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Peer-Assisted Learning and Orthopaedic Evaluation Psychomotor Skills

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Context: Athletic training educators often anecdotally suggest that athletic training students enhance their learning by teaching their peers. However, peer-assisted learning (PAL) has not been examined within athletic training education to provide evidence for PAL's current use or for its use as a pedagogic tool.

Objective: To assess the effectiveness of intentional, formal PAL on the performance of psychomotor skills and to identify students' perceptions of PAL.

Design: Randomized, pretest-posttest experimental design.

Setting: Athletic Training Research and Education Laboratory.

Patients or Other Participants: Fifty-one undergraduate students (27 athletic training majors, 24 nonmajors).

Intervention(s): Review sessions led by either an Approved Clinical Instructor or peer tutor.

Main Outcome Measure(s): We assessed pretest and posttest performance scores (number of correct skills) and the amount of time to complete the psychomotor skills in 3 categories of orthopaedic evaluation of the hand and wrist for subjects assigned to either a peer tutor or an Approved Clinical Instructor review group. Using the Athletic Training Peer-Assisted Learning Assessment Survey, we evaluated the perceptions of students assigned to the peer-tutor group regarding the benefits of, and preferences for, PAL.

Results: Differences in the pretest-posttest skill scores were noted in both groups ($P < .05$). No differences in the posttest skills scores or the times to perform the skills were seen between the groups. The Athletic Training Peer-Assisted Learning Assessment Survey revealed that most (n = 19, 70.4%) of the subjects felt less anxious when practicing psychomotor skills with peer tutors than with the laboratory instructor, and many students (n = 12, 44.4%) felt more self-confident when practicing psychomotor skills with a peer tutor.

Conclusions: Peer-assisted learning appears to be a valid method for improving athletic training psychomotor skills. Peers can be resources for practicing clinical skills and report benefiting from the collaboration. Peer-assisted learning should be deliberately integrated into athletic training education programs to enhance student learning and collaboration.

Key Words: athletic training education, peer education, peer teaching, clinical instruction, athletic training students

Key Points

- Peer-assisted learning was as effective as Approved Clinical Instructor–led skill review in improving students' orthopaedic assessment skills for the wrist and hand.
- Many subjects participating in peer-assisted learning reported less pressure, embarrassment, and anxiety performing psychomotor skills in front of a peer tutor as compared with a laboratory instructor. Thus, peer-assisted learning may contribute to a positive learning environment.
- The use of peer-assisted learning, while effective, should not replace the initial instruction of psychomotor skills by a clinical instructor or Approved Clinical Instructor. Rather, peer-assisted learning should be used to practice, to reinforce, and to review psychomotor skills.

Peer-assisted learning (PAL) has long been recognized in theory, research, and clinical education as an educational experience in which students encounter mutual benefits as teachers and learners.[1–3] This literature advocates that students who are involved actively in their learning, rather than passively receiving information from an instructor, will learn more readily. Peer-assisted learning is a purposeful component of professional preparation programs in the fields of dentistry, nursing, occupational therapy, and physical therapy.[4] Positive outcomes identified by peer learners include a decreased level of stress or anxiety when working with peers compared with clinical instructors,[5] improved communication skills,[6,7] increased cognitive and psychomotor improvement scores,[8,9] increased confidence in clinical skills and decision making,[6,10] and improved organizational skills.[11] Positive outcomes identified by peer teachers include opportunities to practice leadership[12] and teaching[13] skills and to review and enhance understanding of clinical skills.[5,14,15]

Recognizing that students often naturally engage in PAL (eg, peer tutors, peer teachers, peer learners, peer coaches, peer leaders, peer supervisors), researchers recently have explored students' perceptions regarding the prevalence and benefits of, and preferences for, peer clinical education in athletic training.[4] This research reveals that 66% of athletic training students (ATSs) practiced a moderate to high number of clinical skills with other ATSs and that 60% of students reported feeling less anxious performing clinical skills on patients when in front of other ATSs than when in the presence of their clinical instructors. The researchers concluded that ATSs are using their peers as resources for practicing clinical skills and are benefiting from the collaboration. They recommended that PAL be deliberately integrated into athletic training education

programs to enhance student learning and collaboration. However, despite the apparently clear benefits of PAL, we should acknowledge that PAL does not always guarantee that skills are practiced or performed correctly.

