2012

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ATHLETIC TRAINING EDUCATION JOURNAL

www.nataej.org
ISSN: 1947-380X
DOI: 10.5608/0704176

ORIGINAL RESEARCH

The Effect of Self-Reported Efficacy on Clinical Skill Performance

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Context: Self-efficacy can enhance an individual's perception of their ability to perform a challenging task.
Objective: To determine whether repeated performance of a skill would improve students' self-efficacy across a range of academic classifications.
Design: Cohort study.
Setting: Graduate and undergraduate professional athletic training education programs accredited by the Commission on Accreditation of Athletic Training Education.
Participants: Twenty-seven athletic training students (sophomores, n = 10; juniors, n = 10; graduate, n = 7).
Intervention: We assessed participants within one day of performing a psychomotor clinical skill (PCS) of joint mobilizations or an upper quarter screen before (PCS_1) and after (PCS_2) a video intervention. The video that provided augmented feedback was viewed between PCS_1 and PCS_2.
Main Outcome Measures: Outcome measures included self-efficacy scores from the Clinical Skill Performance Self-Efficacy Form assessed over five time points throughout the learning period, PCS performance scores pre- and post-intervention, and the correlation between these measures.
Results: Following the intervention, PCS performance significantly improved in sophomores and juniors (Bonferroni post-hoc, $P < .001$); graduate students performed at a similar high level on PCS_1 and PCS_2 (Bonferroni post-hoc, $P = .72$). Academic classification affected baseline self-efficacy with graduate students reporting higher self-efficacy compared to sophomores (9.7 ± 4.1) and juniors (19.1 ± 4.1) (Bonferroni post-hoc, $P < .001$). All groups experienced an increase in self-efficacy ahead of PCS_1 with sophomores displaying a further increase between PCS_1 and PCS_2. With combined participants, we noted a positive correlation between self-efficacy assessed immediately following PCS_1 and performance on PCS_1 ($r = 0.502$, $P = 0.007$), and between relative increases in self-efficacy assessed immediately after PCS performance and relative increases in performance from PCS_1 to PCS_2 ($r = 0.533$, $P = 0.02$). Conclusions: The intervention positively affected performance in those who initially scored low. Students who reported higher degrees of self-efficacy immediately after the first PCS performance also performed better on this PCS. Student self-efficacy and PCS skill performance can be improved with the use of video feedback.
Key Words: clinical education, self-efficacy, psychomotor assessment

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Full Citation:
Bobo, L, Benson AA, Green M. The Effect of Self-Reported Efficacy on Clinical Skill Performance. *Athl Train Educ J.* 2012;7(4):176-186.

The Effect of Self-Reported Efficacy on Clinical Skill Performance

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INTRODUCTION

Individuals possessing a high degree of self-efficacy tend to participate in novel and challenging experiences as a result of a strong conviction that their skills and abilities will result in a successful outcome.[1-6] Success on past performances also creates a positive effect by enhancing one's self-efficacy.[1,7-10] Confidence, a colloquial term commonly associated with self-efficacy, is used in reference to a person's strength of belief. Self-esteem is more concerned with judgment of self-worth. Perceived self-efficacy is generally understood to be a person's belief in their ability to perform at a high level through the self-evaluation of personal capability and the organization and execution of a given performance.[1] Although all of these characteristics could be examined with athletic training students, our study investigated only self-efficacy. Students enrolled in Commission on Accreditation of Athletic Training Education (CAATE) accredited professional athletic training education programs (ATEP) utilize new knowledge, skills, and clinical integration proficiencies that would seemingly involve perceived self-efficacy on a daily basis.

Bandura[1] believes a high self-efficacy can enhance a person's perception of his or her ability to perform, which in turn may enhance the results of the accomplishment. Another facet of Bandura's research is when a person sets a goal to overcome a novel challenge, self-efficacy can help lessen the initial threat of encountering the new task. Zimmerman[11] purports that self-efficacy beliefs can be influenced by instructional interventions and alter an individual's development and use of their academic abilities. Athletic training students face new encounters as they progress through an ATEP. A high degree of self-efficacy, as it is defined, could assist a student in performing successfully academically, clinically, and professionally.

