when compared to instructor observation. Students stated they were able to provide their peers with suggestions for improvements with patient

relationships in an objective manner, although some were hesitant to be critical. Peer collaboration and accountability increased because of the peer evaluations. Several students commented that there was a need for more guidance to decrease apprehension and help the students provide more specific feedback.¹³

Medicine

Similarly, medical education has used PAF with psychomotor skills. First year medical students completed written peer and self assessment during an interviewing course.¹⁷ Performance was evaluated with a 15-point Likert scale. The students assessed each other on interviewing style, interview structure, and interviewing techniques. The students were also asked to write comments regarding the strengths and areas of improvement. The peer and faculty ratings were significantly correlated. Although the faculty gave a greater amount of feedback, peers were willing to provide positive and corrective feedback.¹⁷

Furthermore, second year medical students performed self and peer assessments of various physical examinations as part of an introduction to clinical sciences course.¹⁸ The physical examinations were general physical, abdominal, cardiac, musculoskeletal, neurologic, ophthalmologic and pulmonary. The evaluation sheet used a detailed rubric and the students checked “correct,” “incorrect,” or “not done.”¹⁸ The students did not have accurate assessments when compared to the expert evaluations. Even though the assessments were not accurate, the students thought the experiences was valuable, enjoyable and encouraged them to learn more and review their skills.¹⁸

In addition, medical residents assessed their peers during an internal medicine program.⁷⁰ Areas evaluated include the following: physical examinations, team relationships, industriousness, enthusiasm, teaching, physician-patient relationships, case presentations, written workups, history taking, basic science and clinical knowledge, procedural skills, clinical judgment, and overall competence.⁷⁰ There were no significant differences between faculty and peer ratings in six competence categories. However, there were six categories in which there were significant differences. The faculty tended to rate higher than the peers. One reason may have been that peer evaluations were confidential and the faculty evaluations were not. Another explanation provided by the authors was that the faculty have a superficial knowledge of the physical exam performance of the students while the peers have observed the student more frequently in the clinical setting and can give a better global evaluation.⁷⁰

First year medical student who assessed their peers during a PBL curriculum appreciated the ideas and methods for improvement presented by their peers. The students felt they knew their strengths and weaknesses better after the peer assessments which allowed them to self assess and make improvements.²⁴ In a separate study, first year medical students who assessed a peer's professionalism in a gross anatomy course provided written feedback. There were 1234 peer evaluations that provided 2810 reaffirming comments and 355 corrective comments. The majority of feedback was related to the areas of inter-professional respect, excellence and responsibility. A majority of the corrective comments concentrated on failures in inter-professional respect, accountability and self-policing.²⁸ Similarly, first year medical students that completed

written peer and self assessment during an interviewing course provided reaffirming and corrective feedback. Reaffirming feedback was at a much higher ratio than corrective feedback. The authors thought this would promote acceptance of corrective feedback by the students.¹⁷

Moreover, peer assessment in a PBL medicine curriculum allowed the students to provide qualitative descriptive feedback to their peers regarding strengths and weaknesses. Students were reluctant to assess and criticize fellow students prior to a workshop. However, the students' attitudes became positive after assessing a peer. Interestingly, only 41% (n=55) thought the training session was useful.²⁶ Finally, third year medical students were comfortable and eager to give and receive feedback on professional attitudes and behavior. The authors believed the students gave more significant feedback than the faculty.¹⁹

Health Professions

Health professional students reviewed tapes of a peer interviewing a standardized patient. The student graded the peer on a 5-10 point scale focusing on the peer's communication skills.⁴⁷ The student assessments were significantly higher than the marks of the unit coordinator. There were also decreased ranges and standard deviations. The grade accounted for 35% of the unit grade, thus some were reluctant to award bad marks. The students thought observing another student was helpful because it gave them a benchmark for self assessment and they were able to see other ways of completing the task. Students found that feedback they received from their peers was helpful, but they would have like more detailed feedback and some questioned if their peers were reluctant

to be critical. The students would have liked more stringent guidelines and groups of four students instead of two.⁴⁷

Summary

PAF has been used successfully in many allied health and medical education programs. There are differences in implementation, but there is clear evidence that PAF can be successfully applied in higher education.

Benefits

There are many benefits of PAF documented in the allied health and medical education literature. The benefits can be divided into educational benefits, increased self-assessment, psychosocial benefits and professional development.

Educational Benefits

Various educational benefits have been documented in allied health and medical education. These benefits include improved grades and clinical skills improvement. First, grades of athletic training students who attended review sessions led by a peer tutor had better scores on their posttest skills score than on their pretest.² There were no significant differences between their scores and a group of students who attended skills review sessions led by an approved clinical instructor. This indicates that students improved their understanding of the material and students that attended lab sessions led by a clinical instructor did not benefit more.²

Besides grade improvement, students have improved their clinical skills. Medical students in a problem-based learning (PBL) curriculum felt that assessing peers' presentations and fulfillment of role responsibilities allowed for self reflection to improve

future skill performances.²⁴ Students were aware that their input helped another student learn and it challenged them to give constructive feedback to better the group as a whole.²⁴ Nursing students that used mandatory peer review in the clinical education setting had increased accountability, problem solving skills and increased confidence. The instructors noticed that the students expanded their views of their clinical experiences beyond their individual assignments and implemented theory into practice.¹⁴ Finally, health professional students who graded a peer's videotaped interview of a standard patient felt it was helpful to see another student's interview because they were able to view different interviewing approaches and compare performances. Some students felt the feedback from the peer was helpful and highlighted aspects that needed improvement.⁴⁷

Authors examining PAF have hypothesized that students will improve their own performance of the skill because it assists them in understanding the skill.⁶ Authors have also theorized that students should perform better on end-of-course exams because they have reflected on their peers and their own performance.⁴ Outside of athletic training and allied health, grades have been examined after the use of peer assessment. A study in teacher education found that students who participated in a PAF training program before assessing a peer's creative lesson had higher scores on the final creative lesson plan than students who did not have the training.⁴⁰ However, the same was not true in a separate study in teacher education where students assessed each other's lesson plan for discovery learning. There were no significant differences in their final discovery learning lesson plan between students who had PAF training and those that did not.⁶ It is possible that

students that participate in PAF training have better grades as a result of improved feedback and skill correction and needs to be explored further.

Self-Assessment

Self-assessment is important for students' academic success because it helps the student take an active role in his/her education to increase learning⁴ and is important for modifying skills or behaviors.¹⁷ Nursing students that participated in reciprocal peer evaluation of a patient home visit also reflected on their own performance that helped promote shared learning and objectivity of their peer assessments.¹³ Likewise, students who assessed their peers as part of a PBL medical curriculum thought peer assessment helped them reflect on their strengths as weaknesses and this improved future performances in the clinical setting.²⁴ Similarly, sports studies students who assessed a peers annotated bibliographies stated that it encouraged active involvement in the assessment process and self critique.⁵² In a different study, sports studies students who assessed peers' poster presentations found it help understand what they did wrong and what they can do to improve next time.⁶² Students not only learn from the feedback they receive from their peers during PAF, but also from comparing their skill performance to their peers' performances. A PAF training can discuss self assessment as a benefit of PAF to make the students aware and encourage self reflection.

Psychosocial Benefits

The students that have assessed and provided feedback to peers have reported psychosocial benefits as well. Athletic training students who attended a review session led by a peer tutor rather than a clinical instructor described that they felt less pressure,

less embarrassment, and less anxiety. The students also felt the experience increased their collaboration and it was more collaborative than competitive.² A survey of athletic training students also found peer assisted learning techniques were less anxiety provoking and increased collaboration.¹⁰ Furthermore, nursing students that completed patient home visits with a peer felt more relaxed with a peer, although a few felt apprehensive. Some students commented that they were more at ease with a peer observing them rather than an instructor. The presence of a peer also decreased initial apprehension that is often felt at home visits.¹³ In addition, sports studies students that provided their peers with formative assessments of annotated bibliographies found the process helped them gain confidence. They liked the discussions, debates and collaboration that accompanied the peer assessments.⁵² It is evident that students can have psychosocial benefits from PAF. PAF training could enhance psychosocial benefits because students may have less anxiety and more confidence performing and receiving feedback because they understand how to provide feedback.

Professional Development

Students in nursing and medical education programs have acknowledged that PAF activities have helped with their professional development. Mandatory peer review in the nursing clinical education setting encouraged collaborative problem solving, accountability and responsibility, which will be beneficial in the future.¹⁴ Furthermore, nursing students who performed formative and summative assessments of intellectual reasoning, analytical ability and interpersonal communication thought the mid-term evaluations made them change behavior and work habits during the second half of the

semester, indicating they implemented change based on the assessments. The students thought the experience would be useful later in their careers, especially in their clinical work.²⁶ Students assessed a peer as part of a PBL medical curriculum thought the experience was beneficial to help prepare them for peer and self assessment in future careers.²⁴ Although professional development was not a reason for implementation in the articles cited above, the students benefited professionally from PAF.

Summary

PAF has many documented benefits that provide evidence for implementation. Benefits may increase from a PAF training that emphasizes how to provide and receive corrective feedback.

Precautions when Implementing PAF

Although there are many benefits to peer assessment, it is not a panacea.¹ Issues that have been documented in the literature include acceptance of feedback and difficulty of the experience.

Acceptance

One issue is that students may not accept the PAF provided by their peers. A national sample of athletic training students who completed a survey disagreed that the feedback they received from peers in the clinical education setting is more helpful than feedback from the clinical instructor.¹⁰ Similarly, a majority of athletic training students who attended a review session led by a peer tutor were undecided or disagreed that peer feedback was more helpful than the feedback from the laboratory instructor even though

there were no differences in grades between the two groups indicating the peer feedback did not cause harm.²

Medical students who participated in peer assessment of a PBL experience worried that other students would not be honest, score their friends higher or not take the exercise seriously.²³ In a separate study on peer assessments in a medical PBL curriculum, students felt the criteria were not relevant to the learning objectives. They also thought the peer assessments were not taken seriously and “not too much thought went into the marking.”²⁴ Many students were not confident in their peers’ ability to assess. Almost a quarter of the students withdrew from the peer assessment activity because they were skeptical of the process.²⁴ The students felt that they had no previous experiences with peer assessment and did not like the structure. Some students even commented that they didn’t appreciate the exercise and gave high marks rather than critically reading and properly assessing. Students also found it difficult to criticize peers and thought it actually hurt the collaborative learning environment.²⁴

Additionally, the largest negative response from second year medical students who assessed a peer’s professional competence was that some peer assessments lacked constructive feedback.²⁷ However, the students noted that the comments were more helpful than the feedback from the Likert questions.²⁷ Furthermore, there was some evidence that third year medical students were not comfortable evaluating their peers or receiving feedback during peer assessments of professional attitudes and behaviors during various clerkships. Certain students were classified as “problem students” who changed their behavior towards their peers after receiving feedback.¹⁹

Similarly, first year medical students that provided feedback on clinical case reports were unsure of the feedback.⁶¹ The students wanted their peers to justify their decisions in order to gain confidence in the feedback. Interestingly, almost 70% of the students believed the quality of their work increased because of the insights from the peer feedback.⁶¹ In a separate study, medical students who assessed a peer on intellectual reasoning, analytical ability and interpersonal communication felt the summative assessments were biased, but many appreciated the formative assessments.²⁶

Health professional students who assessed their peers' videotaped interviews of a standardized patient felt that the process was not fair and equitable. Some felt the feedback was too general and those who knew they performed poorly and still received high marks questioned the feedback. Nevertheless, the students overwhelmingly thought the exercise was a useful learning experience.⁴⁷

However, some students do feel they can provide fair assessments. For example, fifth year surgery students overwhelmingly believed that they should be able to assign grades to peers in a responsible manner. They were comfortable assessing a peer and they thought they were fair and responsible.²¹ A PAF program that emphasizes how to perform assessments and provide feedback could enhance the students' ability to provide accurate feedback. This should increase the students' confidence in and acceptance of PAF.

Difficulty

A documented issue with peer assessment is that the students found it difficult to assess a peer and provide feedback. Although the difficulty of PAF may mean increased

critical thinking and learning, it can decrease the students' willingness to participate and accept a peer's feedback. For example, medical student in a PBL curriculum felt that they had no previous experiences assessing a peer and did like the structure because it was difficult to criticize and it hurt the collaborative learning environment. Some students even commented that they didn't appreciate the exercise and gave high marks rather than critically reading and properly assessing.²⁴

Similarly, medical students from various years in their medical education were not always willing to assess a peer's professionalism. Some students were unsure of their ability to assess peers and if their assessment would actually influence the peers' behavior. Students would have preferred the feedback to be anonymous in order to prevent animosity or giving generic feedback. The students stated education for peer assessment would increase their willingness to participate in peer assessments. Suggestions included education on the meaning of professionalism, the faculty expectations of professionalism, conflict resolution, training on giving and receiving feedback and clear instructions.⁴³ Likewise, first year medical students that gave feedback to their peers on an anatomy case report found the experience difficult and they were unsure how to give feedback. The faculty recognized that more practice and training was needed.⁶¹ Students that participate in a PAF training program may have decreased negative experiences because they feel comfortable providing feedback and understand the process.

Preferences

Preferences for PAF as compared to instructor assessment and feedback in allied health and medical education are largely unknown. A national survey of athletic training students suggests that students may prefer collaborative clinical learning experiences because it is less anxiety provoking and they are more self confident when compared to interactions with their clinical instructor.¹⁰ There is evidence in the literature that students like PAF, but it is unknown whether they preferred PAF to instructor assessment/feedback.^{27, 52}

There is minimal evidence that students do not prefer PAF. A majority of athletic training students that participated in a peer tutoring program disagreed or were undecided if feedback from a peer was more helpful than the feedback received from the laboratory instructor.² In addition, over half of the students did not feel more comfortable asking questions to a peer tutor than the lab instructors and a little less than half of the students did not feel the peer tutors were more supportive than the lab instructor.² Some studies have reported that students do not like PAF, which may indicate the students did not prefer PAF over instructor assessment/feedback.^{61, 71} It is important to understand if students prefer PAF as opposed to instructor assessment/feedback and traditional learning methods. It is also possible that a PAF training program may increase student preferences because they better understand the process and the benefits.

PAF Training

Training for PAF has occurred in several educational programs. Previous PAF training programs have used a discussion of background information to improve the PAF

process in peer tutoring in medical education,⁷²⁻⁷⁴ peer assessment in teacher education,⁴⁰ peer coaching in mathematics⁷⁵ and peer assessment in psychology.⁵¹ Reflection of past experiences has also been an important component during training programs for peer tutoring in medical education.^{72, 73} Discussion and reflection has been incorporated into PAF training in programs for peer tutoring in medical education,⁷²⁻⁷⁴ peer assessment in a medical anatomy class,⁶¹ peer teaching in medical school,⁷⁶ peer assessment in sport sociology,⁶² peer assessment in teacher education^{6, 40, 50} and peer coaching in engineering.⁷⁷ Observations of strategies or techniques have been used in training for peer tutoring in medical education,⁷⁴ peer coaching in math⁷⁵ and peer assessment in psychology.⁵¹ Role playing exercises have been used successfully in training programs for peer tutoring in medical education,⁷²⁻⁷⁴ peer teaching in medical education,⁷⁶ peer assessment in sport sociology,⁶² peer assessment in teacher education⁴⁰ and peer coaching in math.⁷⁵

Researchers of PAF have stated that some type of training would improve PAF.^{2, 4, 6, 8, 38, 41, 43-51} The programs previously mentioned give an indication of the training for PAF activities in higher education. This information was used to construct the PAF program for pre-allied health students that was used for the current study. Some of the articles gave specific recommendations for constructing a PAF program^{6, 40, 44, 48, 78} that were helpful in program construction. Use of techniques that were used successfully and following guidelines and suggestions should maximize the effectiveness of the PAF training.

Summary of Literature Review

Peer assessment/feedback has been shown in the literature to be a functional educational tool. Positive aspects include educational benefits, self assessment, psychosocial benefits and professional development. However, it is not a panacea and there are issues with student acceptance and students finding the experience difficult. PAF training based on adult learning theory and the current literature may improve the feedback students provide to their peers, enhance perceived benefits, increase preferences for PAF and improve skill performance.

CHAPTER III

METHODOLOGY

This study was designed to determine how a peer assessment/feedback (PAF) training program affects the quality of student feedback provided to peers, explore student perceptions about providing their peers with feedback, determine student preferences for giving and receiving feedback from their peers, and examine if PAF training improves skill performance. This chapter describes the research design, study participants, instrumentation, procedures, and data analysis techniques.

Design and Setting

This quasi-experimental study used a repeated measures design to compare quality of feedback, type of feedback, student perceptions, preferences and skill performance. The study took place at the University of North Carolina at Greensboro, a research intensive university. The primary investigator was a graduate student and teaching assistant at the University of North Carolina at Greensboro.

Subjects

A convenience sample of undergraduate kinesiology majors within the sports medicine concentration (pre-allied health) was used for this study. Subjects were recruited from the KIN 391: Athletic Training Clinical Education I course. The researcher was the primary instructor for this course and KIN 390 which is a co-requisite.

The study took place during the Fall 2009 semester. Student enrollment consisted of 75 undergraduate students enrolled in their second to fifth academic year of study. Subjects enrolled for one of two sections of KIN 390/391; 36 in the experimental section and 39 in the control section. There was no investigator control over the section selection. Students did not know ahead of time which section was the control group and which section was the experimental group. Students were not allowed to switch sections in order to maintain the separation of the two groups. Students were randomly put into groups of 4 students within in each section that remained the same over the entire semester. Because the class enrollment did not make even groups of four, groups of three were used for remaining students. The same groups were used for all data collection/laboratory sessions.

IRB approval was obtained before the study began and each student completed an informed consent. Students were required to complete all parts of the study, except for the videotaped portion, as part of a course requirement. The instructor/principle investigator knew who was participating in the videotaped portion of the study during data collection. However, she did not know who agreed to have their data analyzed from the other portions of the study until two days after final grades were posted. Of the students enrolled in the two sections, 33 subjects in the experimental group and 36 subjects in the control group were willing to have their data analyzed for this study.

A subset of students was videotaped during six lab sessions while they practiced laboratory skills and provided corrective feedback to their peers. During the study recruitment process, students were given the opportunity to opt out of the videotaped

portion of the study. Eight of the remaining students from both the control group and experimental group were randomly selected to be videotaped. Sixteen students of the 54 willing to participate were chosen to examine the feedback students provided in order to see variation while being able to provide rich descriptions.

Instructor

The instructor was a doctoral student in the Department of Kinesiology. She was a teaching assistant for KIN 391 fall 2002 when she was working on her master's degree and was also the primary instructor for both KIN 390 and KIN 391 fall 2007 and fall 2008. The instructor used peer assessment in several athletic training laboratory classes and as an athletic training clinical instructor. As a result, the instructor favored the use of peer assessment with psychomotor skills. This was a consideration during data collection, analysis and discussion. Measures were taken to minimize any bias. Such measures included peer debriefing of video analysis, member checking of video data, blinding to who is participating in the non-video portion of the study until after final scores were posted and exploration of biases through field notes.

Course

Data was collected in KIN 391: Athletic Training Clinical Education I course at the University of North Carolina at Greensboro. KIN 391 was taught concurrently with KIN 390: Prevention and Emergency Care of Athletic Injuries. KIN 390 focused on the cognitive domain and KIN 391 focused on the psychomotor domain of introductory sports medicine topics. The content of the two courses were taught in sections throughout the semester. The course calendar shows the course content for both classes (see

Appendix B, page 118). The courses were required for students in the kinesiology major with a concentration in sports medicine. However, two kinesiology students with a fitness leadership concentration enrolled in the course. Blackboard, an on-line course management tool, was used to post course content, communicate and display grades. The courses were taught at 8 and 10 AM on Monday, Wednesday and Friday's for 50 minutes during a 15 week semester.

Instrumentation

Peer Feedback Data Form

Videotaped lab sessions were analyzed to determine the quality of feedback students provide to their peers. Group data was recorded on a Peer Feedback Data Form (see Appendix C, page 120). One Peer Feedback Data Form was used for each group for each lab session. It had a section to record who provided the feedback and what feedback they provided; the feedback could include oral, facial and physical feedback. There were also three sections to categorize the data. The first section described the type of feedback as either reaffirming (i.e., something they did correctly) or corrective (i.e., something they performed incorrectly). Reaffirming was symbolized by + and corrective was symbolized by – on the Peer Feedback Data Form. The second section described the quality of the assessment and feedback using the Feedback Quality Scale (FQS). Initially the FQS was a four-point scale (0-3). However, once analysis began it was evident that more points were needed in order to accurately categorize the feedback that subjects provided. The final FQS used the following 8 point scale. It is important to note that the

numbers do not represent a quality value but rather a way to code the feedback provided:

- 0 Did not recognize the item was performed incorrectly
- 1 Recognized skill was performed incorrectly but gave incorrect feedback
- 2 Recognized skill was performed incorrectly and gave feedback that was not corrective
- 3 Recognized skill was performed incorrectly and gave detailed corrective feedback
- 4 Provided general positive feedback on an item performed correctly, feedback was not descriptive
- 5 Provided descriptive and detailed feedback on an item performed correctly
- 6 Self assessment
- 7 Provided corrective feedback on an item performed correctly (incorrect assessment)

The final section was for comments and qualitative observations that provided greater insights into the quality and type of feedback. For example, it was recorded when students were distracted by side conversations or their cell phones and when they asked an instructor for assistance or further clarification.

Inter-observer reliability of analyzing videotaped peer feedback was established between the co-investigators (Marty and Henning) as 0.82 for the frequency counts after independent evaluation and peer debriefing. Inter-observer reliability was calculated by “dividing the total number of agreed observations by the total number of agreed and

disagreed observations.⁵⁵ The inter-rater reliability was 1.0 (100% agreement) for the feedback quality scale.

Sports Medicine Peer Assessment/Feedback Survey (SM-PAFS)

A peer assessment/feedback survey was adapted with permission from a previously validated survey on PAL in athletic training¹⁰ (see Appendix D, page 121). The survey had five sections: demographics, past use of peer assessment, perceptions of peer assessment, preferences for peer assessment, and summary of peer assessment. A complete description of each section follows.

Section I: Demographics

Subjects were asked to indicate their sex, year in school, age, academic major and previous clinical experiences related to the sports medicine/allied health field.

Section II: Previous Experience with Peer Assessment/Feedback

Section II was designed to measure the perceived frequency and prior use of peer assessment/feedback. This information gave insights to the students' background and would have been used as covariates in data analysis if there were significant group differences. Using a 4-point Likert type scale (1 = Never, 2 = Rarely, 3 = Often, 4 = Almost Always), students were asked to indicate how frequently they have used various peer assessment and peer feedback activities in the past from a list of 11 activities. No items were reverse coded. In addition, they were asked to describe past experiences assessing or providing feedback to peers, and past training on how to assess or provide constructive feedback. An example is "My peers help me correct my laboratory skills when I am having difficulty."

Section III: Perceptions of Peer Assessment/Feedback

Section III was designed to measure perceptions of peer assessment/feedback. Using a 4-point Likert type scale (1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree), all participants were asked to indicate their level of agreement with 32 descriptive statements. Five statements referred to perceived benefits of peer learning, 21 statements referred to perceived benefits of PAF, and 12 items referred to perceptions of the PAF process. All five statements referred to perceived benefits of peer learning were from the original survey. Thirteen of the statements that referred to perceived benefits of PAF are from the original survey and eight items were added based on current feedback literature. All 12 of the items that referred to perceptions of the PAF process are new. No items were reverse coded. They were also requested to provide any additional comments regarding the benefits of PAF. An example item is “I provide my peers with useful feedback on their laboratory skills.”

Section IV: Preferences for Peer Assessment/Feedback

Section IV was designed to measure perceptions regarding student preferences for peer assessment/feedback. Using a 4-point Likert type scale (1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree), all participants were asked to indicate their level of agreement with 11 descriptive statements regarding preferences for PAF. No items were reverse coded. They were also requested to provide any additional comments regarding the benefits of PAF. An example item is “I prefer to practice laboratory skills with my peers rather than with instructors.”

Section V: Summary of Peer Assessment/Feedback

Section V was designed to gain insight on how the student the perceived peer assessment/feedback process. Students were asked open-ended questions regarding how PAF feedback helped them during the semester, if they think the PAF will help them in future semesters and/or career, and suggestions for improvement to PAF. The experimental group was asked to summarize the positive aspects of the PAF training, the negatives of the PAF training, how the PAF training assisted them during the skills practice sessions and suggestions for PAF training improvement. Not all questions in this section gathered data to answer a specific research question and therefore are not reported in Chapter IV.

Pilot Testing

The SM-PAFS was adapted from a previously validated survey on PAL in athletic training.¹⁰ The primary researcher and her advisor used the original survey nationally with 933 participants. The items used for the current study had internal consistency of 0.90.^{3,9} More items were added to section III based on PAF literature (see Appendix E, page 129).

Pilot testing was performed with 47 undergraduate sports medicine students. Four cases were excluded for reliability assessment due to missing answers. The new survey had an internal consistency of 0.96. Internal consistency by section is as follows: section II had an internal consistency of 0.87, section III had an internal consistency of 0.96 and section IV had an internal consistency of 0.91. Thus, no new items were deleted.

Field Notes

The instructor/principal investigator took field notes to record observations from the class and student interactions. Information from the field notes was used to provide rich descriptions, add support to the above data collection methods, describe the classroom atmosphere, document student concerns/complaints, and document student support. The field notes were also used to record things that might bias the instructor during data analysis and discussion of results. A code book was used to analyze the field notes (see F, page 130). The instructor has used field notes in previous research to add support to qualitative methods.

PAF Training

The PAF training was based on suggestions from the literature and learning theories.^{6, 40, 50, 51, 61, 62, 68, 72-77} The PAF training had the following goals: 1) to provide information on how to use the rubrics and provide feedback, 2) to allow the students to see and discuss examples of corrective feedback and improper feedback, 3) to allow students to practice PAF of a previously learned skill in their small groups and 4) to allow the students to discuss concerns of PAF. The agenda for the PAF training can be found in Appendix G, page 131. A PowerPoint presentation (see Appendix H, page 132) was used for the training and the students received a handout (see Appendix I, page 135).

Background, Purpose and Reflection

One of the first activities of the PAF training was a presentation on the background and purposes of peer assessment and peer feedback. Details of how PAF would be used in the class were discussed as well as documented benefits to provide

students with evidence that it is a valid educational tool. The students then reflected on a positive peer interaction outside of KIN 390/391 to encourage them to reflect on previous experiences and think about the strategies used, how they felt, what they thought worked well, what did not go well and how the peer responded. This was structured to give them a starting point for reflecting on previous experiences and how they can learn from those experiences to make the current experiences more productive.

Technique

Information on how to properly assess laboratory skills and provide feedback was the second component of the PAF training program. The students completed PAF of blood pressure and pulse four weeks prior to the training. The first PAF training activity was a brainstorming reflection on what helped during the first laboratory sessions and what would have helped. This helped students reflect on what helped them so that they can perform those techniques while providing PAF. A class discussion of feedback tips from the literature allowed for students to learn proper techniques or reinforce their prior knowledge.

Videotaped Scenarios

Day two of the PAF training started with a brief review of PAF, PAF characteristics and a chance for students to ask questions. Next the students watched videotaped scenarios of PAF so they could observe behaviors they can model and avoid (see Appendix J, page 137). The first videotape was of two peers assessing three pulses. The students in this scenario used proper PAF techniques and applied knowledge to clinical practice. The second scenario was of two students practicing blood pressure. The

student assessing was distracted and did not notice mistakes or the other student's uncertainty of the skill performance. Pulse and blood pressure were chosen for the videos because students already completed the lab and practical exam for these skills and they could focus on the PAF and not the skills themselves. After each scenario there was a discussion of what went well and what needed improvement using the think-pair-share technique. Think-pair-share is when the students first reflect individually, then discuss their thoughts in their small groups and finally the entire class will discuss the items.

Role Playing

The final activity of the PAF training was role playing exercises. The students practiced taking pulses or blood pressure in their small group. These skills were chosen so they could focus on the PAF process and not the skills. The student being assessed was instructed to make some errors so were opportunities for the other peer to provide corrective feedback. Students discussed in their small group what went well, what needed improvement and any uncertainties.

Role playing exercises allowed for students to practice the skills in a less threatening environment and receive feedback. Reflection and discussion of what went well, what needed improvement and what the students were unsure of enhanced the benefits from the role playing exercises.

Procedures

Students enrolled in KIN 391 fall 2009 were required to complete all parts of the study, except for the videotaped portion, as classroom assignments. Students consented to

have their data analyzed. The 8:00 section was the experimental group and participated in the two-day Peer assessment/feedback (PAF) Training program. All students completed the Sports Medicine Peer Assessment/Feedback Survey (SM-PAFS) twice during the semester. Students completed sections I-IV of the SM-PAFS during the second week of the semester before participating in any peer assessment for KIN 391. The students completed sections III-V the thirteenth week of the semester.

Six psychomotor laboratory skills were taught during the semester. The skills were taught in the following groups of two: 1) blood pressure and pulse, 2) wound care and ICE (ice, compression and elevation), and 3) crutch fitting and splinting. Two class sessions were dedicated for each set of skills. The two videotape groups in each section were taped during the skill practice with PAF time both days. An audiotape was used as a back-up method in case there was a camera malfunction and to ensure voices were recorded. The class instructor and teaching assistants circulated among the groups to informally evaluate skills and answer any questions. The students received a rubric one week prior to skill introduction that was used for the PAF and the practical exam (see Appendix K, page 139).

Both the control and experimental groups completed the laboratory sessions for the first skill set (blood pressure and pulse) without any training in how to provide corrective feedback during the third week of the semester. Students took a practical exam on the skills the following week.

During week seven the experimental group participated in the PAF training while the control group watched the movie *Supersize Me*. Students that missed either of the

PAF training days completed the training outside of class in a similar format; all subjects completed all parts of the PAF training.

All students had the two-day laboratory skill instruction, skill practice and PAF the following week for wound care and ICE and took the practical exam during week nine. In a similar fashion, both groups completed the two-day laboratory skill instruction, skill practice and PAF during week eleven crutch fitting and splinting and took the practical exam during week twelve. The course calendar (see Appendix B, page 118) and procedural outline (see Appendix L, page 144) reflect the timeline for data collection.

