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ORIGINAL RESEARCH

Effect of Performance Feedback on Perceived Knowledge and Likelihood to Pursue Continuing Education

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Context: For practicing health care professionals, waiting for a teachable moment to identify a gap in knowledge could prove critical. Other methods are needed to help health care professionals identify their knowledge gaps.

Objective: To assess the effect of performance feedback on Athletic Trainers' (AT) perceived knowledge (PK) and likelihood to pursue continuing education (CE).

Design and Setting: Pre-test, post-test control-group design to measure PK and likelihood to pursue CE before and after assessing actual knowledge (AK) in an on-line classroom (Campus Edition 6; Blackboard Inc.).

Participants: We randomly sampled potential participants (n = 2000) from the National Athletic Trainers' Association membership directory and then randomly assigned (n = 103/2000, 5.1%) them to control (n = 58) or experimental groups (n = 45).

Interventions: Performance feedback following the AK assessment in the experimental group.

Main Outcome Measures: We assessed PK and likelihood to pursue CE before and after the AK assessment. We calculated differences between pre-test and post-test scores and knowledge gap. Two independent samples t-tests examined the effects of feedback on the dependent measures. Multiple linear regression was used to predict post-test likelihood to pursue CE using three variables: PK, pre-test likelihood to pursue CE knowledge gap.

Results: We found a significant difference (68.2%) between groups for likelihood to pursue CE (P = 0.01, ES = 0.45). The experimental group demonstrated a 13.8% (pre-test = 4.12 ± 1.32, post-test = 4.78 ± 1.13) increase in likelihood to pursue CE, while the control group increased 4.4% (pre-test = 4.60 ± 1.07, post-test = 4.81 ± 1.08). Pre-test likelihood to pursue CE was a significant predictor of post-test likelihood to pursue CE (r = 0.74, R^2 = 0.55, P = 0.05). We observed a moderate relationship between pre-test knowledge gap and post-test likelihood to pursue CE (r = 0.31, R^2 = 0.10, P < 0.01). Pre-test knowledge gap was a significant predictor of post-test knowledge gap (r = 0.88, R^2 = 0.77, P < 0.01).

Conclusions: Knowledge assessment alone increases the likelihood to pursue CE, yet when feedback is provided ATs are more likely to pursue CE.

Key Words: actual knowledge, self-directed learning, knowledge gap

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Effect of Performance Feedback on Perceived Knowledge and Likelihood to Pursue Continuing Education

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The dynamic nature of continuing education (CE) makes it an ideal platform to present health care providers with new knowledge that extends beyond entry-level education. Developments in medical research advance the depth and breadth of knowledge at a rate that often exceeds the capabilities of entry-level educators and traditional texts. Therefore, CE is essential in providing practicing health care professionals with current methods of recognition and treatment of injuries and illnesses. In the athletic training profession, CE provides skills that broaden the body of knowledge beyond the National Athletic Trainers' Association (NATA) Education Competencies of professional education. Exertional heat illness and fluid replacement are examples of topics for which research has yielded new knowledge beyond that of entry-level curricula; understanding such advanced clinical skills will help practitioners improve their ability to prevent, recognize, and treat exercise-associated muscle cramps (EAMC).

Exercise associated muscle cramps occur most frequently when athletes are participating in extreme environmental conditions.[1] Although most cases of EAMC are benign, attributed to mineral deficiencies, and easily treated,[2] the condition can be extremely painful, involve multiple muscle groups, and may be associated with more serious and fatal conditions, such as myopathy, rhabdomyolysis, and acute renal failure.[2] The NATA Education Competencies regarding EAMC are limited in that they are neither specifically addressed, nor do they reflect new research regarding prevention, recognition, and treatment. Continuing education is necessary to inform practitioners of these new advances.