While a full explanation of Bandura's findings on self-efficacy is beyond the scope of this paper, much of his research centers on mastery modeling with mental training or reconditioning of addictive behaviors. The technique used for this training/reconditioning is quite similar to how students learn new skills. Mastery modeling is comprised of: (1) having a skill modeled with the basic rules and strategies, (2) learners receiving guided practice under simulated conditions, and (3) applying the new skill independently in work situations to help demonstrate successful learning.[1] Within a CAATE-accredited program, it is quite common for the following to occur as a student masters a psychomotor skill: (1) course instructor demonstrates and models the correct technique for performing a psychomotor skill during lecture or laboratory coursework, (2) student practices the skill within a laboratory or clinical setting with instructor guidance, and (3) student performs the learned skill during an assessment of a clinical integration proficiency or within a real-time clinical setting. The similarity of mastery modeling and mastery of a student's psychomotor skill is another reason why this study focuses on Bandura's findings of self-efficacy.

Published research that has investigated the relationship among self-efficacy, skill performance, and didactic education in students and professional practitioners highlights the challenges of learning difficult clinical skills in health profession education programs. One example of this research is Mann and Eland's[12] educational intervention using videotape instruction, which appeared to improve physician self-efficacy. This study investigated the self-efficacy of an entire class of first-year osteopathic medicine students mastering a therapeutic skill involving the orthopedic evaluation of the shoulder. Their design involved four primary steps in the following order: (1) students were led by an instructor demonstration during a laboratory session, (2) students were paired to practice the skill during the laboratory session, (3) students practiced outside class at their own pace using an instructional handout and a videotape, and (4) students received individualized feedback from the instructor on the skill performance. The researchers measured participant self-efficacy after students completed each of the four steps. Steps one and two were defined as skill instruction, whereas steps three and four were labeled as mastery learning.

A different study by Leopald et al[13] suggested that a physician's confidence level with a surgical task appears inversely related to competence levels (ie, a higher confidence level earned a lower competence score). Leopold et al[13] examined self-efficacy in a similar manner as Mann and Eland[12] but with medical phy sicians who may have already received instruction of the psychomotor skill. The intent of this study was to see if repetition and an educational intervention would improve mastery and self-efficacy of the physicians who were attending a continuing education course. Although the specialties of the physicians varied, participant assignment to the three educational intervention groups—a printed guide of knee injections, a CD-ROM instructional video, and a hands-on instruction by a trained tutor—was randomized.

Research addressing self-efficacy within athletic training education is minimal. Jurges et al[14] administered a survey to both undergraduate and graduate students that investigated whether the quality of undergraduate clinical education affected students' self-efficacy. The findings of this study suggested that the quality of clinical education did not relate to student self-efficacy, nor were there differences in self-efficacy between the undergraduate and graduate student.

We are not aware of any published studies investigating the relationship between self-efficacy and clinical skill performance in athletic training education. Creating a combination of the cited studies performed by the different sets of authors,[12-14] our study sought to determine whether repeated performance of a psychomotor clinical skill (PCS) would improve student self-efficacy across a range of academic classifications (ie, sophomores, juniors, and first-year graduate professional athletic training students). An additional aim of our study was to investigate the effect of a video feedback intervention on a student's self-efficacy. We hypothesized that self-efficacy would be positively related to PCS performance, improve as a function of repeated skill performance and video feedback, and be affected by academic classification.

METHODS

Participants

Using e-mail and flyers, we recruited participants (N = 27) from three cohorts of students enrolled in two different CAATE-accredited ATEPs . The participants included sophomore (n = 10, 8 males, 2 females, age = 19.6 ± 0.9 years), junior (n = 10, 6 males, 4 females, age = 20.8 ± 1.5 years), and first-year-graduate professional students (n = 7, 6 males, 1 female, age = 24.0 ± 1.5 years). The ethnicity of our participants consisted of five African-American students, two Hispanic students, one Asian student, and nineteen Caucasian students. Two of the graduate students possessed the professional credentials for a personal trainer (ie, certified strength and conditioning specialist). None of the participants reported having prior experience with Dartfish as a means of video feedback. Graduate students were included because the findings of Jurges et al[14] suggested there were no differences in self-efficacy between undergraduate and graduate professional students. The participants reported that they were never formally instructed or evaluated in a CAATE-accredited program on the skill they were being asked to perform. Since the first-year-graduate professional students completed the same competencies and proficiencies as the undergraduate students, we assumed that all participants were at a comparable skill level. We received Institution Review Board approval from both institutions. We apprised all participants of the purpose of the study via a written informed consent document.

Design

For consistency purposes, we both participated in the administration of the study at each institution. Study participants received identical instructor-led lectures and demonstrations on the simulated clinical skills, which were either (a) joint mobilizations or (b) an upper quarter screen. We selected the clinical skills according to the curricular progression and level of learning for each student's classification. To ensure there were no differences in the dissemination of information, we required all participants from each cohort to be present at the same time for the formal instruction of the PCS. We used a traditional lecture with PowerPoint™ slides for the didactic instruction, which was followed by peer-practicing of the PCS. The instructional period lasted 60 minutes.

