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Perceived Frequency of Peer-Assisted Learning in the Laboratory and Collegiate Clinical Settings

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Context: Peer-assisted learning (PAL) has been recommended as an educational strategy to improve students' skill acquisition and supplement the role of the clinical instructor (CI). How frequently students actually engage in PAL in different settings is unknown.

Objective: To determine the perceived frequency of planned and unplanned PAL (peer modeling, peer feedback and assessment, peer mentoring) in different settings.

Design: Cross-sectional study.

Setting: Laboratory and collegiate clinical settings.

Patients or Other Participants: A total of 933 students, 84 administrators, and 208 CIs representing 52 (15%) accredited athletic training education programs.

Intervention(s): Three versions (student, CI, administrator) of the Athletic Training Peer Assisted Learning Survey (ATPALS) were administered. Cronbach α values ranged from .80 to .90.

Main Outcome Measure(s): Administrators' and CIs' perceived frequency of 3 PAL categories under 2 conditions (planned, unplanned) and in 2 settings (instructional laboratory, collegiate clinical). Self-reported frequency of students' engagement in 3 categories of PAL in 2 settings.

Results: Administrators and CIs perceived that unplanned PAL (0.39 ± 0.22) occurred more frequently than planned PAL (0.29 ± 0.19) regardless of category or setting ($F_{1,282} = 83.48$, $P < .001$). They perceived that PAL occurred more frequently in the collegiate clinical (0.46 ± 0.22) than laboratory (0.21 ± 0.24) setting regardless of condition or category ($F_{1,282} = 217.17$, $P < .001$). Students reported engaging in PAL more frequently in the collegiate clinical (3.31 ± 0.56) than laboratory (3.26 ± 0.62) setting regardless of category ($F_{1,860} = 13.40$, $P < .001$). We found a main effect for category ($F_{2,859} = 1318.02$, $P < .001$), with students reporting they engaged in peer modeling (4.01 ± 0.60) more frequently than peer mentoring (2.99 ± 0.88) ($P < .001$) and peer assessment and feedback (2.86 ± 0.64) ($P < .001$).

Conclusions: Participants perceived that students engage in unplanned PAL in the collegiate clinical setting with a stronger inclination toward engagement in peer modeling. Educators should develop planned PAL activities to capitalize on the inherent desire of the students to collaborate with their peers.

Key Words: peer teaching, clinical education

Key Points

- Administrators and clinical instructors perceived that unplanned peer-assisted learning (PAL) occurred more frequently than planned PAL and that PAL occurred more frequently in the collegiate clinical than the laboratory setting.
- Athletic training students more frequently engaged in unplanned than planned PAL and more frequently engaged in PAL in the collegiate clinical than the laboratory setting.
- Athletic training students engaged in peer modeling more frequently than peer mentoring and peer assessment and feedback.
- Planned PAL activities can be used to capitalize on the desires of the students to collaborate with their peers.

Athletic training professional preparation has been evolving rapidly over the past 15 years. It has progressed away from loosely structured internship routes to highly structured accredited programs. Standards established for these accredited programs place much emphasis on the quality of clinical education, including the vast array of associated clinical skills.[1] Consequently, *clinical instructors* (CIs), who are operationally defined in this study as Approved Clinical Instructors (ACIs) or CIs, and athletic training students have greater responsibilities for teaching or learning and for mastering clinical skills. Certainly, CIs already are encountering substantial role strain as they balance patient care and student education.[2] A particular clinical education standard from the Commission on Accreditation of Athletic Training Education (CAATE)[1] entails carefully scrutinizing the number of weekly clinical hours in which students are engaged in formal clinical

experiences. The limited number of hours that this standard implies challenges athletic training education programs (ATEPs) to maximize the clinical learning opportunities of their students. One approach for maximizing clinical learning is to encourage peer-assisted learning (PAL) to supplement the role of the CI. Peer-assisted learning is conceptualized in the literature as a multifaceted model of student interactions in which multiple peers benefit mutually from the exchange.[3,4] In general, PAL is the act or process of gaining knowledge, understanding, or skill in athletic training from students who are at different or equivalent academic or experiential levels.[5] International scholars have identified several different categories or strategies that embody PAL, including peer teaching, peer learning, peer modeling, and peer assessment and feedback.[4] Other scholars have described the use of peer mentoring and support,[6–9] peer leadership,[10,11] and peer coaching and collaboration[9,12,13] in nursing and physical therapy programs. We focused specifically on peer modeling, peer assessment and feedback, and peer mentoring as defined in Table 1.