Because athletic training clinical instructors are reported to be encountering role strain in their dual roles as clinicians and clinical instructors,[16] results from research on PAL may assist athletic training education program directors in creatively meeting the demands of rising student enrollments, increasing educational requirements, limited faculty, and the conflicting expectations of clinical instructors who simultaneously provide athletic health care and clinical education.

Even though it is being established that peer education is prevalent and beneficial in the athletic training clinical setting,[4] research is needed regarding the potential efficacy of PAL in athletic training clinical education. Specifically, evidence is needed to establish whether a formalized PAL program would provide clinical educators with a systematic method for ATSs to practice their psychomotor skills with one another before being evaluated formally on those skills by Approved Clinical Instructors (ACIs). Therefore, the primary purpose of our study was to compare the effectiveness of intentional PAL versus instructor-led skill review on student performance of entry-level psychomotor skills related to orthopaedic assessment. A second purpose was to assess the perceptions and preferences of students related to their PAL experience. The following questions guided this research: Is there a difference in psychomotor skill performance of the orthopaedic assessment of the wrist and hand, as determined by practical skills scores and the time to complete these skills, between students who attended review sessions led by peer tutors and students who attended review sessions led by an ACI? What are the perceptions and preferences of students toward learning from peer tutors in an intentional PAL program?

The ultimate value of this research is that the clinical segment of athletic training education could be enhanced in order to better prepare students to become proficient practitioners.

METHODS

Subjects

A total of 66 undergraduate students who were enrolled over the spring 2004 and spring 2005 semesters in the Ball State University (Commission on Accreditation of Allied Health Education Programs–accredited athletic training education program) courses on upper extremity injury evaluation were recruited to participate in this study. The same laboratory instructor taught all courses. The subjects were limited to the students enrolled in this course because of the type and level of skills being instructed. Students in this course (2 sections for each spring semester) consisted of 29 athletic training majors and 37 nonmajors (eg, exercise science and physical education majors). A total of 51 subjects (27 athletic training majors, 24 nonmajors) completed all requirements of the study (Table 1). Volunteers from each course section for each year were assigned randomly to either the ACI or the peer-tutor group. Subjects were stratified as athletic training majors or nonmajors in order to ensure an even distribution of these students in the ACI and peer-tutor groups.

Table 1. Subject Demographics

	Peer-Tutor Group		Approved Clinical Instructor Group	
Demographic Variable	n	%	n	%
Sex				
Men	7	25.9	8	33.3
Women	20	74.1	16	66.7
Total	27	100.0	24	100.0
Academic status				
Sophomore	9	33.3	12	50.0
Junior	10	37.0	6	25.0
Senior	8	29.6	6	25.0
Total	27	100.0	24	100.0
Major				
Athletic training	12	44.4	15	62.5
Exercise science	13	48.1	9	37.5
Other	2	7.4	0	0.0
Total	27	100.0	24	100.0

Peer Tutors

Eight Ball State University upper-division athletic training majors (2 men and 2 women per semester) were recruited to serve as peer tutors for this study. These students had successfully completed the course on upper extremity injury evaluation within the past 1 to 2 years and were recommended by the course instructor. Additionally, all peer tutors were deemed proficient in wrist and hand evaluation, as evaluated through the practical examinations completed when they were enrolled in the course and reassessed at the time of the study.

Approved Clinical Instructors

Two Ball State University ACIs (1 woman in spring 2004, 1 man in spring 2005) who were certified by the Board of Certification and licensed to practice in Indiana were recruited for this study. Both individuals had 1 to 2 years of experience as ACIs.

Testing Models

Psychomotor skills were demonstrated on testing models. In order to help ensure that subjects were not given any advantage during practical testing, they were not permitted to use models who had experience with wrist and hand assessment (eg, another student currently enrolled in the course on upper extremity injury evaluation, a student who had already completed the course, a certified athletic trainer).