Data Analysis

Data Management

All data collected during the semester had the students' names, date and section. Each student was given a code number to ensure each subject's data was matched for the multiple sources of data during data entry. Data from the videotapes were analyzed by the primary investigator within one week in order to determine if member checks with the students are necessary to clarify material on the videotapes. The instructor/principle investigator contacted the student via e-mail for a member check if necessary. During the member check the instructor discussed certain aspects of the results and analysis with the student to clarify and ensure a correct analysis. For example, during the crutch fitting and splinting labs control group 1 increased the amount of feedback provided and the percentage of descriptive feedback. It was hypothesized that they provided more feedback because the skills were more difficult. This was asked during the member check and the subjects stated that it was because there were more steps, not necessarily because

the skills were more difficult. This information gave greater insights into the feedback that students provide. The co-investigators independently analyzed the data and completed a peer debriefing to discuss findings and ensure an accurate analysis. They had a 96.43% (702/728) independent inter-rater agreement and 100% agreement after discussion.

All other data was not entered or analyzed until two days after the final grades were posted, when students had the ability to withdraw consent to use their data. Surveys were organized by date and stored in a filing cabinet until the end of the semester. Data from the videotapes, surveys and grades were entered into excel and SPSS.

Quantitative Data Analysis

Descriptive statistics were computed on all quantitative items. For conciseness, the statistical analyses are presented relative to the research question. All analyses were conducted using SPSS 14.0 (Chicago, IL). An a priori alpha level was set at 0.05.

Research Question 1: In what ways did the quality and type of feedback students provide to their peers improve over time and after a peer assessment/feedback training program? Videotapes of each skills practice session with peer assessment were analyzed by transcribing and coding the feedback. Content and quality of the feedback was evaluated with the feedback quality scale (descriptive, general, incorrect or missing). The videotaped feedback was also categorized by the type of feedback (reaffirming or corrective). Frequency counts of the quality and type of feedback were calculated to describe differences in the number of times students provided feedback to each other by the experimental group when compared to the control group. Percent of quality and type

described differences in the feedback given by the experimental group when compared to the control group. No statistical analysis was performed due to the descriptive nature of this section.

Research Question 2: Do perceptions of and preferences for peer assessment/feedback of undergraduate sports medicine students change over time and after a PAF training program? Mean and frequency counts of each survey item described student perceptions and preferences for PAF. A repeated measures ANOVA with one between subject factor (control vs. experimental) and two time points (levels) within subjects was used to examine differences throughout the semester as well as differences across each group.

Research Question 3: Did peer assessment/feedback training affect skill performance? An independent t-tests was computed on exam one grades to ensure there are no group differences. An independent t-test was performed on exam 2 grades and an independent t-test was performed on exam 3 grades. This was used to determine differences in exam grades among the students who received the PAF training and those who did not to make implications for changes in skill performance.

Qualitative Data Analysis

Research Question 1: In what ways did the type and quality of feedback that students provide to their peers improve over time and after a peer assessment/feedback training program? The comments of the videotaped data were coded for themes. The researchers noted any items that could give further information regarding the feedback

they provide. Member checks were performed through discussions with the videotaped subjects to ensure accuracy.

Research Question 2: Did the perceptions of and preferences for peer assessment/feedback of undergraduate sports medicine students change over time and after a peer assessment/feedback training program? The qualitative data gathered from the surveys was coded by hand for themes using the same code book that was used to analyze the field notes (see Appendix F, page 130). Quotes were categorized by theme for each research question.

Field Notes: Evidence from the field notes added information regarding research question 1 and 2.

CHAPTER IV RESULTS

The purpose of this study was to examine the following: 1) if a PAF training program affected the quality of feedback students provided to their peers and if feedback improved over time, 2) if students' perceptions of and preferences for PAF changed over time and as a result of a PAF training program, and 3) if PAF training affected skill performance. This chapter presents the quantitative and qualitative analyses that examined the feedback students provided during laboratory skill practice sessions, student perceptions, student preferences and skill acquisition. A discussion of the sample is also included. This chapter is organized by research question.

Description of Subjects

Demographics for the Subjects that Participated in the Video Analysis

The subjects that participated in the videotaped analysis of peer feedback were randomly selected from the 54 students that were willing to participate. These subjects were put in four groups of four, two experimental groups and two control groups. The subject demographics are described in Table 1.

Table 1. Videotaped Subject Demographics

	Mean Age (SD)	Gender		Year in School		
		N		N		
		Male	Female	Third	Fourth	Fifth
Experimental Group 1	21.00 (1.41)	0	4	3	0	1
Experimental Group 2	21.75 (0.50)	1	3	0	2	2
Control Group 1	21.25 (0.50)	0	4	0	3	1
Control Group 2	21.00 (1.41)	3	1	1	1	2
Total	21.77 (2.76)	4	12	4	6	6

Demographics for the Subjects that Completed the Surveys and Exams

A total of 69 subjects of the possible 74 were willing to have their data included in the analysis of the non-video portion of the study; 33 in the experimental group and 36 in the control group. A summary of gender, academic year, age, academic major and minor demographics is presented in Table 2. The average age of the subjects was 21.77 (± 2.76) years. The grade point average was collected from all subjects to determine if there were group differences (mean = 3.12 ± 0.43). Although the experimental group had a slightly higher mean GPA (3.22 ± 0.46) than the control group (3.03 ± 0.38), there were no significant differences in GPA, $t(67) = 1.93, p = 0.06$.

Table 2. Survey and Exam Subject Demographics

		Academic Year				Academic Major (Minor)		Total
		Second	Third	Fourth	Fifth	KIN (Sport Medicine)	KIN (Fitness Leadership)	
Experimental	Male	0	2	3	3	7	1	8
	Female	0	8	10	7	25	0	25
Control	Male	1	0	5	3	9	0	9
	Female	0	5	17	5	26	1	27
Total		1	15	35	18	67	2	69

During the first distribution of the PAF survey (week two) all subjects reported any previous use of PAF to determine if there were any group differences. There were no

significant differences between the experimental and control groups for any items. Thus, previous participation in PAF activities was not considered a confounding factor in the other data analyses. Over half of the students (53.6%, n=37) had never been formally evaluated by their peers and had never formally evaluated their peers. On the other hand, over 50% often or almost always participate in the other PAF activities. The most frequently cited activity was having a peer help correct lab skills when having difficulty. This indicates that to some extent students participate in PAF activities naturally. Frequency data and t-test results can be found in Appendix M, table 16, page 145.

Quality and Type of Feedback

The first research question aimed to examine the type and quality of feedback students provided to their peers and whether it improved over time and after a peer assessment/feedback training program. The feedback provided by the subjects was categorized according to the quality feedback scale (see page 36). The quality feedback scale is an eight-point scale that describes if the feedback was descriptive, general, incorrect or missing. The quality feedback scale also describes the type of feedback as reaffirming (when an item was performed correctly) or corrective (when an item was performed incorrectly). It is important to note that quality and type were not mutually exclusive. For example, subject feedback could be scored as both reaffirming and general (e.g., “good job”).

Quality of Feedback

The first part of research question 1 examined the change in the quality of the students' feedback after the PAF training and over time. Two aspects of the feedback

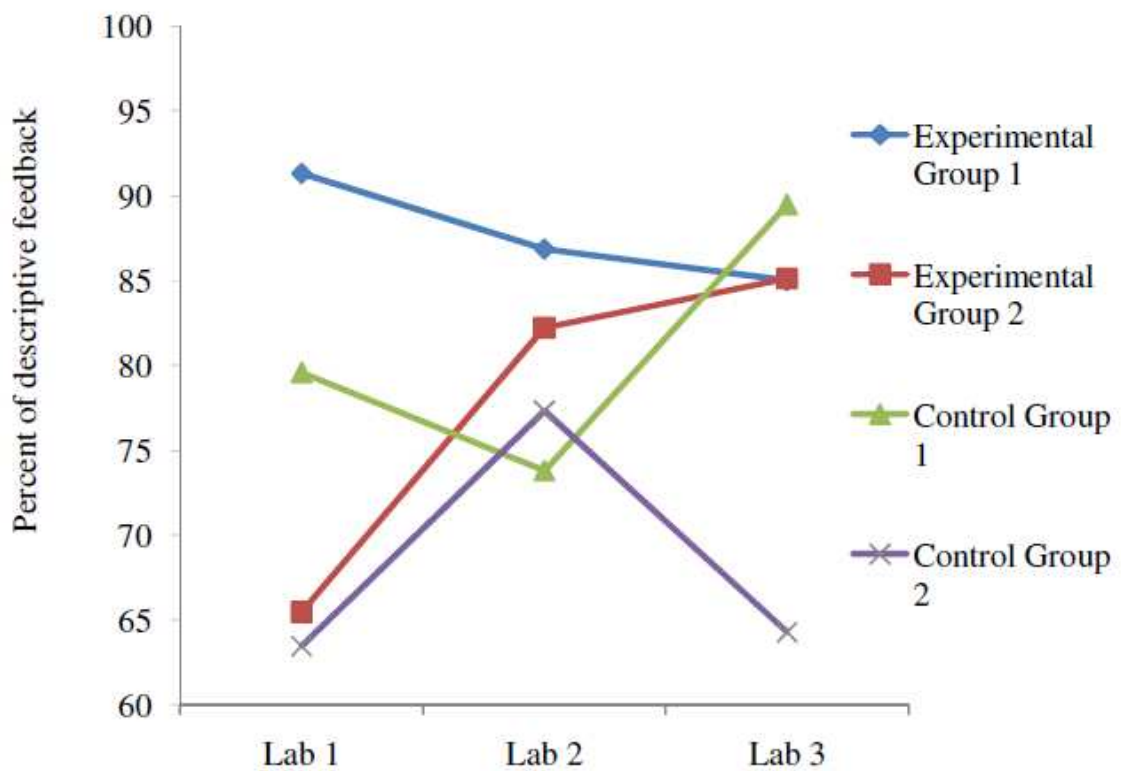
quality scale regarding quality are highlighted below: the percentage of descriptive feedback and percentage of incorrect feedback. A full description of the scores can be found in the videotaped case summaries (Appendix N, page 168). The PAF suggested making clinical connections, using strategic questioning, using the lab sheet, talking out loud and accepting feedback as ways to increase the quality of the feedback. These aspects will be discussed as well as confounding factors.

Descriptive Feedback

First, one of the main factors that affect the quality of feedback is the ability of the students to provide descriptive feedback. Reaffirming descriptive feedback for skill components performed correctly identified what was performed correctly and reinforced the accurate performance of the laboratory skill. Corrective descriptive feedback for items performed incorrectly identified what was performed wrong in order to improve future performances. For example, descriptive feedback was provided by a subject in control group 1 during the second set of labs. A peer asked her if she was applying pressure to the brachial artery in the correct spot in order to stop bleeding. The subject answered, "Uh huh, right between the two muscles." This feedback provided specific details about what was completed correctly and confirmed that the skill was properly executed. An example of non-descriptive feedback can be shown through a comment from a subject in experimental group 1 during the second set of labs. A peer was trying to splint a forearm fracture, but had difficulties trying to avoid putting pressure on the fracture site. The peer said, "It is kind of hard to go around it." The subject responded, "Yeah, you just do the best you can." The feedback was general and did not provide any

strategies for successfully completing the skill. A majority of the feedback provided on all occasions was descriptive. A summary of the descriptive feedback is described in Figure 1. Examples of descriptive and general feedback from each group can be found in the videotaped case summaries in Appendix N, page 168.

Figure 1. Percentages of Descriptive Comments Subjects Provided



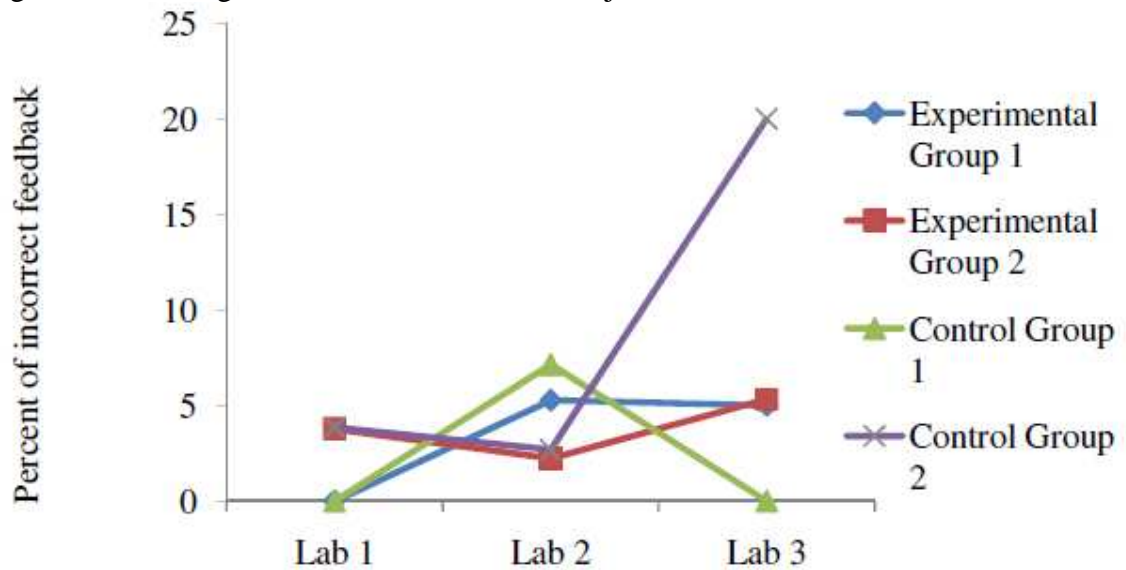
Feedback from the first set of labs provided a baseline measurement for each group and was used to determine change in quality over time and after the PAF training. The data shows that after the training both experimental groups consistently had a high percentage of descriptive feedback. Additionally, both control groups had a lab session with a high percentage of descriptive feedback but also had one session with a low

percentage of descriptive feedback. Thus, the PAF training was not necessary in order for the students to provide descriptive feedback but it helped the groups to consistently provide a high percentage of descriptive feedback. Also, it appears that the time did not have a dependable affect on the quality of the feedback since the control groups variable scores and that the experimental groups did not differ much between the second and third lab sessions.

Incorrect Feedback

Additionally, the percentage of incorrect feedback presents an indication of the quality of the feedback students provided. Figure 2 shows the percent of incorrect feedback provided and the changes during the semester. An example of incorrect feedback occurred during the first set of labs, a subject in experimental group 2 told a peer, “Generally if you can ask the patient what their BP is... So, if they are generally 120 then just go up to 140.” The feedback was incorrect based on what they were taught in class and what was on the lab sheet; the feedback could have potentially caused the peer to lose points on the practical exam and perform the skill incorrectly in the clinical setting. Based on the data there is no pattern in the percentage of incorrect feedback provided based on receiving the PAF training and over time for these particular subjects.

Figure 2. Percentages of Incorrect Feedback Subjects Provided



Clinical Connections

The PAF training stressed making connections between the lab skills and the real world as a way to increase the quality of the PAF. Making connections may encourage deeper learning and help the students apply the skills learned in class during their professional preparation and as a professional. There is evidence that students may do this naturally. For example, during the first set of labs, before the PAF training, experimental group 1 made clinical connections with the skills and brought in knowledge from previous classes. They used their knowledge of anatomy in order to find the dorsal pedal pulse more easily. The person who played the part of the patient acted like a real patient and they discussed the physiological reasons for the changes in blood pressure based on the patient's position and health habits. The discussion moved towards non-exercise scenarios such as the effects of dehydration and drinking alcohol on blood pressure and pulse. Experimental group 1 continued to use this strategy, during the third

set of labs they continued to think critically about how they would use the skill in the real world and different scenarios they might encounter. For example, they thought critically about how they would splint the forearm of a person wearing long sleeves. They discussed the reasons for leaving the sleeve down and pulling up the sleeve.

During the second set of lab experimental group 2 tried to make clinical connections by discussing how to splint other parts of the body. They attempted to use their knowledge of splinting theory and what they practiced in class to decide how to splint a broken hip. However, they did not have the practical experience to alter what they knew in order to effectively perform the skill. Neither of the control groups attempted to make clinical connections during their lab practice time without being asked to do so. Although experimental lab group 1 used this strategy before the PAF training, it is possible that experimental group 2 would not have attempted this strategy without the training.

Strategic Questioning

Another tactic emphasized in the PAF training to increase quality was asking peers questions that would encourage critical thinking in order to accurately complete the skill without being directly told what to do. Strategic questioning may make the practice more meaningful and interactive in order to improve future performances. None of the groups used this tactic during the baseline feedback. During the second set of labs experimental group 1 utilized this strategies several times. For example, one subject applied a compression wrap to a peer's ankle and couldn't remember the next step. The

peer said, “Can I take it off at night?” This prompted the subject to remember the next step and she said, “Ummm, no. You can loosen it if you want to...”

However, control group 1 also used this strategy even though they did not receive any training. During the third set of labs one subject used descriptive feedback and probing questions to help her peers better understand the skill:

Subject 1: “Well if you think about it, OK. Let’s look at the chair, pretend that the chair is a step. So if you go up what would you do?”

Subject 2: “You use your crutches on the good one first.”

Subject 3: “With your uninjured leg up on the first step.”

Subject 1: “With the crutches?”

Subject 3: “Follow with crutches. No, OK, lift the *uninjured* leg first.”

Subject 1: “The uninjured one first. So you would go like this and your crutches are behind you to put you up the stairs...”

She used the chair as a prop and mimed going up and down stairs with crutches and her peers were then able to instruct a patient on how to walk up and down stairs with the crutches. It is possible that the PAF training prompted experimental group 1 to use strategic questioning in the labs following the training. However, experimental group 2 did not use strategic questioning after the training and control group 1 used this strategy even though they did not receive the training. Perhaps this technique is beyond the experimental group 2’s abilities and further training on this area would help. Also, some students, such as those in control group 1, innately use this strategy and the training may not be necessary for this aspect for all subjects. But, the training reinforced the skill to

those who already use that strategy and ensures that all subjects are exposed to the technique.

Using the lab sheet

In order to ensure an accurate assessment, it was emphasized in the PAF training to use the lab sheet as a guide when assessing a peer. The lab sheets provided the subjects with step-by-step instructions on how to perform the laboratory skills. During the first lab session experimental group 1 used the lab sheet to guide their practice. Although, sometimes it was more of an afterthought rather than something that was used every time to ensure that they were providing accurate feedback. For instance, a group member watched a peer measuring blood pressure and then stated, “I guess we should be doing [using] this little sheet... was her elbow slightly flexed? Was it on a flat surface?” They did a better job in subsequent labs, after the PAF training, using the lab sheet while the peer was practicing in order to accurately assess.

Some of the subjects used the lab sheets to guide their practice, even though they did not have the training. For example, one subject in control group 2 during the second set of labs was practicing wound care and asked, “When do we use the antiseptic?” The peer he was practicing was unsure of the order of the steps and used the lab sheet to go over the order of the steps. However, when the subjects used the lab sheet to guide the practice, they weren’t always able to use it accurately. For example, during the first set of labs members of control group 2 were using the lab sheet when practicing the skills. They did not detect all errors, thus were not 100% effective at using the lab sheet to provide feedback. One member used the lab sheet and made sure that another member had the

cuff around heart level, but she missed that he had the stethoscope ears in backwards. It is possible that being encouraged to critically use the lab sheets to guide the peer assessments would have improved this lab session.

Talking Out Loud

Additionally, during the training it was suggested to the experimental subjects to talk out loud while performing a skill. Talking out loud is a way to self-assess and also lets the group members know that the person practicing understood the skill rather than doing the skill correctly by chance. None of the subjects talked themselves through the skill during the baseline labs. During the second set of labs all of the subjects in experimental group 2 talked out loud while practicing the skills. For example, one subject was practicing wound care. She said, “First you apply the gloves. First you apply the gauze. Well probably not like that,” as she applied the gauze to her peers arm in a rough manner. Her peer may have been prompted by her talk and responded, “Don’t you clean first?” This was incorrect feedback to an item performed correctly. The subject recognized that the feedback was not correct and responded, “No you apply [the gauze] first, you have to stop the bleeding.” This helped her correct her peer’s misconception about the skill. However, three of the subjects in control group 1 talked themselves through the skills during the second set of labs. Again, this is an example of how students innately do what is in the training, and thus, the training may not be necessary for this aspect for all subjects. But, the training reinforced the skill to those who already used that strategy and ensured that all subjects were exposed to the technique. Subjects in control group 2 did not talk themselves through the skills and may have benefited from the PAF

training. Although some subjects use this tactic naturally, it is important that all are encouraged to talk out loud and those that use the tactics are not harmed from being reminded of proper PAF procedures. Thus, PAF training would be beneficial in this aspect because the training makes the expectations and suggestions explicit and consistent.

Being Assessed and Receiving Feedback

A small portion of the PAF training dealt with being assessed and receiving feedback. There were some issues with the subjects' ability to use the feedback to increase the quality of the lab session and also accepting the feedback.

Using feedback. During the first set of labs, it appeared that the members of experimental group 2 did not fully understand how to receive feedback from each other. Many of the comments were one-line sentences and there was not much dialogue after feedback as seen in other groups. For example, one person was measuring blood pressure and did not turn the valve tight enough when inflating the blood pressure cuff, a peer responded, "You might need to tighten it a little bit more." During the same skill the subject did not pump the cuff up to 200 mmhg and the same peer responded, "You have to get it over 200." The person receiving the feedback did not respond or even acknowledge the feedback. During a member check, some of the subjects identified this. For example, one person responded, "Our group works okay together. No one really seems to want to take much initiative. It may have just been the lab though.... We felt more comfortable with each other I think (the second day)."

The group improved in subsequent lab sessions. In the following example subject 1 instructed a peer on how to walk up and down stairs with the crutches. Two peers helped her understand the skill.

Subject 1: "OK, up up the stairs you use your ummm, uninjured leg first."

Subject 2: "So this part of my body is not splinted, so give me instructions." And shakes her right leg

Subject 1: "Start with your left leg first. And umm. And then to go down the stairs- is there something else I need to tell her?"

Subject 3: "Follow through with the crutches."

Subject 1: "OK, follow through with the crutches."

This allowed subject 1 to not only check her knowledge, but give instructions to a peer like she was a real patient. There may be other factors that affected the improvements with feedback, but the PAF training and time could have improved the subject's ability to accept feedback.

One other subject had problems using feedback during the first set of labs. A subject in control group 1 was given verbal feedback twice and visual feedback that she needed to release the blood pressure cuff faster, but she was focused on the gauge that she did not change the speed of letting the air out of the cuff. She did not have this problem in successive labs, and thus, time may have helped her ability to use feedback from her peers to improve her lab skills.

Accepting feedback. Most of the groups did not have examples where the feedback was not accepted. On the second lab day during the second set of labs, a subject

in control group 2 received feedback on a different way to wrap an ankle. The other group member said, “It looked like you might want to try and go up and go down in the figure eight thing. That helps it stay on better.” The peer providing feedback had used this skill before and provided feedback on a different way to perform the skill. During a member check the subject used this as an example of feedback that was not helpful. When asked why he stated, “One of my lab members said the best way to wrap in a figure 8 which I didn’t feel so, that’s all. Probably because I am better at wrapping it regular.” Even though the feedback was correct, the feedback was not accepted by the peer. Thus, the PAF training did not ensure all feedback was accepted fully.

Confounding factors

The quality of the feedback students provided could have been affected by numerous things besides the PAF training and time. Things that appeared to affect the quality of the feedback students provided during this study include the subjects’ baseline ability to provide feedback and the difficulty of the skill.

First, experimental group 1 provided 91.30% descriptive feedback and provided no incorrect feedback during the first set of labs. The first set of labs was meant to provide a baseline measurement of how the subjects provide feedback and the subjects in this group were already able to provide quality feedback. During the second set of labs this group’s percentage of descriptive feedback actually decreased. However, they still had the highest percentage of descriptive feedback out of all of the groups. During the third set of labs this group’s percentage of descriptive feedback decreased another 1.84%; they were the third highest group, but only 0.11% lower than the other experimental

group. The fact that this group had a high percent of descriptive feedback (11.71% higher than the other groups at the baseline testing) makes comparisons to other groups with a lower baseline ability to provide descriptive feedback difficult because they had less room for improvement.

Additionally, the difficulty of the skill and/or the number of steps involved appeared to affect the quality of the feedback the subjects provided. For example, during the third set of labs a subject in experimental group 1 stated she thought she was more accurate because the material was more difficult. She wrote in a member check, “This [the increased difficulty of the skills] in turn caused me to concentrate more on how I would give feedback and also how I would receive feedback because I needed to become accurate with my skills.” It appears that the increased difficulty of the skills affected the subject’s perceptions of how she interacted with the feedback. Moreover, when analyzing the feedback of control group 1 for the third set of labs it was theorized that this group provided a higher percentage of descriptive feedback because the skills were more difficult. When asked in a member check, one subject stated, “The only thing that was a little difficult about the crutch fitting part was remembering all the instructions to give the patient/client. It seemed simple, but just needed more practice.” Another subject responded, “I think the labs were the same as any other, it just required a bit more independent study in memorizing the material.” The subjects in this group stated earlier that the items in the first two sets of labs were easy and it appears that the multiple steps required of this set of skills kept them on task and improved their feedback.

Summary of Data Related to Quality

To summarize, all of the groups provided descriptive feedback over 50% of the time. There appeared to be no effect of time on the quality of the feedback provided by the subjects. This does not support hypothesis 1.1 that stated students would improve the quality of the feedback they provide from the beginning of the semester to the end of the semester. There is a small amount of evidence that time affected the subjects' abilities to use the feedback provided to them which would increase the quality of the peer interaction. The qualitative data illustrated that the PAF training was beneficial for improving the consistency of the feedback and the use of strategic questions, partially supporting hypothesis 1.2 which stated students who receive peer assessment/feedback training would provide higher quality feedback than the students who do not. The percent of incorrect feedback, accepting feedback and using the lab sheets did not have a consistent pattern based on participation in the PAF training and time. Besides the percentage of descriptive feedback, the only item used by the experimental group and not the control groups was the use of strategic questioning.

Type of Feedback

The second part of research question 1 examined the change in the type of the students' feedback after the PAF training and over time. The type of feedback refers to whether the feedback was reaffirming or corrective as categorized using the feedback quality scale. The PAF training emphasized staying on task as a way to increase the amount of feedback during the labs sessions and is discussed in the section below as well as confounding factors.

Type of feedback

The number of comments provided by the students was examined by type of feedback (reaffirming vs. corrective). The data for the type of feedback can be found in Tables 3 and 4. The experimental groups more than doubled their reaffirming feedback on the second two labs when compared to the first lab. The control groups decreased their amount of reaffirming feedback from the first session in three of the four instances, further showing the PAF training affected the amount of reaffirming feedback. The PAF training does not appear to have an effect on the amount of corrective feedback provided. All groups increased their number of corrective feedback with each successive lab except for one instance- control group 1 during lab 2. Although not an original research question, this suggests a possible effect of time.

Table 3. Number of Reaffirming Feedback Comments Provided by Subjects and Percent Change

	Experimental Group 1	Experimental Group 2	Control Group 1	Control Group 2
Comments Lab 1	10	13	19	39
Comments Lab 2	25	44	31	32
% Change From Lab 1	+150.00	+238.46	+63.16	-17.95
Comments Lab 3	20	28	16	12
% Change From Lab 1	+100.00	+115.38	-15.79	-69.23
% Change From Lab 2	-20.00	-57.14	-48.39	-62.50

Table 4. Number of Corrective Feedback Comments Provided by Subjects and Percent Change

	Experimental Group 1	Experimental Group 2	Control Group 1	Control Group 2
Comments Lab 1	13	40	30	13
Comments Lab 2	13	46	24	43
% Change From Lab 1	0	+15.00	-20.00	+230.77
Comments Lab 3	20	66	60	58
% Change From Lab 1	+53.85	+65.00	+100.00	+346.15
% Change From Lab 2	+53.85	+43.48	+150.00	+34.88

Time on Task

An item stressed during the training was staying focused on the skills and observing peers in order to assess and provide feedback. This would affect quantity of feedback and can be examined in two different ways, staying on task and ending early.

Staying on task. One obvious difference between the experimental groups and control group 1 was how often control group 1 checked their cell phone during the lab sessions and had conversations not related to the lab. During the second set of labs several subjects were texting or looking on their phone when a peer was practicing. During day two they sat for several minutes doing nothing and talked about other classes and items not related to class. I tried to keep them on task by giving them photos of different injuries and having them discuss how they would treat the wounds. They talked about them briefly, but when I left their group they talked about items not related to class. One member recognized this and wrote in her member check, “We were probably more on task the first day than we were on the second because by the second lab it was review and we did not feel like we needed much practice anymore.” During the third set of labs, three of the four members in this group frequently checked their cell phones and received text messages. Checking text messages was an item shown in the ‘what not to do’ video and it was emphasized that group members needed to be present during the lab sessions; subjects in the experimental groups did not use their phones during lab sessions. Interestingly, control group 1 provided the most feedback during the third set of labs when they were the most distracted by their phones.

Ending early. Although the experimental groups did not text or go on their phones during the labs, both experimental groups ended early. Experimental group 2 ended early once during the first set of labs. The groups were instructed to take blood pressure in different positions to see if there were any differences. This group decided to not try that and one member thought they were, “beating a dead horse.” During the member check, one person said that nobody really wanted to take the lead. She thought it was because the lab was fairly easy and they had too much time. On the second day two of the three members ended early while the third kept practicing. Experimental group 2 did not end early on any of the subsequent labs.

Additionally, experimental group 1 consistently ended before the class period was finished. In member checks, the group members stated that they were comfortable with the skills and did not need as much time to practice. Some of these students had previous experiences and did not feel like they needed to practice the skills as much. Often the students were on task during the lab, but would occasionally get side tracked with discussions. They also took out their laptops at the end of the class and worked on items other than lab items. Even when I brought in additional activities (pictures of other wounds, other body parts to splint) they would get off task once I left the group. Ending skill practice early decreased the amount of feedback they provided to each other. Using all of the class time to practice skills was not covered during the PAF training and it did not appear to affect their ability to perform the skills during the practical exam. However, the subjects could have made more connections to the real-world during this time and

have better preparation for their professional education and perhaps part of future training should include what to do if they finish the lab activities early.