Figure 1 identifies the chronological order of events for the study. We conducted two identical assessments of the psychomotor skill performance before and after the educational intervention. For the purpose of this study, PCS_1 is identified as the first time they performed the skill while PCS_2 is identified as the second time they performed the exact same skill. A stationary video camera recorded both performances allowing for subsequent analysis and grading. We provided students with an annotated videotape review only after PCS_1. The digitally annotated videotape was consistently reviewed by the researcher with 15 years of experience as a certified athletic trainer and 9 years of experience as an athletic training educator. The digitally annotated videotape contained the participant's entire PCS performance, so the student was able to see and hear the entire session. Annotation consisted of comments such as "good job" or "your hand place phyment is wrong" in order to assist the student in the self-evaluation process. This function was made possible by the Dartfish software. Even though the instructors scored the PCS assessment, the student was never provided a quantitative score. We purposefully did not provide the grade to avoid skewing the participants' self-efficacy.[11,15] Both PCS performances and educational intervention occurred in a one-day period to help reduce the chance of the student seeking feedback or additional instruction from external sources or clinicians.

Instrument

A previous study by Bobo and Andrews[16] that measured the self-efficacy of graduate-level professional students developed and piloted a modified self-efficacy questionnaire. The instrument, titled Clinical Skill Performance Self-Efficacy Form (CSPSF), was created from two validated instruments from Mann and Eland[12] as well as Leopold et al.[13] (These authors provided written permission to use and modify their instruments.) The Spencer Technique Self-Efficacy form used by Mann and Eland[12] used "yes" and "no" responses; however, we decided to use the 10-point Likert scale as based on the self-efficacy research of Leopold et al.[13.] Bandura[17] suggests that when establishing content validity of a self-efficacy scale, it is best to use the leading stem of "can do" as well as tailoring it to the construct of the study. Therefore, the questions on the modified CSPSF began with "I can perform…" and listed the components involved in completing the clinical skills.

We decided to use the CSPSF form for this study. We instructed the students to circle a value from 1–10 with a one being "not at all confident to perform" and ten meaning "very confident to perform" the involved skills. Although Bandura[17] does suggest a response scale on a 100-point scale ranging in 10-unit intervals from 0, a simpler response format with unit intervals ranging from 0 to 10 can retain the same validity. Again, we did not provide the students with quantitative scores of the performed PCS in order to avoid a positive (incentive) or negative (disincentive) expectation, or outcome expectation.[17]

We assessed self-efficacy via the CSPSF (Table 1) at five time points: prior to instruction ($SE_{Baseline}$), immediately prior to PCS_1 and PCS_2 ($SE_{PrePCS1}$ and $SE_{PrePCS2}$), and immediately following PCS_1 and PCS_2 ($SE_{PostPCS1}$ and $SE_{PostPCS2}$). A score of 1 meant "not at all confident to perform" and a score of 10 meant "very confident to perform" with the continuum of confidence running

Table 1. Clinical Skill Performance Self-Efficacy Form (CSPSF)

Questions Used for Upper Quadrant Screening	Likert Values*
1. I can find the dermatomal areas of sensation for nerve roots C_5 – T_1.	1 2 3 4 5 6 7 8 9 10
2. I can perform deep tendon reflex testing for the biceps tendon (C_5).	1 2 3 4 5 6 7 8 9 10
3. I can perform deep tendon reflex testing for the brachioradialis tendon (C_6).	1 2 3 4 5 6 7 8 9 10
4. I can perform deep tendon reflex testing for the triceps tendon (C_7).	1 2 3 4 5 6 7 8 9 10
5. I can perform a manual muscle testing for the C_5 myotome (shoulder abduction).	1 2 3 4 5 6 7 8 9 10
6. I can perform a manual muscle testing for the C_6 myotome (wrist extension and elbow flexion).	1 2 3 4 5 6 7 8 9 10
7. I can perform a manual muscle testing for the C_7 myotome (wrist flexion and elbow extension).	1 2 3 4 5 6 7 8 9 10
8. I can perform a manual muscle testing for the C_8 myotome (finger flexion).	1 2 3 4 5 6 7 8 9 10
9. I can perform a manual muscle testing for the T_1 myotome (finger abduction and adduction).	1 2 3 4 5 6 7 8 9 10

*1 = Not at all confident to perform; 10 = Very confident to perform

Figure 1. Study design.