In nursing education, PAL has been demonstrated not only to reduce demands on clinical instructors but also to improve the overall clinical experiences for students.[10] In athletic training education, PAL should not replace the role of the CI in providing initial instruction, evaluation, supervision, and role modeling.[5] Rather, PAL should be used to practice and reinforce clinical skills[16] and professional behaviors. Students involved in PAL can be expected to derive mutual benefits during this relationship.[17]

Researchers have begun to explore the frequency, benefits, and preferences for PAL in athletic training clinical education.[5,16,18] For example, the first investigators examining PAL in athletic training found that 66% (n = 91) of the undergraduate athletic training students participating in the study practiced a moderate to large amount of their clinical skills with their peers.[5] In this same study, Henning et al[5] also found that 60% of participants reported feeling less anxious when performing clinical skills in front of their peers than in front of their CIs. Similarly, in a quasiexperimental study in which investigators examined the efficacy of an intentionally planned student peer-tutoring program, athletic training students reported feeling less anxious performing skills in front of their peers than in front of their laboratory instructors.[16] The investigators also found that students participating in the peer-tutoring program performed just as well on orthopaedic assessment skills as those who received instruction from their laboratory instructors only.[16]

This study is part of a larger project in which we aimed to establish further evidence for intentionally implementing PAL in athletic training clinical education. Athletic training clinicians and educators often report that students naturally learn from and with their peers in the collegiate clinical setting; however, we did not know how frequently PAL occurs as a planned (eg, formally structured peer assessment of skills) or unplanned (eg, natural modeling of behaviors) educational activity in the laboratory and collegiate clinical settings. Therefore, the purpose of this aspect of our larger study was to determine the perceived frequency of 3 categories of PAL (peer modeling, peer feedback and assessment, peer mentoring) that occur under 2 different conditions (planned, unplanned) and in 2 different educational settings (instructional laboratory, collegiate clinical setting). We hypothesized that the frequency of PAL would be greater in the collegiate clinical setting than in the laboratory setting because of the high student to CI ratio (8:1) allowed by accreditation standards.[1] Furthermore, we hypothesized that differences would exist in ATEP administrators' and CIs' perceived frequency of PAL based on the condition (planned, unplanned) of PAL and the educational setting (laboratory, collegiate clinical) in which it occurs. We assumed that PAL would occur more frequently as a planned activity in the laboratory setting because pedagogical strategies are designed more intentionally in controlled settings, and previous athletic training researchers have indicated that formal peer tutoring in the laboratory setting is effective.[16] From this study, we can more fully describe the phenomenon of PAL in athletic training education and improve our understanding of how and when to implement PAL during professional preparation.

METHODS

Participants

We used a geographically stratified random selection of programs to recruit a representative sample of ATEPs from the 10 districts of the National Athletic Trainers' Association (NATA). Our intention was to have 100 programs proportionally representing each of the 10 districts. After several rounds of recruitment, we ultimately invited 350 programs (not including the host institution) to participate. Athletic training students; program administrators, including program directors and clinical education coordinators; and CIs, including both ACIs and CIs, from 52 entry-level ATEPs representing all 10 districts of the NATA participated in our study, resulting in a 15% program response rate. Forty-six (88.5%) of the participating programs had professional programs at the undergraduate level, 4 (7.7%) had professional programs at the graduate level, and 2 (3.8%) had both types of programs. The ATEP demographics are presented in Table 2. A total of 933 students participated, with an average number of 17.6 students per program (range, 4–41 students). Demographics of student participants are presented in Table 3. A total of 292 program personnel (ATEP administrators = 84, CIs = 208) also participated in this study. Demographics of administrators and CIs are presented in Table 4.

People indicated consent to participate by completing and returning the Athletic Training Peer-Assisted Learning Survey

Table 1. Definitions of Peer-Assisted Learning Categories Supported in the Factor Analysis

Term	Definition
Peer modeling	The process by which students pattern their thoughts, beliefs, strategies, and actions after those who demonstrate targeted actions, verbalizations, and expressions.[4]
Peer assessment and feedback	An instructional technique in which a student judges the level or quality of a peer's understanding[14] and provides corrective comments to improve the execution of a task.[15]
Peer mentoring	A supportive relationship between 2 students of differing academic or experience levels within the professional program with a focus on acquiring norms, values, knowledge, and skills to function as a future professional.[7,8]

Table 2. Selected Demographics of Athletic Training Education Programs

Demographic	n (%)
Type of professional program	
Baccalaureate	46 (88.5)
Graduate	4 (7.7)
Both	2 (3.8)
Academic years program has been accredited	
≤1	1 (1.9)
2–3	9 (17.3)
4–6	19 (36.5)
7–10	8 (15.4)
>10	15 (28.8)
Academic years in professional phase of athletic training education program	
2	12 (23.1)
3	31 (59.6)
4	1 (1.6)
Other	8 (15.4)
Athletic training students per clinical instructor[a]	
1	3 (5.8)
2	19 (36.5)
3	16 (30.8)
4	10 (19.2)
≥5	4 (7.7)

[a] *Clinical instructor* was defined operationally as an Approved Clinical Instructor or clinical instructor.

Table 3. Selected Demographics of Student Participants, n (%)[a]

Academic Year in Athletic Training Education Program	Sex		
	Male	Female	Total
1	97 (11)	145 (16)	242 (26)
2	102 (11)	184 (20)	286 (31)
3	93 (10)	119 (13)	212 (23)
4	56 (6)	102 (11)	158 (17)
5	9 (1)	12 (1)	21 (2)
Total	357 (39)	562 (61)	919 (100)

[a] Not all participants indicated sex. Percentages are based on the number of responses to the item.