Confounding Factors

The quantity of the feedback students provided could have been affected by numerous things besides the PAF training and the amount of time they have been assessing and providing feedback to their peers. The main item that appeared to affect the quantity of feedback provided, besides ending early, appeared to be the number of errors while practicing the skills. Experimental group 1 consistently had the fewest errors when practicing the lab skills. For the three labs they had 18, 21 and 22 errors. Experimental group 2 made more errors while practicing the skills with 47, 48 and 68 errors. Control group 1 made 34, 32 and 61 errors while control group 2 made 47, 51 and 60 errors. Thus, it makes logical sense that experimental group 1 provided less feedback because they made fewer mistakes while practicing the skills and their peers have less to correct. For this reason, the quality of the feedback was examined through percent change rather than through the raw data to inspect the quality and type separately.

Summary of Data Related to Type

In conclusion, the PAF training appears to have increased the amount of reaffirming feedback, supporting hypothesis 1.3 which stated students who received the PAF training would provide more reaffirming feedback than students who did not. The PAF training did not affect the amount of corrective feedback, not supporting hypothesis 1.4 that stated students who receive the PAF training would provide more corrective feedback than the students who did not receive the training. The PAF training also

appears to have increased time on task. Although not an original research question, time may have a positive effect on the amount of corrective feedback.

Member Checks on Subject Perceptions of PAF Training

Student perceptions of the training was not an original research question but can provide valuable insights and is an important factor when considering the merit of PAF training and future implementation. When asked in a member check if they thought if the PAF training had an effect on the labs, all subjects in experimental group 1 said that it had a positive effect. One wrote, “I think the feedback training made us more aware of the type of feedback that we gave. We made a point to give specific, immediate and positive/constructive feedback.” Another stated, “My feedback was more meaningful and purposeful.” A subject also gave an example of what aspect she thought was valuable, “... my other two group members gave each other the “sandwich” style feedback. It was very beneficial.” Similarly, all subjects in experimental group 2 felt the PAF training had a positive influence on their labs. For example, one subject wrote, “I do feel the fb training had an effect in that it taught some the correct way to give fb and what type of questions to ask.” Another stated, “I liked that the peer review and feedback was explained as far as what was expected of us and how to go about approaching feedback successfully. Later, the same subject also stated, “Our feedback improved. Everyone was more specific and not scared to correct people. I felt more confident going into the 2nd practical than the first.” One subject identified a negative, “Analyzing and providing feedback for our every move actually caused us to lose time and everyone didn’t get to practice the same amount of time.” Although the time needed to provide feedback was

perceived as a negative, improper practice without feedback or correction is not worth the time spent practicing and should be emphasized in future training.

Summary of Videotape Data

This qualitative data illustrates the ways in which quality and type of feedback students provide to their peers changed over time and after a PAF training program within an undergraduate sports medicine course for 16 subjects. Findings suggest that PAF training potentially shaped the consistency of descriptive feedback, use of strategic questioning, on-task behavior and amount of reaffirming feedback. Findings also suggest that other factors shaped the peer feedback, such as baseline ability to provide quality feedback, difficulty of the skill and number of errors while performing the skills. Some of the strategies discussed in the PAF training were used by the control groups even though they did not receive training, but not all of the strategies. The training could be beneficial for all students to either reinforce what they already do or to teach new strategies. Subjects in the PAF training found it beneficial, which may improve the acceptance of feedback and their willingness to provide feedback. Overall, the qualitative data provided insight into the complex dynamics of PAF and opened more areas of future research which will be discussed in chapter V.

Perceptions

The first part of research question 2 aimed to examine student perceptions and whether they improved over time and after a peer assessment/feedback training program. The subjects completed the SM-PALS during week two and 13 during a 15-week semester. During both distributions of the SM-PALS subjects were asked to indicate their

level of agreement with 32 descriptive statements regarding perceptions. Five statements referred to perceived benefits of peer learning, 21 statements referred to perceived benefits of PAF, and 12 items referred to perceptions of the PAF process. The subjects also answered a series of short answer questions during the second distribution. Not all questions had responses and data analysis was based on the number of responses for each particular question. Frequency data and all analysis of variance computations can be found in Appendix M, page 145.

Perceived Benefits of Peer Learning

Subjects were asked to indicate their level of agreement with five statements regarding the benefits of peer learning. The reliability, measured by Cronbach's alpha, for this section was 0.86 during the first distribution and 0.84 during the second distribution. There were no significant differences between the experimental and control groups meaning the groups had similar perceived benefits of peer learning. There was no significant interaction effect of group by time indicating that the PAF training did not affect the perceived benefits of peer learning. However, there was a significant effect of time for all five items, meaning the students perceived benefits increased from the beginning of the semester to the end of the semester (see Table 5).

Table 5. Summary of Survey Questions Related to Perceived Benefits of Peer Learning with a Significant Time Effect

Question	Exp Mean Survey 1 (SD)	Cont Mean Survey 1 (SD)	Exp Mean Survey 2 (SD)	Cont Mean Survey 2 (SD)	DF _N	DF _D	F	p- value
I am receptive to learning from my peers.	3.18 (0.39)	3.33 (0.54)	3.42 (0.50)	3.58 (0.50)	1	67	10.43	<0.01
I seek out learning opportunities with my peers.	3.00 (0.66)	3.19 (0.53)	3.21 (0.74)	3.39 (0.60)	1	67	4.87	0.03
I view my peers as valuable resources for learning.	3.18 (0.58)	3.25 (0.50)	3.36 (0.60)	3.58 (0.55)	1	67	13.36	<0.01
I gain a deeper understanding of clinical application from my peers.	2.97 (0.68)	3.06 (0.64)	3.33 (0.65)	3.58 (0.50)	1	66	21.77	<0.01
I gain multiple perspectives on approaches to clinical problem solving from my peers.	3.18 (0.68)	3.37 (0.55)	3.45 (0.62)	3.67 (0.48)	1	66	8.386	<0.01

Subjects overwhelmingly had positive perceptions of peer learning. At the end of the semester 100% (n=69/69) of the subjects were receptive to learning from their peers, 95.65% (n=66/69) viewed their peers as a valuable resource for learning and 91.30% (n=63/69) sought out learning opportunities from their peers. Furthermore, by the end of the semester 97.1% (n=67/69) of the subjects felt they gained multiple perspectives on approaches to clinical problem solving from their peers and 95.65% (n=66/69) thought they gained a deeper understanding of the clinical applications from their peers. A description of all items can be found in Appendix M, Table 17, page 146.

The subjects gave further evidence that they thought peer learning was a beneficial part of the class through their answers to the short answer questions and reinforce that there are benefits from learning with their peers. When analyzing the short answer questions, three themes regarding benefits of peer learning emerged (see Table 6). The first theme was learning and correcting skills. One student wrote,

I learn by seeing something done, doing it myself and then explaining it again. I always feel comfortable with my grasp of the subject material if I can explain it well- that's my litmus test of whether I know it or not. So assessing my and others' labs skills has allowed me to test myself by explaining the concepts and procedures.

Another subject wrote, "It has helped me to better understand the material because I'm applying the info to correctly assess my peers, which helps reinforce the subject." The subjects felt like their learning was enhanced and PAF can be an alternative way for students to learn laboratory skills. The second theme was that the required peer activities helped the subject prepare for the practical exams. A subject reflected on this concept and also the carry over to her future professional career, "It has been helpful because it is good practice for interacting with my PT clients. It also better prepared me for our skills testing with the instructors." Again, PAF appears to be a viable method for the students to learn laboratory skills and prepare for exams. The third theme was self assessment. One student saw benefits through assessing herself, "It has helped me as a better communicator as well as prepared me for the practicals, by analyzing mistakes that they make." The self-assessment also increases critical thinking as shown through one subjects comment, "It [PAF] has helped me reevaluate my skills and knowledge of those skills.

When I assess my peers, I recheck what I know in order for me to give constructive feedback. I have learned my skills instead of memorizing them.” Self-assessment has been shown to help the students take an active role in his/her education to increase learning⁴ and as a way to help students modify skills or behaviors.¹⁷

Table 6. Themes Related to Perceived Benefits of Peer Learning from Short Answer Questions

Themes	Number of comments
Learning and correcting skills	44
Prepare for practical exams	3
Self assessment	14

Perceived Benefits of Peer Assessment with Feedback

Subjects were asked to indicate their level of agreement with 21 statements regarding the benefits of PAF. The reliability, measured by Cronbach’s alpha, for this section was 0.92 during the first distribution and 0.93 during the second distribution. There was a significant effect of time for 11 of the 21 items where the students had increased positive perceptions at the end of the semester (see Table 7). There a significant group effect for four items where the control group had higher perceived benefits than the experimental group (see Table 8). There were no significant interaction effects of group and time showing the PAF training had no effect on subjects’ perceived benefits of PAF.

Table 7. Summary of Survey Questions related to Perceived Benefits of PAF with a Significant Time Effect

Question	Exp Mean Survey 1 (SD)	Cont Mean Survey 1 (SD)	Exp Mean Survey 2 (SD)	Cont Mean Survey 2 (SD)	DF _N	DF _D	F	p- value
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I am able to accurately assess a peer's laboratory	2.97 (0.53)	2.94 (0.66)	3.21 (0.49)	3.33 (0.48)	1	66	17.43	<0.01
My peers are able to accurately assess my laboratory skills	2.91 (0.53)	2.91 (0.66)	3.15 (0.44)	3.28 (0.45)	1	66	16.10	<0.01
I am receptive to receiving feedback on my laboratory skills from my peers	3.27 (0.45)	3.31 (0.53)	3.61 (0.50)	3.64 (0.54)	1	67	24.03	<0.01
I provide my peers with useful feedback on their laboratory skills	3.15 (0.36)	3.17 (0.66)	3.36 (0.55)	3.53 (0.56)	1	67	10.02	<0.01
I gain a deeper understanding of clinical concepts when <i>I provide</i> my peers with feedback on their laboratory skills	3.24 (0.44)	3.33 (0.54)	3.45 (0.56)	3.58 (0.50)	1	67	11.06	<0.01
<i>Receiving</i> feedback from my peers on my clinical skills peers increases my confidence in my laboratory skills	3.18 (0.58)	3.19 (0.62)	3.36 (0.60)	3.56 (0.50)	1	67	8.67	<0.01
<i>Providing</i> my peers with feedback on their clinical skills increases my confidence in my laboratory skills	3.21 (0.55)	3.22 (0.59)	3.42 (0.61)	3.58 (0.50)	1	67	10.58	<0.01
My peers provide specific details with suggestions for improvement when my peers <i>provide me</i> feedback on my laboratory skills	2.79 (0.55)	3.06 (0.59)	3.03 (0.53)	3.22 (0.49)	1	66	5.19	0.03
Providing feedback to my peers on their laboratory skills improves my ability to <i>receive</i> constructive criticism from others	3.24 (0.44)	3.19 (0.53)	3.36 (0.60)	3.44 (0.56)	1	67	4.93	0.03
Seeing how others perform laboratory skills increases my learning	3.19 (0.60)	3.39 (0.49)	3.39 (0.70)	3.72 (0.45)	1	66	13.59	<0.01
Seeing how others perform laboratory skills allows me to see skill variations	3.26 (0.52)	3.50 (0.51)	3.48 (0.62)	3.69 (0.47)	1	66	9.34	<0.01

Table 8. Summary of Survey Questions Related to Perceived Benefits of PAF with a Significant Group Effect

Question	Exp Mean Survey 1 (SD)	Cont Mean Survey 1 (SD)	Exp Mean Survey 2 (SD)	Cont Mean Survey 2 (SD)	DF _N	DF _D	F	p- value
I provide specific details with suggestions for improvement when <i>I provide</i> feedback to my peers on their laboratory skills	2.76 (0.50)	3.19 (0.62)	3.09 (0.52)	3.17 (0.45)	1	67	7.86	<0.01
My peers provide specific details with suggestions for improvement when my peers <i>provide me</i> feedback on my laboratory skills	2.79 (0.55)	3.06 (0.59)	3.03 (0.53)	3.22 (0.49)	1	66	6.12	0.02
Seeing how others perform laboratory skills increases my learning	3.19 (0.59)	3.39 (0.49)	3.39 (0.70)	3.72 (0.45)	1	66	4.98	0.03
My motivation increases when my peers and I assess and provide feedback to each other	3.13 (0.55)	3.34 (0.54)	3.12 (0.65)	3.36 (0.59)	1	65	4.28	0.04

During the first distribution of the survey before the subjects participated in PAF in this particular class, over 73% of the subjects agreed or strongly agreed with all of the items. The items with the least amount of agreement were, “I feel less intimidated when my laboratory skills are evaluated by my peers than by my instructor,” which had 73.91% (n= 51/69) agreement. On the second distribution of the survey after the subjects participated in PAF of their laboratory skills, over 75% of the subjects either agreed or strongly agreed with all of the items. The two items which had the lowest percent agreement of 75.36% (n=52/69) were “I feel less intimidated when my laboratory skills are evaluated by my peers than by my instructor,” and “I am more empathetic than

instructors when laboratory skills are not performed correctly by my peers.” A full description of all items can be found in Appendix M, Table 19, page 148.

The subjects provided further evidence that they thought PAF was a beneficial part of the class through their answers to the short answer questions. When analyzing the short answer questions, seven themes associated with benefits of PAF emerged (Table 9). The first theme was seeing variations of the laboratory skills. A subject confirmed this when she wrote, “It has helped me better retain the information as well as see variations in how to perform skills.” Another peer further showed evidence for this by stating, “It has provided me with new ways of viewing things as I have seen how my peers do different scenarios. I see the different ways I can do skills.” Seeing skill variations is important because the students can learn how to adapt the skill to specific patients.

Table 9. Themes Related to Perceived Benefits of PAF from Short Answer Questions

<u>Themes</u>	<u>Number of comments</u>
See skill variations	15
Improved communication skills	19
Improved ability to provide feedback	35
Improved ability to receive feedback	12
Increased confidence	15
Collaborative environment	25
Professional preparation	9

The second theme related to perceived benefits of PAF was improved communication skills. By verbalizing to a peer what was performed correctly or incorrectly, the subjects improved their communication skills. This is shown through the following comment, “Explaining in detail our lab skills has helped me organize and vocalize my instructions when preparing for practicals.” Improve communication may be

transferable to other situations and is confirmed through one subject's comment, "I have gained more confidence in speaking to others and by learning what good feedback is. I can now use it in other situations." Communication skills need to be developed in pre-allied health students in order for them to be able to communicate with future colleagues and patients. The third theme related to improved ability to provide feedback. For instance, one subject felt his feedback skills improved, "It has helped me to gain confidence, and has helped improve my communication skills on giving constructive feedback." Further confirmation is shown by a subject who wrote, "It's helped me be able to learn to notice things and look for signs that I may not have before. It's taught me to give better overall feedback and not leave out any important areas." The students will be expected to have feedback skills in their professional careers and it appears that PAF can help them develop these before their professional education. The fourth theme was improved ability to receive feedback. One subject wrote, "It has helped me to open up to my peers. We all provided feedback, so it's easier for me to provide it too. I am also not nervous about receiving feedback." The ability to receive feedback is important to pre-allied health students because they will likely be evaluated by their future instructors and supervisors and they need to learn how to take feedback in a constructive manner to improve patient care. Also, this may better their ability to receive different types of feedback (verbal, facial, body positioning) from future patients in order to improve care.

The fifth theme was increased confidence. Many wrote that increased confidence was helpful during the semester. Confidence was reported in areas such as confidence in skills, receiving feedback, providing feedback, working in groups and speaking to others.

Improved confidence in any of these areas will benefit the students in the future. For example, one subject wrote, “[PAF] helps to boost my confidence when performing the skill and has also helped my communication skills. It has given me practice for giving feedback for my future clients.” Further evidence is shown through a different subject’s response, “Assessing has helped me to become more confident in groups. It has allowed me to become more open when sharing my opinions and asking questions when I am confused.” The sixth theme related to benefits associated with the collaborative environment. For instance, a subject wrote, “[PAF] helped me because it gave me a chance to interact and talk about the skill that was given. I am more of a hands on and verbal person so this helped out a lot.” Subjects also commented that the community feeling was enhanced because they were all “in the same boat” and had similar goals.

Finally, the seventh theme related to perceived benefits as a professional. One subject felt it will help her provide feedback to future patients, “[PAF] has helped me in knowing how to go about giving feedback, how to address the issue in a positive matter etc. It has also allowed me to see how different people respond to feedback.” Another subject felt that his experiences will help in the future because, “Peer assessment/feedback is all about communication skills. Of course enhancing my communication skills in a lab/clinical setting will prove to be beneficial in the future.”

Other subjects thought they will be more comfortable in the future providing feedback, “I feel peer assessment and feedback has and will extremely help me in my future career- it has made me feel more comfortable when giving feedback and a new understanding of its benefits.” Many others commented they will benefit in the future because their ability to

assess improved, their ability to provide quality feedback improved and receive feedback from other professionals. The subjects provided nine comments related to professional development during the general short answer questions. However, there was an open ended question that specifically asked if the subjects believed peer assessments would help them in future semesters and/or as a professional. In response to that question, 59 said yes, three said no, one said maybe and one person did not respond. Although professional preparation was not one the benefits that the subjects immediately thought of, a majority of the subjects thought their PAF experiences would help them in the future.

Perceptions of the PAF Process

Subjects were asked to indicate their level of agreement with 12 statements regarding the PAF process. The reliability, measured by Cronbach's alpha, for this section was 0.92 during the first distribution and 0.92 during the second distribution. There was a significant effect of time for 9 of the 12 items where subjects had increased positive perceptions at the end of the semester (see Table 10). There was a significant effect of group for one item where the subjects in the control group had greater positive perceptions than the subjects in the control group (see Table 11). There were no significant interaction effects of group and time which means the PAF training did not affect subjects' perceptions of the PAF process. No themes regarding perceptions of the PAF process emerged during analysis of the short answer questions.

Table 10. Summary of Survey Questions Related to Perceptions of the PAF Process with a Significant Time Effect

Question	Exp Mean Survey 1 (SD)	Cont Mean Survey 1 (SD)	Exp Mean Survey 2 (SD)	Cont Mean Survey 2 (SD)	DF _N	DF _D	F	p- value
<i>Receiving</i> feedback from my peers on my clinical skills peers is non-threatening	3.13 (0.61)	3.31 (0.47)	3.39 (0.56)	3.61 (0.55)	1	66	11.23	<0.01
<i>Providing</i> feedback from my peers on my clinical skills peers in non threatening	3.16 (0.57)	3.25 (0.60)	3.33 (0.54)	3.56 (0.56)	1	66	8.91	<0.01
My peers are respectful when my peers <i>provide me</i> feedback on my laboratory skills	3.34 (0.55)	3.44 (0.50)	3.61 (0.50)	3.64 (0.49)	1	66	9.69	<0.01
I am non-judgmental when <i>I provide</i> feedback to my peers on their laboratory skills	3.38 (0.49)	3.42 (0.55)	3.55 (0.51)	3.78 (0.42)	1	66	13.36	<0.01
My peers are non-judgmental when my peers <i>provide me</i> feedback on my laboratory skills	3.31 (0.54)	3.34 (0.54)	3.58 (0.50)	3.72 (0.45)	1	65	18.79	<0.01
I focus on the skill and not personality when <i>I provide</i> feedback to my peers on their laboratory skills	3.25 (0.51)	3.31 (0.71)	3.52 (0.57)	3.53 (0.70)	1	66	7.73	<0.01
My peers focus on the skill and not personality when my peers <i>provide me</i> feedback on my laboratory skills	3.16 (0.52)	3.29 (0.71)	3.52 (0.57)	3.53 (0.61)	1	65	11.10	<0.01
I am comfortable providing feedback to my peers on their laboratory skills	3.09 (0.30)	3.31 (0.58)	3.24 (0.50)	3.61 (0.55)	1	66	6.65	0.01

Assessing and providing feedback to my peers does NOT interfere with our personal relationship	3.16 (0.45)	3.39 (0.55)	3.52 (0.51)	3.64 (0.49)	1	66	16.64	<0.01
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Table 11. Summary of Survey Questions Related to Perceptions of the PAF Process with a Significant Group Effect

Question	Exp Mean Survey 1 (SD)	Cont Mean Survey 1 (SD)	Exp Mean Survey 2 (SD)	Cont Mean Survey 2 (SD)	DF _N	DF _D	F	p- value
I am comfortable providing feedback to my peers on their laboratory skills	3.09 (0.30)	3.31 (0.58)	3.24 (0.50)	3.61 (0.55)	1	66	12.25	<0.01

During the first survey distribution, students overwhelmingly indicated that they had positive thoughts regarding the PAF process. The items with the lowest percentage (67.65%, n=46/68) of agree/strongly agree was. “I am eager *to provide* feedback to my peers when practicing laboratory skills.” During the second distribution this item again had the lowest percentage (81.16%, n=13) of agree/strongly agree. The next lowest percent agree/strongly agree was “I am eager *to receive* feedback from my peers when practicing laboratory skills” with 85.29% (n=58/68) agree/strongly agree during the first distribution and 85.51% (n=59/69) agree/strongly agree during the second distribution. All other items were all above 89.55% (n=60/67) agree/strongly agree on the first distribution and above 92.75% (n=64/69) on the second distribution. There were five items during the second distribution that had 100% (n=69/69) agree/strongly agree. These items are, “I am respectful when *I provide* feedback to my peers on their laboratory skills,” “My peers are respectful when my peers *provide me* feedback on my laboratory skills,” “I am non-judgmental when *I provide* feedback to my peers on their laboratory

skills,” “My peers are non-judgmental when my peers *provide me* feedback on my laboratory skills,” and “Assessing and providing feedback to my peers does NOT interfere with our personal relationship.” A full description of all items can be found in Appendix M, Table 21, page 157.

Summary of Perceptions

This data partially supports hypothesis 2.1 that stated students would have increased positive perceptions across time. The hypothesis is partially supported because there were significant improvements from the beginning of the semester for 25 of 38 items and the qualitative data provides further evidence. The data also disproves hypothesis 2.2 that stated student who receive the training would have greater positive perceptions of PAF because there were no differences among the subjects who had the training and those who did not have the training.

Preferences

The second part of research question 2 aimed to examine student preferences and whether they changed over time and after a PAF training program. During both distributions of the SM-PALS subjects were asked to indicate their level of agreement with 11 descriptive statements regarding preferences for PAF. The reliability, measured by Cronbach’s alpha, for this section was 0.92 during the first distribution and 0.90 during the second distribution. There was a significant effect of time for six of the 11 items where the subjects had higher preferences for PAF at the end of the semester (see Table 12). There was a significant effect of group for three items where subjects in the control group had higher preferences for PAF (see Table 13). There were no significant

interaction effects of group and time indicating the PAF training did not affect subject preferences.

Table 12. Summary of Survey Questions Related to Preferences with a Significant Time Effect

Question	Exp Mean Survey 1 (SD)	Cont Mean Survey 1 (SD)	Exp Mean Survey 2 (SD)	Cont Mean Survey 2 (SD)	DF _N	DF _D	F	p- value
I prefer to learn new laboratory skills from my peers rather than from my instructors.	2.06 (0.56)	2.00 (0.59)	2.18 (0.77)	2.31 (0.79)	1	66	4.40	0.04
I prefer to be informally evaluated (i.e., without a grade) by my peers rather than by my instructors.	2.63 (0.71)	2.94 (0.63)	2.91 (0.81)	3.00 (0.54)	1	66	4.12	0.05
The feedback I receive from my peers is as specific as the feedback I receive from my instructors.	2.00 (0.62)	2.19 (0.81)	2.15 (0.76)	2.39 (0.69)	1	66	4.03	0.05
The feedback I receive from my peers is as helpful as the feedback I receive from my instructors.	2.38 (0.75)	2.51 (0.74)	2.58 (0.56)	2.94 (0.68)	1	65	11.97	<0.01
I prefer the feedback I receive from my peers because it is more immediate than what I receive from my instructors.	2.25 (0.67)	2.64 (0.68)	2.52 (0.67)	2.72 (0.62)	1	66	4.22	0.04
I am equally confident in the feedback I receive from peers as the feedback I receive from instructors.	2.25 (0.67)	2.51 (0.70)	2.42 (0.83)	2.81 (0.75)	1	65	7.12	0.01

Table 13. Summary of Survey Questions Related to Preferences with a Significant Group Effect

Question	Exp Mean Survey 1 (SD)	Cont Mean Survey 1 (SD)	Exp Mean Survey 2 (SD)	Cont Mean Survey 2 (SD)	DF _N	DF _D	F	p- value
I prefer to be corrected on my laboratory skills by my peers rather than by my instructors	2.28 (0.77)	2.56 (0.70)	2.33 (0.82)	2.71 (0.71)	1	65	4.62	0.04
I prefer the feedback I receive from my peers because it is more immediate than what I receive from my instructors	2.25 (0.67)	2.64 (0.68)	2.52 (0.67)	2.72 (0.62)	1	66	4.71	0.03
I am equally confident in the feedback I receive from peers as the feedback I receive from instructors	2.25 (0.67)	2.78 (0.87)	2.42 (0.83)	2.81 (0.75)	1	65	4.45	0.04

During the first distribution of the survey over 50% of the subjects agreed or strongly agreed for four items and over 50% answered disagree or strongly disagree for seven items. The items most favored by the subjects “I prefer to be informally evaluated by my peers rather than by my instructors,” which had 73.53% agree/strongly agree (n=50/68), and “I prefer to practice laboratory skills with my peers rather than with instructors,” which had 72.01% agree/strongly agree (n=49/68). Subjects had the highest level of disagree/strongly disagree with “I prefer to learn new laboratory skills from my peers rather than from my instructors,” (85.29%, n=58/68) and “The feedback I receive from my peers is as specific as the feedback I receive from my instructors,” (77.94%, n=53/68).

The subjects' preferences for PAF activities were higher. Over 50% agreed or strongly agreed with six items and over 50% disagreed/strongly disagreed for five items; six of the items had a statistically significant increase. Similar to the first distribution, the items most favored by the subjects "I prefer to be informally evaluated by my peers rather than by my instructors," which had 78.26% agree/strongly agree (n=54/69), and "I prefer to practice laboratory skills with my peers rather than with instructors," which had 71.01% agree/strongly agree (n=49/69). Again, the activity least favored by the subjects was learning new skills from a peer, (72.46% disagree/strongly disagree n=50/69). The two activities that were the next highest for disagree/strongly disagree were "I prefer to learn new laboratory skills from my peers rather than from my instructors," and "I prefer to be *formally* evaluated by my peers rather than by instructors," (68.12%, n=47/69). A full description of all items can be found in Appendix M, Table 23, page 163.

The subjects elaborated further through the short answer section of the survey. Six themes emerged from the short answer questions related to preferences (Table 14). Three themes related to preferring instructor interactions, one theme related to subjects' conflicted views and two themes related to preferring PAF. The first theme that emerged from many of the subjects' responses was that instructors knew the material better than peers. One subject wrote, "I think that feedback from instructors can be more reliable and trusted as far as knowing they are more likely going to not give you misinformation." This is further supported through a comment from another subject, "The first hand knowledge of instructors is viable and more accurate than from peers." The limited knowledge of a peer is a concern and is the second theme. One subject wrote, "I feel that

sometimes my peers know as much as I do. They might have limited knowledge as to what to correct me on.” The following quote is further evidence that knowledge was a major concern, “Overall, I prefer feedback from my instructors more so than from my peers. I like my information from the most knowledgeable source so that I really understand the material. Sometimes, peers might tell you wrong information.” The lack of confidence in peers’ abilities and the belief that the instructor is the best (if not only) source for accurate feedback are barriers to PAF and promote instructor preference.

Table 14. Themes Related to Preferences from Short Answer Questions

Theme	Number of comments
Instructors know material better	16
Peers have limited knowledge	21
Students not confident in their ability to provide feedback	15
Students conflicted about preferences	11
Immediate feedback	6
Less stressful working with a peer	20

The third theme that emerged was that the subjects were not confident in their own ability to provide feedback. For example, one subject wrote, “At times I did not feel confident enough in my own knowledge of a skill to be able to critique someone else. We all learned the skills at the same time and for the most part they were new to us.” Some subjects worried that they might offend a peer, one subject explained, “Sometimes I worry whether I’m giving enough feedback or worried about how to phrase it so as to not offend them.” Confidence in their own abilities to provide feedback is a barrier to PAF.

There was also evidence that some students were conflicted about their preferences and is the fourth theme. For example, a subject reflected, “I learn better when

the instructor teaches me some skill rather than a peer. I do however feel more confident with my peer than with an instructor.” Another subject had similar feelings,

I like to practice with peers because it feels more non-threatening if you make a mistake and they can correct you and you can move on. I feel like I can get better instruction and graded evaluation from the instructor because they have already mastered the skills and can likely be more specific. You also get graded by the same person who taught you so you know exactly what to practice.

Some also felt that peer feedback while learning a skill was beneficial, but instructors are more important at other times. One subject supported this through her comment, “When learning and practicing it is better to have peer feedback but during critical times such as grading and correcting skills. I feel it is important for the instructor to provide feedback,” and another wrote, “Though I enjoy working with my peers, I feel grades should only be given by my instructors.” It appears that students preferred peers for the activities related to practicing and refining skills while preferring instructors for initial learning and grading.

The fifth theme related to the immediacy of the feedback. One subject appreciated, “being able to have more time to work on skills because we were assessing our peers and not having to wait for an instructor, we got a lot more practice time.” One subject wrote,

The feedback was very helpful because normally when one of us did something wrong another group member was able to help them. It also allows more immediate feedback because the instructor couldn't get to each individual for every question and have time to answer them all.

Immediate feedback allows students to make immediate changes to their skill performance and make for more meaningful practice. Many subjects also liked working with peers because it was less stressful than working with an instructor, and is the sixth theme. For example, one subject reflected, “It has helped me learn new skills in a non-threatening environment. It helped me open up to peer-evaluation and group work.” Further evidence was shown through another subjects thoughts, “I was better able to understand the concept and complete it better and more accurately because I wasn’t under pressure.” A more relaxed environment may make for a better learning environment.

This data partially supports hypothesis 2.1 that stated students would have greater preferences for PAF over time. The hypothesis is partially supported because there were significant improvements from the beginning of the semester for six of 11 items. The students preferred instructor assessment and feedback in some instances and preferred PAF in other cases. The qualitative data shows that the students are mainly concerned with their peers’ knowledge, their peers’ ability to provide feedback and their own ability to provide feedback. Other students were conflicted because they saw benefits to PAF, but still trusted the instructor more. Others preferred PAF because the feedback was immediate and more frequent. The data also disproves hypothesis 2.2 which stated student who receive the training would have greater preferences for PAF.