Practitioners must be motivated to seek out CE and gain new knowledge about EAMC and exertional heat illness in order for patients to benefit from current medical research. Adult learning theory suggests that the ideal learner is interested in the application of new knowledge and self-directed, and is therefore capable of directing his or her own learning.[3] Self-directed learners choose what to learn, taking into account both personal and professional experiences.[3] These experiences help self-directed learners set educational content, make education decisions, and set goals, which are the 3 critical steps of the adult learning process.[4] The self-directed learner initiates the educational process after reflecting on his or her own understanding of the topic and identifying a knowledge gap. Once aware of the knowledge gap, the self-directed learner then seeks methods, such as individual learning or CE, to address the gap. Researchers measure such knowledge gaps by comparing perceived knowledge defined as what the learner thinks he or she knows, with actual knowledge what the learner actually knows.[5-10] A poor relationship exists, however, between perceived knowledge and actual knowledge[5-10] suggesting that most learners are unaware of their knowledge gap or are not self-directed and are therefore not likely to pursue CE. Without adequate professional or personal experiences, all learners, even self-directed learners, may require external feedback to identify the gap in their knowledge. Once a learner identifies a knowledge gap, the likelihood of pursuing CE may improve.[11-14]

In an ideal clinical simulation or formal education, a learner can easily identify a shortcoming and resolve it through further study. For practicing health care professionals, however, waiting for a personal experience to identify a knowledge gap for the recognition and treatment of an emergent condition could prove critical to the patient. Another method is needed to provide health care professionals the opportunity to become aware of any such knowledge gap. External feedback has been shown as an effective means of initiating such awareness and exploring CE opportunities in various professions.[15-17] No research has quantified the effects of external performance feedback on athletic trainers' (AT) perceived knowledge and likelihood to pursue CE. Therefore, our purpose was to identify the effects of performance feedback on AT perceived knowledge and likelihood to pursue CE. Because of the risk of the potential grave consequences of poorly managed exertional heat illnesses, we chose to assess AT perceived and actual knowledge of current standards for the prevention, recognition, and treatment of EAMC.

METHODS

Research Design

We measured the effect of performance feedback on perceived knowledge and likelihood to pursue CE using a pre-test post-test control-group design. We measured each AT perceived knowledge and likelihood to pursue CE prior to and after assessing his/her actual knowledge. Immediately following a knowledge assessment, we provided members of the experimental group with performance feedback consisting of both item-by-item and summative feedback. The control group received no external performance feedback. The two dependent variables were perceived knowledge and likelihood to pursue CE regarding the prevention, recognition, and treatment of EAMC. The independent variable was external performance feedback.

Participants

We used the NATA membership directory to select a random sample of ATs (n = 2000). We then randomly assigned ATs to the experimental and comparison groups. Of the 2000 invitations sent, 103 individuals volunteered to participate in the study (response rate = 5.15%; control group n = 58, experimental group n = 45). Levene's statistic indicated that the groups were heterogeneous on three of the five demographic variables (Table 1), therefore we compared the groups using parametric statistics. The groups were not significantly different with regard to occupational region, occupational setting, and level of expertise. The groups were significantly different, but with very little effect, with regard to gender (t_{101} = 2.45, P = .02, ES = 0.12 [small]) and level of education ($F_{1,101}$=5.48, P=0.02, ES= 0.04 [small]).

Instrumentation

We used two instruments to measure the dependent variables: the Perceived Knowledge Questionnaire (PKQ) and the Actual Knowledge Assessment (AKA).

Perceived Knowledge Questionnaire

The PKQ is a 16-item questionnaire (Table 2) we modified from a validated 5-item subjective knowledge assessment tool.[18] The original instrument was implemented with a 7-point Likert-scale[18] which provided participants with a centralized option.[19] We preferred a 6-point Likert-scale, so we performed a test-retest crossover pilot study design (n = 18 AT and AT students) to compare results of the PKQ employing a 6-point scale. Fourteen of the 16 items as well as the mean of all the item-correlations demonstrated strong[20] (0.50-1.00) reliability. In light of such strong correlations and to obtain greater variance in answers, we decided to employ the 6-point scale.

The 5-item subjective knowledge assessment tool was validated to interchange a variety of constructs from several disciplines. We were able to insert the concepts of prevention (5-items), recognition (5 items), and treatment (5 items) of EAMC directly into the instrument for our purposes. The 16th item was used to determine each participant's likelihood to pursue CE. Previous investigations have identified the self-perceived CE needs of ATs[21] and deterrents to obtaining CE units,[22] but neither measured the likelihood to pursue CE.