Procedures

The Institutional Review Board at Ball State University approved this study before data collection for the spring 2004 and spring 2005. A pretest-posttest experimental design was used in this study. To provide baseline (pretest) information, all subjects performed a variety of psychomotor skills used to conduct hand and wrist orthopaedic evaluation 1 week before the laboratory and review sessions associated with the study. After completing the laboratory course instruction and review sessions that occurred over a 2-week period, subjects were tested once again on their performance of these skills. To

maintain consistency, the same researcher conducted both the pretests and posttests.

All subjects attended their regularly scheduled upper extremity injury evaluation classroom and laboratory sessions (attendance was recorded). Traditional instructor-led laboratory instruction regarding the psychomotor skills for the orthopaedic evaluation of the hand and wrist occurred over a 2-week unit of instruction in this course. The laboratory sessions were conducted twice per week for 50 minutes per session (as was the case for the entire semester). Laboratory sessions included instructor explanation and demonstration of skills, along with student practice and instructor feedback. For consistency, the same instructor taught both laboratory sections of the course for each of the 2 years of this study. In addition to the regular laboratory classes, subjects in both PAL (led by a peer tutor) and ACI (led by an ACI) groups were required to attend 1-hour review sessions 1 night per week during the 2 consecutive weeks of the study. The laboratory instructor and researcher who conducted the pretest-posttest were blinded as to which subjects were assigned to each group, and neither participated in the review sessions for either the PAL or ACI review group. Lastly, the researcher who conducted the pretest-posttest did not attend the regularly scheduled laboratory sessions. Both review sessions were held after 2 regular laboratory sessions had been conducted, ensuring that the subjects had ample skills to review. All review sessions were held in the Athletic Training Research and Education Laboratory at Ball State University. Subjects were requested to refrain from practicing their skills with someone outside of the laboratory and review sessions, but they were permitted to review the skills individually. Subjects later disclosed any violation of these practice requirements (number of minutes). The subjects were reminded about these expectations on a regular basis.

Peer-Tutor Review Group

Before the first peer-tutor review session, the peer tutors met with the laboratory instructor and researchers to review the psychomotor skills related to the orthopaedic evaluation of the hand and wrist. Peer tutors were requested to review the material again on their own before the review sessions. The peer tutors were given an outline of the specific psychomotor skills and tasks being presented to the subjects during their normally scheduled laboratory classes. For consistency, the peer tutors were instructed in how to review (ie, demonstrate, coach) these skills and tasks with the subjects during the sessions. This included having the subjects practice the various skills and tasks on one another. As time permitted, the peer tutors quizzed the subjects on the skills that were practiced during the review session. Questions from the subjects were addressed at this time.

For the first review session, each peer tutor was instructed to work with a group of 3 peer learners. For the second review session, each tutor was instructed to work with a different group of 3 peer learners. This was done to ensure that the peer tutors had more equal exposure to the subjects as a whole, rather than having 1 or 2 peer tutors affecting 1 or 2 groups of peer learners. The ratio of learners to peer tutors during the review sessions was approximately 3:1, allowing for appropriate review and feedback from peer tutors. One peer tutor was assigned to send reminders to the subjects regarding the next peer-education review session. This person followed up with subjects who did not attend the peer-education review session and arranged a makeup review session.

Approved Clinical Instructor Review Group

Subjects in the ACI review group attended review sessions led by an ACI. This was a more traditional approach common to athletic training (laboratory) clinical education, in which one instructor supervises and provides feedback for a larger group of students. Before the first ACI review session, the ACIs met with the laboratory instructor and researchers to review the psychomotor skills related to the orthopaedic evaluation of the hand and wrist. The ACIs also were given an outline of the specific psychomotor skills and tasks that were being presented to the subjects during their normally scheduled laboratory classes. For consistency, the ACIs were instructed in how to review (ie, demonstrate, coach) these skills and tasks with the subjects during the review sessions. This included having the subjects practice the various skills and tasks on one another. As time permitted, the ACIs quizzed the subjects on the skills that were reviewed during the review session. Questions from the subjects were addressed at this time.

An ACI sent reminders to the subjects regarding the next review session and followed up with subjects who did not attend the review session to arrange a makeup review session.