Table 4. Selected Demographics of Administrators and Clinical Instructors, n (%)[a]

Demographic	Administrators	Clinical Instructors
Sex		
Male	39 (47.0)[b]	105 (50.5)
Female	44 (53.0)	103 (49.5)
Time in current position		
Currently in first academic year	17 (20.2)	70 (34.3)[c]
2–3 academic years	25 (29.8)	65 (31.9)
4–6 academic years	17 (20.2)	39 (19.1)
7–10 academic years	18 (21.4)	13 (6.4)
>10 academic years	7 (8.3)	17 (8.3)
Time working with or supervising students		
Currently in first academic year	4 (4.8)	38 (18.6)[d]
2–3 academic years	4 (4.8)	65 (31.9)
4–6 academic years	18 (21.4)	41 (20.1)
7–10 academic years	21 (25.0)	26 (12.7)
>10 academic years	37 (44.0)	33 (16.2)

[a] *Clinical instructor* was defined operationally as Approved Clinical Instructor or clinical instructor.
[b] Indicates 1 administrator did not state sex.
[c] Indicates 4 clinical instructors did not indicate length of time in current position.
[d] Indicates 5 clinical instructors did not indicate length of time working with or supervising students.

(AT-PALS). This study was deemed exempt by the University of North Carolina at Greensboro Institutional Review Board.

Instrumentation

Three versions of the AT-PALS were used to determine the perceived frequency of PAL in athletic training instructional laboratory and collegiate clinical settings. The AT-PALS instrument has been used with athletic training students[5] and was revised and expanded based on student interviews and further review of the literature. To revise the AT-PALS, open-ended interviews were conducted with 16 students who were enrolled in an accredited professional education graduate ATEP and had experience with PAL in the laboratory and collegiate clinical settings. Interviews were framed around 3 broad questions: How do students interact with each other in the instructional laboratory and collegiate clinical settings, how do students benefit from those interactions, and are there situations in which students prefer peer interactions over interactions with a CI? The primary investigator (J.M.H.) used open and axial coding to identify themes in the interview data. Open coding was used to label text from the interviews by key words or themes. Axial coding then was used to link or categorize the key words or themes into broader concepts. The themes helped to identify the PAL categories of peer teaching, peer learning, peer assessment and feedback, peer mentoring, and peer leadership. These categories provided the constructs and structure for the revised AT-PALS instrument. Separate versions of the instrument were developed for ATEP administrators, CIs, and students. Each version contained similar sections to measure demographic characteristics and frequency of PAL. Face and content validity of all 3 versions of the AT-PALs instruments were determined by 5 athletic training educators and researchers familiar with the PAL literature. These 5 people also commented on overall clarity, purpose, and relevance, and revisions were made accordingly. Internal consistency measures were determined for each version of the AT-PALS. The program administrator version of the AT-PALS was pilot tested with 12 athletic training program directors or clinical coordinators. The internal consistency as measured by the Cronbach α was .94. The clinical supervisor version of the AT-PALS was pilot tested with 9 CIs. The internal consistency as measured by the Cronbach α was .91. The athletic training student version of the AT-PALS was pilot tested with 44 athletic training students in professional education programs. The internal consistency as measured by the Cronbach α was .97. The participants in the pilot study were excluded from eligibility in the final data collection process.

Demographics. Section 1 of each AT-PALS instrument contained demographic questions. The administrator and CI instruments contained items about sex, title of current position, number of academic years in the current position, and total number of years supervising or working with athletic training students in the collegiate setting. The administrator version also inquired about the total number of academic years of experience as an ATEP administrator. In addition, program-level data were obtained through the administrator version, including questions about NATA district, degree status of the ATEP, the average number of students assigned to each CI for each clinical education experience or rotation, the number of academic years the ATEP had been accredited, and the number of academic years required in the professional phase of the ATEP. The CI version inquired about the average number of athletic training students he or she directly supervised each semester. The student version inquired about the respondent's sex and in which academic year he or she was enrolled in the ATEP.

Frequency of Peer-Assisted Learning. Section 2 of each AT-PALS instrument was designed to measure the perceived frequency of PAL in the laboratory and collegiate clinical education settings. The administrator and CI versions contained descriptions of 15 student activities representing various categories of PAL. For each of the 15 activities (eg, "Students practice a previously learned skill with their peers," "Students provide their peers with constructive feedback on their clinical skills"), the participants indicated on a checklist whether they regularly observed the activities during students' clinical experiences in the collegiate clinical setting or during laboratory classes and indicated whether such activities were planned deliberately (eg, formally structured) or unplanned (eg, occurred naturally). Thus, administrators and CIs provided 4 binary ratings for each of the 15 activities. Response options were not mutually exclusive, and participants could check all situations that applied. The student version contained 31 activities representing the same categories of PAL. For each of the 31 activities (eg, "I practice a previously learned skill with my peers," "My peers ask me for constructive feedback on their clinical skills"), students indicated on a 5-point Likert scale (1=*never,* 2=*rarely,* 3=*fairly often,* 4=*often,* 5=*almost always*) how frequently they engaged in the described activities in the instructional laboratory and collegiate clinical settings. Unlike administrators and CIs, student participants were not instructed to provide responses about planned and unplanned PAL because we believed that students might not be aware of whether PAL interactions were planned intentionally by their CIs or administrators.