Actual Knowledge Assessment

The 25-item AKA quantified each participant's understanding of the prevention, recognition, and treatment of EAMC that was developed from the Inter-Association Task Force and NATA position statements on exertional heat illness and fluid replacement.[23-25] These position statements define the professional standards for athletic trainers. We solicited 3 experts to review the AKA for clarity, accuracy, and reflection of current knowledge regarding exertional heat illnesses and fluid replacement. The panel scored each item's level of clarity (4-point Likert scale), accuracy (dichotomous: Yes or No), and level of agreement (4-point Likert scale) that the item reflects current knowledge. An analysis of the panel's agreement with the AKA revealed strong clarity (mean= 4±0), strong accuracy (3 items deemed inaccurate by 2 or more panelists), and strong agreement on reflection of current knowledge (mean= 4±0). More importantly, the experts provided comments for item improvement which were incorporated into the instrument. Each expert was a member of the NATA's Exertional Heat Illness or Fluid Replacement Task Force or a researcher with publications along this area of expertise.

Table 1. Demographic Characteristics of Experimental (n = 45) and Control Groups (n = 58)

		Experimental		Control	
Characteristic		n	%	n	%
Gender	Male	18	40.0	37	63.8
	Female	27	60.0	21	36.2
Occupational Region	District 1	0	0.0	1	1.7
	District 2	7	15.6	4	6.9
	District 3	4	8.9	9	15.5
	District 4	11	24.4	12	20.7
	District 5	3	6.7	7	12.1
	District 6	5	11.1	6	10.3
	District 7	3	6.7	3	5.2
	District 8	5	11.1	2	3.4
	District 9	5	11.1	11	19
	District 10	2	4.4	3	5.2
Occupational Setting	Professional Sports	0	0.0	3	5.2
	College/University	20	44.4	25	43.1
	Secondary/Intermediate School	11	24.4	18	31
	Sports Medicine Clinics	5	11.1	1	1.7
	Industrial/Occupational Setting	1	2.2	1	1.7
	Physician's Office/Hospital	1	2.2	1	1.7
	Other	7	15.6	9	15.5
Level of Education	Doctoral	2	4.4	5	8.6
	Masters	25	55.6	42	72.4
	Bachelors	18	40.0	11	19
Level of Expertise	More than 5 years of working experience	26	57.8	33	56.9
	5 years or fewer of working experience	19	42.2	25	43.1

Table 2. Correlation Analysis to Employ a 6-point Likert Scale in the Perceived Knowledge Questionnaire

Item	Description	Spearman's rho Correlation	*P* value
1	I know pretty much about preventing EAMC.	0.85	< 0.001
2	I do not feel very knowledgeable about preventing EAMC. (reverse scored)	0.94	< 0.001
3	Among my colleagues, I'm one of the "experts" on preventing EAMC.	0.82	< 0.001
4	Compared to most other ATs, I know less about preventing EAMC. (reverse scored)	0.64	0.005
5	When it comes to preventing EAMC, I really don't know a lot. (reverse scored)	0.67	0.003
6	I know pretty much about recognizing EAMC.	0.78	< 0.001
7	I do not feel very knowledgeable about recognizing EAMC. (reverse scored)	0.88	< 0.001
8	Among my colleagues, I'm one of the "experts" on recognizing EAMC.	0.90	< 0.001
9	Compared to most other ATs, I know less about recognizing EAMC. (reverse scored)	0.39	0.11
10	When it comes to recognizing EAMC, I really don't know a lot. (reverse scored)	0.94	< 0.001
11	I know pretty much about treating EAMC.	0.83	< 0.001
12	I do not feel very knowledgeable about treating EAMC. (reverse scored)	0.85	< 0.001
13	Among my colleagues, I'm one of the "experts" on treating EAMC.	0.84	< 0.001
14	Compared to most other ATs, I know less about treating EAMC. (reverse scored)	0.35	0.15
15	When it comes to treating EAMC, I really don't know a lot. (reverse scored)	0.79	< 0.001
16	I am likely to pursue continuing education to improve my knowledge of EAMC.	1.00	< 0.001
	Mean =	0.78	
	SD =	0.19	

Procedures

The Institutional Review Board approved the investigation prior to soliciting potential participants, whom we contacted via electronic mail with instructions and an individualized access code for the secure testing site (Campus Edition 6; Blackboard Inc.). The testing site was accessible for approximately 6 weeks after the initial email. Upon accessing the test site (implying consent to participate), each participant answered 6 demographic questions, followed by the pre-test PKQ and then the AKA. Immediately following the AKA, each member of the experimental group received both summative feedback (total and percent of correct questions and an item-by-item feedback regarding every question in the AKA. The item-by-item feedback detailed each question including the list of possible responses, the participant's chosen response, the correct response, and then the correct response in sentence format (Figure 1). Members of the comparison group did not receive any feedback. All participants then completed the post-test PKQ.