Skill Pretests

Skill pretests based on the number of correct responses and time to completion were administered to all subjects in the peer-tutor and ACI groups. The subjects were given instructions related to format and time limitations, both orally and in writing, before beginning the pretest. The subjects read the instructions for an assigned task while the researcher read the same instructions aloud. The skill pretest consisted of 6 individual psychomotor skills (considered of equal difficulty by the laboratory instructor and researchers) related to hand and wrist assessment, administered in a random order. Three categories of psychomotor skills were identified and represented a cross-section of such skills: range of motion (radial deviation, wrist extension), palpation (anatomical snuffbox, abductor pollicis longus tendon, extensor digitorum tendon, proximal interphalangeal joint of the second digit, hypothenar eminence, ulnar styloid process, hamate, second metacarpal, radial artery, scaphoid, radial styloid process, palmaris longus tendon, pisiform, lunate, distal interphalangeal joint of the third digit, extensor pollicis longus tendon, thenar eminence, fifth metacarpal, third metacarpophalangeal joint), and special tests (Finkelstein test, valgus stress test for the second proximal interphalangeal joint). The subjects performed 2 skills in each category, for a total of 6 skills. The skill pretests were developed from the textbook *Practical Exam Preparation Guide of Clinical Skills for Athletic Training*.[17] This text consists of individual psychomotor skills in athletic training, constructed in such a way as to mimic the Board of Certification practical examination. Although the examinations were not assessed by the authors for validity or reliability, they are based on currently accepted practices in orthopaedic assessment. For each psychomotor skill related to hand and wrist assessment, a systematic process exists to perform the skill properly; the skill pretests reflect this process.

The skill pretests were scored by simply marking yes or no

for each step involved in performing the skill properly; all steps were weighted equally. The number of yes marks served as a score for each skill pretest.

The time taken to perform each skill pretest was recorded also. The researcher started the time 10 seconds after the instructions were read or when the subject initiated a response, whichever came first. The time was kept with a stopwatch and recorded to the nearest 0.1 second. If a subject requested the instructions be reread, the time was started immediately after the second reading. The time ended when the subject indicated that he or she was finished with the skill pretest. However, a 5-minute time limitation was imposed for each skill pretest. This time period was considered ample to complete the skill tests. The subject was evaluated on the first actions performed. Therefore, if a subject recognized an error and repeated the action correctly within the 5-minute time period, he or she was still scored on the first, improper action.

Subjects were required to provide a model on whom to perform the psychomotor skills related to the evaluation of the wrist and hand. The model was required to wear clothing that allowed the forearm, wrist, and hand to be exposed easily. The model had to be free of any injury to or condition of the upper extremity that would sustain additional harm or injury or would impede the subject's ability to perform the psychomotor skills related to the evaluation of the wrist and hand.

Skill Posttests

The skill posttests were administered in a similar fashion to the pretests. However, only 3 psychomotor skills were tested, one from each category mentioned above. This was done in order to avoid alerting the subjects as to which specific skills would be in the posttest. Therefore, 6 skills were examined in the pretest, whereas only 3 of these 6 skills were included in the posttest. The 3 skills for the posttest were selected randomly from each of the skill categories mentioned above. These skill posttests were performed in random order. Each skill posttest was administered, scored, and timed in the same fashion as described above for the skill pretests. The skill posttest scores for subjects in both the peer-tutor and ACI review groups were considered the test scores in the laboratory course and thus served as an incentive for the subjects to perform well on these tests.

At the end of the skill posttests, subjects in the peer-tutor group completed the previously validated Athletic Training Peer-Assisted Learning Assessment Survey.[4] In addition to demographic items (sex, major, year in school), subjects indicated their level of agreement or disagreement on 6 close-ended questions regarding preferences for, and benefits of, PAL. They also provided comments to support their ratings in 2 open-ended questions addressing these preferences and benefits.