Skill Performance

The third research question related to the effects of PAF training on skill performance as measured by laboratory exam grades. All 69 subjects took three laboratory exams. Descriptions of the laboratory exam grades can be found in Table 15.

The scores of the first laboratory exam were used as a baseline to determine if there were group differences between the control and the experimental group. An independent t test showed that there were no significant differences between the exam scores of the experimental and control groups, $t(67) = -1.5$, $p = 0.14$. There were no differences in second exam grades, $t(67) = 0.93$, $p = 0.36$. There were also no differences in the third exam grades, $t(67) = -0.08$, $p = 0.94$. Thus, the results of this study do not support an immediate change in skill performance due to PAF training and disproves hypothesis 3.

Table 15. Practical Exam Grades

Exam	Group	N	Mean	SD
1	Experimental	33	96.63	0.84
	Control	36	97.93	0.62
2	Experimental	33	96.47	4.74
	Control	36	95.16	6.78
3	Experimental	33	91.79	7.09
	Control	36	91.93	7.19

CHAPTER V

DISCUSSION

Peer assessment and feedback (PAF) are useful techniques that help students learn as well as prepare them to be proficient practitioners.⁴⁻⁶ Athletic training educators and researchers have suggested that peer assisted learning (PAL), which includes PAF, be implemented as a means for students to practice and reinforce clinical skills.^{1,2} Several researchers exploring PAF in higher education have stated that some type of training or guidelines would be beneficial and may enhance the quality of feedback provided, improve students' acceptance of the feedback, as well as increase the accuracy and/or reliability of that feedback.^{2, 4, 6, 8, 38, 41, 43-51} However, there are few studies that trained students how to properly assess their peer's performance and provide feedback. The purpose of this study was to examine the following: 1) if a PAF training program affected the quality and type of feedback students provided to their peers and if feedback improved over time, 2) if students' perceptions of and preferences for PAF changed over time and as a result of a PAF training program, and 3) if PAF training affected skill performance. This chapter will begin by discussing the findings, relate findings to previous research and discuss the implications for future research.

Quality and Type of Feedback

The first research question related to the quality and type of feedback students provided to each other. Quality and type of feedback were measured through an eight

point scale. Quality was described as whether the feedback was descriptive, general, incorrect or missing. Type was categorized as either reaffirming feedback for items performed correctly or corrective feedback for items performed incorrectly.

Quality of Feedback

One indicator of the quality of feedback is the percentage of descriptive feedback provided by students. While both the experimental and control groups provided a relatively high percentage of descriptive feedback at baseline, the students that received the PAF training consistently used a high percentage of descriptive feedback across time; while those without training varied greatly in their use of descriptive feedback. There is no comparative research in medical or allied health education that examined the effects of PAF training on the quality of feedback provided by students. However, research in teacher education examined the effects of peer assessment training with a similar repeated measures experimental design.⁴⁰ The subjects viewed a video of a peer leading a classroom session and assessed their performance using a rating form as well as providing written feedback. The subjects that received training in peer assessment provided more constructive feedback than those in the control group.⁴⁰ The peer assessment training intervention in this study provided subjects with more opportunities to practice providing and receiving feedback than we offered in our program. Therefore, it is plausible that our experimental groups might have had higher percentages of descriptive feedback when compared to the control groups if the PAF training included more opportunities for them to practice and receive feedback on their skills. A more detailed PAF training program is an area of further research.

Not only did the subjects in the experimental groups consistently provide a high percentage of descriptive feedback, all subjects that participated in the PAF training believed it improved the feedback they provided and received. This is similar to the findings in a study that examined a workshop for third year medical students who tutored first year students in a patient-centered interviewing course.⁷² Medical students who attended a three hour peer tutoring workshop reported that it met their personal expectations and the practical exercises that simulated the tutoring sessions were the most useful. In addition, the peer tutors thought the learning objectives were met for giving feedback (74%, n=20) and receiving feedback (64%, n=18). Unfortunately, their study design did not include any measures to determine how effective the peer tutoring workshop was on the actual tutoring process (i.e., were the suggestions implemented).

A limitation of our study that is addressed in the PAF literature is the length of time of the study.^{26, 28, 40, 54} Our study only spanned a 15 week academic semester. A study examining a medical tutor training workshop found that a longer period of time may be needed to ultimately show the effectiveness of that training.⁷⁴ There was significant difference in the improvement of tutoring behaviors/skills one year after the training, but not one month after the training.⁷⁴ Since we analyzed our students' feedback one week and four weeks post-PAF training, we perhaps might see a more significant change in the feedback students provided after a longer period of time; future studies should include a longer length of data collection.

Type of Feedback

Most of the feedback provided by the students in our study was corrective. This is not surprising because one of the purposes of PAF was for the peers to help each other learn the skills and improve future executions. This is opposite of a study conducted with first year medical students who completed written peer and self assessment of patient interviews.¹⁷ Reaffirming feedback was at a much higher ratio than corrective feedback. The authors thought this would promote acceptance of corrective feedback by the students.¹⁷ Similarly, students were found to provide more positive comments when providing feedback to a peer in a study completed with physical therapy students that assessed an oral presentation¹⁶ and medical education students that assessed professionalism.²⁸ The students in the studies mentioned above did not assess and provide feedback for specific and discrete laboratory skills, and could be an explanation for the different findings compared to our results.

Similar to our study, research conducted with sport sociology students also found that the students offered more comments for items that needed improvement with a peers poster.⁶² In the sport sociology study, reaffirming feedback tended to be general and did not provide details for what specifically was done well. The students participated in five one-hour long training sessions and the authors suggested that in future research the training needs to include guidance on how to make positive comments.⁶² However, in our study, providing corrective and reaffirming feedback was emphasized during the PAF training, but the experimental groups were not consistent with the type feedback they provided. Our study examined feedback to a peer performing a laboratory skill and may

lend itself more towards descriptive feedback because there is a specific way the skills were supposed to be performed.

Perceptions

The first part of the second research question examined the effects of a PAF training program and time on student perceptions. Student perceptions were divided into three categories (peer learning, PAF and process) and measured during the second and 13th week of a 15 week semester. There were group differences for eight items. For all eight items the control group had greater perceptions than the experimental group. There were no significant differences in past use of PAF activities or GPA and this should not have been a confounding factor.

The students had increased positive perception from the beginning of the semester to the end of the semester for all five items relating to perceived benefits of peer learning, 11 of the 21 items related to perceived benefits of PAF and nine of the 12 items related to perceptions of the process. The students were receptive to learning from their peers and sought out the opportunities to gain a deeper understanding of the material and different approaches to the laboratory skill. Furthermore, the students had increased confidence in performing their skills and improved their own learning while providing feedback to a peer. They also believed the feedback they received was useful and detailed. There were no negative perceptions of peer learning, PAF or the PAF process. As discussed below, the subjects preferred instructor interactions for some activities. But, the students perceived many benefits associated with PAF activities, which indicates PAF is a viable learning tool.

Many other studies have also shown that students find the process beneficial, but none examined the change in perception over time. Subjects in a study that examined peer assessment of a poster in a sport sociology class were more self reflective, saw variations and put more effort into the project because it was going to be seen by their peers.⁶² First year medical student who assessed their peers as part of a PBL curriculum felt they knew their strengths and weaknesses better after the peer assessments which allowed them to self assess and make immediate improvements.²⁴ The students also thought they would benefit in the future when a medical professional assessing themselves and peers. Conversely, students felt that assessing each other made the environment judgmental, competitive and less threatening. A majority of the subjects cited problems with objectivity and anonymity as the major barriers to assessing their peers. The researchers did not state whether the scores from the peer assessments were used to determine a grade. But the peer assessments were compared to the tutor assessments, which could explain the students distaste for the activity. All the subjects in our study felt that PAF did not interfere with the relationship with their peers, but a barrier was the lack of confidence in their peers' ability to accurately assess.

In this study the PAF training had no effect on student perceptions. There is little research in medical and allied health education that examines the effects of PAF training on student perceptions. The researchers in one study examined peer assessment in a medical curriculum that utilized problem-based learning where students provided descriptive feedback to their peers regarding strengths and weaknesses in intellectual reasoning, analytical ability and interpersonal communication.²⁶ Students were reluctant

to assess and criticize fellow students prior to a workshop on how to give and receive descriptive feedback. However, after completing the peer assessment the students' attitudes became more positive. For example, 72% (n = 55) thought the assessments were important and 67% (n=55) appreciated being assessed by their peers. However, the students did not think the peer assessments would benefit them in the clinical education setting- only 44% (n=55) thought the peer assessment made them change their behavior and working habits during their clerkship and only 31% (n=55) thought the peer assessments would be useful during their clerkship. On the other hand, 56% (n=55) thought the peer assessments would benefit them later in their career. Nevertheless, only 41% (n=55) thought the training session was useful.²⁶ Similarly, our study found that students thought the peer assessments would be beneficial to their professional careers, but we did not ask the students if they found the training beneficial in the survey. Student perception of the training is an area of future research. A strength of our study is that we evaluated student perceptions, but also used video analysis to examine change in the laboratory setting. Interviews that would allow for a more in depth understanding of student perceptions could give greater insights than the videos and member checking alone.

Research performed in teacher education also examined the effects of peer assessment training with a similar repeated measures experimental design.⁴⁰ The students completed a survey before and after a semester long course and there were improved perceptions for 11 of the 13 variables. However, there were no differences between the students who had the peer assessment training and those who did not. The authors

suggested training the students in peer assessment earlier in their academic career because they may still feel the teacher is “the expert and only objective assessor” and starting the training earlier should help students rely on judgments of their peers and themselves.⁴⁰ Perhaps examining the student preferences after a longer period of time and/or using PAF during their freshman and sophomore years would show that the PAF training had a significant effect on student perceptions as the students increase their experiences.

Preferences

The second part of the second research question examined the effects of a PAF training program and time on student preferences. Student preferences were measured through 11 items with a four point Likert-type scale at the beginning of the semester and the end of the semester. There was a group differences for one item where the control group had greater preference than the experimental group. There were no significant differences in past use of PAF activities and this should not have been a confounding factor.

There was a significant improvement in students’ perception of PAF over time for nine of the 11 items. Students in our study preferred to practice laboratory skills with peers and be informally evaluated by their peers. Conversely, the students did not want to learn new skills from their peers or be formally evaluated by peers. The data shows the students preferred peers for the activities related to practicing and refining skills while preferring instructors for initial learning and grading. Subjects had concerns whether a

peer could accurately assess their performance and unsure of their own assessment and feedback skills.

Most studies examining PAF do not look at change over time, but student preferences have been examined in sports medicine and allied health education fields. Preferences for PAL activities were examined in athletic training education. ATS reported in a national survey that they were undecided or disagreed that they were more self-confident practicing skills with peers than their clinical instructor.¹⁰ In a separate study, ATS that attended a review session led by a peer tutor were also varied in their preferences for peer interactions.² Over half of the students felt less anxious performing psychomotor skills with a peer than with an instructor, thought the peer tutoring increased their collaboration and the experience was more collaborative than combative. However, only 44.4% (n=12) of the ATS were more confident practicing skills with their peers,² which is similar to the national survey¹⁰ but different than our study. Similar to our study, the ATS preferred to learn skills from their instructor and were undecided or disagreed that the peer feedback was more helpful as the feedback received from the instructor.² The ATS likewise stated that they preferred instructor feedback because they have more experience with the material and the students had greater confidence in the instructors' feedback. While there is nothing wrong with students preferring instructor assessment and feedback, a strong dislike of PAF can hamper the peer interactions and possibly limit the benefits. Methods to increase students' confidence in peer feedback need to be explored further.

In this study the PAF training had no effect on student preferences. There are two comparative research studies that examined preferences for students that received training. Similar to our results, sport sociology students who participated in PAF training reported benefits to using peer assessment but preferred instructor examination because they felt instructors would be more accurate, less biased and would provide more useful feedback.⁶² Perhaps emphasizing to students that research has shown that students can accurately assess will alter preferences and other methods to increase confidence should be examined. Also, PAF should supplement instructor assessment and feedback, not replace it. Students may increase their preferences for PAF if they see for themselves that their peer can accurately assess and provide quality feedback. Likewise, first-year medical students that provided their peers with feedback on clinical case reports were unsure of the feedback they received.⁶¹ The students suggested it would be helpful if their peer evaluators justified their scores in order to gain confidence in the assessment and feedback provided. Interestingly, almost 70% of the students believed the quality of their work increased because of the insights from the peer feedback while many students believed the entire assessment should be completed by supervising physicians.⁶¹ The authors believed more practice and training would increase the confidence in the feedback from peers.

Skill Performance

The third research question examined the effects of the PAF training program on skill performance as measured by the scores on the second and third practical exam. There were no significant differences in exam grades thus the PAF training did not affect

skill performance. A limiting factor in our study is the high scores on the practical exams and the small range of scores. The mean score for all three exams was above 90% and there was little variability. Students usually perform well on these exams because they test individual skills and the lab sheets they use to practice with are almost identical to the rubrics used to grade them during the practical. We might have seen differences in exam scores if the practical exams were scenario based, more difficult and produced a wider range of scores.

Although a study performed in athletic training did not examine the effects of PAF training on skill performance, it showed that an ATS led a review session of psychomotor skills improved orthopedic assessment skills.² Students who attended a review session led by a peer tutor had improvements from the pre-test to the post-test. There were no differences in the post-test between the students who attended a review session led by peer tutor and students who attended a review session led by an approved clinical instructor. This indicates peer tutors assisted in learning psychomotor skills and did not put the students who worked with the peer tutor at a disadvantage. Although the study did not examine the effectiveness of PAF training on skill performance, the study showed that students are able to learn psychomotor skills through interactions with their peers. Thus, PAF is a useful learning tool for students to learn and practice skills, and the effects of PAF training need further exploration.

There is no comparable research in allied health that examines the effects of PAF training on skill performance. However, research performed in teacher education examined the effects of peer assessment training with a similar repeated measures

experimental design.⁴⁰ At the end of the semester the teacher assessed a collection of assignments completed by the subjects. The subjects that received the training scored higher than the subjects who did not receive any training. The peer assessment training intervention in this study provided subjects with more opportunities to practice providing and receiving feedback than we offered in our program.⁴⁰ Perhaps we would have seen similar results if the PAF training would have had included more opportunities for them to practice and receive feedback on their feedback skills. They may have then had greater confidence in their abilities to provide feedback along with greater confidence in the feedback they received and then use the feedback to improve their laboratory skills and should be a consideration in future PAF trainings.

Limitations

A limitation of this study is the length of time of data collection. The study was conducted in a 15 week semester. The students completed the first survey during the second week and the first set of labs took place during the third week. The training took place during the seventh week followed by the second set of labs during week eight and the third set of labs during week 11. The second survey was completed during week 13. Four weeks may not be enough time to see a change in the feedback provided by the students and skill performance; 11 weeks may not be enough time to see a change in perceptions and preferences. This limitation has also been noted by other researchers.^{26, 28, 40, 54} Research in teacher education has shown that it takes several years for students to fully incorporate what they are taught, even if they believe in the theory or procedure.⁷⁹ Furthermore, in addition to member checks, interviews with the subjects that participated

in the videotaped portion of the study would have allowed for greater dialogue and possibly better insights into the feedback they provided, how the laboratory sessions went and the effectiveness of the PAF training.

Also, the subjects have past and current experiences that could have affected the way they assessed and provided feedback. However, this is unlikely because there were no significant differences between groups for GPA, scores on the first exam and previous PAF experiences. Some students stated that they had experiences assessing each other and providing feedback in classes like anatomy lab and communications. Although the survey found that past experiences did not vary significantly, there is a possibility that past experiences played a role in the results of the study. The students were asked in a short answer question if they practiced with students from the other section. A few said they discussed the skills with people from the other section and only three practiced with a peer(s) from the other section, none were subjects that were videotaped. This likely did not have a significant effect on the outcomes of the study. Finally, the students may have been affected by the Hawthorne effect and the novelty effect. The Hawthorne effect is when the changes are due to the fact that students are participating in a study and not due to the treatment⁵⁵ and the novelty effect where interest, motivation and engagement of the students increased because they were doing something different.⁵⁵

Delimitations

Only undergraduate students enrolled in KIN 391 served as subjects in this study and only one of the two sections received the PAF training. Only 16 students were videotaped. Therefore, the ability to generalize the results of this study to the general

study body is limited. Implications can be made for athletic training and other allied health education programs because the psychomotor skills involved in this study are basic and common to a majority of allied health fields. Also, the subjects participated in PAF of laboratory skills for the purposes of this study. Thus, the ability to generalize our results to other items (such as written work or professionalism) is limited.

Recommendations for Future Research

Additional studies in sports medicine and pre-allied health are needed to further evaluate best practices for PAF and PAF training. This study provided an initial look at PAF training and provided more evidence for student perceptions, preferences and skill performance. Further research on the effectiveness of PAF training is necessary. A longer time for data collection is essential to determine if the students need time to absorb and use the skills taught in the training in order to affect their feedback, perceptions, preferences and skill performance. Also, a more in depth PAF training with more opportunities for the student to practice providing feedback and also receive advice on their performances should be investigated. PAF can be further studied with more complex scenarios instead of only isolated psychomotor skills. Student openness to PAF and their developmental stage can be examined as well in order to determine student readiness for a variety of PAF activities. Research regarding PAF training and cognitive skills, written work, professionalism and collaboration are also necessary.

Furthermore, additional studies that use mixed methods to formulate evidence based educational methods are necessary. This study used multiple methods in order to evaluate PAF and PAF training. Qualitative and quantitative methods allowed for

examination from different angles and combine qualitative methods and statistical analysis to determine best practices. The qualitative data allowed for students' personal experiences to be examined and their voice heard while the quantitative data examined the experiences of the entire class. Furthermore, some allied health educators did not receive training on how to teach during their professional preparation and research on educational methods and theory will explore alternative teaching methods. This may improve the education students receive and lead to better patient care as a professional.

Implications of Results

The results of this study will be valuable to sports medicine and allied health educators when preparing to use PAF in their courses. Some students may innately use the strategies suggested in the PAF training and may be able to provide quality feedback. But, this study shows that not all students are able to effectively provide quality feedback and PAF training can ensure that students either are taught the skills or have the skills reinforced. Students perceived the PAF process as a way to learn and refine skills and PAF allowed students to receive more feedback at a faster rate in situations where faculty cannot provide detailed feedback to all students. PAF may become an important part of the learning process with the increased teaching, research and service demands placed on faculty as well as large class sizes.³⁹ The current study, as well as past research in athletic training, indicates that students naturally use PAF activities and PAF training can enhance the way that some students naturally learn.^{9, 10} Research indicates that feedback is more effective when it is gathered from multiple sources, such as from a peer, an instructor and oneself.⁸⁰ Furthermore, feedback is more effective when it occurs soon

after the action, is considered part of the process and the giver is considered credible and knowledgeable.⁸⁰

The current study and past research show students perceive benefits of PAF but prefer instructor assessment and feedback.^{2, 10} Implementing PAF in the beginning of the curriculum may allow for students to take greater ownership of their learning and be more confident in PAF. PAF should supplement, not replace instructor feedback,¹⁰ to increase the amount of times the students practices skills and receive immediate feedback. Past research has shown that students can accurately assess a peer performing a psychomotor skill¹² and that students are able to learn psychomotor skills through peer interactions.² Thus, PAF is a viable educational tool.

As part of this study the feedback quality scale was developed as a way to measure the quality of the peer feedback. It is a tool previously used⁴² that was further developed based on the needs of the study. The feedback quality scale can be used by other researchers to observe and categorize feedback, whether it is feedback from students, instructors, clinical supervisors, etc. Also, the study used a modified version of a previously used survey to examine frequency of PAF activities, perceived benefits of peer learning, perceived benefits of PAF, perceptions about the PAF process and preferences. The survey could be used by educators to assess student activities and opinions before and/or after utilizing PAF.

Conclusion

Sports medicine and allied health students are required to learn numerous laboratory skills during their pre-professional and professional educational career.

Practicing by one's self is inefficient and practicing with a peer without feedback will not help a student become proficient. PAF is a student centered pedagogical technique that allows students to receive immediate descriptive feedback that is perceived as useful, specific and non-intimidating. Students are also able to improve their communication skills, their ability to receive feedback and their ability to provide feedback while possibly perfecting these skills for their professional careers. Assessing and providing feedback is difficult for some students and PAF training can reinforce or teach the students proper techniques and procedures to enhance the process. This, in turn, may help the students to become competent practitioners and benefit society.

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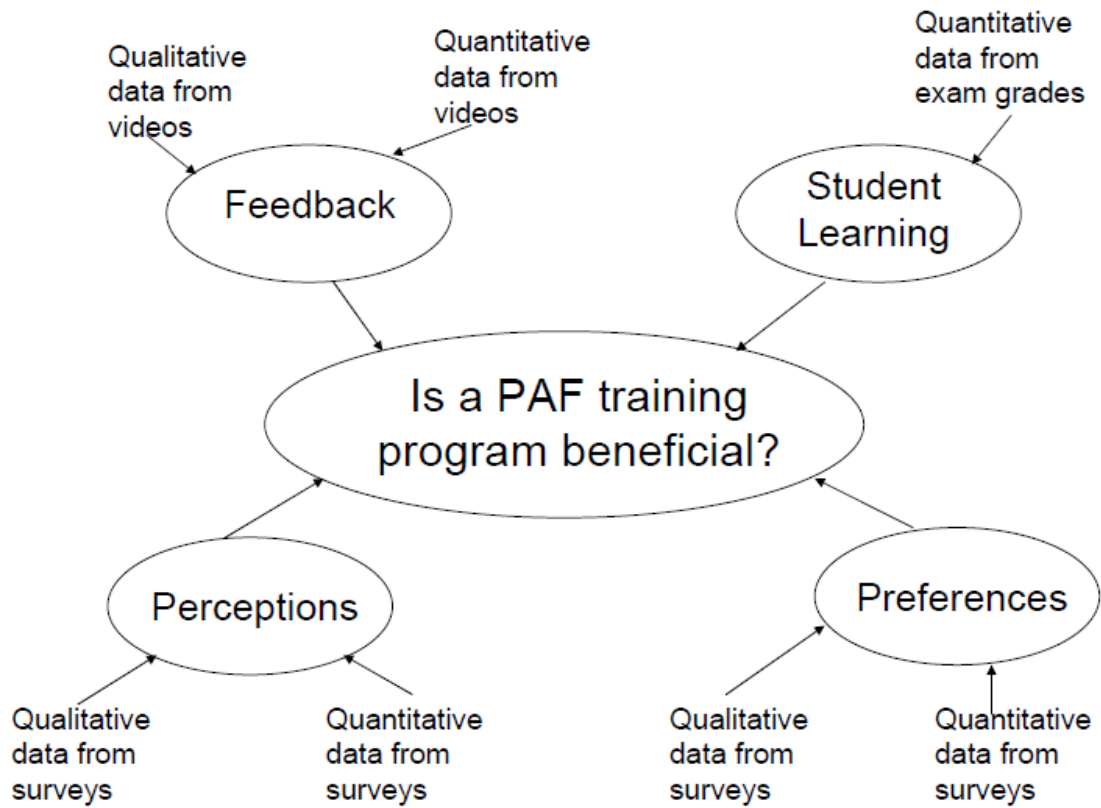
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APPENDIX A
STUDY SCHEMATIC



APPENDIX B.

KIN 390/391 CALENDAR FALL 2009

<u>Month</u>	<u>Day</u>	<u>Topic</u>	<u>Course</u>
August	M 24	Introduction to Class	390 & 391
	W 26	Role of Sports Medicine Team and Career Options	390
	F 28	Sport Injury Prevention	390
	M 31	The Injury Process	390
September	W 2	Writing a Resume: Tony Abruzzi from Career Services	390
	F 4	Written Exam 1	390
	M 7	No Class	
	W 9	Lab: Blood Pressure and Pulse	391
	F 11	Lab: Blood Pressure and Pulse	391
	M 14	Lab Exam 1: 1/3 of class	391
	W 16	Lab Exam 1: 1/3 of class	391
	F 18	Lab Exam 1: 1/3 of class	391
	M 21	Epidemiology	390
	W 23	Research	390
	F 25	Taking a History	390
	M 28	Signs and Symptoms and Patient Assessment	390
	W 30	Pre-Participation Examinations	390
October	F 2	Emergency Action Plans	390
	M 5	Peer Assessment Training (experimental group) <i>Supersize Me</i> (control group)	391
	W 7	Peer Assessment Training (experimental group) <i>Supersize Me</i> (control group)	391

	F 9	Blood Borne Pathogens and Universal Precautions	390
	M 12	No Class: Fall Break	
	W 14	Lab: Wound Care and ICE	391
	F 16	Lab: Wound Care and ICE	391
	M 19	Lab Exam 2: 1/3 of class	391
	W 21	Lab Exam 2: 1/3 of class	391
	F 23	Lab Exam 2: 1/3 of class	391
	M 26	Legal and Ethical Issues	390
	W 28	Written Exam 2	390
	F 30	Diabetes	390
November	M 2	Seizures and Stroke	390
	W 4	Lab: Crutch Fitting and Splinting	391
	F 6	Lab: Crutch Fitting and Splinting	391
	M 9	Lab Exam 3: 1/3 of class	391
	W 11	Lab Exam 3: 1/3 of class	391
	F 13	Lab Exam 3: 1/3 of class	391
	M 16	Snakes, spiders and other yucky stuff	390
	W 18	Shock	39
	F 20	Heat Illnesses	390
	M 23	Cold Illnesses	390
	W 25	No Class: Thanksgiving Break	
	F 27	No Class: Thanksgiving Break	
	M 30	Guest Lecturer	390
December	W2	Other Medical Conditions	390
	F 4	Special Considerations	390
	M 7	Written Exam 3	390

APPENDIX C

PEER FEEDBACK DATA FORM TO RECORD AND ANALYZE PEER FEEDBACK

Video Analysis of Feedback

Date:

Group Members:

- Scale:
- 0 Did not recognize the item was performed incorrectly
 - 1 Recognized skill was performed incorrectly but gave incorrect feedback
 - 2 Recognized skill was performed incorrectly and gave feedback that was not corrective
 - 3 Recognized skill was performed incorrectly and gave detailed corrective feedback
 - 4 Provided general positive feedback on an item performed correctly, feedback was not descriptive
 - 5 Provided descriptive and detailed feedback on an item performed correctly
 - 6 Self assessment
 - 7 Provided corrective feedback on an item performed correctly (incorrect assessment)

Name	Feedback Provided	+/- (type)	Score	Comment

APPENDIX D

SPORTS MEDICINE PEER ASSESSMENT/FEEDBACK SURVEY

Section I. Demographics

INSTRUCTIONS: Please circle or fill in your response to the following demographic questions.

Personal Demographics

1. What is your sex?
 - a. Male
 - b. Female

2. In which academic year are you currently enrolled?
 - a. I am currently in my first academic year of college
 - b. I am currently in my second academic year of college
 - c. I am currently in my third academic year of college
 - d. I am currently in my fourth academic year of college
 - e. I am currently in my fifth academic year of college

3. What is your age? _____

4. What is your academic major and minor?
 - a. Kinesiology- sports medicine concentration
 - b. Kinesiology- fitness leadership concentration
 - c. Kinesiology- physical education teacher education concentration
 - d. Kinesiology- community youth sport development concentration
 - e. Other: _____

5. What clinical experiences have you had related to the sports medicine/allied health field?

Section II: Frequency of Peer Assessment with Feedback (PAF) Activities

INSTRUCTIONS: This section is designed to measure how **frequently you participate in PAF activities** in the **past**. Peer assessment is when you evaluate a fellow student's laboratory skills or work. It can also include feedback to help them learn the skill or understand the material. In the table below please circle the one response for each statement that best represent the frequency for engaging in the described activities in previous classes. Use the following scale to define your selections:

1=Never, 2= Rarely, 3= Often, 4 =Almost Always

I have practiced laboratory skills taught in class with my peers	1	2	3	4
My peers have helped me correct my laboratory skills when I am having difficulty.	1	2	3	4
I have helped my peers correct their laboratory skills when they are having difficulty.	1	2	3	4
I have asked my peers for constructive feedback on my laboratory skills.	1	2	3	4
My peers have asked me for constructive feedback on their laboratory skills.	1	2	3	4
I have <i>formally</i> evaluated (i.e., provide written comments or a grade) my peers' laboratory skills.	1	2	3	4
My peers have <i>formally</i> evaluated (i.e., provide written comments or a grade) my laboratory skills.	1	2	3	4
I have <i>informally</i> evaluated (i.e., without written comments or a grade) my peers' laboratory skills.	1	2	3	4
My peers have <i>informally</i> evaluated (i.e., without written comments or a grade) my laboratory skills.	1	2	3	4
I have demonstrated how to appropriately perform laboratory skills for my peers.	1	2	3	4
My peers have demonstrated how to appropriately perform laboratory skills.	1	2	3	4

Open Ended Questions:

Please describe your past experiences assessing or providing feedback to your peers.

Have you had any training on how to assess or provide constructive feedback?