Reliability. Taking advantage of a large student data set (n=933), we conducted an exploratory factor analysis to further examine the reliability of the revised AT-PALS instrument. The instrument was designed originally to examine 5 categories of PAL (peer teaching, peer learning, peer mentoring, peer assessment and feedback, peer leadership) in 2 different settings (laboratory, collegiate clinical). However, the factor analysis supported the 3 factors defined in Table 1 (peer modeling, peer mentoring, peer assessment and feedback) rather than 5 factors. The reliability scores for the new factor structure in the student data had an acceptable Cronbach α ranging from .80 to .91 when each factor was examined separately in the laboratory and collegiate clinical settings. We allowed the student data to drive the factor structure rather than the administrator and CI data because we believed that students could more reliably indicate their own engagement in PAL activities, whereas administrators and CIs might or might not observe all activities performed by students. We also recognized the limitation in how administrators and CIs might have different perceptions of how they interpreted the frequency with which they observed PAL activities (eg, 1 time versus daily).

Procedures

We sent letters via e-mail describing the purpose and need for the study and the importance of their participation in the study to directors of all CAATE-accredited ATEPs (n=351). They were instructed to complete and return via e-mail the Athletic Training Peer-Assisted Learning Study: Statement of Interest form, on which they indicated the number of collegiate

CIs (ACIs and CIs) and the number of students enrolled in the professional phase of their ATEPs. Survey packets were mailed to only the program directors who returned the Statement of Interest form, and they contained the following items: a cover letter providing instructions and a reminder of the need for and purpose of the study; appropriate numbers and versions of the AT-PALS instruments; and an addressed, postage-paid return envelope. The ATEP directors and clinical education coordinators were instructed to complete the administrator version of the AT-PALS and distribute appropriate versions of the instruments to the collegiate CIs and students associated with their ATEPs. The program directors were instructed to collect and return completed surveys to the primary investigator in the postage-paid, addressed envelope within 3 weeks. The ATEP directors were sent reminders via e-mail that were to be forwarded to their CIs and students 2 weeks after the initial mailing. Surveys were coded by institution for the purpose of following up with nonrespondents via the program director and for conducting statistical analysis. The data collection period, including follow-up, for each institution concluded 5 weeks after the initial mailing.

Data Reduction

Given that the data collected from administrators and CIs were binary (*yes* or *no*), we recoded the data for each of the 15 student activities as 1, *observed,* and 0, *not observed,* for each setting (instructional laboratory, collegiate clinical) and each condition (planned, unplanned). This resulted in each item being scored 4 times (ie, planned laboratory setting, unplanned laboratory setting, planned collegiate clinical setting, unplanned collegiate clinical setting). In addition, given that each of the 15 activities was categorized into a small subset of 3 factors (peer modeling, peer mentoring, peer assessment and feedback), we aggregated the items within a category by averaging the binary responses. This produced a frequency of observation that could range from 0 to 1. Thus, a mean score of 0.56 for peer mentoring that was unplanned in the collegiate clinical setting indicated that, across the 4 items in this factor, such activities were observed on average 56% of the time by the administrators or CIs. We recognize that these aggregated scores are not normally distributed, but we found that they behaved as well in the parametric analyses that we report as they did in nonparametric analyses. We have chosen to report the parametric analyses because we have more flexibility in modeling the data in more complex factorial models. Based on our analyses, no bias relative to the nonparametric analyses appears to exist.

Several differences in coding existed between the student data and the administrator and CI data. Student data included more activities (31 versus 15), and the responses were Likert-type items. In addition, the students were not presented with the condition (planned, unplanned); rather, they responded only with regard to setting (instructional laboratory, collegiate clinical). The data were aggregated by taking the mean responses within a category; however, in this case, the means represented perhaps more nuanced information about frequency because the students were not instructed to report whether PAL was planned or unplanned. As reported, the response deviated from normality somewhat, but given the large sample size, we followed the recommendation by Norman[19] to use parametric analyses, such as analyses of variance (ANOVAs).

Data Analysis

Descriptive statistics were calculated for all items. Not all questions received responses, and data analysis was based on the number of responses for each question. Our overall analytical approach was to use repeated-measures ANOVAs in which condition (planned, unplanned) and setting (instructional laboratory, collegiate clinical) were treated as within-subject variables. Furthermore, we examined differences among the 3 PAL categories (peer modeling, peer mentoring, peer assessment and feedback) as a second within-subject factor.

To analyze the administrator and CI observations, we used separate 2 (condition) × 2 (setting) × 3 (PAL categories) repeated-measures ANOVAs. For administrators, we separately examined the frequencies of observed planned and unplanned PAL in only the instructional laboratory setting with a 2 (condition) × 3 (PAL categories) repeated-measures ANOVA because of the likelihood that administrators worked with students primarily in the laboratory setting. Similarly for CIs, we separately examined the frequencies of observed planned and unplanned PAL in the collegiate clinical setting with a 2 (condition) × 3 (PAL categories) repeated-measures ANOVA because of the increased likelihood of the CIs observing such behaviors in this particular setting. We conducted post hoc analyses using the Bonferroni adjustment for familywise error to examine some aspects of the interactions.