Statistical Analysis

We imported the data from the test-delivery system into SPSS Statistical Package for Windows (Version 15.0) for statistical analysis. We calculated descriptive statistics for dependent measures and all demographic data. To quantify the effects of the AKA and the independent variable, we calculated the variable 'change in PKQ' as the difference between pre and post PKQ scores and the variable 'change in likelihood to pursue CE' in the same manner. We isolated the effects of the feedback provided by comparing these variables between the two groups using two independent samples t-tests. To identify knowledge gap, we calculated z-scores from the dependent measures and measured the differences (ie, Pre-test knowledge gap = Z-score (Pre-test PKQ) – AKA).

We used multiple linear regression (MLR) to identify the prediction qualities of the dependent variables and the demographic characteristics (gender, occupational setting, occupational location, level of expertise, level of education). We chose this

Question: Sweat rate generally increases after a period of acclimatization, typical after ____ of heat exposure, requiring a greater fluid intake for a similar bout of exercise.

Student Response	Value	Correct Answer	Feedback
A. 0-5 days	0%		
B. 7-12 days	***0%***		Incorrect
C. 10-14 days	100%	√	
D. 15-20 days	0%		
Score:	**0%**		

General Feedback:

Sweat rate generally increases after a period of acclimatization, typical after **10 to 14 days** of heat exposure, requiring a greater fluid intake for a similar bout of exercise.

Figure 1. Item-by-item performance feedback including the question, list of possible responses, participant's response (***italics***), and correct response (√) were provided.

method of analysis because it is more flexible than a traditional ANOVA. We analyzed the relationship between the dependent variables, post-test perceived knowledge and likelihood to pursue CE using MLR. We used MLR to identify the degree to which pre-test knowledge gap can predict post-test knowledge gap. We also used MLR to identify the degree to which knowledge gap can predict likelihood to pursue CE. Finally, we analyzed the degree to which gender, occupational setting, occupational region, level of expertise, and level of education affected the predictive relationship between knowledge gap and likelihood to pursue CE using MLR. We set the a-priori alpha level at $p < 0.05$.

RESULTS

Effect of Performance Feedback

We identified no significant differences with the independent samples t-tests between groups on difference-scores of the pre and post PKQ means ($t_{10\,1} = -0.66$, $P = 0.50$, $1\text{-}\beta = 0.54$). However, we found a 68.4% significant difference ($t_{101} = 2.72$, $P = 0.01$, ES = 0.45) between groups in the change scores for likelihood to pursue CE because of the performance feedback. The experimental group demonstrated a 13.7% increase in the likelihood to pursue CE after the AKA in the experimental group, as compared to only a 4.3% in the group receiving no feedback.

Predicting Post-Test Likelihood to Pursue Continuing Education

Pre-test likelihood to pursue CE was a significant predictor of post-test likelihood to pursue CE ($r = 0.73$, $R^2 = 0.53$, $P < 0.01$). This model of predicting post-test likelihood to pursue CE was enhanced when the variable 'group' was included; 'group' accounted for a significant amount of unique variance in the model ($r = 0.74$, $R^2 = 0.55$, $P = 0.05$). The finding indicates that pre-test likelihood to pursue CE is a significant predictor of post-test likelihood to pursue CE in the experimental group.

$$Y_{CEpost} = 0.76X_{CEpre} - 0.34X_{group} + 2.24 + E$$

We observed a moderate relationship between pre-test knowledge gap and post-test likelihood to pursue CE ($r = 0.31$, $R^2 = 0.10$, $P < 0.01$) regardless of group allocation:

$$Y_{CEpost} = 0.31X_{KGpre} + 4.80 + E$$

None of the demographic variables were significant predictors between pre-test and post-test measures of knowledge gap and post-test likelihood to pursue CE.