Section III: Perceptions of Peer Assessment with Feedback (PAF)

This section is designed to assess your general opinion on the **benefits and process** of PAF. Please respond to the statements below using the following scale:

1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree

Perceived Benefits of Peer Learning				
I am receptive to learning from my peers.	1	2	3	4
I seek out learning opportunities with my peers.	1	2	3	4
I view my peers as valuable resources for learning.	1	2	3	4
I gain a deeper understanding of clinical application from my peers.	1	2	3	4
I gain multiple perspectives on approaches to clinical problem solving from my peers.	1	2	3	4
Perceived Benefits of Peer Assessment with Feedback				
I am able to accurately assess a peer's laboratory skills	1	2	3	4
My peers are able to accurately assess my laboratory skills	1	2	3	4
I am receptive to receiving feedback on my laboratory skills from my peers.	1	2	3	4
I provide my peers with useful feedback on their laboratory skills.	1	2	3	4
I gain a deeper understanding of clinical concepts when my peers <i>provide me</i> with feedback on my laboratory skills.	1	2	3	4
I gain a deeper understanding of clinical concepts when <i>I provide</i> my peers with feedback on their laboratory skills.	1	2	3	4
<i>Receiving</i> feedback from my peers on my laboratory skills increases my confidence in my laboratory skills.	1	2	3	4
<i>Providing</i> my peers with feedback on their laboratory skills increases my confidence in my laboratory skills.	1	2	3	4
I provide specific details with suggestions for improvement when <i>I provide</i> feedback to my peers on their laboratory skills	1	2	3	4
My peers provide specific details with suggestions for improvement when they <i>provide me</i> with feedback on my laboratory skills	1	2	3	4
I am more self-reflective of my own laboratory skills when I receive feedback from my peers.	1	2	3	4

My communication skills have improved by providing feedback to my peers	1	2	3	4
Providing feedback to my peers on their laboratory skills improves my ability to <i>give</i> constructive criticism to others.	1	2	3	4
Providing feedback to my peers on their laboratory skills improves my ability to <i>receive</i> constructive criticism from others.	1	2	3	4
I feel less intimidated when my laboratory skills are evaluated by my peers than by my instructor.	1	2	3	4
I am more empathetic than instructors when laboratory skills are not performed correctly by my peers.	1	2	3	4
Seeing how others perform laboratory skills increases my learning	1	2	3	4
Seeing how others perform laboratory skills allows me to see skill variations	1	2	3	4
Providing feedback to my peers will help prepare me to provide feedback to patients when I am a professional	1	2	3	4
Discussion increases when my peers and I assess and provide feedback to each other	1	2	3	4
My motivation increases when my peers and I assess and provide feedback to each other	1	2	3	4
Perceptions of the Process				
<i>Receiving</i> feedback from my peers on my laboratory skills is non-threatening	1	2	3	4
<i>Providing</i> feedback to my peers on their laboratory skills is non-threatening	1	2	3	4
I am respectful when <i>I provide</i> feedback to my peers on their laboratory skills	1	2	3	4
My peers are respectful when they <i>provide me</i> with feedback on my laboratory skills	1	2	3	4
I am non-judgmental when <i>I provide</i> feedback to my peers on their laboratory skills	1	2	3	4
My peers are non-judgmental when my peers <i>provide me</i> with feedback on my laboratory skills	1	2	3	4
I focus on the skill and not personality when <i>I provide</i> feedback to my peers on their laboratory skills	1	2	3	4
My peers focus on the skill and not personality when my peers <i>provide me</i> with feedback on my laboratory skills	1	2	3	4
I am comfortable providing feedback to my peers on their laboratory skills	1	2	3	4
I am eager <i>to provide</i> feedback to my peers when practicing laboratory skills	1	2	3	4

I am eager <i>to receive</i> feedback from my peers when practicing laboratory skills	1	2	3	4
Assessing and providing feedback to my peers does NOT interfere with our personal relationship	1	2	3	4

Comments:
Please provide any additional comments regarding your perceptions of peer assessment with feedback.

Section IV: Student Preferences for Peer Assessment with Feedback (PAF)

This section of the survey is designed to measure **your preferences** for peer assessment compared to learning interactions with your instructor. Please respond to the following statements using your **own experiences** as a basis of comparison rather than just offering a general opinion. Please circle your response to the statements below using the following scale:

1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree

I prefer to practice laboratory skills with my peers rather than with instructors.	1	2	3	4
I prefer to be corrected on my laboratory skills by my peers rather than by my instructors.	1	2	3	4
I prefer to receive constructive feedback on laboratory skills from my peers rather than from instructors.	1	2	3	4
I prefer to learn new laboratory skills from my peers rather than from my instructors.	1	2	3	4
I prefer to be <i>formally</i> evaluated (i.e., with a grade) by my peers rather than by instructors.	1	2	3	4
I prefer to be <i>informally</i> evaluated (i.e., without a grade) by my peers rather than by my instructors.	1	2	3	4
The feedback I receive from my peers is as specific as the feedback I receive from my instructors.	1	2	3	4
The feedback I receive from my peers is as helpful as the feedback I receive from my instructors.	1	2	3	4
I prefer the feedback I receive from my peers because it is more immediate than what I receive from my instructors.	1	2	3	4

I am equally confident in the feedback I receive from peers as the feedback I receive from instructors.	1	2	3	4
I am more confident when interacting with my peers than when interacting with my instructors.	1	2	3	4

Comments: Please provide any additional comments regarding your preferences for peer assessment with feedback

Section V: Summary of Peer Assessment and Feedback

This section of the survey is designed for you to reflect on your peer assessment with feedback experience over the past semester.

How has assessing your peers' laboratory skills and providing feedback helped you during the semester?

What have you enjoyed when assessing your peers' laboratory skills or providing feedback this semester?

What did you dislike about assessing your peers laboratory skills and providing feedback this semester?

Did you practice your laboratory skills outside of class with classmates or students from the other 391 section (please specify which section and details)?

Do you believe the peer assessment and feedback will help you in future semesters and/or as a professional to give feedback to patients or assess a fellow professional?

Do you have any suggestions for improvement to peer assessment and feedback?

For those who received the peer assessment and feedback (PAF) training:

What were the positive of the PAF training? Please give as much detail as possible.

What were the negatives of the PAF training? Please give as much detail as possible.

How has the PAF training program assisted you in assessing your peers' laboratory skills?

Do you have suggestions for improving the PAF training?

APPENDIX E

ITEMS ADDED TO ORIGINAL SURVEY

The following items were added:

- I. Perceived Benefits of Peer Assessment/Feedback
 - a. I provide specific details with suggestions for improvement when ***I provide*** feedback to my peers on their laboratory skills
 - b. My peers provide specific details with suggestions for improvement when they ***provide me*** with feedback on my laboratory skills
 - c. My communication skills have improved by providing feedback to my peers
 - d. Seeing how others perform laboratory skills increases my learning
 - e. Seeing how others perform laboratory skills allows me to see skill variations
 - f. Providing feedback to my peers will help prepare me to provide feedback to patients when I am a professional
 - g. Discussion increases when my peers and I assess and provide feedback to each other
 - h. My motivation increases when my peers and I assess and provide feedback to each other
- II. Perceptions of the Process
 - a. ***Receiving*** feedback from my peers on my laboratory skills is non-threatening
 - b. ***Providing*** feedback to my peers on their laboratory skills is non-threatening
 - c. I am respectful when ***I provide*** feedback to my peers on their laboratory skills
 - d. My peers are respectful when they ***provide me*** with feedback on my laboratory skills
 - e. I am non-judgmental when ***I provide*** feedback to my peers on their laboratory skills
 - f. My peers are non-judgmental when my peers ***provide me*** with feedback on my laboratory skills
 - g. I focus on the skill and not personality when ***I provide*** feedback to my peers on their laboratory skills
 - h. My peers focus on the skill and not personality when my peers ***provide me*** with feedback on my laboratory skills
 - i. I am comfortable providing feedback to my peers on their laboratory skills
 - j. I am eager ***to provide*** feedback to my peers when practicing laboratory
 - k. I am eager ***to receive*** feedback from my peers when practicing laboratory skills
 - l. Assessing and providing feedback to my peers does NOT interfere with our personal relationship.

APPENDIX F.

CODE BOOK FOR FIELD NOTES AND SHORT ANSWER QUESTIONS

<u>Color</u>	<u>Positive Theme (highlighted)</u>
--------------	-------------------------------------

Yellow	Learn skills
Light blue	Prepare for practicals
Dark green	Self-assessment
Teal	See skill variation
Light green	Improved communication
Dark blue	Improved ability to provide feedback
Red	Improved ability to receive feedback
Pink	Increased confidence
Green	Collaborative environment
Purple	Prepare for future/profession
Grey	Immediate feedback
Dark red	Informal/less stressful

<u>Color</u>	<u>Negative Theme (font color change)</u>
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Blue	Peers not knowledgeable
Purple	Instructor know more
Green	Not confident in own ability to provide feedback
Red	Conflicted about preferences

<u>Symbol</u>	<u>Observation</u>
---------------	--------------------

☺	Positive observation of classroom behavior
☹	Negative observation of classroom behavior
??	Unsure of what classroom behavior means
ME	Observation of my behavior

APPENDIX G

PEER ASSESSMENT/FEEDBACK TRAINING AGENDA

Day 1

- 8:00 Introduction and review items
- 8:10 Introduction to peer assessment
 - Background
 - Purpose
 - Examples
- 8:25 Introduction and characteristics of feedback

Day 2

- 8:00 Introduction and brief review of yesterday
- 8:10 Videotaped scenarios of proper feedback
- 8:25 Role playing in small groups
- 8:35 Debriefing and discussion

APPENDIX H

PEER ASSESSMENT/TRAINING TRAINING POWER POINT

**Peer Assessment
and
Feedback Training
Day 1**

ESS 391
Athletic Training Clinical Education I
Fall 2009


What are peer assessment and feedback (PAF)?

- Part of the peer assisted learning
- Assessing a classmate performing a laboratory skill or understanding of material
- Providing feedback on a classmate's performance of a laboratory skill or understanding of material

How are we going to use it in this class?

- Laboratory skill
- In class
- Assess each other in small groups
- Provide feedback to improve skill performance
- Benefits: increased practice, increased feedback, decreased anxiety, encourages collaboration, prepare you to be a future professional

Time to reflect...




Reflect on a positive peer interaction

- First, write a description of the situation including as much detail as you can remember.
- Picture and describe the situation.
- Characterize the subject matter or the topic you were teaching.
- Describe the role of your peer. What strategies did you use?
- Think about this teaching moment and how it made you feel.
- What did you do that worked well?
- What didn't work well?
- How did your peer respond to you?

What do you look for in feedback?

- What did help you during the first lab sessions?
- What would have helped you during the first lab sessions?



Assessing and Providing Feedback


- Focus on skill performance
- Use rubric as a guide
- Non-verbal feedback
 - Demonstrate or model correct response
 - Lead peer to imitate correct response
- Verbal cues
- Re-evaluate peer unaided to ensure retention of correction

Assessing and Providing Feedback

- Provide feedback on things performed correctly and incorrectly
- Be specific, but not overwhelming
- Don't be afraid to admit you don't know!
- Ask if classmate has any questions
- Apply to real world situations

Receiving Feedback

- Feedback is meant to help you learn the material
- Talk out loud when practicing laboratory skills
- Ask for clarification if needed



Any Questions?



Peer Assessment and Feedback Training Day 2

ESS 391
Athletic Training Clinical Education I
Fall 2009

Review of Last Class

- What is peer assessment and peer feedback?
- What are characteristics of proper feedback?
- Any questions?

Videotape Scenario #1



Videotape Scenario #1

- What went well?
- What needs improvement?

Videotape Scenario #2



Videotape Scenario #2

- What went well?
- What needs improvement?

Role Playing Exercise

- Get in your small groups
- Practice taking pulse or BP as the assessed
- Assess a peer taking a pulse or BP
 - Make some errors so there are items to provide corrective feedback
- What went well?
- What needs improvement
- Were you unsure of anything?

Any Questions?



APPENDIX I

PEER ASSESSMENT/FEEDBACK TRAINING STUDENT HANDOUT

Peer Assessment

What is it?

- Assessing a classmate's understanding of material or how a classmate performs a laboratory skill

How are we going to use it in this class?

- Assess each other in small groups
- Laboratory skills
- In class
- Benefits: increased practice, increased feedback, possibly decrease anxiety, prepare you to be a future professional

Assessing a peer and providing feedback:

Receiving Feedback:

Videotape Scenario #1

- What went well?
- What needs improvement?

Videotape Scenario #2

- What went well?
- What needs improvement?

Role-Playing Exercise as Assessor

- What went well?
- What needs improvement?
- Were you unsure of anything?

Role-Playing Exercise as the Assessed

- What went well?
- What needs improvement?
- Were you unsure of anything?

APPENDIX J

PEER ASSESSMENT/FEEDBACK TRAINING SCENARIOS

This will be done after the first practical exam. The first practical exam covers BP and pulse. Thus, the scenarios for the PAT will use BP and pulse so that the students can focus on the training material and not new class material.

E = evaluator

A= person being assessed

Videotaped Scenario #1

- Pulse
- E asks A to name the pulse in the neck, wrist and foot
- A correctly states the carotid pulse and finds it with no problems
 - A: “Your pulse is 16 for 15 seconds... which give you a pulse of 64. That is a good resting pulse rate.”
 - E: “Great job of not pressing to hard- and good math! When would you check the carotid pulse?”
 - A: “I would definitely use the carotid pulse when checking the ABC’s of an unconscious person. Maybe also if somebody had a cut on his/her wrist or an amputee.”
 - E: “Good examples, I never thought about the amputee situation before.”
- A correctly states radial pulse, but palpates it on the ulnar side
 - E: “The hand placement is a bit off. Where the radius is in the forearm?” Stated in a professional manner
 - A corrects hand placement: “Oh yes, thanks for a good method to remember what side the radial pulse is on.”
 - A correctly measures radial pulse “Same as carotid, 16 for 15 seconds which give you a pulse of 64.
- A calls the dorsal pedal pulse as the “plantar pulse” but palpates it correctly
 - E: “I don’t think that is the correct name, but good palpation skills”
 - A: “Ugh, this one is never used so I never remember it.”
 - E: “Well, think back to anatomy terms. Where is the plantar surface?”
 - A: “That’s right; the plantar surface is the bottom of the foot.”
 - E: “Good, now what is the top of the foot called?”
 - A: “Umm, the dorsum- oh yeah. It is the dorsal pedal pulse.”

- E: “Great. It always helps me to think of anatomical terms. Can you think of any examples of why you would check the dorsal pedal pulse?”
- A: “Not really. The other pulses are easier to feel and easier to get to.”
- E: “True, but what if you want to determine if a fracture is impeding blood flow?”
- A: “That is a good example. I think it can also be used to for different vascular diseases.”
- E: “True, I remember hearing about that in exercise physiology.
- A correctly measures dorsal pedal pulse. “This one is more difficult to feel. This time I measured 15 for 15 seconds which give you a pulse of 60”
- E: “Great work, do you have any questions?”
- A: “Nope, now it is your turn to practice your pulses.”

Videotaped Scenario #2

- Blood pressure
- E asks A to find blood pressure with a bored look
- A asks E to sit on the stool and grabs the cuff. Looks at it confused and put the cuff too high
- E looks at the cuff and says it is lined up correctly.
- A: “Is it at the right level on the arm?”
- E: “Umm, I guess it is a little high”
- A: “Yeah, I guess.” And looks unconfident.
- E: “So, let get going.”
- A: “Ok... ummm” looks at the stethoscope with slight confusion and places ear pieces towards outer ear
- E is looking away and doesn’t notice the mistake
- A places bell correctly “I am inflating the BP cuff to 200 mm Hg
- E: “Go faster, my arm is falling asleep.” In a slightly irritated tone.
- A gets a little flustered and apologizes
- E groans
- A releases the BP cuff at a proper rate “The first sound was a 125 and the noises stopped around 80”
- E: “That is way too high for me; you must have heard it wrong.”
- A: “That is what I heard. Maybe you ate too much salt this morning. I am just learning how to do this.”
- E: “Possibly. Alright, my turn.”

APPENDIX K

LABORATORY RUBRICS

ESS 391 BP and Pulse Assessment

Student _____ **Date** _____ **Evaluator** _____

BLOOD PRESSURE:

Athlete Placement: ___ Seated, at rest ___ Elbow slightly flexed ___ Arm on flat surface

Cuff Placement: ___ Selected correct cuff size ___ Wrapped cuff firmly around upper arm at heart level ___ Aligned cuff with brachial artery

Stethoscope Placement: ___ Ear pieces in towards inner ear ___ Bell over brachial artery

Measurement ___ Inflated quickly to 200 mm Hg (or 20 mm Hg above estimated systolic BP) ___ Slowly released pressure at rate of 2-3 mm Hg per second ___ Noted first Korotkoff sound ___ Noted when sound becomes muffled or absent ___ Released all pressure in cuff ___ Reported BP within 10 mm Hg of tester (listening concurrently)

COMMENTS:

PULSE:

Named ___ carotid ___ radial ___ dorsal pedal pulse sites

Located ___ carotid ___ radial ___ dorsal pedal pulse sites

Measured (using two fingers) ___ carotid ___ radial ___ dorsal pedal pulse

COMMENTS:

Student _____ Date _____ Evaluator _____

WOUND CARE:

- Put on gloves before touching wound area
- Controlled bleeding by direct pressure elevation pressure point
- Used gauze pad or other non-lint cloth to cover wound
- Cleaned wound by wiping away from exposed area, not toward it.
- Applied appropriate dressing over wound
- Applied appropriate protective cover over wound
- Disposed of blood-stained materials in biohazardous waste container
- Put blood-stained towels & clothes in biohazardous waste container for laundry
- Cleaned area (counter, floor) of blood
- Removed gloves without contaminating self
- Removed gloves only after all care and cleaning is finished
- Disposed of gloves in biohazardous waste container

COMMENTS:

SKIN CLOSURE:

- Applied strips in manner to close wound completely
- Applied strips in parallel fashion (not criss-crossed)
- Applied appropriate covering over strips
- Wore gloves during the entire procedure
- Took gloves off without contaminating self
- Disposed of all blood-stained materials in biohazardous waste container

COMMENTS:

ICE:

Ice:

- Properly ties bag so air is not trapped
- Applies and secures ice bag to ankle knee shoulder wrist
- Uses ice water for finger

Compression Wrap of Ankle:

- Started at toes Overlapped Adequate tension Constant (even) tension
- Applied to encourage lymphatic drainage & venous return
- Instructed athlete to take off the wrap and re-wrap looser if foot, ankle or leg starts to throb
- Instructed athlete on what to do if wrap becomes painful while sleeping

Elevation:

- Instructed athlete to keep body part elevated as much as possible
- Described or demonstrated correct elevation
- Quizzed athlete to determine if instructions were understood (asked athlete to repeat instructions)

COMMENTS:

Student _____ Date _____ Evaluator _____

CRUTCH FITTING AND INSTRUCTION:

- Fitting:** ___ Instructed athlete to stand erect with feet shoulder width apart.
 ___ Placed the crutch tips 6” from the outer margin of the shoe
 ___ Placed the crutches 2” in front of the shoe.
 ___ Adjusted the length of the crutches so there is 2-3 finger widths space between the top of the crutches and the axilla.
 ___ Adjusted the handgrip even with the athlete’s hand when the elbow is flexed 25-30 degrees.

Gait Instruction: ___ Instructed the athlete to sustain as normal a gait motion as possible to maintain relative flexibility and allow for proprioceptive contact.

Controlled or Partial Weight Bearing (PWB): Instructed athlete to:

- ___ Place both crutches and the injured limb forward simultaneously.
 ___ Swing bodyweight forward and push off the uninjured foot.
 ___ Move the uninjured foot through and step ahead of the crutches.
 ___ Attempt a normal heel-strike to toe-off movement with the injured foot, with as much dorsiflexion as comfortable.
 ___ To balance body weight between the hands (not shoulders) and the injured leg.

Non-Weight-Bearing (NWB): Instructed athlete to:

- ___ Move the crutches forward together to a position 12”-15” in front and 6” outside the lateral margin of the shoe.
 ___ Bear the bodyweight with the hands, not the shoulders.
 ___ Swing the body through between the crutches.
 ___ Land in front of the crutches on the heel of the uninjured leg.
 ___ If the injured leg is not immobilized, dorsiflex the ankle as the leg is brought forward.
 ___ Avoid weight-bearing on the axillary region with crutches

Ascending Stairs: Instructed athlete to:

- ___ Lift the uninjured leg up the step first, follow with crutches and injured leg.

Descending Stairs: Instructed athlete to:

- ___ Lower the crutches and the injured leg down first, follow with uninjured leg.

COMMENTS:

SPLINTING:

- ___ Assessed vascular (cap refill) function before starting
- ___ Assessed vascular (temperature) function before starting
- ___ Assessed vascular (pulse) function before starting
- ___ Assessed sensation before starting
- ___ Proper choice of splinting materials
- ___ Splint in position found
- ___ Joint/bone below properly immobilized
- ___ Joint/bone above properly immobilized
- ___ Assessed vascular (cap refill) function after applying splint
- ___ Assessed vascular (temperature) function after applying splint
- ___ Assessed vascular (pulse) function after applying splint
- ___ Assessed sensation after applying splint

COMMENTS:

APPENDIX L

TIMELINE FOR PROCEDURES

Week	1	2	3	4	5	6	7	8
Control		Informed Consent SM-PAFS Sections I-IV	2 Days Lab Practice with PAF: Blood Pressure and Pulse	Practical Exam: Blood Pressure and Pulse				2 Days Lab Practice with PAF: Wound Care and ICE
Experimental		Informed Consent SM-PAFS Sections I-IV	2 Days Lab Practice with PAF: Blood Pressure and Pulse	Practical Exam: Blood Pressure and Pulse			PAF Training	2 Days Lab Practice with PAF: Wound Care and ICE

Week	9	10	11	12	13	14	15
Control	Practical Exam: Wound Care and ICE		2 Days Lab Practice with PAF: Crutch Fitting and Splinting	Practical Exam: Crutch Fitting and Splinting	SM-PAFS Sections III-V		
Experimental	Practical Exam: Wound Care and ICE		2 Days Lab Practice with PAF: Crutch Fitting and Splinting	Practical Exam: Crutch Fitting and Splinting	SM-PAFS Sections III-V		

APPENDIX M

SPORTS MEDICINE PEER ASSESSMENT/FEEDBACK SURVEY TABLES

Table 16. Descriptive Statistics for Survey Questions Related to Past PAF Experiences and t-test Indicating No Group Differences

Question	n	Mean	SD	Never	Rarely	Often	Almost Always	t	Sig
I have practiced with my peers laboratory skills taught in class	69	2.65	0.78	4 (5.8)	25 (36.2)	31 (44.9)	9 (13.0)	0.01	0.94
My peers have helped me correct my laboratory skills when I am having difficulty.	69	2.72	0.75	3 (4.3)	22 (31.9)	35 (50.7)	9 (13.0)	0.40	0.53
I have helped my peers correct their laboratory skills when they are having difficulty.	69	2.8	0.72	3 (4.3)	17 (24.6)	40 (58.0)	9 (13.0)	0.61	0.44
I have asked my peers for constructive feedback on my laboratory skills.	69	2.49	0.76	6 (8.7)	28 (40.6)	30 (43.5)	5 (7.2)	0.03	0.87
My peers have asked me for constructive feedback on their laboratory skills.	69	2.55	0.78	6 (8.7)	25 (36.2)	32 (46.4)	6 (8.7)	0.10	0.76
I have <i>formally</i> evaluated (i.e., provide written comments or a grade) my peers' laboratory skills.	69	1.62	0.79	37 (53.6)	23 (33.3)	7 (10.1)	2 (2.9)	0.81	0.37
My peers have <i>formally</i> evaluated (i.e., provide written comments or a grade) my laboratory skills.	69	1.62	0.79	37 (53.6)	23 (33.3)	7 (10.1)	2 (2.9)	0.81	0.37
I have <i>informally</i> evaluated (i.e., without written comments or a grade) my peers' laboratory skills.	69	2.16	0.80	14 (20.3)	33 (47.8)	19 (27.5)	3 (4.3)	<0.01	0.96
My peers have <i>informally</i> evaluated (i.e., without written comments or a grade) my laboratory skills.	69	2.14	0.75	13 (18.8)	35 (50.7)	19 (27.5)	2 (2.9)	0.06	0.81
I have demonstrated how to appropriately perform laboratory skills for my peers.	69	2.46	0.72	6 (8.7)	28 (40.6)	32 (46.4)	3 (4.3)	0.32	0.57
My peers have demonstrated how to appropriately perform laboratory skills.	69	2.46	0.74	7 (10.1)	26 (37.7)	33 (47.8)	3 (4.3)	0.03	0.86

Table 17. Descriptive Statistics for Survey Questions Related to Perceived Benefits of Peer Learning

Question	Occasion	Group	N	Mean	SD	Strongly Disagree	Disagree	Agree	Strongly Agree
I am receptive to learning from my peers.	1	Exp	33	3.18	0.39	0 (0)	0 (0)	27 (81.8)	6 (18.2)
		Cont	36	3.33	0.54	0 (0)	1 (2.8)	22 (61.1)	13 (35.1)
	2	Exp	33	3.42	0.50	0 (0)	0 (0)	19 (57.6)	14 (42.4)
		Cont	36	3.58	0.50	0 (0)	0 (0)	15 (41.7)	21 (58.3)
I seek out learning opportunities with my peers.	1	Exp	33	3.00	0.66	1 (3.0)	4 (12.1)	22 (66.7)	6 (18.2)
		Cont	36	3.19	0.53	0 (0)	2 (5.6)	25 (69.4)	9 (25.0)
	2	Exp	33	3.21	0.74	1 (3.0)	3 (9.1)	17 (51.5)	12 (36.4)
		Cont	36	3.39	0.60	0 (0)	2 (5.6)	18 (50.0)	16 (44.4)
I view my peers as valuable resources for learning.	1	Exp	33	3.18	0.58	0 (0)	3 (9.1)	21 (63.6)	9 (27.3)
		Cont	36	3.25	0.50	0 (0)	1 (2.8)	25 (69.4)	10 (27.8)
	2	Exp	33	3.36	0.60	0 (0)	2 (6.1)	17 (51.5)	14 (42.4)
		Cont	36	3.58	0.55	0 (0)	1 (2.8)	13 (36.1)	22 (61.1)
I gain a deeper understanding of clinical application from my peers.	1	Exp	33	2.97	0.68	0 (0)	8 (24.2)	18 (54.5)	7 (21.2)
		Cont	35	3.06	0.64	0 (0)	6 (17.1)	21 (60.0)	8 (22.9)
	2	Exp	33	3.33	0.65	0 (0)	3 (9.1)	16 (48.5)	14 (42.4)
		Cont	36	3.58	0.50	0 (0)	0 (0)	15 (41.7)	21 (58.3)
I gain multiple perspectives on approaches to clinical problem solving from my peers.	1	Exp	33	3.18	0.68	0 (0)	5 (15.2)	17 (51.5)	11 (33.3)
		Cont	35	3.37	0.55	0 (0)	1 (2.9)	20 (57.1)	14 (40.0)

	2	Exp	33	3.45	0.62	0 (0)	2 (6.1)	14 (42.4)	17 (51.5)
		Cont	36	3.67	0.48	0 (0)	0 (0)	12 (33.3)	24 (66.7)

Table 18. 2X2 ANOVA Summary of Survey Questions Related to Perceived Benefits of Peer Learning

Question	Source	Sum of Squares	DF	Mean Square	F	Sig
I am receptive to learning from my peers.	Time	2.09	1	2.09	10.43	<0.01
	Time x Group	0	1	0	<0.01	0.96
	Error (within)	13.41	67	0.20		
	Group	0.83	1	0.83	3.04	0.09
I seek out learning opportunities with my peers.	Error (between)	18.31	67	0.27		
	Time	1.42	1	1.42	4.87	0.03
	Time x Group	0.003	1	0.003	<0.01	0.92
	Error (within)	19.58	67	0.30		
I view my peers as valuable resources for learning.	Group	1.19	1	1.19	2.34	0.13
	Error (between)	34.13	67	0.51		
	Time	2.29	1	2.29	13.36	<0.01
	Time x Group	0.20	1	0.20	1.156	0.29
I gain a deeper understanding of clinical application from my peers.	Error (within)	11.46	67	0.17		
	Group	0.71	1	0.71	1.56	0.22
	Error (between)	30.59	67	0.46		
	Time	6.98	1	6.98	21.77	0.00
I gain multiple perspectives on approaches to clinical problem solving from my peers.	Time x Group	0.27	1	0.27	0.85	0.36
	Error (within)	21.16	66	0.32		
	Group	1.07	1	10.7	2.39	0.13
	Error (between)	29.43	66	0.45		
Time	2.65	1	2.65	8.39	0.01	

	Time x Group	0.001	1	0.001	0.01	0.95
	Error (within)	20.84	66	0.32		
	Group	1.31	1	1.31	3.55	0.06
	Error (between)	24.30	66	0.37		

Table 19. Descriptive Statistics for Survey Questions Related to Perceived Benefits of PAF

Question	Occasion	Group	N	Mean	SD	Strongly Disagree	Disagree	Agree	Strongly Agree
I am able to accurately assess a peer's laboratory skills	1	Exp	33	2.97	0.53	0 (0)	5 (15.2)	24 (72.7)	4 (12.1)
		Cont	35	2.94	0.66	1 (2.9)	5 (14.3)	24 (66.7)	5 (14.3)
	2	Exp	33	3.21	0.49	0 (0)	1 (3.0)	24 (72.7)	8 (24.2)
		Cont	36	3.33	0.48	0 (0)	0 (0)	24 (66.7)	12 (33.3)
My peers are able to accurately assess my laboratory skills	1	Exp	33	2.91	0.53	0 (0)	6 (18.2)	24 (72.7)	3 (9.1)
		Cont	35	2.91	0.66	1 (2.9)	6 (17.1)	23 (65.7)	5 (14.3)
	2	Exp	33	3.15	0.44	0 (0)	1 (3.0)	26 (78.8)	6 (18.2)
		Cont	36	3.28	0.45	0 (0)	0 (0)	26 (72.2)	10 (27.8)
I am receptive to receiving feedback on my laboratory skills from my peers	1	Exp	33	3.27	0.45	0 (0)	0 (0)	24 (72.7)	9 (27.3)
		Cont	36	3.31	0.53	0 (0)	1 (2.8)	23 (63.9)	12 (33.3)
	2	Exp	33	3.61	0.50	0 (0)	0 (0)	13 (39.4)	20 (60.6)
		Cont	36	3.64	0.54	0 (0)	1 (2.8)	11 (30.6)	24 (66.7)
I provide my peers with useful feedback on their laboratory skills	1	Exp	33	3.15	0.36	0 (0)	0 (0)	28 (84.8)	5 (15.2)
		Cont	36	3.17	0.66	1 (2.8)	2 (5.6)	23 (63.9)	10 (27.8)