Data Analysis

To ensure equivalency of the 2 groups before the study began, we performed independent *t* tests between the peer-tutor and ACI groups on the pretest practical skills scores and the time to complete these skills (even though random assignment of the subjects should ensure equivalency of the 2 groups). Separate, repeated-measures analyses of variance with between-subjects (group) and within-subjects (time) effects were performed to assess pretest to posttest changes in practical skill scores and the time needed to complete these skills. Frequencies and percentages also were calculated for the ratings of each question in the Athletic Training Peer-Assisted Learning Assessment Survey. Written comments were compiled and were categorized as supporting either high or low ratings. To further ensure equivalency between the peer tutor and ACI groups, we conducted *t* tests to identify any difference between the number of minutes of independent practice (outside of the laboratory and review sessions) between the 2 groups. The minimum target sample size of subjects in each group was 30, which yielded a power of .92 for detecting a large effect. Sample sizes of 25 and 20 yield powers of .86 and .76, respectively. The α level was set at $P \leq .05$. SPSS software (version 11.0; SPSS Inc, Chicago, IL) was used to analyze the data.

Table 2. Pretest-Posttest Differences for Combined (Peer-Tutor and Approved Clinical Instructor) Groups

	F	*P*	η^2
Palpations			
Score*	493.12	<.001‡	.910
Time†	26.34	<.001‡	.350
Ranges of motion			
Score*	169.79	<.001‡	.776
Time†	.78	>.05	.016
Special tests			
Score*	108.13	<.001‡	.688
Time†	.20	>.05	.004

*Score indicates number of correct responses.
†Time indicates seconds.
‡$P < .001$.

RESULTS

Psychomotor Skill Performance

No differences were noted in the pretest psychomotor skill scores and the time to complete these skills between the peer-tutor and ACI groups. A significant difference was seen in the number of correct skills performed between the pretest and posttest for the combined groups on the palpations ($F_{1,49} = 493.12$, $P < .001$), range-of-motion assessments ($F_{1,49} = 169.79$, $P < .001$), and special tests ($F_{1,49} = 108.13$, $P < .001$). The time to complete the palpations task between the pretest and posttest ($F_{(1,49)} = 26.34$, $P < .001$) was different, with students taking more time on the posttest. We saw no difference in the time to complete the range of motion or special test skills between the pretests and posttests or in the posttest skill scores or the times to perform the skills between the groups. Tables 2 and 3 summarize the results regarding skill scores and time to completion.

Benefits and Preferences Regarding Peer-Assisted Learning

All 27 subjects (Table 1) in the peer-tutor group completed the Athletic Training Peer-Assisted Learning Assessment Survey. Of these subjects, 19 (70.4%) felt less anxious performing psychomotor skills in the presence of the peer tutors than in the presence of their laboratory instructor, and 12 (44.4%) indicated that they felt more self-confident when practicing their skills with the peer tutors than when practicing with their in-

structor (Table 4). Furthermore, 14 (51.9%) of these subjects indicated that working with peer tutors increased their collaboration with other students more than working with their laboratory instructor did, and 14 (51.9%) felt that working with peer tutors was more collaborative than competitive. With regard to feedback and support from peer tutors and the laboratory instructor, 26 (96.3%) of PAL subjects indicated that they disagreed or were undecided that peer feedback was more helpful than the feedback received from the laboratory instructor, and 11 (40.7%) of PAL subjects did not feel that peer tutors were more supportive during skill practice than the lab instructor was. In addition, 15 (55.6%) of PAL subjects did not necessarily feel more comfortable asking questions of a peer tutor than of the lab instructor.

Comments from the subjects in the peer-tutor group supported their ratings in the close-ended questions. Representative comments regarding the benefits of practicing psychomotor skills with peer tutors included less embarrassment when asking a question of the peer as opposed to the instructor. Subjects commented that they felt less anxiety when learning from a peer tutor because the peer is more on the student's level. The subjects indicated that peers are more understanding because they are closer in age, they understand the roadblocks to learning the skills, and they explain things in a way that may help the students to better remember. Subjects also felt less pressure when learning from a peer tutor and indicated that the peer has more time for working with the student. Regarding their preferences about practicing psychomotor skills, they preferred to learn from peers because they felt more comfortable, felt less pressure, and were able to work more one-on-one. Some subjects (n = 7, 25.9%) commented that they preferred learning from the laboratory instructor for reasons ranging from the instructor's knowledge and greater experience to more confidence that the instructor will answer questions correctly. A few subjects (n = 3, 11.1%) indicated that they preferred a combination of practicing with their peers and laboratory instructor. They noted the benefits of working with peers outside of the classroom, but they also felt that the instructor's direction and feedback were invaluable.