Predicting Post-Test Knowledge Gap

Pre-test knowledge gap, the difference between perceived knowledge and actual knowledge, was a significant predictor of post-test knowledge gap ($r = 0.88$, $R^2 = 0.77$, $P < 0.01$):

$$Y_{KGpost} = 0.88X_{KGpre} + 0.002 + E$$

DISCUSSION

Effect of Performance Feedback

The primary purpose of this investigation was to measure the effect of performance feedback on perceived knowledge and likelihood to pursue CE regarding EAMC. We hypothesized that providing participants with performance feedback would affect both their post-test perceived knowledge and likelihood to pursue CE. Our findings suggest that performance feedback did not have a significant effect on perceived knowledge, but did significantly increase the likelihood to pursue CE regarding EAMC (68.4% difference between groups). These results indicate that providing ATs with an AKA and performance feedback can facilitate a learner to recognize the need to seek out new knowledge, but may not necessarily change their perception of their own knowledge gap.

This finding contradicts previous literature suggesting feedback will alter perceived knowledge;[26-28] however it supports the reports that feedback will alter participant information-seeking behavior. When there is a large discrepancy between goals and outcome feedback, perceived knowledge is altered and, often, goals are realigned.[26,29,30] Our investigation only resulted in a small change in pre-test and post-test perceived knowledge scores. This smaller discrepancy may not have warranted the changes in perceived knowledge, but did refocus goals toward gathering CE for the prevention, recognition, and treatment of EAMC. In planning new CE opportunities, including knowledge assessments prior to participation may help ATs set more focused goals to meet their knowledge needs.

Predictive Relationships Between Variables

Perceived Knowledge

Self-efficacy theory suggests that students' perception of ability is positively related to his or her level of engagement in strategies to improve a task.[11,31] Further, as a student's interest in learning for the sake of improving knowledge increases, the use of strategies to improve knowledge also increases.[32-34] A strong relationship between perceived knowledge and likelihood to pursue CE has been theorized in the literature. Although our results failed to indicate this relationship, the role of perceived knowledge is one important component to guiding CE. Needs assessments, often driven by the learner's current patient care needs, have been used to plan CE.[35-37] An assessment of knowledge prior to acquiring learners' perceived needs may be more effective in focusing CE curricula.

Knowledge Gap

The MLR we employed indicated that a pre-test knowledge gap was a significant predictor of a post-test knowledge gap. Previous reports, which only provide an assessment of perceived knowledge prior to a test, suggest that perceived and actual knowledge are poorly correlated.[5-10] In contrast to these reports that correlated pre-and post-test values, we calculated the difference between perceived knowledge and actual knowledge and sought to answer the applicable question: Can pre-test

values predict the post-test knowledge gap? Our results indicate that a pre-test knowledge gap was indeed a strong and significant predictor of a post-test knowledge gap. These findings imply that early identification of a knowledge gap may help to guide more specific learning to meet a deficit. Needs assessments to plan CE have used only perceived needs[38] to articulate a potential topic for CE.[35-37] These learners are often unaware of their knowledge gaps and are likely to report their needs based on a current problem, not an identified knowledge deficit. Further, the "clinical care gap" described as the difference between evidence and practice in medical CE literature, is also unknown by practitioners. Therefore, perceptions alone will fail to resolve the gap, unless some means to identify the knowledge deficit is utilized.

Predictors of Pursuing Continuing Education and Perceived Knowledge

Our findings indicate that a pre-test knowledge gap was a moderate and significant predictor of post-test likelihood to pursue CE. However, performance feedback did not significantly enhance the relationships between these variables. No researcher has incorporated the theory of external or performance feedback in investigations that compare actual and perceived knowledge. Research suggests that learners are more effective when responding to externally provided feedback,[15,17] like that provided through peer evaluation, teacher remarks on class work, or answer sections of a textbook.[39] This external feedback is most often provided after a task is completed and is therefore feedback about performance aimed at improving student scores on the task.[39]

Performance feedback may also serve an alternative purpose, particularly with self-directed or adult learners. Self-directed learners who experience an impediment to learning, which may come in the form of negative performance feedback, will trigger reassessment of the educational goal.[40] Our findings support the theory that performance feedback that identifies a knowledge gap may trigger a learner to reassess and subsequently increase the likelihood of engaging in CE opportunities.[11-14] Our results suggest this change may be a result of test taking, where internal and external feedback are both affecting the outcome. We may then conclude that test taking prior to instruction may have a significant impact on the subsequent learning. These implications are far-reaching, from a first-year Introduction to Athletic Training course to post-professional education, in that identifying what is not known can guide students in acquiring new knowledge.