The student analyses differed from the administrator and CI analyses because the students did not indicate the condition (planned, unplanned) in which PAL occurred. Thus, we used a 2 (setting) × 3 (PAL categories) ANOVA to analyze the student data. For all analyses, the α level was set at .05. We used SPSS (version 18; SPSS Inc, Chicago, IL) to analyze the data.

RESULTS

Overall Frequency of PAL Reported by Administrators and Clinical Instructors

When collectively examining administrator and CI responses, we found a main effect of condition ($F_{1,282} = 83.48$, $P < .001$), with unplanned PAL (0.39 ± 0.22) occurring more frequently than planned PAL (0.29 ± 0.19), regardless of PAL category, setting, or respondent (ie, administrator of CI). We also found a main effect of category of PAL ($F_{2,281} = 105.37$, $P < .001$). Peer modeling occurred (0.45 ± 0.25) more frequently than both peer assessment (0.30 ± 0.19) and peer mentoring (0.27 ± 0.21). Furthermore, we found a main effect of setting ($F_{1,282} = 217.17$, $P < .001$), with PAL occurring more frequently in the collegiate clinical (0.46 ± 0.22) than in the laboratory (0.21 ± 0.24) setting. We found a condition by setting interaction ($F_{1,282} = 156.59$, $P < .001$). The nature of this interaction was that differences existed in planned (0.35 ± 0.03) and unplanned (0.58 ± 0.28) PAL in the collegiate clinical setting ($P < .001$) but not in the instructional laboratory setting ($P = .08$). We found a condition by category interaction ($F_{2,281} = 93.47$, $P < .001$). As presented in Figure 1, the nature of this interaction was that all 3 categories differed in the planned condition ($P < .001$), whereas peer modeling and peer mentoring did not differ in the unplanned condition ($P = .20$). In addition, a setting by category interaction occurred ($F_{2,281} = 78.62$, $P < .001$). As presented in Figure 2, the nature of this interaction was that in the instructional laboratory setting, the frequency of all 3 categories differed

from each other (peer modeling = 0.27 ± 0.32, peer mentoring = 0.15 ± 0.25, peer assessment and feedback = 0.24 ± 0.25) ($P < .001$). However, in the collegiate clinical setting, we found a difference between peer modeling (0.62 ± 0.30) and the other categories ($P < .001$) but not between the frequencies of peer mentoring (0.40 ± 0.25) and peer assessment and feedback (0.37 ± 0.25) ($P = .25$).

Frequency of PAL Reported by Administrators

The frequencies of observed planned and unplanned PAL reported by the administrators were examined separately from the CIs for the laboratory setting because of the likelihood of their working with students primarily in this setting. We found no main effect for condition ($F_{1,81} = 0.182$, $P = .67$). However, we found a main effect for category of PAL regardless of condition ($F_{2,80} = 29.42$, $P < .001$), with peer modeling (0.50 ± 0.32) observed more frequently than peer assessment (0.44 ± 0.22) and peer mentoring (0.23 ± 0.26). Although post hoc analyses indicated that all means differed, the differences between modeling and assessment were the weakest ($P = .04$). We also found a condition by category interaction ($F_{2,80} = 29.74$, $P < .001$). Planned peer modeling (0.53 ± 0.34) and planned peer assessment and feedback (0.53 ± 0.29) occurred more often than planned peer mentoring (0.13 ± 0.24). Unplanned peer modeling (0.48 ± 0.39) occurred more than unplanned peer mentoring (0.33 ± 0.40) and unplanned peer assessment and feedback (0.34 ± 0.29). We found no interactions between years of experience administrators had working with athletic training students and condition ($F_{2,4} = 0.362$, $P = .84$) or category ($F_{8,154} = 1.46$, $P = .18$) of observed PAL. Similarly, we found no interaction between number of years of experience as an administrator and condition ($F_{4,77} = 0.105$, $P = .98$) or category of observed PAL ($F_{8,76} = 0.625$, $P = .76$).

Frequency of PAL Reported by Clinical Instructors

The frequencies of observed planned and unplanned PAL that the CIs reported were examined separately from the administrators for the collegiate clinical setting because of the likelihood of their working with students primarily in this setting. We found a main effect for condition ($F_{1,201} = 95.66$, $P < .001$), with unplanned PAL (0.57 ± 0.25) occurring more frequently than planned PAL (0.36 ± 0.25). We found a main effect for category of PAL ($F_{2,200} = 110.29$, $P < .001$), with peer modeling (0.63 ± 0.29) occurring more frequently than peer mentoring (0.39 ± 0.25) and peer assessment and feedback (0.38 ± 0.25). We found a condition by category interaction ($F_{2,200} = 57.68$, $P < .001$), with planned peer modeling (0.60 ± 0.37) occurring more than planned peer assessment and feedback (0.31 ± 0.31) and peer mentoring (0.17 ± 0.29). Unplanned peer modeling (0.64 ± 0.40) and peer mentoring (0.62 ± 0.37) occurred more than peer assessment and feedback (0.45 ± 0.29). We found no interaction between number of students supervised and condition ($F_{4,195} = 1.723$, $P = .15$) or category ($F_{8,390} = 1.857$, $P = .07$). However, we did notice a trend in the increased frequency of observed PAL as the number of students supervised also increased.