	2	Exp	33	3.36	0.55	0 (0)	1 (3.0)	19 (57.6)	13 (39.4)
		Cont	36	3.53	0.56	0 (0)	1 (2.8)	15 (41.7)	20 (55.6)
I gain a deeper understanding of clinical concepts when my peers <i>provide me</i> with feedback on my laboratory skills.	1	Exp	33	3.15	0.51	0 (0)	2 (6.1)	24 (72.7)	7 (21.2)
		Cont	35	3.34	0.54	0 (0)	1 (2.9)	21 (60.0)	13 (37.1)
	2	Exp	33	3.21	0.65	0 (0)	4 (12.1)	18 (54.5)	11 (33.3)
		Cont	36	3.56	0.50	0 (0)	0 (0)	16 (44.4)	20 (55.6)
I gain a deeper understanding of clinical concepts when <i>I provide</i> my peers with feedback on their laboratory skills	1	Exp	33	3.24	0.44	0 (0)	0 (0)	25 (75.8)	8 (24.2)
		Cont	36	3.33	0.54	0 (0)	1 (2.8)	22 (61.1)	13 (36.1)
	2	Exp	33	3.45	0.56	0 (0)	1 (3.0)	16 (48.5)	16 (48.5)
		Cont	36	3.58	0.50	0 (0)	0 (0)	15 (41.7)	21 (58.3)
<i>Receiving</i> feedback from my peers on my clinical skills increases my confidence in my laboratory skills	1	Exp	33	3.18	0.58	0 (0)	3 (9.1)	21 (63.6)	9 (27.3)
		Cont	36	3.19	0.62	0 (0)	4 (11.1)	21 (58.3)	11 (30.6)
	2	Exp	33	3.36	0.60	0 (0)	2 (6.1)	17 (51.5)	14 (42.4)
		Cont	36	3.56	0.50	0 (0)	0 (0)	16 (44.4)	20 (55.6)
<i>Providing</i> my peers with feedback on their clinical skills increases my confidence in my laboratory skills	1	Exp	33	3.21	0.55	0 (0)	2 (6.1)	22 (66.7)	9 (27.3)

		Cont	36	3.22	0.59	0 (0)	3 (8.3)	22 (61.1)	11 (30.6)
	2	Exp	33	3.42	0.61	0 (0)	2 (6.1)	5 (45.5)	16 (48.5)
		Cont	36	3.58	0.50	0 (0)	0 (0)	15 (41.7)	21 (58.3)
I provide specific details with suggestions for improvement when <i>I provide</i> feedback to my peers on their laboratory skills	1	Exp	33	2.76	0.50	0 (0)	9 (27.3)	23 (69.7)	1 (3.0)
		Cont	36	3.19	0.62	1 (2.8)	1 (2.8)	24 (66.7)	10 (27.8)
	2	Exp	33	3.09	0.52	1 (3.0)	0 (0)	27 (81.8)	5 (15.2)
		Cont	36	3.17	0.45	0 (0)	1 (2.8)	28 (77.8)	7 (19.4)
My peers provide specific details with suggestions for improvement when my peers <i>provide me</i> feedback on my laboratory skills	1	Exp	33	2.79	0.55	0 (0)	9 (27.3)	22 (66.7)	2 (6.1)
		Cont	35	3.06	0.59	1 (2.9)	2 (5.7)	26 (74.3)	6 (17.1)
	2	Exp	33	3.03	0.53	1 (3.0)	1 (3.0)	27 (81.8)	4 (12.1)
		Cont	36	3.22	0.49	0 (0)	1 (2.8)	26 (72.2)	9 (25.0)
I am more self-reflective of my own laboratory skills when I receive feedback from my peers	1	Exp	33	3.21	0.60	0 (0)	3 (9.1)	20 (60.6)	10 (30.3)
		Cont	35	3.29	0.57	0 (0)	2 (5.7)	21 (60.0)	12 (34.3)
	2	Exp	33	3.18	0.58	0 (0)	3 (9.1)	21 (63.6)	9 (27.3)
		Cont	36	3.56	0.50	0 (0)	0 (0)	16 (44.4)	20 (55.6)

My communication skills have improved by providing feedback to my peers	1	Exp	33	3.06	0.61	0 (0)	5 (15.2)	21 (63.6)	7 (21.2)
		Cont	36	3.28	0.62	0 (0)	3 (8.3)	20 (55.6)	13 (36.1)
	2	Exp	33	3.21	0.65	1 (3.0)	1 (3.0)	21 (63.6)	10 (30.3)
		Cont	36	3.19	0.62	0 (0)	4 (11.1)	21 (58.3)	11 (30.6)
Providing feedback to my peers on their laboratory skills improves my ability to <i>give</i> constructive criticism to others	1	Exp	33	3.18	0.47	0 (0)	1 (3.0)	25 (75.8)	7 (21.2)
		Cont	35	3.31	0.47	0 (0)	0 (0)	24 (68.6)	11 (31.4)
	2	Exp	33	3.42	0.61	0 (0)	2 (6.1)	15 (45.5)	16 (48.5)
		Cont	36	3.33	0.63	0 (0)	3 (8.3)	18 (50.0)	15 (41.7)
Providing feedback to my peers on their laboratory skills improves my ability to <i>receive</i> constructive criticism from others	1	Exp	33	3.24	0.44	3 (9.1)	7 (21.2)	15 (45.5)	8 (24.2)
		Cont	36	3.19	0.53	0 (0)	2 (5.6)	25 (69.4)	9 (25.0)
	2	Exp	33	3.36	0.60	0 (0)	2 (6.1)	25 (69.4)	17 (51.5)
		Cont	36	3.44	0.56	0 (0)	1 (2.8)	18 (50.0)	17 (47.2)
I feel less intimidated when my laboratory skills are evaluated by my peers than by my instructor	1	Exp	33	2.85	0.91	3 (9.1)	7 (21.2)	15 (45.5)	8 (24.2)
		Cont	36	3.06	0.79	1 (2.8)	7 (19.4)	17 (47.2)	11 (30.6)

	2	Exp	33	3.21	0.86	1 (3.0)	6 (18.2)	11 (33.3)	15 (45.5)
		Cont	36	3.06	0.86	1 (2.8)	9 (25.0)	13 (36.1)	13 (36.1)
I am more empathetic than instructors when laboratory skills are not performed correctly by my peers.	1	Exp	32	2.72	0.73	3 (9.4)	5 (15.6)	22 (68.8)	2 (6.3)
		Cont	36	2.89	0.62	0 (0)	9 (25.0)	22 (61.1)	5 (13.9)
	2	Exp	33	2.97	0.81	2 (6.1)	5 (15.2)	18 (54.5)	8 (24.2)
		Cont	36	2.92	0.69	0 (0)	10 (27.8)	19 (52.8)	7 (19.4)
Seeing how others perform laboratory skills increases my learning	1	Exp	32	3.19	0.60	0 (0)	3 (9.4)	20 (62.5)	9 (28.1)
		Cont	36	3.39	0.49	0 (0)	0 (0)	22 (61.1)	14 (38.9)
	2	Exp	33	3.39	0.70	1 (3.0)	1 (3.0)	15 (45.5)	16 (48.5)
		Cont	36	3.72	0.45	0 (0)	0 (0)	10 (27.85)	26 (72.2)
Seeing how others perform laboratory skills allows me to see skill variations	1	Exp	32	3.26	0.52	0 (0)	1 (3.0)	21 (65.6)	10 (31.3)
		Cont	36	3.50	0.51	0 (0)	0 (0)	18 (50.0)	18 (50.0)
	2	Exp	33	3.48	0.62	0 (0)	2 (6.1)	13 (39.4)	18 (54.5)
		Cont	36	3.69	0.47	0 (0)	0 (0)	11 (30.6)	25 (69.4)
Providing feedback to my peers will help prepare me provide feedback to patients when I am a professional	1	Exp	32	3.41	0.50	0 (0)	0 (0)	19 (57.6)	13 (39.4)
		Cont	36	3.5	0.51	0 (0)	0 (0)	18 (50.0)	18 (50.0)
	2	Exp	33	3.45	0.71	1 (3.0)	1 (3.0)	13 (39.4)	18 (54.5)
		Cont	36	3.56	0.61	0 (0)	0 (0)	11 (30.6)	25 (69.4)

Discussion increases when my peers and I assess and provide feedback to each other	1	Exp	32	3.8	0.49	0 (0)	0 (0)	20 (62.5)	12 (37.5)
		Cont	36	3.31	0.67	1 (2.8)	1 (2.8)	20 (55.6)	14 (38.9)
	2	Exp	33	3.30	0.59	0 (0)	2 (6.1)	19 (57.6)	12 (36.4)
		Cont	36	3.44	0.61	0 (0)	2 (5.6)	16 (44.4)	18 (50.0)
My motivation increases when my peers and I assess and provide feedback to each other	1	Exp	32	3.13	0.55	0 (0)	3 (9.4)	22 (66.7)	7 (21.9)
		Cont	35	3.34	0.54	0 (0)	1 (2.9)	21 (60.0)	13 (37.1)
	2	Exp	33	3.12	0.65	1 (3.0)	2 (6.1)	22 (66.7)	8 (24.2)
		Cont	36	3.36	0.59	0 (0)	2 (5.6)	19 (52.8)	15 (41.7)

Table 20. 2X2 ANOVA Summary of Survey Questions Related to Perceived Benefits of PAF

Question	Source	Sum of Squares	DF	Mean Square	F	Sig
I am able to accurately assess a peer's laboratory skills	Time	3.20	1	3.20	17.43	0.00
	Time x Group	0.14	1	0.14	0.77	0.38
	Error (within)	12.12	66	0.18		
	Group	0.05	1	0.05	0.12	0.73
	Error (between)	25.80	66	0.39		
My peers are able to accurately assess my laboratory skills	Time	3.20	1	3.20	16.10	0.00
	Time x Group	0.14	1	0.14	0.71	0.40
	Error (within)	13.12	66	0.20		
	Group	0.17	1	0.17	0.46	0.50
	Error (between)	23.74	66	0.36		
I am receptive to receiving feedback on my laboratory skills from my peers	Time	3.83	1	3.83	24.03	0.00

	Time x Group	0.00	1	0.00	0.00	1.00
	Error (within)	10.67	67	0.16		
	Group	0.04	1	0.04	0.11	0.78
	Error (between)	23.70	67	0.35		
I provide my peers with useful feedback on their laboratory skills	Time	2.83	1	2.83	10.02	0.002
	Time x Group	0.19	1	0.19	0.68	0.41
	Error (within)	18.91	67	0.28		
	Group	0.28	1	0.28	0.89	0.35
	Error (between)	20.94	67	0.32		
I gain a deeper understanding of clinical concepts when my peers <i>provide me</i> with feedback on my laboratory skills.	Time	0.58	1	0.58	2.27	0.14
	Time x Group	0.17	1	0.17	0.65	0.42
	Error (within)	16.74	66	0.25		
	Group	2.32	1	2.32	6.48	0.01
	Error (between)	23.59	66	0.36		
I gain a deeper understanding of clinical concepts when <i>I provide</i> my peers with feedback on their laboratory skills	Time	1.84	1	1.84	11.06	0.001
	Time x Group	0.01	1	0.01	0.07	0.79
	Error (within)	11.13	67	0.17		
	Group	0.42	1	0.42	1.68	0.28
	Error (between)	23.86	67	0.36		
<i>Receiving</i> feedback from my peers on my clinical skills peers increases my confidence in my laboratory skills	Time	2.54	1	2.54	8.67	0.004
	Time x Group	0.28	1	0.28	0.95	0.33
	Error (within)	19.61	67	0.29		
	Group	0.36	1	0.36	0.95	0.33
	Error (between)	25.47	67	0.38		
<i>Providing</i> my peers with feedback on their clinical skills increases my confidence in my laboratory skills	Time	2.83	1	2.83	10.58	0.002

	Time x Group	0.19	1	0.19	0.72	0.40
	Error (within)	17.91	67	0.27		
	Group	0.25	1	0.25	0.67	0.42
	Error (between)	24.64	67	0.37		
I provide specific details with suggestions for improvement when <i>I provide</i> feedback to my peers on their laboratory skills	Time	0.80	1	0.80	2.97	0.09
	Time x Group	1.12	1	1.12	4.14	0.05
	Error (within)	18.15	67	0.27		
	Group	2.26	1	2.62	7.86	0.01
	Error (between)	19.27	67	0.29		
My peers provide specific details with suggestions for improvement when my peers <i>provide me</i> feedback on my laboratory skills	Time	1.46	1	1.46	5.19	0.03
	Time x Group	0.04	1	0.04	0.15	0.70
	Error (within)	18.52	66	0.28		
	Group	1.86	1	1.86	6.12	0.02
	Error (between)	20.03	66	0.31		
I am more self-reflective of my own laboratory skills when I receive feedback from my peers	Time	0.44	1	0.44	1.95	0.17
	Time x Group	0.70	1	0.70	3.12	0.08
	Error (within)	14.83	66	0.23		
	Group	1.60	1	1.60	3.86	0.05
	Error (between)	27.43	66	0.42		
My communication skills have improved by providing feedback to my peers	Time	0.04	1	0.04	0.11	0.74
	Time x Group	0.48	1	0.48	1.35	0.25
	Error (within)	23.50	67	0.35		
	Group	0.34	1	0.34	0.80	0.34
	Error (between)	28.76	67	0.43		
Providing feedback to my peers on their laboratory skills improves my ability to <i>give</i> constructive criticism to others	Time	0.50	1	0.50	1.83	0.18

	Time x Group	0.50	1	0.50	1.83	0.18
	Error (within)	18.03	66	0.27		
	Group	0.004	1	0.004	0.01	0.91
	Error (between)	22.03	66	0.33		
Providing feedback to my peers on their laboratory skills improves my ability to <i>receive</i> constructive criticism from others	Time	1.19	1	1.19	4.93	0.03
	Time x Group	0.14	1	0.14	0.59	0.44
	Error (within)	16.13	67	0.24		
	Group	0.01	1	0.01	0.03	0.87
	Error (between)	22.09	67	0.33		
I feel less intimidated when my laboratory skills are evaluated by my peers than by my instructor	Time	1.14	1	1.14	20.7	0.16
	Time x Group	1.14	1	1.14	20.7	0.16
	Error (within)	36.82	67	0.55		
	Group	0.02	1	0.02	0.02	0.88
	Error (between)	60.18	67	0.91		
I am more empathetic than instructors when laboratory skills are not performed correctly by my peers.	Time	0.81	1	0.81	2.25	0.14
	Time x Group	0.54	1	0.54	1.51	0.22
	Error (within)	23.72	66	0.36		
	Group	0.06	1	0.06	0.10	0.76
	Error (between)	43.05	66	0.65		
Seeing how others perform laboratory skills increases my learning	Time	2.88	1	2.88	13.59	0.00
	Time x Group	0.06	1	0.06	0.23	0.60
	Error (within)	14.00	66	0.21		
	Group	2.00	1	2.00	4.98	0.03
	Error (between)	26.53	66	0.40		
Seeing how others perform laboratory skills allows me to see skill variations	Time	1.67	1	1.67	9.34	0.003
	Time x Group	0.03	1	0.03	0.15	0.70

	Error (within)	11.82	66	0.18		
	Group	1.24	1	1.24	3.51	0.07
	Error (between)	23.26	66	0.35		
Providing feedback to my peers will help prepare me provide feedback to patients when I am a professional	Time	0.19	1	0.19	0.76	0.39
	Time x Group	0.01	1	0.01	0.05	0.82
	Error (within)	16.30	66	0.25		
	Group	0.19	1	0.19	0.46	0.50
	Error (between)	27.30	66	0.41		
Discussion increases when my peers and I assess and provide feedback to each other	Time	0.10	1	0.10	0.48	0.49
	Time x Group	0.25	1	0.25	1.19	0.28
	Error (within)	13.64	66	0.21		
	Group	0.01	1	0.01	0.02	0.90
	Error (between)	31.61	66	0.48		
My motivation increases when my peers and I assess and provide feedback to each other	Time	0.03	1	0.03	0.10	0.76
	Time x Group	0.00	1	0.00	0.00	0.99
	Error (within)	19.97	65	0.31		
	Group	1.57	1	1.57	4.28	0.04
	Error (between)	23.81	65	0.37		

Table 21. Descriptive Statistics for Survey Questions Related to Perceptions of the Process

Question	Occasion	Group	N	Mean	SD	Strongly Disagree	Disagree	Agree	Strongly Agree
<i>Receiving</i> feedback from my peers on my clinical skills peers is non-threatening	1	Exp	32	3.13	0.61	0 (0)	4 (12.5)	20 (62.5)	8 (25.0)
		Cont	36	3.31	0.47	0 (0)	0 (0)	25 (69.4)	11 (30.6)
	2	Exp	33	3.39	0.56	0 (0)	1 (3.0)	18 (54.5)	14 (42.4)
		Cont	36	3.61	0.55	0 (0)	1 (2.8)	12 (33.3)	23 (63.9)

<i>Providing feedback from my peers on my clinical skills</i>	1	Exp	32	3.16	0.57	0 (0)	3 (9.4)	21 (65.6)	8 (25.0)
		Cont	36	3.25	0.60	0 (0)	3 (8.3)	21 (58.3)	12 (33.3)
	2	Exp	33	3.33	0.54	0 (0)	1 (3.0)	20 (60.6)	12 (36.4)
		Cont	36	3.56	0.56	0 (0)	1 (2.8)	14 (38.9)	21 (58.3)
I am respectful when <i>I provide</i> feedback to my peers on their laboratory skills	1	Exp	32	3.50	0.51	0 (0)	0 (0)	16 (50.0)	16 (50.0)
		Cont	36	3.61	0.49	0 (0)	0 (0)	14 (38.9)	22 (61.1)
	2	Exp	33	3.67	0.48	0 (0)	0 (0)	11 (33.3)	22 (66.7)
		Cont	36	3.67	0.48	0 (0)	0 (0)	12 (33.3)	24 (66.7)
My peers are respectful when my peers <i>provide me</i> feedback on my laboratory skills	1	Exp	32	3.34	0.55	0 (0)	1 (3.1)	19 (69.4)	12 (37.5)
		Cont	36	3.44	0.50	0 (0)	0 (0)	20 (55.6)	16 (44.4)
	2	Exp	33	3.61	0.50	0 (0)	0 (0)	13 (39.4)	20 (60.6)
		Cont	36	3.64	0.49	0 (0)	0 (0)	13 (36.1)	23 (63.9)
I am non-judgmental when <i>I provide</i> feedback to my peers on their laboratory skills	1	Exp	32	3.38	0.49	0 (0)	0 (0)	20 (62.5)	12 (37.5)
		Cont	36	3.42	0.55	0 (0)	1 (2.8)	19 (52.8)	16 (44.4)
	2	Exp	33	3.55	0.51	0 (0)	0 (0)	15 (45.5)	18 (54.5)
		Cont	36	3.78	0.42	0 (0)	0 (0)	8 (22.2)	28 (77.8)
My peers are non-judgmental when my peers <i>provide me</i> feedback on my laboratory skills	1	Exp	32	3.31	0.54	0 (0)	1 (3.1)	20 (62.5)	11 (33.3)
		Cont	35	3.34	0.54	0 (0)	1 (2.9)	21 (60.0)	13 (37.1)

	2	Exp	33	3.58	0.50	0 (0)	0 (0)	14 (42.4)	19 (57.6)
		Cont	36	3.72	0.45	0 (0)	0 (0)	10 (27.8)	26 (72.2)
I focus on the skill and not personality when <i>I provide</i> feedback to my peers on their laboratory skills	1	Exp	32	3.25	0.51	0 (0)	1 (3.1)	22 (68.8)	9 (28.1)
		Cont	36	3.31	0.71	0 (0)	5 (13.9)	15 (41.7)	15 (44.4)
	2	Exp	33	3.52	0.57	0 (0)	1 (3.0)	14 (42.4)	18 (54.5)
		Cont	36	3.53	0.70	0 (0)	4 (11.1)	9 (25.0)	23 (63.9)
My peers focus on the skill and not personality when my peers <i>provide me</i> feedback on my laboratory skills	1	Exp	32	3.16	0.52	0 (0)	2 (6.3)	23 (71.9)	7 (21.9)
		Cont	35	3.29	0.71	0 (0)	5 (14.3)	15 (42.9)	15 (42.9)
	2	Exp	33	3.52	0.57	0 (0)	1 (3.0)	14 (42.4)	18 (54.5)
		Cont	36	3.53	0.61	0 (0)	2 (5.6)	13 (36.1)	21 (58.3)
I am comfortable providing feedback to my peers on their laboratory skills	1	Exp	32	3.09	0.30	0 (0)	0 (0)	29 (90.6)	3 (9.1)
		Cont	36	3.31	0.58	0 (0)	2 (5.6)	21 (58.3)	13 (36.1)
	2	Exp	33	3.24	0.50	0 (0)	1 (3.0)	23 (69.7)	9 (27.3)
		Cont	36	3.61	0.55	0 (0)	1 (2.8)	12 (33.3)	23 (63.9)
I am eager to <i>provide</i> feedback to my peers when practicing laboratory skills	1	Exp	32	2.72	0.68	0 (0)	13 (40.6)	15 (46.9)	4 (12.5)
		Cont	36	2.92	0.65	0 (0)	9 (25.0)	21 (58.3)	13 (36.1)
	2	Exp	33	2.97	0.80	0 (0)	5 (15.2)	24 (72.7)	4 (12.1)
		Cont	36	3.03	0.70	0 (0)	8 (22.2)	19 (52.8)	9 (25.0)

I am eager to receive feedback from my peers when practicing laboratory skills	1	Exp	32	3.06	0.70	0 (0)	6 (18.8)	18 (56.3)	8 (25.0)
		Cont	36	3.17	0.61	0 (0)	4 (11.1)	22 (61.1)	10 (27.8)
	2	Exp	33	3.24	0.61	0 (0)	3 (9.1)	19 (57.6)	11 (33.3)
		Cont	36	3.14	0.72	0 (0)	7 (19.4)	17 (47.2)	12 (33.3)
Assessing and providing feedback to my peers does NOT interfere with our personal relationship	1	Exp	32	3.16	0.45	0 (0)	1 (3.1)	25 (75.8)	6 (18.8)
		Cont	36	3.39	0.55	0 (0)	1 (2.8)	20 (55.6)	15 (41.7)
	2	Exp	33	3.52	0.51	0 (0)	0 (0)	16 (48.5)	17 (51.5)
		Cont	36	3.64	0.49	0 (0)	0 (0)	13 (36.1)	23 (63.9)

Table 22. 2X2 ANOVA Summary of Survey Questions Related to Perceptions of the Process

Question	Source	Sum of Squares	DF	Mean Square	F	Sig
<i>Receiving</i> feedback from my peers on my clinical skills peers is non-threatening	Time	2.92	1	2.92	11.29	0.001
	Time x Group	0.01	1	0.01	0.02	0.89
	Error (within)	17.05	66	0.6		
	Group	1.26	1	1.26	3.71	0.06
	Error (between)	22.36	66	0.34		
<i>Providing</i> feedback from my peers on my clinical skills peers in non threatening	Time	2.06	1	2.06	8.91	0.004
	Time x Group	0.12	1	.012	0.51	0.48
	Error (within)	15.26	66			
	Group	0.79	1	0.79	1.88	0.18
	Error (between)	27.82	66	0.42		
I am respectful when I provide feedback to my peers on their laboratory skills	Time	0.50	1	0.50	3.18	0.08

	Time x Group	0.15	1	0.15	0.94	0.34
	Error (within)	10.38	66	0.16		
	Group	0.07	1	0.07	0.22	0.64
	Error (between)	21.05	66	0.62		
My peers are respectful when my peers <i>provide me</i> feedback on my laboratory skills	Time	1.92	1	1.92	9.69	0.003
	Time x Group	0.06	1	0.06	0.32	0.57
	Error (within)	13.05	66	0.20		
	Group	0.11	1	0.11	0.35	0.56
	Error (between)	20.86	66	0.32		
I am non-judgmental when <i>I provide</i> feedback to my peers on their laboratory skills	Time	2.55	1	2.55	13.36	0.001
	Time x Group	0.26	1	0.26	1.34	0.25
	Error (within)	12.29	66	0.19		
	Group	0.56	1	0.56	1.87	0.18
	Error (between)	19.76	66	0.30		
My peers are non-judgmental when my peers <i>provide me</i> feedback on my laboratory skills	Time	3.56	1	3.56	18.79	0.00
	Time x Group	0.07	1	0.07	0.34	0.55
	Error (within)	12.32	65	0.19		
	Group	0.19	1	0.19	0.58	0.45
	Error (between)	21.30	65	0.33		
I focus on the skill and not personality when <i>I provide</i> feedback to my peers on their laboratory skills	Time	2.15	1	2.15	7.73	0.01
	Time x Group	0.03	1	0.03	0.11	0.75
	Error (within)	18.35	66	0.23		
	Group	0.02	1	0.02	0.04	0.83
	Error (between)	34.23	66	0.52		
My peers focus on the skill and not personality when my peers <i>provide me</i> feedback on my laboratory skills	Time	3.05	1	3.05	11.10	0.001

	Time x Group	0.18	1	0.18	0.65	0.42
	Error (within)	17.84	65	0.27		
	Group	0.11	1	0.11	0.23	0.64
	Error (between)	30.24	65	0.47		
I am comfortable providing feedback to my peers on their laboratory skills	Time	1.81	1	1.81	6.65	0.01
	Time x Group	0.19	1	0.19	0.70	0.41
	Error (within)	17.93	66	0.27		
	Group	2.78	1	2.78	12.25	0.001
	Error (between)	14.98	66	0.23		
I am eager to provide feedback to my peers when practicing laboratory skills	Time	1.11	1	1.11	3.07	0.09
	Time x Group	0.16	1	0.16	0.45	0.50
	Error (within)	23.78	66	0.36		
	Group	0.56	1	0.56	1.18	0.28
	Error (between)	31.38	66	0.48		
I am eager to receive feedback from my peers when practicing laboratory skills	Time	0.22	1	0.22	0.57	0.45
	Time x Group	0.39	1	0.39	1.04	0.31
	Error (within)	24.92	66	0.38		
	Group	0.00	1	0.00	0.001	0.98
	Error (between)	32.26	66	0.49		
Assessing and providing feedback to my peers does NOT interfere with our personal relationship	Time	3.31	1	3.31	16.64	0.00
	Time x Group	0.13	1	0.13	0.67	0.42
	Error (within)	13.13	66	0.20		
	Group	0.98	1	0.98	3.25	0.08
	Error (between)	19.92	66	0.30		

Table 23. Descriptive Statistics for Survey Questions Related to Preferences for PAF Activities

Question	Occasion	Group	N	Mean	SD	Strongly Disagree	Disagree	Agree	Strongly Agree
I prefer to practice laboratory skills with my peers rather than with instructors.	1	Exp	32	2.78	0.94	3 (9.4)	9 (28.1)	12 (37.5)	8 (25.0)
		Cont	36	3.00	0.72	1 (2.8)	6 (16.7)	21 (58.3)	8 (22.2)
	2	Exp	33	2.79	.093	3 (9.1)	9 (27.3)	13 (39.4)	8 (24.2)
		Cont	36	3.03	0.70	0 (0)	8 (22.2)	19 (52.8)	9 (25.0)
I prefer to be corrected on my laboratory skills by my peers rather than by my instructors.	1	Exp	32	2.28	0.77	3 (9.4)	20 (62.5)	6 (18.8)	3 (9.4)
		Cont	36	2.56	0.70	0 (0)	20 (55.6)	12 (33.3)	4 (11.1)
	2	Exp	33	2.33	0.92	3 (9.1)	20 (60.6)	6 (18.2)	4 (12.1)
		Cont	35	2.71	0.71	0 (0)	15 (42.9)	15 (42.9)	5 (14.3)
I prefer to receive constructive feedback on laboratory skills from my peers rather than from instructors.	1	Exp	32	2.44	0.72	2 (6.3)	16 (50.0)	12 (37.5)	2 (6.3)
		Cont	36	2.50	0.74	1 (2.8)	20 (55.6)	11 (30.6)	4 (11.1)
	2	Exp	33	2.48	0.80	2 (6.3)	17 (51.5)	10 (30.3)	4 (12.1)
		Cont	35	2.69	0.72	0 (0)	16 (45.7)	14 (40.0)	5 (14.3)
I prefer to learn new laboratory skills from my peers rather than from my instructors.	1	Exp	32	2.06	0.56	4 (12.5)	22 (68.8)	6 (18.8)	0 (0)
		Cont	36	2.00	0.59	5 (13.9)	27 (75.0)	3 (8.3)	1 (2.8)
	2	Exp	33	2.18	0.77	4 (12.1)	22 (66.7)	4 (12.1)	3 (9.1)
		Cont	36	2.31	0.79	4 (11.1)	20 (55.6)	9 (25.0)	3 (8.3)

I prefer to be <i>formally</i> evaluated (i.e., with a grade) by my peers rather than by instructors.	1	Exp	32	2.28	0.77	4 (12.5)	17 (53.1)	9 (28.1)	2 (6.3)
		Cont	36	2.50	0.88	4 (11.1)	15 (41.7)	12 (33.3)	5 (13.9)
	2	Exp	33	2.27	0.84	4 (12.1)	20 (60.6)	5 (15.2)	4 (12.1)
		Cont	36	2.31	0.95	7 (19.4)	16 (44.4)	8 (22.2)	5 (13.9)
I prefer to be <i>informally</i> evaluated (i.e., without a grade) by my peers rather than by my instructors.	1	Exp	32	2.63	0.71	2 (6.3)	10 (31.3)	18 (56.3)	2 (6.3)
		Cont	36	2.94	0.63	1 (2.8)	5 (13.9)	25 (69.4)	5 (13.9)
	2	Exp	33	2.91	0.81	1 (3.0)	9 (27.3)	15 (45.5)	8 (24.2)
		Cont	36	3.00	0.54	0 (0)	5 (13.9)	26 (72.2)	5 (13.9)
The feedback I receive from my peers is as specific as the feedback I receive from my instructors.	1	Exp	32	2.00	0.62	6 (18.8)	20 (62.5)	6 (18.8)	0 (0)
		Cont	36	2.19	0.71	4 (11.1)	23 (63.9)	7 (19.4)	2 (5.6)
	2	Exp	33	2.15	0.76	6 (18.2)	17 (51.5)	9 (27.3)	1 (3.0)
		Cont	36	2.39	0.69	1 (2.8)	23 (63.9)	9 (25.0)	3 (8.3)
The feedback I receive from my peers is as helpful as the feedback I receive from my instructors.	1	Exp	32	2.38	0.75	5 (15.6)	10 (31.3)	17 (53.1)	0 (0)
		Cont	35	2.51	0.74	3 (8.6)	13 (37.1)	17 (48.6)	2 (5.7)
	2	Exp	33	2.58	0.56	1 (3.0)	12 (36.4)	20 (60.6)	0 (0)
		Cont	35	2.94	0.68	1 (2.8)	23 (63.9)	9 (25.0)	3 (8.3)