Practice Habits

At the outset of the study, subjects were asked to refrain from practicing their skills with anyone outside the laboratory and review sessions. Information gathered from the subjects during the posttest indicated that 86.3% (n = 44) spent minimal time (1 to 20 minutes) practicing their skills with someone outside of these sessions. A *t* test revealed no differences between the peer-tutor and ACI groups in the amount of time spent studying outside of the laboratory and review sessions.

DISCUSSION

Effects of Peer-Assisted Learning on Psychomotor Skill Performance

Our results indicate that intentional PAL is as effective as ACI-led skill review in improving students' skills related to the orthopaedic assessment of the wrist and hand. All subjects in this study improved on the number of correct skills from pretest to posttest, with students in the peer-tutor group performing as well as students in the ACI group. In addition, no significant differences were noted between groups in the time it took subjects to perform each skill. Subjects did, however, take significantly longer to complete the palpation skills during the posttest. This was not a surprise given that during the pretest, subjects often either opted to skip a palpation or to take a quick guess regarding the skill. Once the subjects learned the palpations, they seemed to take more time to carefully complete them during the posttest. The lack of differences between the time it took to complete the range-of-motion assessments and special tests between the pretests and posttests was also not a surprise, because subjects did attempt to perform these particular tasks during the pretest. Research in medical education has noted similar findings regarding equal improvements in psychomotor skills between those subjects practicing with peer tutors and those practicing with clinical instructors. Specifically, medical students who were taught a skill by an upper-division peer performed as well on a practical examination as did those students who were taught by faculty.[18–20] Furthermore, medical students who attended review sessions led by upper-division students showed improvements in their practical examination scores and were satisfied with the sessions and their peer tutors.[21]

Table 3. Posttest Differences Between Peer-Tutor and Approved Clinical Instructor Groups

	F	*P*	η^2
Palpations			
Score*	1.473	>.05	.029
Time†	0.422	>.05	.009
Range of motion assessments			
Score*	0.030	>.05	.001
Time†	0.382	>.05	.008
Special tests			
Score*	0.036	>.05	.001
Time†	0.352	>.05	.007

*Score indicates number of correct responses.
†Time indicates seconds.

Certainly, PAL occurs incidentally among peers during clinical education.[4] The results of this study demonstrate the increased role and associated benefits that can be expected from an intentional PAL program during athletic training clinical education. However, we caution that PAL should not replace the initial instruction of psychomotor skills by a clinical instructor or an ACI. Rather, PAL should be used to practice and to reinforce these skills. It can be expected that the peer tutor and peer learner derive mutual benefits during this relationship.[1,15,21,22] In addition, we recommend that peer tutors should not be practicing or assessing the clinical proficiency of their peers but rather the individual psychomotor skills that comprise the clinical proficiency.

Preferences and Perceived Benefits Regarding Peer-Assisted Learning

Results of the Athletic Training Peer-Assisted Learning Assessment Survey indicated some preference for PAL among subjects in the peer-tutor group. Specifically, 70.4% (n = 19) of the subjects felt less anxious performing psychomotor skills when in the presence of a peer tutor than when in front of the laboratory instructor. This finding is consistent with previous athletic training PAL research.[4] Increased levels of anxiety in the peer learner may lead to decreased levels of learning dur-

Table 4. Peer-Tutor Subjects' Impressions Regarding Preferences and Perceived Benefits of Peer-Assisted Learning (Frequency [%])