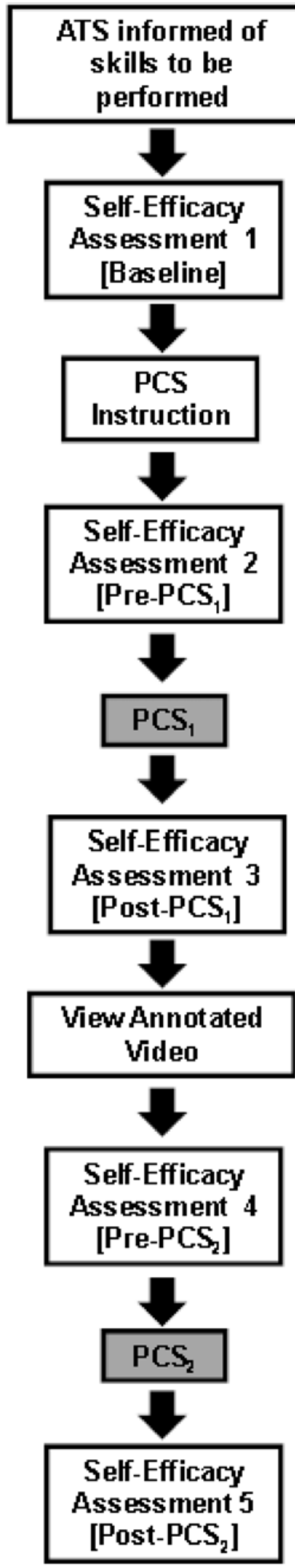

Table 2. Psychomotor Clinical Skill Performance and Self-Efficacy Ratings

	Psychomotor Clinical Skill Score (%)		Self-Efficacy Score				
Classification	PCS_1	PCS_2	Baseline	$Pre\text{-}PCS_1$ §	$Post\text{-}PCS_1$ §	$Pre\text{-}PCS_2$ §	$Post\text{-}PCS_2$ §
Sophomore	57.4±6.1	77.7±6.6 †	9.7±0.5	69.7±2.7	67.7±4.4	76.7±3.6 ¶	79.5±2.7
Junior	67.9±4.3	92.4±2.4 †	19.1±4.5	67.1±3.9	67.1±4.5	72.4±2.6	77.9±2.4
Graduate	90.6±2.8*	92.5±2.5	55.3±6.5 ‡	74.9±4.2	77.0±3.9	82.0±2.6	85.7±2.2
Total	70.6±3.7	87.2±4.8	26.1±4.3	69.3±2.1	70.1±2.6	76.7±1.8	80.7±1.5

Psychomotor clinical skill performance (PCS_1, PCS_2) and self-efficacy ratings (Baseline, Pre-PCS_1, Post-PCS_1, Pre-PCS_2, Post-PCS_2) assessed before and after a video intervention. *Graduate PCS_1 score higher than sophomore and junior PCS_1 score ($P < .05$). †Sophomore and junior PCS_2 score higher than respective PCS_1 score ($P < .001$). ‡Graduate self-efficacy score higher than sophomore and junior at Baseline ($P < .001$).
§Self-efficacy score higher in all groups compared to Baseline ($P < .05$). ¶Sophomore self-efficacy score at Pre-PCS_2 higher than Post-PCS_1 ($P < .01$). Scores are depicted as means ± SEM.

between these endpoints. We provided formal instruction in a classroom setting and only prior to PCS_1. Between PCS_1 and PCS_2 (a two-hour time period) we instructed the students to privately review the digitally annotated videotape at least one time. However, we encouraged students, while knowing it would not be tallied, to view the videotape as many times as necessary in the allotted time to assure that students were able to correct any errors before performing PCS_2.

Data Analysis

We expressed psychomotor clinical skill scores as a percentage of available points (0-100%), whereas we reported self-efficacy scores as the sum of the nine questions on the CSPSF (9-90 points). We analyzed PCS performance and self-efficacy scores with a two-way (classification and time) ANOVA with repeated measures on the within-subjects factor of time. Analyses had three levels of classification (sophomore, junior, and graduate) with two levels of PCS scores (PCS_1 and PCS_2) and five levels of self-efficacy ($SE_{Baseline}$, $SE_{PrePCS1}$, $SE_{PostPCS1}$, $SE_{PrePCS2}$, and $SE_{PostPCS2}$). We conducted post-hoc comparisons when warranted using the Bonferroni adjustment for multiple t-tests. We determined the relationship between self-efficacy scores and PCS scores using Pearson product moment correlation (Pearson *r*). We performed statistical analyses using SPSS 19.0 (SPSS, Chicago, IL), and we used an alpha level of .05.