I prefer the feedback I receive from my peers because it is more immediate than what I receive from my instructors.	1	Exp	32	2.25	0.67	3 (9.4)	19 (59.4)	9 (28.1)	1 (3.1)
		Cont	36	2.64	0.68	1 (2.8)	14 (38.9)	18 (50.0)	3 (8.3)
	2	Exp	33	2.52	0.67	1 (3.0)	16 (48.5)	14 (42.4)	2 (6.1)
		Cont	36	2.72	0.62	0 (0)	13 (36.1)	20 (55.6)	3 (8.3)
I am equally confident in the feedback I receive from peers as the feedback I receive from instructors.	1	Exp	32	2.25	0.67	4 (12.5)	16 (50.0)	12 (37.5)	0 (0)
		Cont	35	2.51	0.70	2 (5.7)	15 (42.9)	16 (45.7)	2 (5.7)
	2	Exp	33	2.42	0.83	4 (12.1)	14 (42.4)	12 (36.4)	3 (9.1)
		Cont	36	2.81	0.75	1 (2.8)	11 (30.6)	18 (50.0)	6 (16.7)
I am more confident when interacting with my peers than when interacting with my instructors.	1	Exp	32	2.69	0.78	2 (6.3)	10 (31.3)	16 (50.0)	4 (12.5)
		Cont	36	2.78	0.87	3 (8.3)	9 (25.0)	17 (47.2)	7 (19.4)
	2	Exp	33	2.85	0.87	1 (3.0)	12 (36.4)	11 (33.3)	9 (27.3)
		Cont	36	2.97	0.77	1 (2.8)	8 (22.2)	18 (50.0)	9 (25.0)

Table 24. 2X2 ANOVA Summary of Survey Questions Related to Preferences for PAF Activities

Question	Source	Sum of Squares	DF	Mean Square	F	Sig
I prefer to practice laboratory skills with my peers rather than with instructors.	Time	0.30	1	0.30	0.13	0.72
	Time x Group	0.00	1	0.00	0.00	0.98
	Error (within)	14.97	66	0.23		
	Group	1.60	1	1.60	1.42	0.24
	Error (between)	74.35	66	1.13		

I prefer to be corrected on my laboratory skills by my peers rather than by my instructors.	Time	0.35	1	0.35	1.04	0.31
	Time x Group	0.05	1	0.05	0.16	0.69
	Error (within)	22.08	65	0.34		
	Group	3.65	1	3.65	4.62	0.04
	Error (between)	51.32	65	0.79		
I prefer to receive constructive feedback on laboratory skills from my peers rather than from instructors.	Time	0.46	1	0.46	1.71	0.20
	Time x Group	0.10	1	0.10	0.37	0.55
	Error (within)	17.42	65	0.27		
	Group	0.58	1	0.58	0.68	0.41
	Error (between)	54.74	65	0.84		
I prefer to learn new laboratory skills from my peers rather than from my instructors.	Time	1.57	1	1.57	4.40	0.04
	Time x Group	0.28	1	0.28	0.77	0.38
	Error (within)	23.57	66	0.36		
	Group	0.03	1	0.03	0.04	0.83
	Error (between)	38.82	66	0.59		
I prefer to be <i>formally</i> evaluated (i.e., with a grade) by my peers rather than by instructors.	Time	0.32	1	0.32	0.63	0.43
	Time x Group	0.32	1	0.32	0.63	0.43
	Error (within)	33.82	66	0.51		
	Group	0.50	1	0.50	0.50	0.48
	Error (between)	65.76	66	1.00		
I prefer to be informally evaluated (i.e., without a grade) by my peers rather than by my instructors.	Time	1.15	1	1.15	4.12	0.05
	Time x Group	0.56	1	0.56	2.01	0.16
	Error (within)	18.38	66	0.28		
	Group	1.24	1	1.24	2.00	0.16
	Error (between)	40.88	66	0.62		

The feedback I receive from my peers is as specific as the feedback I receive from my instructors.	Time	1.24	1	1.24	4.03	0.05
	Time x Group	0.00	1	0.00	0.001	0.97
	Error (within)	20.26	66	0.31		
	Group	1.33	1	1.33	2.05	0.16
	Error (between)	42.81	66	0.65		
The feedback I receive from my peers is as helpful as the feedback I receive from my instructors.	Time	3.50	1	3.50	11.97	<0.01
	Time x Group	0.37	1	0.37	1.26	0.27
	Error (within)	19.02	65	0.29		
	Group	1.99	1	1.99	3.03	0.09
	Error (between)	42.83	65	0.66		
I prefer the feedback I receive from my peers because it is more immediate than what I receive from my instructors.	Time	1.13	1	1.13	4.22	0.04
	Time x Group	0.33	1	0.33	1.24	0.27
	Error (within)	17.61	66	0.27		
	Group	2.85	1	2.85	4.71	0.03
	Error (between)	39.89	66	0.60		
I am equally confident in the feedback I receive from peers as the feedback I receive from instructors.	Time	2.11	1	2.11	7.12	0.01
	Time x Group	0.13	1	0.13	0.46	0.40
	Error (within)	19.21	65	0.30		
	Group	3.59	1	3.59	4.45	0.04
	Error (between)	52.38	65	0.81		
I am more confident when interacting with my peers than when interacting with my instructors.	Time	1.24	1	1.24	2.79	0.10
	Time x Group	0.00	1	0.00	0.001	0.98
	Error (within)	29.26	66	0.44		
	Group	0.30	1	0.30	0.33	0.57
	Error (between)	60.31				

APPENDIX N

VIDEOTAPED CASE SUMMARIES

Demographics

The video tape subjects were randomly selected from those willing to participate and put in groups of four, two group experimental groups and two control groups. The subjects are described below:

Experimental Group 1

Experimental group 1 consisted of four females. All subjects were sports medicine concentration. Two were 20 years old, one was 21 and one was 23; three were in their third academic year and one was in her fifth. One subject completed an EMT course and observed a physician assistant; she never worked as an EMT. One subject completed volunteer hours with athletic trainers and personal trainers. Another subject completed observation and practiced triage with nurses at a community clinic and a different subject had no professional experience related to the sports medicine/allied health field. Past experiences assessing and providing feedback were basic. Three subjects informally helped peers during classes learn the information, but no formal experiences. One subject was required to assess peers during several classes and was a peer tutor. Training on assessing and providing feedback was only completed by the subject who was a peer tutor who received training on how to provide feedback through the tutoring program. Three subjects had no formal training.

Experimental Group 2

Experimental group 2 was comprised of three females and one male. All were sports medicine concentration. One was 21 and three were 22; two were in their fourth academic year and two were in their fifth academic year. One subject was a certified nursing assistant and an exercise physiology lab assistant. One subject observed a physical therapist and a chiropractor. Two subjects had no professional experience related to the sports medicine/allied health field. Past experiences assessing and providing feedback were minimal. One subject was required to provide feedback to peers in her physiology course. One subject informally helped peers with editing papers and lab reports. Two subjects had never assessed or provided feedback to their peers. Training on assessing and providing feedback was completed by only one subject who was taught how to provide constructive feedback in an English course and when she was an exercise physiology lab assistant. Three subjects had no formal training.

Control Group 1

Control group 1 consisted of four females. All four were sports medicine concentration. Three were 21 years old and one was 22; three were in their fourth academic year and one was in her fifth. Two subjects volunteered with physical therapy and an athletic training. Two subjects had no professional experience related to the sports medicine/allied health field. Past experiences assessing and providing feedback varied. Two subjects were required to provide feedback to peers in other classes, such as physiology. One subject informally assessed peers while learning the skills and one subject had never assessed or provided feedback to her peers. Training on assessing and

providing feedback was also mixed. One subject took two communications courses where she had to learn and demonstrate how to properly provide feedback. One subject she stated she had training, but did not elaborate on the setting. Two subjects had no formal training.

Control Group 2

Control group 2 was comprised of one female and three males. All were sports medicine concentration. One was 19, one was 21 and two were 22; one was in her third academic year, one was in his fourth academic year and two were in their fifth academic year. Some of the subject had previous allied health experiences. One subject previously volunteered in a hospital and shadowed in the rehabilitation department at a nursing home. Another subject had volunteered with a nursing homes' physical therapy and occupational therapy department. Another subject shadowed with a physical therapist and physical therapy assistant. One subject had no professional experience related to the sports medicine/allied health field. All subjects had past experiences assessing and providing feedback. One subject was a resident advisor in a dorm and had to provide feedback to other students as a part of that job. Two subjects used peer assessment during an anatomy lab to help peers learn the material. Training on assessing and providing feedback varied. One subject had training of effective feedback in a communications class. The subject who was a resident advisor had training on how to give and receive constructive criticism. Another subject stated that he had some training on using the sandwich approach to providing feedback. Two subjects had no formal training.

Baseline Feedback

The videos from the blood pressure and pulse lab were conducted to provide a baseline for the feedback they provide initially and without any training. Table 1 shows the scores of the feedback using the feedback quality scale.

Table 25. Baseline Feedback Scores

BP and Pulse	Experimental Group 1 N (%)	Experimental Group 2 N (%)	Control Group 1 N (%)	Control group 2 N (%)
0	5	7	4	8
1	0	2	0	2
2	0	6	3	10
3	13	32	27	27
4	2	5	7	7
5	8	8	12	6
6	6	9	8	9
7	0	0	0	0
Total (+)	10 (43.48)	13 (24.53)	19 (38.78)	13 (25.00)
Total (-)	13 (56.52)	40 (75.47)	30 (61.22)	39 (75.00)
Total incorrect	0 (0)	2 (3.77)	0 (0)	2 (3.85)
Total general	2 (8.70)	11 (20.75)	10 (20.41)	17 (31.69)
Total descriptive	21 (91.30)	40 (75.47)	39 (79.59)	33 (63.46)
Total Comments	23	53	49	52
Disagreements	3	3	2	0

Experimental Group 1

The most noticeable difference with experimental group 1 is their lack of feedback; they had roughly half as many comments as any of the other groups. During a member check, two members commented that they had already learned the skills in previous classes so they didn't feel like they had to practice as much. They did miss five things performed incorrectly over the two lab periods. Even though there were some instances of not catching something performed wrong, they did not provide any incorrect feedback and their feedback was largely descriptive (91.3%). This is much higher than

the other groups (75.47%, 79.59%, and 63.46%). Feedback on items performed correctly constituted 56.52% of the feedback they provided. They got off task several times. The first day they even turned off the voice recorder early because they were done practicing. Interestingly, two of the subjects stated in a member check that they thought that they were more on topic than they would have been if the camera was not there.

Group members felt they worked well together and “clicked.” One member said that they didn’t take the lab too seriously the first day, but they worked better the second day and she received the most useful feedback on the second day. Another member stated, “Our group worked well together. We each expressed our thoughts and ideas to each other and we suggested things to each other and we all took each other’s advice. Everyone was very nice and helpful in the advice they gave.” Group cohesiveness should allow them to be open to providing and receiving feedback. However, the fact that they get along could be a down side because it may make it more likely that they will get off task.

They used the lab sheet in certain instances to guide their practice and feedback. This should help with assessment and improve feedback. For example, during the first day one group member was putting the blood pressure cuff on another group member and a third was guiding their practice by reading off of the lab sheet, “It’s supposed to be matched up with that line, yeah.” This should help the students learn the material and confirm they are performing the skill correctly. Although, sometimes it was more of an afterthought rather than something that was used every time to ensure that they were providing accurate feedback. For instance, a group member watched a peer measuring

blood pressure and then stated, “I guess we should be doing this little sheet... was her elbow slightly flexed? Was it on a flat surface?” There was several times where the students assessed themselves when performing the skills. Occasionally it was when their peers did not give feedback on an item performed correctly and other times it was reassurance that the item was performed correctly. An illustration of this is when one peer was putting on the blood pressure cuff. She started to put the cuff on inside out and then realized it was incorrect when she tried to Velcro the cuff. She stated, “Whoa, this way...” and assessed herself as performing the item incorrectly. Self assessment is an added benefit because it has been shown to increase learning and improve future performances.

There were a few instances where students commented on ways to perform the skill when not being prompted to provide feedback. For example, when one student was not sure when she heard the first sound and commented on seeing the ticks, a peer stated that she also gets distracted by the ticks of the needle and tries to use her hearing more than her eyes. This may help provide support and ease frustration if a person knows a peer has similar problems.

They tried to make clinical connections of the skills and brought in knowledge from previous classes. They discussed the foot anatomy and using their knowledge of anatomy in order to find the dorsal pedal pulse easier. The person playing the part of the patient acted like a real patient the second day and the changes based on the patient’s position. One of the girls in the group exercises a lot and they hypothesized that her blood pressure and pulse should be lower. They also discuss the importance of measuring pulse

immediately after exercise to be accurate because the pulse in fit people will drop quickly. The discussion moved towards non-exercise scenarios such as the effects of dehydration and drinking alcohol on blood pressure and pulse. Being able to make connections may be very beneficial to learning and helping the students use items learned in class during their professional preparation and as a professional.

To summarize, experimental group 1 appears to be efficient at providing descriptive feedback. However, they do not provide a large quantity of feedback and have problems with staying on task.

Experimental Group 2

This group provided a lot of feedback, but they did also miss seven items that were performed incorrectly and gave incorrect feedback twice. Eleven times (20.75%) they provided general non specific feedback, 6 on items performed incorrectly and 5 times for items performed correctly. This may indicate that they are open to the experience, but don't know how to provide feedback effectively. They provided descriptive feedback 75.47% of the time, the second lowest percentage out of all of the groups. Their assessment skills are also lacking. For example, one member put the blood pressure cuff on upside down and it was not staying when the cuff was inflated. The members saw that something was not correct, but thought it was because the cuff was too tight and not because of incorrect application of the cuff. They were not using the lab sheet to guide their practice.

They did provide 32 constructive feedback comments on items performed incorrectly and 8 that were specific about items performed correctly. A good example of

the descriptive feedback they provided was when one subject did not know what to listen for. Her peer responded, “When you listen, you are listening for the first sound, and then you are just going to listen for the last sound. Sometimes it is kind of muffled.” Overall they were attentive, but some group members appeared bored at times. One the first day a subject became disengaged and used the stethoscope to find various pulses on his body.

It almost appeared that the members did not fully understand how to receive feedback from each other. A lot of the feedbacks were one-line sentences and there was not much dialogue after feedback as seen in other groups. For example, one person was measuring blood pressure and did not turn the valve tight enough when inflating the blood pressure cuff, a peer responded, “You might need to tighten it a little bit more.” During the same skill the subject did not pump the cuff up to 200 mmhg and the same peer responded, “you have to get it over 200.” The person receiving the feedback did not respond or even acknowledge the feedback. During a member check, some of the subjects identified this. For example, one person responded, “Our group works okay together. No one really seems to want to take much initiative. It may have just been the lab though.... We felt more comfortable with each other I think (the second day).” Others did not recognize this as a problem. A different peer responded, “My lab went excellent. My group worked well together... everything seems very comfortable!” The group stayed on task when they were practicing their skills; they got off task only once during the second day.

On the second day one of the team members was gone. Another student stated that she liked groups of 3 because there was more time to practice. This particular student

had some difficulties during the first day, once she practiced it successfully a couple of times she didn't want to practice anymore and stated that she didn't want to try the various scenarios suggested by the instructors because that isn't what they would be tested on.

Some members of this group were distracted by the video camera. Two talked so quiet that they were barely audible and one repeated things to the camera a couple of times during the first lab session. They were less aware of the camera during the second day. One member stated in a member check that she felt like she had to always do something so that I wouldn't have to watch them stare into space.

The groups were instructed to take blood pressure in different positions to see if there were any differences. This group decided to not try that and one member thought they were, "beating a dead horse." During the member check, one person said that nobody really wanted to take lead. She thought it was because the lab was fairly easy and they had too much time. On the second day two of the three members ended early while the third kept practicing.

In summary, experimental group 2 needs improvement with accurate assessment, providing descriptive feedback and accepting feedback. They also appear to have some group cohesion issues that may hinder the PAF process.

Control Group 1

This group appeared to work well together. Most of the feedback provided was regarding items performed incorrectly (61.22% of all comments). About 20% of the comments were general and 80% were descriptive. They did not provide any incorrect

feedback, however they did not provide feedback on an item performed incorrectly twice during each lab session. The members felt that they worked well together. Even though three of them were frustrated during the lab practice time, all reports during the member check stated that the group worked well together. This shows that they were willing to receive feedback on how to improve skills without taking the feedback defensively.

Three of the members had issues with determining which way to turn the valve in order to pump up the BP cuff, even though they were given proper feedback. All respondents said that they worked well together during the member checks and they were not influenced by the camera. One member stated that the first day was more stressful because they didn't really know what they were doing and were unfamiliar with the equipment.

One of the group members had prior experiences with measuring blood pressure and pulse. She did a good job trying to encourage one group member who was visibly distressed. However, her feedback was sometimes generic and did not give specific hints for improving the skill. Examples include, "yeah it is [perfect]", and "there you go." Other times this member gave descriptive feedback, such as, "You might want to release it [the air in the blood pressure cuff] a little bit faster." At the end of day 1 she recognized that a group member didn't grasp the concepts and stated that they would practice with her more the next time, which they did.

One of the two members that was frustrated had practiced blood pressure and pulse the week prior in her exercise physiology lab. She admitted in a member check that she was even more frustrated because she felt like she was the only one in her group that

was having a hard time hearing the Korotkoff sound while measuring blood pressure. The room for this class was significantly louder than her exercise physiology lab and the equipment was different. The BP cuff they used had the meter attached to the pump and they had to turn the knob towards themselves rather than to the right to tighten the valve. The different equipment tended to confuse the members of this group. For example, this student did not hear anything when measuring blood pressure during the first lab session. Her response was, "I don't want to do this anymore. Is it just me? Cause I don't know... I am not getting anything. I swear, this sucks. I can't find it." Her group members tried to give her advice and reassure her: "You might be able to hear it better if you like move that around with it in your ears. And then you can hear it. You know what I mean?" and "It is going to be in there... we can ask for help." They then ask a TA for help when the person still has problems. The second day this particular member seemed more confident and assessed herself more. For example, she was measuring blood pressure while using a double stethoscope. She found the same measurement as the other group member and exclaimed, "Ah, go me!" She practiced on several different people and appeared less frustrated. On a member check she stated she could hear the Korotkoff sounds better and could concentrate more, leading her to be less frustrated.

A different member appeared very distracted during the second lab session; she even admitted to the group that she was not focused. Another member had a difficult time comprehending some feedback and was talking with other groups about non-class items, such as jeans. She was given verbal feedback twice and visual feedback that she needed

to release the blood pressure cuff faster, but she was focused on the gauge that she did not change the speed of letting the air out of the cuff.

The group tended to focus on stating the correct numbers and not the technique. Reporting the correct numbers was only worth 3 out of 25 points on the exam. Most of the points were for proper positioning and procedures. They discussed norms and their impression of what the member's blood pressure and pulse should be based on their physical activity habits.

This group also did a good job of asking the instructors for help when they were having problems hearing the Korotokoff sounds. One of the instructors suggested using the double stethoscope so that a partner could confirm the numbers. This helped some, but the classroom was noisy and two students in particular had problems hearing the Korotkoff sounds.

To synopsise, control group 1 got along well and was willing to provide feedback to each other. They provided descriptive feedback about 80% of the time and asked the instructor for help when needed. They tried to be encouraging, but could improve by giving details for what was performed correctly. The encouragement did not always help and two of the members were highly frustrated. Other areas for improvement include using the feedback to improve future performances, focusing on the skill and not the exam and staying on task

Control Group 2

The feedback provided by control group 2 largely focused on items performed incorrectly (75%). This group had the highest percentage of incorrect feedback (3.85%),

had the highest number of items performed incorrectly without any feedback (eight), and provided feedback that was not correct on two occasions. Most of the feedback provided was descriptive (63.46%), but this was the lowest percentage out of all of the groups. The group appeared to work well together. During their first meeting, prior to the labs, the female made a comment about being the only girl and appeared to be intimidated. During a member check I asked if her being the only female affected the group dynamics. She said that she thought it would before the labs started, but when they started the labs she felt comfortable and they all worked well together. The feedback from the member checks showed that the members felt comfortable with each other and the feedback was helpful. For example, one member wrote, “Our group has worked together great, everybody is willing to participate and be tested on, as well as everyone contributing helpful tips if one of us is doing something incorrectly.”

This group did not ask for help either day, even though one of the group members was visibly frustrated because he couldn't hear the sounds because he had the stethoscope ears pointed the incorrect way. When asked during the member check why they did not ask questions of the instructors, one member stated, “I didn't ask questions because I didn't need any assistance. My group answered my questions.” Although this is true, they didn't recognize that they were effectively able to provide feedback to a peer in order for him to correctly measure blood pressure. The member who was frustrated because he couldn't hear the Korkoff sounds stated that he did not sleep much the night before because he was studying for another exam and he was also the only member who hadn't performed the skills before so he was self-conscious. He felt his group members helped

keep him calm and there wasn't anything else they could have done to put him at ease. He did not recognize that he did not receive feedback on an item performed incorrectly, which may have decreased his frustration.

Sometimes the members of this group did not spend the time to help this member grasp the skill. They told him that his measurements are too high, but didn't offer any feedback that would help him improve. At one point, a group member say, "new test subject," after the member having difficulty had another failed attempt. One group member attempted to help this member feel better by telling him that it took him a while to learn the skill, but didn't notice that he had the stethoscope ear pieces in backwards and also that the test subject had his arm raised the entire time. This didn't offer much solace to this person because his next comment was, "I am a failure."

The group was using the lab sheet when practicing the skills. They did not detect all errors, thus were not 100% effective at using the lab sheet to provide feedback. For example, one member used the lab sheet and made sure that another member had the cuff around heart level, but she missed that he had the stethoscope ears in backwards. Alternatively, the lab members provided feedback on how to more effectively perform the skill. For example, one member noticed that his peer was having a hard time holding the bell of the stethoscope, the meter and turning the knob to release the air in the cuff. He showed him how to position the bell and the meter in one hand in order to turn the knob more easily.

The group did provide each other with useful feedback. They had more corrective/detailed feedback than incorrect feedback or no feedback. They had a

discussion on various ways to find the dorsal pedal pulse and practice the skills as if they were and allied health professional measuring blood pressure on a patient. There are several instances where feedback was provided by several of the group members. For example, the following exchange occurred the second time one of the group members attempts to measure blood pressure for the first time:

Member 1: “Like this?” when he is putting on the blood pressure cuff.

Member 2: “You want it higher because you will put the stethoscope there” and points to the antecubital space.

Member 1: “It that tight enough?”

Member 2: “Yeah, it is going to tighten up too.”

Member 3: “Make sure you have the cuff around heart level.”

The ear pieces of the stethoscope were pointed the wrong way, so even though the group members were paying attention and providing feedback, they did not detect all errors.

There is room for improvement.

Some members of this group were distracted by the camera. One member stated, “We tend to joke to the camera and recorder whenever we’re doing the activities.

However, it’s helping us have a bit of fun.” Another member stated that it caused her to be shy and hesitant to talk at first. A different member said that he was quiet at first because he didn’t want to say anything stupid, but once they started he relaxed and just laughed when something out of the ordinary happened.

In review, control group 2 had the lowest percentage of descriptive feedback and the most items that were performed incorrectly that received no feedback. Assessment is

another area of improvement and they had one member who was highly frustrated when he couldn't grasp the skills. They did provide a majority of descriptive feedback and worked as a group to help each other learn.

Summary of Baseline Feedback

The baseline feedback shows that three of the four groups are roughly the same without any training. Experimental group 2 and both control groups provided around 50 feedback items; experimental group 1 only provided 23 comments. The groups missed 4-8 items performed incorrectly, which is considered minimal considering that each group correctly recognized 13, 40, 30 or 39 items performed incorrectly. Experimental group 1 provided the highest percentage of descriptive feedback (91.3%), while the other groups had 75.47%, 79.59% and 63.46%. Experimental group 1 was also the most even when considering if the feedback reaffirming (43.48%) or corrective (56.52%). The other groups tended to provide more corrective feedback, which ranged from 61.22%-79.59%. Based on the baseline feedback data, experimental group 2 and both control groups provided similar feedback and have room for improvement. Experimental group 1 provided good feedback, but needs to work on staying on task. Members in both control groups appeared to get more frustrated than the members of the experimental groups when concepts were not immediately grasped. Experimental group 2 and both control groups also tended to not use the lab sheet as a guide and is an area that needed improvement.

Feedback One Week Post Training

The second set of labs was completed one week after the experimental groups received the two day PAF training. The control groups did not receive any further instruction and watched a movie unrelated to PAF or the lab skills. Table 2 summarizes the scores of the feedback using the feedback quality scale.

Table 26. Feedback during the Wound Care and ICE Labs

	Experimental Group 1	Experimental Group 2	Control Group 1	Control Group 2
0	8	2	8	8
1	1	1	3	2
2	0	4	0	2
3	13	40	21	39
4	3	10	8	13
5	22	34	10	19
6	1	13	7	9
7	1	1	0	0
Total (+)	25 (65.79)	44 (48.89)	18 (42.86)	32 (42.67)
Total (-)	13 (34.21)	46 (51.11)	24 (57.14)	43 (57.33)
Total incorrect	2 (5.26)	2 (2.22)	3 (7.14)	2 (2.67)
Total general	3 (7.89)	14 (15.56)	8 (19.05)	15 (20.00)
Total descriptive	33(86.84)	74 (82.22)	31 (73.81)	58 (77.33)
Total Comments	38	90	42	75
Disagreements	2	0	0	3

Experimental Group 1

Experimental group 1 provided more feedback to each other during the second set of labs (38) than the first set of labs (23). The skills sets are different so the differences in the feedback may be related to the differences in the skills, but this group provided the

least amount of feedback on both sets of labs when compared to the other groups. Interestingly, their percentage of descriptive feedback decreased from 91.3% to 86.84%. But this is still higher than any other groups by 4.62-13.03%. This group also increased the number of items that were performed incorrectly that did not receive feedback. Another interesting thing to note is that their percentage of feedback of items performed correctly is much higher than the percentage of feedback on items performed incorrectly. The percentage of corrective feedback during the first set of labs comprised 56.52% of the feedback, but only made up 34.21% of the feedback during the second set of labs. The fact that this group did not make as many mistakes could account for the percentage disparity. For example, this group only made mistakes on 21 items on both of the days as compared to the 47 mistakes that the experimental group 2 made, the 34 mistakes control group 1 made and the 51 mistakes control group 2 made. Since most groups did not provide as much reaffirming feedback, it was suggested in the training to provide reaffirming feedback as a way to reinforce learning and increase a person's confidence and acceptance of feedback.

This group seemed confident in their skills and sometimes acted like they were in real situations with real patients. They were more on task during these sessions than the blood pressure and pulse labs. They did not provide a lot of feedback on the first day, but many items were performed correctly and did not need corrective feedback. An example of corrective feedback can be seen through a subject's response to a peer that was having difficulty applying the roller gauze, "It will be easier if you put it (the roller gauze) in your dominant hand- because you are trying to apply pressure. But at the same time you

are trying to put the dressing on. You don't want it to spin onto the ground like I did."

They skipped steps occasionally during the lab practice time. Sometimes, the person who skipped the steps acknowledges that the step was skipped and talked through what she would have done. For example, one of the subjects was going to wrap an ankle of a peer. The peer started to take off her sock, but the subject performing the skill told the peer she didn't have to take off the sock because her foot would get cold. Although a step was skipped, they discussed proper procedure and both understood that a step was skipped.

One of the things suggested in the training was to use questioning as a method to prompt a peer that a step was skipped. This group utilized this strategies several times. For example, one subject applied a compression wrap to a peer's ankle and couldn't remember the next step. The peer said, "Can I take it off at night?" This prompted the subject to remember the next step and she said, "Ummm, no. You can loosen it if you want to..."

They could have been more on task, but they were more on task during this lab than the first lab. Several times they talked about what they need to do for the test- not how to better the skill. For instance, one subject was practicing the ICE procedure and questioned, "So you wrap it and then ice it?" and looked at the lab sheet to check. Her peer stated, "She said you could do it that way or the other way." This helped answer her peer's question, but they did not discuss why they would perform the skill differently based on the situation. On the second lab day they finished early and were talking about material unrelated to class and several went on their computers. They were given some pictures of different scenarios and asked how they would treat the different injuries. They

talk about the scenarios and what they would do, but they don't give feedback on each other's thoughts.

When asked in a member check if they thought if the PAF training had an effect on the labs, they all said that it had a positive effect. One wrote, "I think the feedback training made us more aware of the type of feedback that we gave. I remember that we made a point to give specific, immediate and positive/constructive feedback." Another stated, "My feedback was more meaningful and purposeful." A subject also gave an example of what aspect she thought was valuable, "... my other two group members gave each other the "sandwich" style feedback. It was very beneficial."

To summarize, experimental group 1 needed to work on providing more feedback and staying on task based on the baseline data. They provided more feedback and were slightly more on task during this set of labs, but this is still an area that needs improvement. However, they still gave the least amount of feedback of all of the groups, possibly because they made the fewest errors. Occasionally they were more concerned with the testing than the skill at hand. They continued to lead the groups in percentage of descriptive feedback and they made good clinical connections. Several strategies suggested in the PAF training were used, and all members thought the PAF training improved the feedback they provided and received.

Experimental Group 2

Experimental group 2 had the most comments for this set of skills and it was split fairly evenly between reaffirming and corrective feedback. This group had some problems understanding the skills based on the initial instruction and they provided

feedback to each other that corrected misconceptions. Only two items performed incorrectly were missed and received two pieces of feedback that were incorrect. This is an improvement when compared to seven and two during the blood pressure and pulse labs.