Frequency of PAL Reported by Athletic Training Students

Students reported a difference in the overall frequency of PAL in the instructional laboratory and collegiate clinical settings ($F_{1,860} = 13.40$, $P < .001$), with a higher frequency in the collegiate clinical (3.31 ± 0.56) than the instructional laboratory (3.26 ± 0.62) setting. We found a main effect for PAL category ($F_{2,859} = 1318.02$, $P < .001$), with students engaging in peer modeling (4.01 ± 0.60) more frequently than peer mentoring (2.99 ± 0.88; $P < .001$) and peer assessment and feedback (2.86 ± 0.64; $P < .001$). We found no interaction between PAL category and year in the program. As depicted in Figure 3, we found an interaction between setting and PAL category ($F_{2,859} = 33.01$, $P < .001$), with peer assessment and feedback

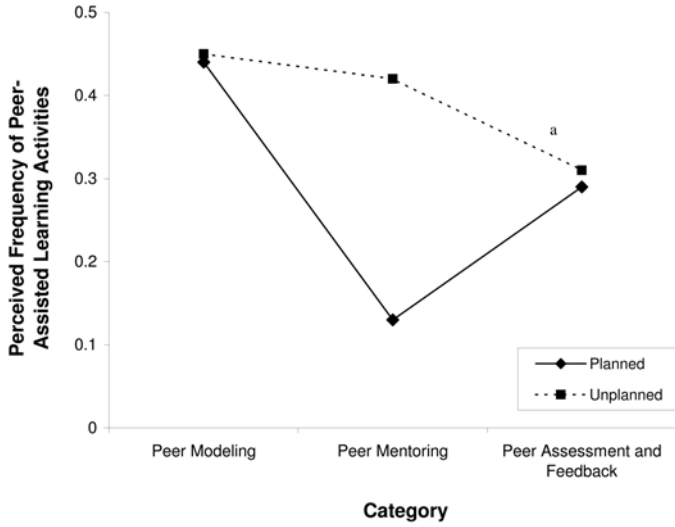

Figure 1. Interaction between condition and perceived frequency of peer-assisted learning activities (0 = *not observed* and 1 = *observed*) as reported by program administrators and clinical instructors (ie, Approved Clinical Instructors or clinical instructors). [a] Indicates that the perceived frequency of all 3 categories differed in the planned condition ($P < .001$).

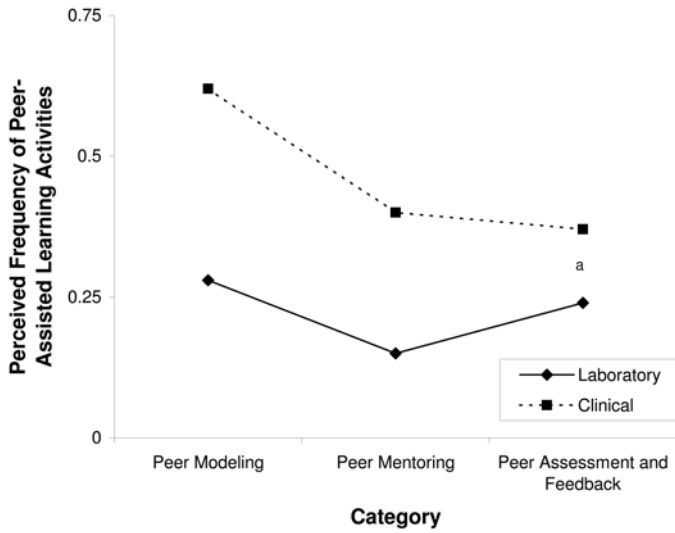

Figure 2. Interaction between clinical education setting (laboratory, clinical) and perceived frequency of peer-assisted learning activities (0 = *not observed* and 1 = *observed*) as reported by program administrators and clinical instructors (ie, Approved Clinical Instructors or clinical instructors). [a] Indicates that the perceived frequency of all 3 categories differed from each other in the instructional laboratory setting ($P < .001$).