RESULTS

Self-Efficacy Over Time

Self-efficacy scores changed significantly with the specific nature of the change being dependent upon the time point and classification ($F_{8,100} = 7.19$, $P < .001$) (Table 2; Figure 2). Sophomores ($t(9) = 22.1$, $P < .001$), juniors ($t(9) = 10.4$, $P < .001$), and graduates ($t(7) = 3.6$, $P = .019$) exhibited an increase in self-efficacy from baseline to immediately before PCS_1(pre-PCS_1) (Table 2; Figure 2). Sophomores ($t(9) = .207$, $P = 1.000$) and juniors ($t(9) = .219$, $P = 1.000$) failed to exhibit any increase in self-efficacy scores as a result of performing PCS_1 (ie, no difference in score between pre-PCS_1 and post-PCS_1). Self-efficacy scores for graduates remained unchanged across subsequent assessments from that assessed before PCS_1 (pre-PCS_1) ($P > .05$). Between PCS_1 and PCS_2 sophomores exhibited an increase in self-efficacy scores ($t(9) = 4.834$, $P = .004$) but the findings did not indicate an increase when assessed after PCS_2 (post-PCS_2) ($t(9) = 1.063$, $P = 1.000$). During this same period, juniors experienced a leveling off of self-efficacy scores between PCS_1 and PCS_2 ($t(9) = 1.966$, $P = .23$), which remained constant across subsequent assessments ($t(9) = 1.842$, $P = .35$). Examining self-efficacy ratings between groups, the findings indicated that graduate students reported higher self-efficacy compared to both sophomores ($t(16) = 7.89$, $P < .001$) and juniors ($t(16) = 4.71$, $P < .001$) at baseline with sophomores and juniors reporting similar ($t(18) = 1.566$, $P = .35$) self-efficacy at this time. Self-efficacy scores displayed

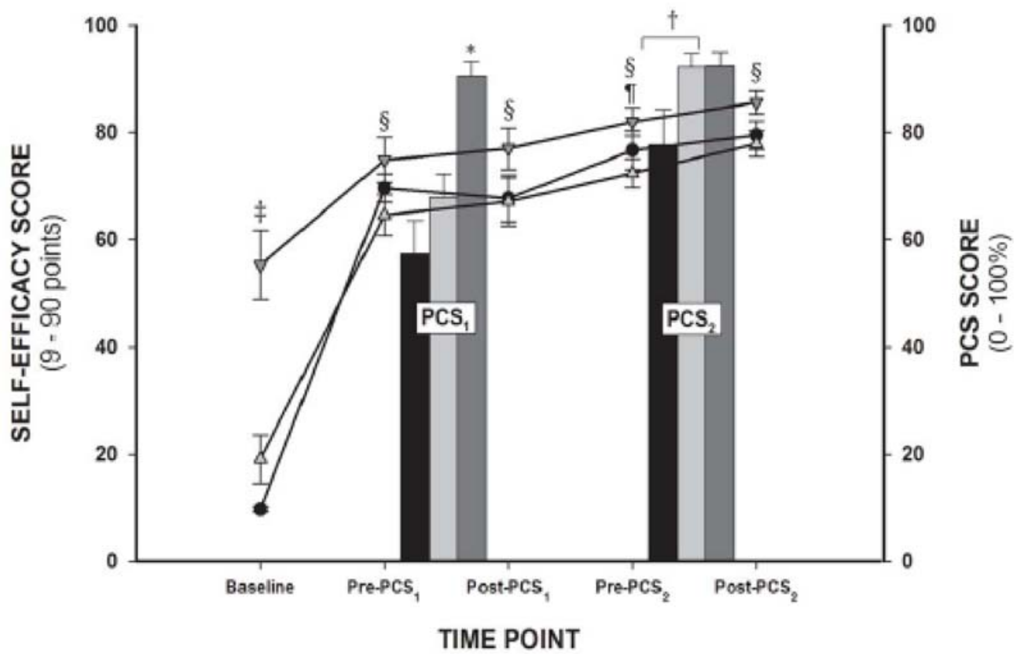

Figure 2. Self-efficacy (left axis; ● = sophomore, ▲= junior, ▼= graduate) and psychomotor clinical skill performance (right axis; black = sophomore, light gray = junior, dark gray = graduate) scores measured before and after a video intervention. PCS_1 = psychomotor clinical skill assessment prior to intervention. PCS_2 = psychomotor clinical skill assessment following intervention. Baseline = baseline self-efficacy, pre-PCS_1 = self-efficacy before PCS_1, post-PCS_1 = self-efficacy after PCS_1, pre-PCS_2 = self-efficacy before PCS_2, post-PCS_2 = self-efficacy after PCS_2. *Graduate PCS_1 score higher than sophomore and junior PCS_1 score ($P < .05$). †Sophomore and junior PCS_2 score higher than respective PCS_1 score ($P < .001$). ‡Graduate self-efficacy score higher than sophomore and junior at baseline ($P < .001$). §Self-efficacy score higher in all groups compared to baseline ($P < .05$). ¶Sophomore self-efficacy score at pre-PCS_2 higher than post-PCS_1 ($p < .01$). Scores are depicted as means ± SEM.