The group used some of the techniques taught to them during the PAF training that they did not use during the first set of lab skills. All of the subjects talked out loud while practicing the skills, and this helped encourage self assessment and the peers watching knew if the steps were done with intent or haphazardly. For example, one subject was practicing wound care. She said, "First you apply the gloves. First you apply the gauze, well probably not like that (she applied the gauze in a rough manner)." Her peer responded, "Don't you clean first?" This was incorrect feedback to an item performed correctly. The subject recognized that the feedback was not correct and responded, "No you apply (gauze) first, you have to stop the bleeding." This helped her correct her peer's misconception about the skill. This same subject does a good job of asking for feedback when she is unsure of her skills. During the same skill she asked, "I am not quite sure, am I pushing too hard?" Her peer responded no. Asking for feedback is an effective strategy because the peer might not have provided feedback without the subject asking for feedback. The peer also provided feedback without being prompted. The subject was applying to the brachial artery for the pressure point to stop bleeding and said, "So then you elevate it and press right here." The peer gave visual feedback and responded, "Fingers here." Because the subject was using her thumb instead of her four fingers. They also used the sheet to confirm and asked an instructor when there was

confusion. Although, these techniques were used by some of the control groups, this particular group did not do this during the first set of lab skills. The group also constructed scenarios in which they would use the skill, such as making an ice bag for a hockey player that was struck in the head with a hockey stick.

One interesting bit of feedback was when one group member did not clean the wound from the middle out. A different group member said, “Make sure you move it away from the wound. I am just helping you, I don’t want you to get points off. Make sure you move it away from the wound, she said clean it away.” She provided correct feedback, but was not confident and didn’t want to offend the other group member. The student receiving the feedback did not take offense and responded with, “Ahh, clean away. Good to know.” On the second lab day a subject received feedback on a different way to wrap an ankle. The other group member said, “It looked like you might want to try and go up and go down in the figure eight thing. That helps it stay on better.” The peer providing feedback has done this skill before and is providing feedback on a different way to perform the skill. On the daily evaluation the subject used this as an example of feedback that was not helpful. During the member check I asked him why and he stated “One of my lab members said the best way to wrap in a figure 8 which I didn’t feel so, that’s all. Probably because I am better at wrapping it regular.” Even though they provided better and more feedback, their lab session still had some areas that needed improvement.

Furthermore, although the group members provided a lot of descriptive feedback, some feedback could have been better. For example, one subject was visibly struggling

with tying the ends of the roller gauze in the way instructed in class. One peer giggled and gave no feedback. Another peer was distracted and didn't notice the difficulties the subject was having so the subject asked the peer, "Which way is the easiest way to do the knot?" The peer then gave corrective oral and visual feedback.

Similar to other groups during this set of lab skills, this group skipped some steps. Once a person did not take off the gloves correctly and several did not take off the sock to wrap the ankle. They did acknowledge that they were skipping steps or not doing the skill 100% correct. A subject gave a peer feedback to ensure the peer knew she did not perform the skill correctly, "You know how to take off the gloves without contaminating, right? I just want to make sure that isn't what you are going to do during the test." Although they skipped steps or performed an item incorrectly, it was acknowledged and it should improve future performances.

The group members state that they work well together, but there still may be some hesitation. One subject wrote during a member check, "I still think that people in my group have a hard time giving feedback. I think they are worried that other people in the group will get offended." Another stated, "[We were] more cohesive this time because we have done several labs together already." All subjects felt the PAF training had a positive influence on their labs. For example, one subject wrote, "I do feel the fb training had an effect in that it taught some the correct way to give fb and what type of questions to ask." Another stated, "I liked that the peer review and feedback was explained as far as what was expected of us and how to go about approaching feedback successfully. Our feedback improved.... Everyone was more specific and not scared to correct people. I felt

more confident going into the 2nd practical than the first.” One subject identified a negative, “Analyzing and providing feedback for our every move actually caused us to lose time and everyone didn’t get to practice the same amount of time.” Although the time needed to provide feedback was perceived as a negative, improper practice without feedback or correction is not worth the time spent practicing.

To synopsise, experimental group 2 increased the amount of feedback they provided to each other; they had the highest number of comments out of all four groups. This group also had the fewest number of items performed incorrectly without feedback. From the baseline data, it was evident that group needed to improve the accuracy of their assessments and increase the percentage of descriptive feedback, improve their acceptance of feedback and enhance group cohesion. Based on the videos of the second set of labs and the member checks, the group was successful in improving the first two items. However, the group still has some room for improvement with group cohesion and the acceptance of feedback. Some evidence also showed that there are some hesitations of the peer being offended when providing feedback. All group members thought the PAF training enhanced their labs and they implemented many of the suggestions of the PAF training.

Control Group 1

During the second set of labs, control group one did not change considerably. Again, the skills sets are different so the differences in the feedback may be related to the differences in the skills. But this group actually provided less feedback that during the first set of labs while all of the other groups increased the amount of feedback provided.

The most noteworthy thing is that their percent of descriptive feedback decreased from 79.59% to 73.81%. Furthermore, they doubled the amount of items that were performed incorrectly and received not feedback and they had three incorrect feedbacks where they did not have any the first set of labs. Their distribution of feedback regarding items that were performed correctly and incorrectly was more evenly distributed at 42.86% and 57.14% respectively.

Qualitatively, this group seemed to work more cohesively during these lab sessions. The two subjects that had problems during the first lab session worked together and seemed more confident. During a member check, one of the previously frustrated subjects stated that this set of skills was not as difficult as the first set of labs. Another subject responded, "The group worked well together. We are starting to get to know each other a little more so we were more comfortable working with each other this time." However, they were more on task during the first lab session. Several subjects were texting or looking on their phone when a peer was practicing. During day two they sat for several minutes doing nothing and talking about other classes and items not related to class. I tried to keep them on task by giving them photos of different injuries and having them discuss how they would treat the wounds. They talked about them briefly, but when I left they talked about items not related to class. One member recognized this and wrote in her member check, "We were probably more on task the first day than we were on the second because by the second lab it was review and we did not feel like we needed much practice anymore."

Three of the students talked themselves through skills. This was a technique suggested to the experimental group during the training as a way to self assess and so that the group members know that you understand the skill rather than doing the skill correctly by chance. This is an example of how students innately do what is in the training, and thus, the training may not be necessary for this aspect. They also asked for clarification for items they were confused about, such as when to clean the wound; this was another thing emphasized during the training.

Several times during the lab practice time, the students skipped steps and there was no feedback that steps were skipped. For example, one student was practicing wound care and skipped five of the 14 items. Her group members did not recognize that she skipped that many steps and they were not using the lab sheet to guide their practice.

One of the students was the self proclaimed “cheerleader” during day two. She gave a lot of generic positive feedback, but felt that it was an important contribution to the group. Her feedback included, “Woo hoo,” “Awesome,” and “You did a great job.” Although this may be great for moral, it does not help improve skill performance.

A majority of the feedback was descriptive in nature. For example, when one subject asked her peer if she was applying pressure to the brachial artery in the correct spot in order to stop bleeding, the peer answered, “Uh huh, right between the two muscles.” Some of their feedback even included clinical connections. For instance, when one student did not remember what she had to say before treating a patient, a peer responded, “Can I help you? Can I assist you? You have to ask for consent first. Because

some people won't want your help. Which is a legal issue. If you help somebody that doesn't want to be helped, they will sue you.”

To summarize, the feedback that control group 1 provided during the second set of labs was not as high of quality. Their percentage of descriptive feedback decreased to 73.81% to 79.59%. Furthermore, the frequency of feedback decreased while all other groups increased the number of feedback provided. They also doubled the number of items that were performed incorrectly and had no feedback. Although the numbers are worse, the group was still able to provide descriptive feedback and make clinical connections. They also used some of the strategies suggested during the training even though they did not receive the PAF training- three of the four talked themselves through the skills. But they did not utilize the lab sheet to assess each other and provide feedback and they tended to skip steps. According to the baseline data, this group needed to improve on giving specific details, using the feedback to improve future performances, focusing on the skills and not the exam, and staying on task. The group did a better job of using the feedback to improve future executions of the skill and they were more focused on the skills as opposed to the practical. However, they used more descriptive feedback during the first set of labs and they were more off task during this set of labs. These two areas need improvement as well as using the lab sheet as a guide.

Control Group 2

Control group 2 improved slightly from the first set of lab sessions; their descriptive feedback increased from 63.46% to 77.33% and their incorrect feedback decreased from 3.85% to 2.67%. Although these were improvements, they still had eight

items where the peer performed and item incorrectly and there was no feedback. Furthermore, they had a lower percentage of descriptive feedback than the two experimental groups.

During the second set of labs this group had a more evenly distributed percentage of reaffirming feedback (42.67%) and corrective feedback (57.33%) and compared to 25% and 75% respectively during the first set of labs. In some instances, the peers provided reaffirming feedback and gave encouragement. However, the feedback was general and did not state what specific item was being evaluated. For example, one subject had difficulty tying the end of the roller gauze in a method where the knot provided extra pressure over the wound. The group members did a good job providing corrective feedback by saying things such as, "... and then you fold it over. Basically folding that up there. Bring it around to this side... and tie it over the wound." And "It is just like tying your shoes." But when the peer successfully finished the skill, the feedback from two of the peers was, "There you go." This type of feedback did not tell the person performing the skill what item was performed correctly. Although the student might assume that the entire skill was performed correctly, descriptive feedback would ensure what items were performed correctly.

They were in a very sarcastic mood the first day and joked around a lot during the second day. The sarcasm may have lightened the mood, but also got in the way of proper feedback. For example, a subject wrapped a wound with roller gauze and had a minimal amount left over when the skill was finished. The feedback provided was, "Nice, so you have some spare in case you start bleeding on the way home." This was incorrect

feedback on an item performed correctly. And if there was excess roller gauze, corrective feedback should have discussed the purposes of using roller gauze and the proper procedure. Furthermore, even when the skill was not performed correctly, sarcastic feedback was ineffective. One subject was practicing wrapping an ankle with an ace wrap and asked a peer, "How do you think I did that?" The sarcastic feedback provided was, "My ankle feels stiff." This feedback did not provide any details for what was performed correctly or incorrectly; stiff is not an adequate descriptor to even determine if the skill was right or wrong. In a member check, one of the subjects wrote, "Our group is really good about giving feedback to each other and if one of us messes up we normally joke with them about it, but at the same time give them pointers on how to fix it in a way that doesn't make them feel dumb." The sarcasm may have been a method to help the person receiving the feedback to accept it and not feel down, but it was not always an effective method. One positive about the mood of the group the member that was easily frustrated during the first lab session was more confident during these two lab days.

The group did some of the things taught during the PAF training, even though they did not have the training. The group used the lab sheet to guide their practice. For example, one subject was practicing wound care and asked, "When do we use the antiseptic?" The peer he was practicing was unsure of the order of the steps and used the lab sheet to go over the order of the steps. Some also talked out loud while practicing the skills- and used the lab sheet when they were stuck on the proper order. They were off task talking about classes, fall break and a paper. There were two instances where they were confused about an item and did not ask an instructor for help even though I came

by soon after that and asked if they had any questions; there was also one item of confusion in which they did ask an instructor. Interestingly, the ability to ask the instructor was noted as a positive by one of the subjects in a member check, “They (the labs) were perfect for learning the skills because after we got your instruction we know what is required of us and how to do it. After that since we’re working with our peers if we have any questions or problems we feel comfortable to ask them and we can normally figure it out. It’s also positive that we have several people (instructor and teaching assistants) overlooking the sessions so that we can split up into different rooms and each have our person to go to with any questions.” The subject felt like he could discuss questions with his peers and then ask any unanswered questions to an instructor. But, the video analysis showed that they had three areas in which they needed further explanation, but only asked an instructor about one of the items.

In review, control group 2 increased their percentage of descriptive feedback. They had the greatest percentage increase in descriptive feedback out of all the groups, but their percent of descriptive feedback was less than both of the experimental groups. As found in the baseline data, this group needed to increase the percentage of descriptive feedback, decrease the number of items performed incorrectly without any feedback and improve assessment. They increased the percentage of descriptive feedback, but this could be increased even more for a more effective PAF session. There was no change in the number of items performed incorrectly without any feedback or in the number of incorrect feedback provided. Furthermore, data from the second set of labs suggests they need to decrease the sarcasm and joking around to improve the feedback and they need to

remember to ask the instructor when there is confusion. The group members did a good job of using the lab sheet to guide their practice and talking themselves through the skills; these were suggestions during the PAF training which they did not receive.

Summary of Data

All of the groups increased the amount of feedback they provided. The experimental groups had the highest percentage of descriptive feedback (86.84 and 82.22). However, experimental group 1 decreased from their baseline of 91.3%. The experimental group implemented many of the strategies suggested in the training and gave descriptive feedback that the members found helpful.

Control group 1 actually decreased the amount of feedback they provided from the first set of labs by 14.29%, when all the other groups increased the amount of feedback provided. Experimental group 1 increased their feedback by 65.52%, experimental group 2 increased their feedback by 69.81% and control group 2 increased their feedback by 44.23%. It appears that the training may have prompted the subjects in the experimental group to increase the amount of feedback provided.

During the first set of labs, all groups provided more feedback on items performed incorrectly. It was stressed during the PAF training to provide feedback on both items performed incorrectly and items performed correctly. During this set of labs, experimental group 1 gave a higher percentage of feedback on items performed correctly (65.79%), but again, this may be due to fact that subjects in that group did not have as many errors as the other groups. The other three groups narrowed the margin of

difference between the amount of feedback on items performed correctly and incorrectly; they all provided more feedback on items performed incorrectly.

Feedback Three Weeks Post Training

The crutch fitting and splinting labs occurred three weeks after the experimental group received the PAF training. Again, the control groups did not receive any type of training on how to assess or provide feedback. Table 3 shows the scores of the feedback using the feedback quality scale.

Table 27. Feedback during the Crutch Fitting and Splinting Labs

	Experimental Group 1	Experimental Group 2	Control Group 1	Control group 2
0	2	7	10	7
1	2	2	0	7
2	1	1	4	6
3	22	60	56	38
4	3	8	4	5
5	12	20	12	7
6	5	3	8	7
7	0	3	0	7
Total (+)	20 (50.00)	28 (29.79)	16 (21.05)	12 (17.14)
Total (-)	20 (50.00)	66 (70.21)	60 (78.94)	58 (82.86)
Total incorrect	2 (5.00)	5 (5.32)	0 (0)	14 (20.00)
Total general	4 (10.00)	9 (9.57)	8 (10.53)	11 (15.71)
Total descriptive	34 (85.00)	80 (85.11)	68 (89.47)	45 (64.29)
Total Comments	40	94	76	70
Disagreements	4	2	3	4

Experimental Group 1

Experimental group 1 gave the most feedback during this set of labs, but it was the lowest percentage of descriptive feedback (85% compared to 91.3% and 86.84%).

Experimental group 2 and control group 1 provided a higher percentage of descriptive feedback. The subjects did not give feedback for two items performed incorrectly and gave feedback incorrectly twice. Interestingly, some of the subjects did not feel there was a difference in the feedback provided and received. One subject stated she thought she was more accurate because the material was more difficult. She wrote in a member check, "This [the increased difficulty of the skills] in turn caused me to concentrate more on how I would give feedback and also how I would receive feedback because I needed to become accurate with my skills." A different subject wrote, "I don't feel like it was more difficult... if anything I think it was one of the easier ones. There was more explanation involved." The feedback was split evenly between feedback on items performed correctly and incorrectly. Again, this group made the fewest mistakes out of any of the groups. They made 22 mistakes while experimental group 2 made 73, control group 1 made 70 and control group 2 made 65.

Although the feedback was not as high of quality, they were more on task than previous lab sessions. They did a good job of clarifying with me when they had questions, but used the rubric and discuss the skill first. As compared to the control groups who did not discuss the skill first and tended to ask me without trying to figure it out for themselves. They also did a good job of thinking critically about how they would use the skill in the real world and different scenarios they might encounter. For example, they thought critically about how they would splint the forearm of a person wearing long sleeves. They discussed the reasons for leaving the sleeve down and pulling up the sleeve. When they did not come up with a consensus, they asked me for clarification.

While filling out their daily evaluations, one of the subjects stated that she felt they received the most feedback from me. I had more interaction with them on this day, but they asked a lot of questions that showed they were thinking about clinical application of the skills. They also discussed alternative methods of the skills that are acceptable, such as holding both crutches in one hand and using the railing instead of the method taught in class where the patient uses both crutches. The feedback provided tended to be given in a confident manner. For example, one subject finished applying a sling and a peer responded, “The only couple of things I would say was you didn’t check- you have to check both sides, to compare. And then also, if you, to make it as tight as the sling can be. Like once you get it on there, like that... you see how it is a little gappy? You want to take it all the way across. And then do that.” The peer provided verbal and visual feedback that not only identified what was wrong, but also how to improve future performances.

The group did provide a majority of descriptive feedback, but there are examples of general feedback that would not help a peer learn or improve the skill. This can be shown through an example where a subject was trying to splint a forearm fracture, but avoid putting pressure on the fracture site. The subject said, “It is kind of hard to go around it.” The peer responded, “Yeah, you just do the best you can.” A discussion on methods, such as angling the ace wrap differently, would have much more beneficial for the subject.

One thing that is noticeable throughout the semester with this group is their tendency to end early. In member checks, the group members stated that they were

comfortable with the skills and didn't need as much time to practice. Some of these students had previous experiences and did not feel like they needed to practice the skills as much. Often the students were on task for the most part, but would get side tracked with discussions. They would also take out their laptops at the end of the class and work on items other than lab items. Even when I would bring in additional activities (pictures of other wounds, other body parts to splint) they would get off task once I left the group.

To conclude, this group gave a lower percentage of descriptive feedback each successive lab session; their amount of feedback increase each set of labs. Even though their percentage of descriptive feedback decreased each time, they provided the highest percentage the first two sets of labs and on the third set of labs, there was not a huge gap between this group and the other experimental group. Their largest issue throughout the semester was staying on task. They provided the least amount of feedback compared to the other groups each set of labs. This group is unique because several of the members had past experiences and they made the fewest mistakes of any of the groups.

Experimental Group 2

Experimental group 2 continued to have the highest number of comments provided. The gap between the number of comments grew larger during this set of labs. They provided 85 more comments than control group 1, 24 more than control group 2 and 54 more than experimental group 1. As described above, they also had the largest number of errors while practicing the skills. They improved their percent of descriptive feedback and had the second highest percentage of the four groups. During this set of labs they provided 85.11% descriptive feedback, previously they provided 75.47% during the

first set of labs and 82.2% during the second set of labs. In contrast, this group gave the highest percentage of incorrect feedback (5.32%) during this set of labs. There were seven items performed incorrectly without any feedback during this set of labs, they also missed seven during the first set of labs but missed only two during the second set of labs.

The first day this group only had one student practice. Although all the groups had the same amount of time, they did not get through as many skills because the one person had a hard time performing the skill. One member did not participate at all during the first lab day. She tended to be quiet during a majority of the lab sessions. During her member check this subject wrote, "Our group worked together very well. We alternated days on who would actually practice the skill, which was effective." Observing the first day gave this subject more confidence to perform the skill on the second day of the labs.

They provided each other more feedback on the second day where they rest of the members had ample time to practice; the peer that practiced the first day was not there on the second day. They did provide five incorrect feedbacks and missed seven items performed incorrectly. But that is offset a bit by providing 80 detailed feedbacks and 9 general feedbacks that were correct. An example of how the three worked together to learn instructing a person on stairs can be seen through the following:

Member 1: "OK, up up the stairs you use your ummm, uninjured leg first."

Member 2: "So this part of my body is not splinted, so give me instructions."

And shakes her right leg

Member 1: “Start with your left leg first. And umm. And then to go down the stairs- is there something else I need to tell her?”

Member 3: “Follow through with the crutches.”

Member 1: “OK, follow through with the crutches.”

This allowed member 1 to not only check her knowledge, but give instructions to a peer like she was a real patient.

The feedback was not always descriptive and it was evident that the group’s cohesion issues were improving. For example, one subject had difficulty instructing a peer to walk non-weight bearing with crutches. They had the following discussion after the skill was complete:

Member 1: “So how was that?”

Member 2: “That was good. The reason why I didn’t know what to do was because I was following your directions.”

Member 1: “Yeah. I know my directions were not too good.”

Member 2: “No, they were good. They were good afterwards because you were specific and you told me, like, exactly what I needed to do. First when you said shift your body weight forward...” and mimed how she just leaned forward and almost fell over because she was following his directions exactly.

Member 1: “Yeah.”

This dialogue was between the two subjects that had feedback acceptance issues in the previous lab regarding wrapping an ankle using the figure eight method. This is evidence that the subject is better at accepting feedback and they can have a discussion about what

went well and what needed improvement. The “that was good feedback,” was not specific enough to let the subject know what was performed well, but the feedback that followed let him know what part of the skill she was referring to.

They frequently used the lab sheet to check their knowledge and stayed on task the entire time. They tried to make clinical connections by discussing how to splint other parts of the body. They tried to use their knowledge of splinting theory and what they practiced in class to decide how to splint a broken hip. However, they didn’t have the practical experience to alter what they know in order to effectively perform the skill.

To summarize, experimental group 2 continued to improve their percent of descriptive feedback and increase the amount of feedback provided. Conversely, they had the highest percentage of incorrect feedback during this set of labs. Items that needed improvements based on previous labs included accurate assessment and group cohesion. They improved in these two areas with each set of labs. They implemented several of the strategies discussed in the PAF training. Perhaps they would make even greater improvements if their feedback was examined in future semesters since the third set of labs occurred only three weeks after the PAF training.

Control Group 1

Control group 1 made improvements during the third set of labs. Most notable, their percent of descriptive feedback was 89.47%, highest out of any of the groups and much better than the previous labs that had 79.59% and 73.81% descriptive feedback. They also provided 76 total comment, second highest of all of the groups. There was not

incorrect feedback provided, but there were ten items performed incorrectly without any feedback.

The group seemed more on task this time than other lab sessions, possibly because the skills were harder. They offered a lot of corrective feedback, which was essential for their learning because they made 70 mistakes. This session 78.94% of the feedback was for items performed incorrectly, where it was 61.22% the first lab session and 57.14% the second lab session. I hypothesized that this group was more on task because the skill was more difficult. I asked them in a member check and two responded that their skills weren't more difficult but one stated, "The only thing that was a little difficult about the crutch fitting part were remembering all the instructions to give the patient/client. It seemed simple, but just needed more practice." Another subject responded, "I think the labs were the same as any other, it just required a bit more independent study in memorizing the material." The subjects in this group stated earlier that the items in the first two sets of labs were easy and it appears that the multiple steps required of this set of skills kept them on task and improved their feedback. There were some instances where the group did not know how to answer a question. They asked a TA or me questions regarding proper procedures. They also used the rubric to guide practice, although they still missed some mistakes when looking at the guide sheet. For example, the group practiced partial weight bearing walking with crutches. One student used the rubric to guide another student, but the skill was not performed correctly and it was not correctly assessed. The feedback provided was, "you got it." It appears the members of this group may still need improvement in assessing.

They were using some of the things suggested during the training, even though they did not receive the training. One thing was that the first day they tended to use the rubric. On the second day they student performing the skill tried the skill unaided. One student asked a group member to use the sheet to let her know if she was performing anything incorrectly.

One notable point in this set of labs is regarding one member who gave descriptive feedback and also used probing questions and examples in order to help her group members learn the material. These were suggestions in the training, which she did not receive. For example, one peer had difficulty with instructing crutch walking for going up and down stairs. The subject used descriptive feedback and probing questions to help her peers better understand the skill, “Well if you think about it, OK. Let’s look at the chair, pretend that the chair is a step. So if you go up what would you do?... The uninjured one first. So you would go like this and your crutches are behind you to put you up the stairs...” She used the chair as a prop and mimed going up and down stairs with crutches. She also did a good job emphasizing points that we went over at the beginning of the lab that were mistakes I and the TAs saw during the first lab session by saying, “Remember what she just said. She wanted it in neutral. She wants it down. A discussion on why the wrist needs to be splinted in neutral and not in extension could have further improved this conversation. However, she made a lot of mistakes herself when performing the skills and did not self assess. This is a case where the subject was able to provide beneficial feedback to her peers while not being able perform the skills correctly herself.

Other members of the group provide descriptive feedback. One member was practicing the sling and binder skill. She was not sure how to apply the binder. Her peers gave her feedback such as, “You want to go under this arm,” and giving visual feedback on how to perform the skill. Using both verbal and visual feedback should help the peer fully understand the skill. There are also examples of general feedback. One subject was frustrated with how her splint turned out. She stated, “That is so bad, but I don’t know what else to do.” Her peer responded, “It stayed on, it is splinting, so....” This feedback did not describing what was performed correctly or incorrectly and would not likely help the subject’s confidence or improve future performances. Another interesting finding is with a subject who tended to provide the least amount of feedback. A peer practiced splinting before she did on the second lab day and forgot to check sensation before and after splinting. The subject then practiced splinting and remembered to check all of the distal functioning, including sensation. She was able to accurately perform the skill, but was not able to accurately assess and provide feedback to a peer performing the same skill.

One obvious difference between the experimental groups and control group¹ is how often this group checks their cell phone during the lab sessions. Three of the four members in this group were frequently checking their cell phones and receiving text messages. Checking text messages was an item shown in the “what not to do” video and it was emphasized that group members needed to be present during the lab sessions; subjects in the experimental groups did not used their phones during lab sessions.

In summary, this group made improvements in their percent of descriptive feedback and time on task. They still had some issues with time on task because members were checking their phones and text messaging, but there were not any major lulls like there were the first two sets of labs. Based on the first two sets of labs, this group needed to improve on using descriptive feedback, being more on task, and using the lab sheet as a guide. The group improved on all of these areas, with room for further improvement in time on task. It appears that with this group the increased number of items required to execute the task and also time helped improve their feedback.

Control Group 2

The third set of labs was more difficult for control group 2. Twenty percent of the feedback provided was incorrect. This is a dramatic increase from 3.85% during the first set of labs and 2.67% the third set of labs. Their percent of descriptive feedback also fell to 64.29% from 77.33% during the second set of labs. It is still better than the first set of labs where only 63.46% of the feedback was descriptive. Also, 82.86% of the feedback was corrective.

The subjects were more frustrated this time, especially two of the group members that worked together that did not have previous experiences with the skills. One of the frustrated individuals would ask one of the other two who she was not working with questions instead of her partner. I asked her during a member check why and she stated, “The reason I often ask [the other two] as opposed to [the peer I am working with] is because me and [the peer I was working with] worked together so much if we were not getting something we would ask [another peer] just because he always seemed to get the

hand of the skill faster than everyone else.” She would also go directly to me for feedback instead of going to her group members. She also stated, “I was having trouble getting the hang of the skills and I felt pressured to get them in the two day period that we have so that lead to a lot of my frustration.” She also admitted that she was less confident during these lab sessions than previous lab sessions and she felt, “It affected how I provided feedback because I wasn’t confident in the skills therefore I provided little to no feedback.” It is evident that the lack of previous experiences and lack of confidence greatly affected how this group provided feedback to each other during this set of labs.

The subjects gave 14 incorrect feedbacks and missed 7 things performed incorrectly. There were also instances where a peer performed a skill and did not receive any feedback. They did use the rubric as a guide, but had problems interpreting the rubric. The lab sheets have been used for that class for over seven years and used previously in the athletic training education program. Furthermore, at the beginning of each lab session we went over the skills and had a time for students to ask for clarification. It appears to be an issue with their ability to use the rubric rather than the rubric itself. Other groups did not have as much difficulty with the skills or using a rubric as a guide, although control group 1 had minor issues. One subject wrote during his member check, “I was intimidated by all of the steps listed but once I studied it I was able to remember them easily. We still had good feedback but there wasn’t really too much to give because we were constantly referring to the sheet so there was little room for error.” This subject did not realize the amount of incorrect feedback that he provided or that his peers offered him. Occasionally it was their ability to assess what was causing the mistake. For

instance, on the second lab day a subject was fitting a group member for crutches. A peer not participating in the skill noticed that the crutches were too tall. There was not the 2-3 finger widths under the armpit like instructed. However, it was because the person being fitted for the crutches was looking at his toes and not standing up. The crutches were the correct height if the patient would have been positioned correctly, but this was not recognized.

The peers provided useful feedback to each other even though there were some issues. For instance, one of the subjects could not remember how to apply the binder after slinging a peers arm. The peer said, “Remember you just wrap it up and go underneath his arm. Underneath this one I mean. And they you just secure the arm to his chest,” and provided visual feedback. The verbal and visual feedback helped the peer understand the skill and successfully complete the skill. An example of how the peers checked misconceptions is shown through the following dialogue when they were practicing splinting with the vacuum splint:

Member 1: “I think that’s the opposite way. Yeah, I can feel the air going in.”

Member 2 switches the pump to the vacuum splint and starts pumping

Member 2: “I think it is supposed to be the opposite way.”

Member 1: “No, it is getting tighter though.”

Member 2: “No, you’re supposed to suck more out.”

Member 1: “It’s weird because it feels tighter this way, but looser the other way.

Maybe it’s not supposed to be tight.”

Member 2: “Nah, it is supposed to get tight. But I think is supposed to get tight, like suction tight.” And he switches the pump to the vacuum splint back to the correct way.

Member 1: “There it is, it’s getting there.”

This shows that the members helped correct misconceptions through the theory of the vacuum splint and not just memorizing the skill. This should ultimately help with long term learning and being able to use the skill during professional practice.

In conclusion, control group 2 had the most issues with this set of labs due to their lack of confidence, lack of previous experiences and inability to successfully use the rubric as a guide. From the baseline data it was concluded that this group needed to increase the percentage of descriptive feedback, decrease the number of items performed incorrectly without any feedback and improve assessment. The percentage of descriptive feedback is similar to the first set of labs and 13% less than the second set of labs. The number of items performed incorrectly without any feedback remained fairly constant over the three sets of labs (8, 8 and 7). They still had problems properly assessing each other skills, as proven through the 20% incorrect feedback during this set of labs.

Summary of Data

Two of the groups, experimental group 2 and control group 1 increased their percentage of descriptive feedback. Conversely, experimental group 1 and control group 2 decreased their percentage of descriptive feedback provided. Experimental group 1 declined in their percentage of descriptive feedback with each lab session, but they were higher than all the other groups the first two set of labs and close to two groups during the

third set of labs. They still had issues with staying on task, but improvements were seen. Experimental group 2 continued to show increases in their percentage of descriptive feedback and improvements with group cohesion. Remarkable improvements were seen with control group 1, especially after the quality of their feedback decreased during the second set of labs. Control group 2 had roughly the same percentage of descriptive feedback, but increased their percentage of incorrect feedback by over 16%.