Question	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
I am less anxious when performing laboratory skills in the presence of peer tutors than in front of my laboratory instructor.	0 (0.0)	2 (7.4)	6 (22.2)	14 (51.9)	5 (18.5)
Being taught laboratory skills by peer tutors increases my interaction and collaboration with other students more than being taught by my laboratory instructor.	0 (0.0)	7 (25.9)	6 (22.2)	12 (44.4)	2 (7.4)
The feedback I receive from peer tutors is more helpful than feedback I receive from my laboratory instructor.	0 (0.0)	10 (37.0)	16 (59.3)	0 (0.0)	1 (3.7)
Peer tutors are more supportive to me when I am practicing my laboratory skills than my laboratory instructor is.	0 (0.0)	11 (40.7)	13 (48.1)	3 (11.1)	0 (0.0)
I feel more self-confident when practicing my laboratory skills with peer tutors than with my laboratory instructor.	1 (3.7)	5 (18.5)	9 (33.3)	11 (40.7)	1 (3.7)
When I work together with a peer tutor, I feel the experience is more competitive than collaborative.	0 (0.0)	14 (51.9)	7 (25.9)	6 (22.2)	0 (0.0)

ing practicing of clinical skills.[13,23] Several subjects in our study noted that they experienced less pressure and embarrassment when asking their peer tutors questions. This finding supports the notion that a PAL program may decrease the anxiety of peer learners, thus enhancing learning.

Our results indicate that PAL also may increase the self-confidence of the peer learners. In the peer-tutor group, 44.4% (n = 12) of the subjects indicated that they felt more self-confident when practicing their skills with a peer than with the laboratory instructor. Employing PAL during clinical experiences may increase self-confidence (due to increased opportunities for skill practice), may confirm information, and may clarify ideas for both the peer learners and peer tutors.[9,13,24,25] Research in medical,[26] nursing,[6,10,27,28] physical therapy,[9,24] and athletic training[4] education have shown further support for intentional PAL programs, because peers report a greater sense of collaboration than of competition when working with one another in a learning environment. The present study demonstrates support for these findings in that 51.9% (n = 14) of the subjects in the peer-tutor group felt an increase in their collaboration with other students, and 51.9% (n = 14) felt no increase in competition during PAL. Enhancing cooperation and decreasing competition among students may carry over into professional practice in the allied health setting, in which collegiality and collaboration are critical to patient care.[6,10,24,27] Athletic training education programs may do well to allow opportunities for students to practice clinical skills with one another during clinical experiences without the pressure of evaluation by a clinical instructor.

A total of 59.3% (n = 16) of subjects in the peer-tutor group were undecided as to whether the feedback they received from peers was more helpful than the feedback received from the laboratory instructor. Certainly, one should not assume that feedback during PAL is always correct. The above finding varies slightly from related research[29] in which physical therapy students felt that the feedback they received from peers was inadequate and lacked the detail to derive any benefit. Several of the subjects in the peer-tutor group in our study indicated that they still preferred the laboratory instructor over a peer tutor when practicing psychomotor skills, because they felt that the instructor would answer questions correctly; these subjects had more confidence in the knowledge and experience of the laboratory instructor than in that of the peer tutor. In addition, 40.7% (n = 11) of the subjects in the peer tutor group did not feel that the peers were more supportive of them than the laboratory instructor while practicing skills. One recommendation to address these potential shortcomings in a formal PAL program would be to train the peer tutors. Topics such as teaching and learning strategies, effective communication, and methods for providing feedback could be included in such training. Certainly, the ability for these peer tutors to function as effective ACIs during future employment would be enhanced.

LIMITATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

The practical examinations covered only those psychomotor skills related to the orthopaedic assessment of the wrist and hand. Also, the study included a combination of athletic training majors and nonmajors. Along with psychomotor skills from other athletic training educational domains, a larger sample size (athletic training majors only) from a multicenter study could strengthen the confidence in the conclusions of this study. The effects of a PAL program on the knowledge (ie, cognitive competencies) of athletic training students could be examined also. Instead of focusing on the peer learners, future researchers could investigate the effects of a PAL program on the peer tutors (eg, perceptions and clinical knowledge, skills, and proficiency). Finally, it would be valuable to assess the perceptions of students and clinical instructors and objective outcomes (eg, improved skill performance) associated with PAL during clinical experiences rather than with structured review sessions.

CONCLUSIONS

This study provides evidence to support intentional PAL in an athletic training education program for reviewing psychomotor skills. Peers can be resources for practicing clinical skills and report benefiting from the collaboration. Peer-assisted learning should be deliberately integrated into athletic training education programs to enhance student learning and collaboration.

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