Limitations

The most significant and inevitable limitation of our investigation is participant self-selection. Although the effect size statistics suggest that a sufficient sample was acquired to identify a meaningful difference between groups, few ATs (response rate= 5.15%) chose to participate in an EAMC content-specific educational assessment. We understand that CE seeking behavior is multifactorial and the response rate may indicate that athletic trainers do not inherently seek opportunities to test their knowledge in the manner provided. Future research should employ similar methods but attempt to differentiate between internal and external feedback. Also, we did not identify actual CE seeking behavior and therefore future investigations should observe these actual behaviors.

CONCLUSIONS

Performance feedback increased participants' likelihood to pursue CE; however, it did not alter AT perceived knowledge scores. Although the performance feedback we provided did not enhance the participants' abilities to recognize their knowledge deficit after testing, it did increase their likelihood to pursue new knowledge. In this study, we found that learners were able to reflect on their experience by reporting that they would likely seek methods to meet their inadequacy.

Knowledge gap was a significant predictor of likelihood to pursue CE, regardless of whether performance feedback was provided. Individuals often overestimate actual knowledge and thereby create a barrier to acquiring new information.[28-30] Perhaps internal feedback, as a result of self-assessment through test-taking as we employed, rather than the previously suggested external feedback, may be the trigger necessary to seek new knowledge through CE.

For ATs, a more self-directed approach to acquiring new knowledge should be employed. Further, planning CE opportunities should include methods of pre-assessment to aid in more focused knowledge acquisition.

REFERENCES

1. Cooper ER, Ferrara MS, Broglio SP. Exertional heat illness and environmental conditions during a single football season in the southeast. *J Athl Train.* 2006;41(3):332-336.
2. Bergeron MF. Heat cramps: fluid and electrolyte challenges during tennis in the heat. *J Sci Med Sport.* 2003;6(1):19-27.
3. Knowles MS. Andragogy, not pedagogy. *Adult Leadership.* 1968;16(10):350-352.
4. Hewson MG. Clinical teaching in the ambulatory setting. *J Genl Intern Med.* 1992;7 (1):76-82.
5. Clark LR, Jackson M, Allen-Taylor L. Adolescent knowledge about sexually transmitted diseases. *Sex Transm Dis.* 2002;29(8):436-443.
6. Drass JA, Muir-Nash J, Boykin PC, Turek JM, Baker KL. Perceived and actual level of knowledge of diabetes mellitus among nurses. *Diabetes Care.* 1989;12(5):351-356.
7. El-Deirawi KM, Zuraikat N. Registered nurses' actual and perceived knowledge of diabetes mellitus. *J Nurs Staff Develop.* 2001;17(1):5-11.
8. van den Arend IJM, Stolk RP, Rutten GEHM, Schrijvers GJP. Education integrated into structured general practice care for Type 2 diabetic patients results in sustained improvement of disease knowledge and self-care. *Diabetic Med.* 2000;17(3):190-197.