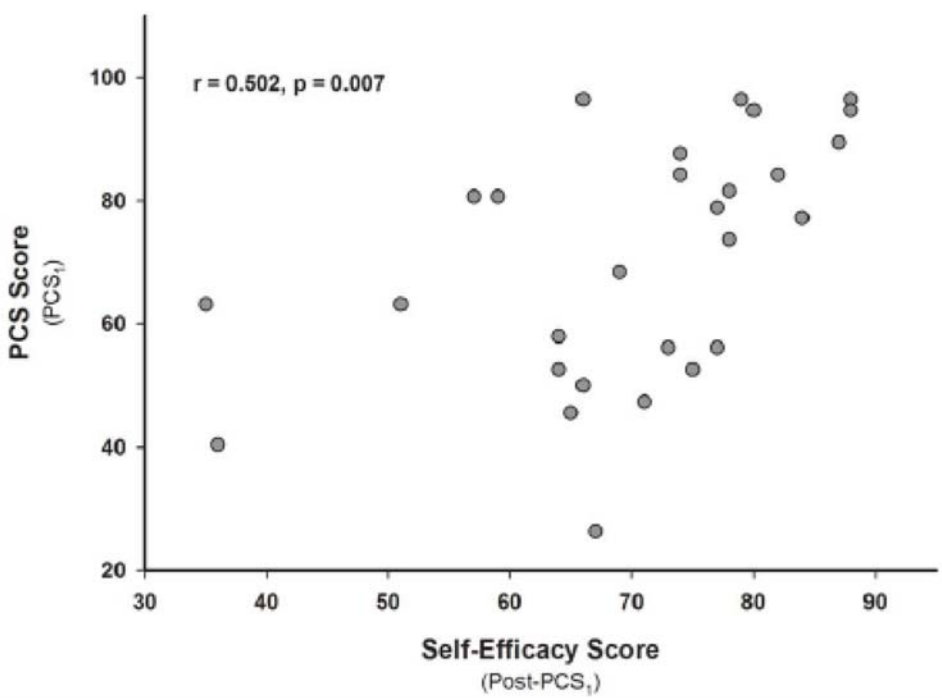

Figure 3. Correlation between self-efficacy measured immediately after PCS_1 (post-PCS_1) and score on the first psychomotor clinical skill assessment (PCS_1).