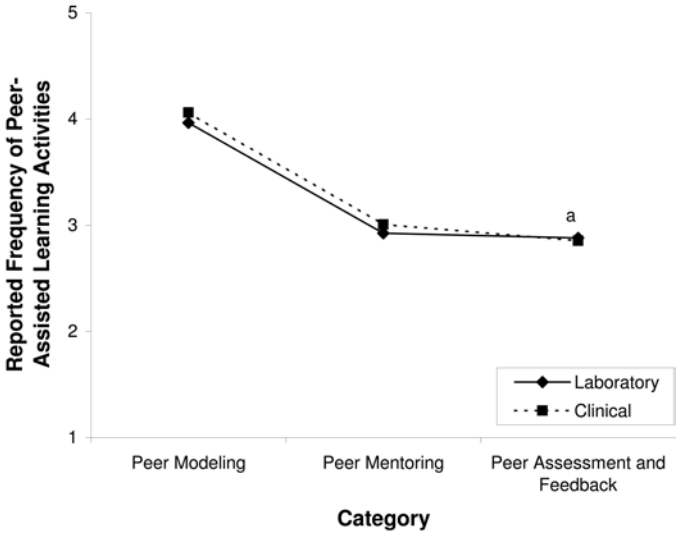

Figure 3. Interaction between educational setting (laboratory, clinical) and frequency of engagement in peer-assisted learning activities as reported by athletic training students. [a] Indicates an interaction between setting and peer-assisted learning category, with peer assessment and feedback reported more frequently in the laboratory setting than in the clinical setting (*P* < .001).

reported more frequently in the laboratory (2.88 ± 0.02) than clinical (2.85 ± 0.02) setting; however, peer modeling and peer mentoring were reported more frequently in the clinical (4.06 ± 0.02 and 3.01 ± 0.03, respectively) than laboratory (3.96 ± 0.03 and 2.92 ± 0.03, respectively) setting.

DISCUSSION

Our findings support previous research findings[5,18] in athletic training that PAL activities are used frequently in athletic training education. Unlike previous work, our results provide greater insight into the nuanced factors that might affect the frequency of PAL, including the educational setting, the type of PAL activities, and the conditions in which they occur.

Educational Settings

Athletic training students, CIs, and ATEP administrators reported that PAL occurs in the collegiate clinical setting more frequently than in the instructional laboratory setting. We provide the following closer examination of the unique characteristics of the collegiate clinical setting that can offer insight into this finding.

Our results support previous research findings that CIs typically simultaneously supervise more than 1 student in the collegiate clinical setting.[2] Consequently, this activity coupled with their patient care demands often creates role strain for CIs[2] and makes it difficult to plan or purposefully facilitate PAL in the collegiate clinical setting. The higher frequency of unplanned PAL in the collegiate clinical setting could be attributed to several different factors present in the collegiate athletic training setting. For example, high patient volume at certain times of day (eg, before practice) might not allow some CIs to provide timely formal feedback to students, opening the opportunity for peer feedback to occur naturally. Our results support the finding of Mackey et al[18] that students report engaging in informal or spur-of-the-moment PAL activities with their peers in the collegiate clinical setting. This finding also might support the notion that our generation of athletic training students enjoys collaborating with their peers and wants more immediate feedback[20] that can be provided through the use of PAL activities in the clinical setting.

Obviously, for PAL to occur, multiple students need to be present in the collegiate clinical setting at one time. Our results suggest a positive trend between the number of students assigned to 1 CI and the observed frequency of PAL. Caution should be used when interpreting this finding. Although simply increasing the number of students assigned to 1 CI might seem ideal, researchers have indicated that CIs might not always feel adequately prepared to facilitate PAL experiences.[21] In a systematic review of PAL in clinical education, Secomb[22] found that multiple studies in nursing and physical therapy indicated that a 2:1 student to CI ratio resulted in positive learning outcomes.[22] Therefore, ATEPs should carefully consider assigning no more than 2 students to 1 CI and providing some form of PAL training for CIs.[21]

Overall, CIs and ATEP administrators reported observing a higher frequency of unplanned than planned PAL activities. We anticipated that instructors in the laboratory setting would report a higher frequency of planned PAL activities because of the more structured nature of a classroom setting. However, we found no difference in planned and unplanned PAL in that setting. We advocate the purposeful use of planned PAL in the laboratory setting; specifically, the planned use of peer assessment and feedback in the instructional laboratory setting could benefit students in multiple ways. To elaborate, athletic training professional preparation is unique among health care disciplines because it requires students to enroll in didactic and laboratory courses while simultaneously completing clinical experiences that involve live patient interactions. Learning new skills in a laboratory course and practicing the same skills on real patients in the clinical setting that same week would not be unusual for a student. Therefore, students probably would benefit from timely feedback on their clinical skills in the laboratory to be prepared for these real-time encounters during clinical experiences. Thus, planned peer-assessment and -feedback programs as described in the literature[23] could provide more timely and frequent feedback for students as they develop their clinical skills. Research in athletic training education has indicated that regardless of their year in an ATEP, students can reliably and accurately assess their peers' psychomotor skills,[24] which could therefore be viewed by educators as a viable means of providing students with benchmarks on their skill performance.

Categories of PAL

According to students, CIs, and ATEP administrators, peer modeling is the most common form of PAL occurring in both the athletic training instructional laboratory and collegiate clinical settings. In the context of our study, students reported that they often modeled for their peers patient care decisions, professional behaviors, communication with supervisors and coaches, and clinical skills. This was confirmed by program administrators and CIs who also reported observing students engage in a high frequency of peer-modeling behaviors.