9. Haywood JL, Goldenberg RL, Bronstein J, Nelson KG, Waldemar A. Comparison of perceived and actual rates of survival and freedom from handicap in premature infants. *Am J Obstet Gynecol.* 1994;171(2):432-439.
10. Khan KS, Awonuga AO, Dwarakanath LS, Taylor R. Assessments in evidence-based medicine workshops: Loose connection between perception of knowledge and its objective assessment. *Med Teach.* 2001;23(1):92-94.
11. Bandura A. *Social Foundations of Thought and Action: A Social Cognitive Theory.* Englewood Cliffs, NJ: Prentice-Hall; 1986.
12. Gist ME, Schwoerer U, Rosen B. Effects of alternative training methods on self-efficacy and performance in computer software training. *J Appl Psychol.* 1989;74(6):884-891.
13. Hill T, Smith ND, Mann MF. Role of efficacy expectations in predicting the decision to use advanced technologies: The case of computers. *J Appl Psychol.* 1987;72(2):307-313.
14. Locke EA, Frederick E, Lee C, Bobko P. Effects of self-efficacy, goals, and task strategies on task performance. *J Appl Psychol.* 1984;69(2):241-251.
15. Bangert-Drowns RL, Kulik CC, Kulik JA, Morgan MT. The instructional effect of feedback in test-like events. *Rev Educ Res.* 1991;61(2):213-238.
16. Kulhavy RW, Stock WA. Feedback in written instruction: the place of response certitude. *Educ Psychol Rev.* 1989;1(4):279-308.
17. Meyer L. Strategies for correcting students' wrong responses. *Elem School J.* 1986;87(2):227-241.
18. Flynn LR, Goldsmith RE. A short, reliable measure of subjective knowledge. *J of Bus Res.* 1999;46(1):57-66.
19. Osgood CE, Suci CJ, Tannenbaum PH. *The Measurement of Meaning.* Urbana: University of Illinois Press; 1957.
20. Cohen J. *Statistical Power Analysis for the Behavioral Sciences* (2nd ed.). Hillsdale, NJ: Erlbaum; 1988.
21. Cuppett MM. Self-perceived continuing education needs of certified athletic trainers. *J Athl Train.* 2001;36(4):388-395.
22. Hughes BJ. Identifying attitudes and deterring factors towards continuing education among certified athletic trainers. *Internet J Allied Health Sci Prac,* 2005;3(1). Retrieved April 17, 2008, from http://ijahsp.nova.edu/articles/vol3num1/hughes.htm
23. Binkley HM, Beckett J, Casa DJ, Kleiner DM, Plummer PE. National Athletic Trainers' Association position statement: Exertional heat illnesses. *J Athl Train.* 2002;37(3):329-343.
24. Casa D J, Armstrong LE, Hillman SK, Montian SJ, Reiff RV, Rich BSE, et al. National Athletic Trainers' Association position statement: Fluid replacement for athletes. *J Athl Train.* 2000;35(2):212-224.
25. National Athletic Trainers' Association. Inter-association *task force on exertional heat illness consensus statement.* 2003. Retrieved February 27, 2007, from http://www.nata.org/publicinformation/files/heatillnessconsensusstatement.pdf
26. Early PC, Northcraft GB, Lee C, Lituchy TR. Impact of process and outcome feedback on the relation of goal setting to task performance. *Acad Manage J.* 1990;33(1):87-105.
27. Erez M. Feedback: A necessary condition for the goal setting-performance relationship. *J Appl Psychol.* 1977;62(5):624-627.
28. Bandura A, Cervone D. Self-evaluative and self-efficacy mechanisms governing the motivational effects of goal systems. *J Pers Soc Psychol.* 1983;45(5):1017-1028.
29. Bandura A, Cervone D. Differential engagement of self-reactive influences in cognitive motivation. *Organ Behav Hum Dec.* 1986;38(1):92-113.
30. Locke EA, Latham GP. *A Theory of Goal Setting and Task Performance.* New York: Prentice-Hall; 1990.
31. Schunk DH. Self-efficacy and academic motivation. *Educ Psychol.* 1991;26:207-231.
32. Ames C, Archer J. Achievement goals in the classroom: Students' learning strategies and motivation processes. *J Educ Psychol.* 1988;80(3):260-267.
33. Meece JL, Blumenfeld PC, Hoyle RH. Students' goal orientation and cognitive engagement in classroom activities. *J Educ Psychol.* 1988;80(4):514-523.
34. Miller RB, Behrens JT, Greene BA, Newman D. Goals and perceived ability: Impact on student valuing, self-regulation, and persistence. *Contemp Educ Psychol.* 1993;18(1):2-14.
35. Tilliczek K, Pong R, Caty S. Innovations and issues in the delivery of continuing education in nurse practitioners in rural and northern communities. *CJRN.* 2005;37(1):146-162.
36. Hoyal FMD. Skills and topics in continuing medical education for rural doctors. *J Cont Educ Health Prof.* 2000;20(1):13-19.
37. Davis D. Continuing education, guidline implementation, and the emerging transdisciplinary field of knowledge translation. *J Cont Educ Health Prof.* 2006;26(1):5-12.
38. Bradshaw J. The concept of social need. *New Society.* 1972;30(3):640-645.
39. Butler DL, Winne PH. Feedback and self-regulated learning: A theoretical synthesis. *Rev Educ Res.* 1995;65(3):245-281.
40. Carver CS, Scheier MF. Origins and functions of positive and negative affect: A control-process view. *Psychol Rev.* 1990;97(1):19-35.