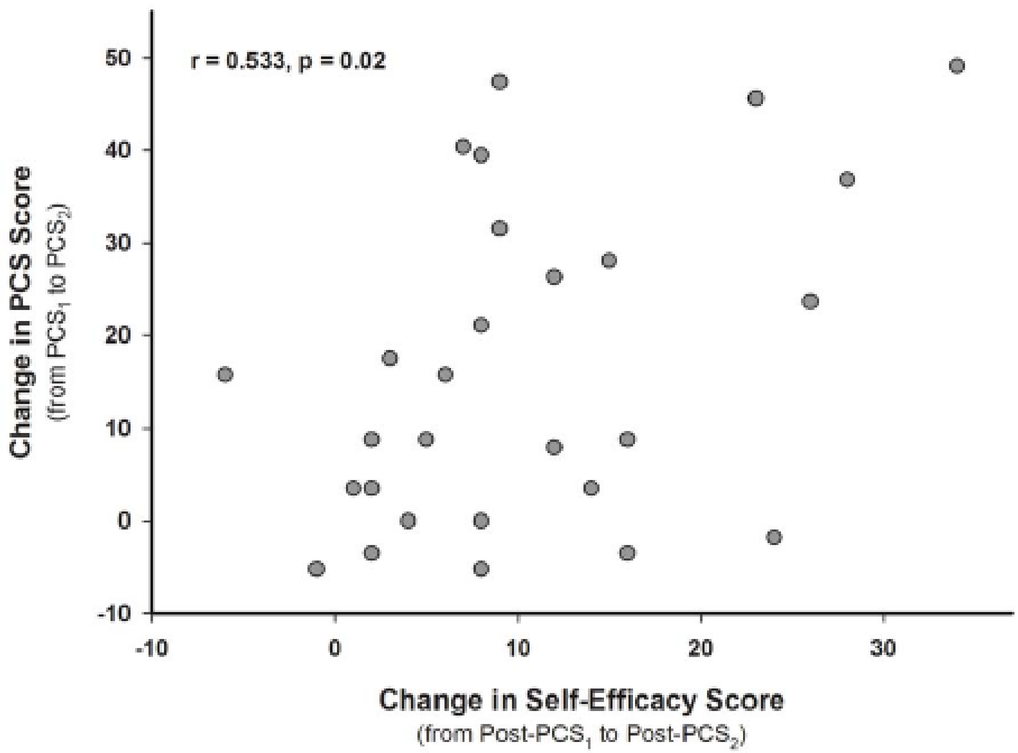

Figure 4. Correlation between the change in self-efficacy measured following each PCS (post-PCS_1 and post-PCS_2) and psychomotor clinical skill (PCS) performance from PCS_1 to PCS_2.

no difference ($P > .05$) between groups at any remaining time following baseline measurements.

Psychomotor Clinical Skill Performance Over Time

PCS scores changed significantly with the specific nature of the change being dependent upon time point and classification ($F_{2,25} = 5.31$, $P = .01$) (Table 2; Figure 2). Examination of the findings for PCS performance within each group suggested that both sophomores (t(9) = 3.305, $P < .001$) and juniors (t(9) = 5.214, $P < .001$) exhibited an increase in PCS score following video feedback, whereas PCS scores for graduate students remained unchanged as a result of the intervention (t(7) = .722, $P = .72$). Examination of PCS performance between groups indicated that sophomores and juniors had similar scores on PCS_1 (t(18) = .176, $P = .37$), with sophomores (t(16) = 4.563, $P <$ .001) and juniors (t(16) = 4.175, $P = .001$) both scoring lower than graduate students. All classifications (sophomore vs. junior, t(18) = 1.410, $P = .176$; sophomore vs. graduate, t(16) = 1.918, $P = .073$; junior vs. graduate, t(16) = .051, $P = .960$) scored similarly to each other on PCS_2.

Relationship Between Self-Efficacy and Psychomotor Clinical Skill Performance

When combining all participants into a single group, our analysis suggested there was no relationship between self-efficacy scores and PCS performance when self-efficacy was assessed immediately before either PCS_1 ($r = 0.251$, $P = .20$) or PCS_2 ($r = 0.127$, $P = .52$). However, when self-efficacy was assessed immediately following PCS_1 performance, our analysis noted a moderate positive correlation with prior performance on PCS_1 ($r = 0.502$, $P = .007$; Figure 3).

We also calculated the relative change in scores from PCS_1 to PCS_2 (ie, the difference between the score on PCS_2 and PCS_1) as well as the relative changes in self-efficacy across the various assessment points. Comparing the relative changes in both self-efficacy and PCS performance, our analysis suggested a moderate correlation ($r = 0.533$, $P = .02$) (Figure 4) between the relative increases in self-efficacy scores when assessed immediately after each PCS performance (post-PCS_1 to post-PCS_2; 10.5 ± 1.8) and the relative increase in PCS performance scores between PCS_1 and PCS_2 (16.6 ± 3.3%).

DISCUSSION

This study sought to determine the effect of repeated PCS performance and an educational intervention (video feedback) on self-reported self-efficacy. PCS performance significantly improved following the video feedback intervention in sophomores and juniors; however, graduate students displayed no such improvement. It is apparent from the raw scores that graduate students performed at a high level on PCS_1 (90.6 ± 2.8%), thus leaving little margin for improvement on PCS_2 (92.5 ± 2.5%). Consequently, the intervention appeared to positively affect PCS performance at least in those participants (ie, sophomores and juniors) who scored relatively low on the first assessment. Indeed, PCS scores for the juniors reached the same high level as those for the graduate students on PCS_2, although scores for the sophomores trailed those of the graduate students despite exhibiting an improvement over their respective PCS_1 performance.

In support of our research hypothesis, academic classification affected the degree of reported self-efficacy. Prior to any instruction or PCS testing, graduate students clearly exhibited a higher level of self-efficacy compared to sophomores and juniors (Figure 2). Leopold et al[13] measured self-confidence and competence levels of orthopedic surgeons prior to performing a simple surgical task. The prior experience and past performances of the surgeons resulted in inflated self-reported self-efficacy scores that did not match the low-earning surgical skill performance scores. Another possible reason the graduate students in our study started at a higher self-efficacy level could be because individuals who have more practical experience, whether worldly or professionally, have a higher self-efficacy.[18,19] However, following the instructional training, all classifications exhibited a sustained increase in their self-efficacy when assessed at pre-PCS_1 and beyond.