No comparative research exists in medicine and other health care disciplines in which investigators have examined the specific use of peer modeling. We recognize that this might be related to the way we described peer modeling in the AT-PALS

instrument. In the PAL literature, researchers have acknowledged the crossover of several PAL constructs, and we recognize that our definition of *peer modeling* also resembled peer teaching and peer tutoring. Therefore, we believe comparing our results with results of studies in which those constructs were examined is appropriate. The authors[18] of a recent qualitative study in which PAL in 1 athletic training collegiate clinical site was examined indicated that peer teaching and peer learning occur naturally in this setting and that students reported peer teaching involved demonstrating skills to help their peers learn. Comparatively speaking, the volume of research in medicine and allied health education in which investigators have examined the use of peer teaching and learning and peer tutoring in didactic courses,[25] nonclinical laboratory courses (eg, gross anatomy),[26] clinical laboratory courses (eg, physical examination course),[27] self-directed learning modules,[28,29] and clinical experiences[21,22,30] is growing. This body of research demonstrates that peer teaching, learning, and tutoring often are used in multiple educational settings, with many benefits to the students engaged in the PAL activities. The benefits of peer teaching and tutoring are beyond the scope of this article but will be examined in our future research.

In the context of this study, the frequency of peer assessment and feedback depends on both the educational setting and whether it is planned or unplanned. Surprisingly, athletic training students reported peer assessment and feedback as the least common category of PAL in which they engage overall, with it occurring slightly more frequently in the instructional laboratory than the collegiate clinical setting. Although the finding was statistically significant, we are cautious about the clinical meaningfulness of whether students actually engage in peer assessment more frequently in the laboratory setting. However, we did not expect to discover that peer assessment and feedback occurred less frequently than the other forms of PAL because peer assessment has been advocated in athletic training as a method to review psychomotor skills.[16,31,32] A survey of athletic training students indicated that students practiced clinical skills with peers and received feedback from peers; however, no comparisons were made with other PAL activities.[5] No comparative research has been conducted in other allied health education programs to compare the frequency of various PAL activities or to explore the use of unplanned peer assessment and feedback. However, evidence exists that peer assessment and feedback has been used in allied health and medical education to enhance student learning. Peer assessment and feedback has been implemented formally into athletic training education for reviewing laboratory psychomotor skills,[23] in physical therapy education to assess oral case presentations,[33] in nursing clinical education to improve psychomotor skills,[34] and in medical education to provide feedback on professionalism[35,36] and patient-interviewing skills.[37]

Peer mentoring was the least common form of PAL observed by CIs and ATEP administrators in both the laboratory and clinical settings. However, students reported that mentoring occurred at a slightly higher frequency than did peer assessment and feedback. This finding is not surprising because the mentoring process is often a more private than public interaction, and CIs and administrators are less likely to observe such interactions among students. Unlike modeling and assessment, peer mentoring focuses on broader socialization issues (eg, professional values and norms) rather than on clinical skill development.[38] However, peer mentoring might be appropriate as a planned component of an ATEP, particularly for observation or beginning students. Pitney and colleagues[39] reported that athletic training students consider their peers to be mentors. Klossner[40] found that athletic training students view their peers in addition to CIs, patients, and coaches as socializing agents as they begin to legitimize their roles as health care providers. We believe that affirmation of this role as a health care provider could be strengthened through a planned peer-mentoring program as described by Henning and Weidner[41] in which pre–athletic training students or sophomore-level students are matched with upper-level peers for orienting the novice students to the athletic training environment.

Limitations

We recognize that the application of our results has several limitations. The differences in the type of data collected from administrators and CIs (binary) and that collected from students (Likert scale) imposes limitations on the direct comparison of observed frequency and self-reported frequency of PAL activities in each setting. In addition, the 5 categories of PAL defined in the original AT-PALS instrument were reduced to 3 categories based on the factor analysis. Therefore, we recognize that our definition of *peer modeling* might be similar to other PAL constructs defined in the literature (peer teaching, peer learning, peer leadership, peer tutoring, peer support), making direct comparisons with other studies more challenging. We examined the frequency of PAL in only 2 settings. Therefore, in the future, researchers examining PAL also should determine the frequency of student engagement in other commonly used clinical education settings, such as high school athletic training facilities and outpatient rehabilitation clinics, to provide a more in-depth analysis in athletic training education.

Our study has several other limitations. Relying on self-reported and perceived frequency of behaviors might not be as valid as recording actual observed behaviors. However, we believe that the large number of people who participated in our study increases the validity of our findings. In the future, researchers should triangulate self-reported frequencies or perceptions of frequency with actual observed behaviors. In the instrument's instructions, we did not define what it meant to *regularly observe* PAL behaviors. Therefore, participants might have had varying ideas about the regularity or frequency of PAL.

CONCLUSIONS

Athletic training students engaged in PAL activities more frequently in the collegiate clinical than in the laboratory setting, and the interactions were more frequently unplanned than planned. Students seem to have a natural tendency to engage specifically in peer modeling. We viewed this natural predisposition to model behaviors to their peers as a positive finding because it might allow for a team approach to patient care in their future professional careers. We encourage the purposeful use of planned PAL activities in both the laboratory and clinical settings to capitalize on this natural tendency and ensure that students have opportunities to benefit from the various PAL activities.

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