Mann and Eland's[12] educational interventions of video demonstration, peer practice, independent practice, and instructor feedback could have contributed to the medical students' increase in self-efficacy scores while mastering a skill. Youngquist et al's[15] study involving airway training with paramedics used a similar research method to Mann and Eland's but measured self-efficacy based on skill retention and the effects of skill retraining. The findings of this study suggested that self-efficacy did not seem to be negatively affected by skill performance degradation, but skill retraining enhanced paramedic self-efficacy. For our study, the reason for all classifications increasing their self-efficacy between the trials may have been attributable to the video feedback that was provided following PCS_1 and the repetitive practicing of the clinical skills. Again, without having a control group, this assumption is inconclusive and would require further research; however, annotated videotapes are effective as a means of feedback in clinical skill performances in a professional health program.[20]

Also in support of our research hypothesis, the findings suggested a relationship between self-efficacy and repeated skill performance. In particular, when self-efficacy was assessed immediately following PCS_1, we observed a moderate positive correlation with prior performance (Figure 3). Therefore, students who reported higher degrees of self-efficacy when questioned immediately after their PCS performance had actually performed better on the preceding PCS (at least in the case of the first assessment, PCS_1). In further support of this relationship, there was a positive correlation between the relative increase in post-PCS self-efficacy score and the relative increase in PCS performance (Figure 4). Bandura[1] discussed how children with a higher self-efficacy performed better in solving conceptual problems than other students who had superior, average, or equal cognitive abilities. Vancouver et al[21] provided findings that support a positive correlation between self-efficacy and performance. Their findings suggested that a good performance positively influences self-efficacy as opposed to the reversal. We question this because the quantitative scores were not provided to the student; however, the student may have felt the performance went well.

Limitations and Suggestions for Further Research

The present study contains some noted limitations. First, self-efficacy was only reported over a 6-hour period, at most. In order to examine if self-efficacy can improve across time, we recommend that it be measured throughout a semester or an academic program. Second, we suggest interpreting the results reported in this study with caution due to the small sample size and no control group. Our sample of 27 participants potentially limits the generalization of the findings to a larger population, although using a larger sample would have proven difficult given the nature of the study's design. However, we feel the experimental design tested the most common means that athletic training students use in learning a PCS (ie, didactic instruction, clinical instructor/teacher practice with feedback, reflective review of feedback, and final PCS assessment). The construct of performing this study in one day was to limit or eliminate the students seeking feedback from external sources or clinicians. It was our intention that the educational intervention (ie, the annotated video feedback) would be the sole source for the students' review of the PCS.

Another limitation of our study could have been that the participants were never provided verbal feedback on their performance. It has been noted that the knowledge of score performance can increase one's self-efficacy.[15,22] Obviously, if this educational intervention was performed throughout a semester-long course, students would have receive scored performances. Therefore, it would be ideal for future research to focus on how a grade can negatively or positively affect one's self-efficacy.

An additional limitation was that the self-efficacy form did not ask the participants how many times they viewed the annotated videotape. The total number of viewings could have negatively or positively affected participants' self-efficacy and should be considered in future research.

Lastly, it is assumed that the students' self-reported self-efficacy scores are honest and accurate.15 In support of this, we suggest creating an original self-efficacy instrument rather than modifying another researcher's instrument. Because skill performance improved following the viewing of the annotated videotape, we recommend that future research examine if feedback, passage of time, or repeated practice independently, or in combination, is/are the specific cause for improvement in a student's self-efficacy

CONCLUSION

Despite the limitations imposed on the data by the small sample size, this study should encourage athletic training educators to consider the importance of a student's self-efficacy in performing clinical skills. The viewing of the annotated videotape could have improved self-efficacy levels in younger students; however, future research needs to be performed in this area to help determine if this was the sole reason for improvement. Due to the mental demands inherent to the profession of athletic training, a high level of self-efficacy is important. The athletic training profession requires competent and confident entry-level professionals; therefore, it is necessary for educators to be aware of the importance of a student's self-efficacy. Further athletic training education research must also elucidate how to improve a student's self-efficacy and the factors that contribute to positive or negative self-efficacy.

Acknowledgements

The Stephen F. Austin State University Research Academy Grant and Faculty Development Mini-grant in Nacogdoches, Texas (Linda Bobo) and the Troy University Faculty Research Development Grant in Troy Alabama, (Amanda Andrews Benson) provided funding for this project.

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