Psychological Constructs as Predictors of Strength Gains in a Strength Training Course

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ABSTRACT
Strength training has many benefits, both affective and physical health-related. However, little research has been done on the psychological constructs that play an important role in exercise adherence, maintenance, and outcomes regarding strength training specifically. The purpose of this study was to examine self-efficacy (SE), perceived competence (PC), and outcome expectancy (OE), several of the key psychological constructs, as predictors of strength gains in a strength training course. It was hypothesized that the changes in participants' measures of SE, PC, and OE from baseline to post-training would predict participants' actual strength gains, but not the levels of SE, PC, and OE at baseline and post-training independently. Participants (*n*=20; 50% 20-21 years old, 40% 22-24 years old, 10% 25 years or older; 60% female, 40% male; 45% Caucasian, 30% Hispanic/Latino, 20% multiracial, 5% Asian/Pacific Islander) in a 15-week strength training technique (STT) course completed a battery of psychological questionnaires assessing SE, PC, and OE in addition to fitness tests consisting of a vertical jump test, an estimated one repetition maximum bench press and a back squat at baseline, mid- and post-training. One-way repeated measures ANOVA was used to examine differences in SE, PC, and OE at baseline, mid-, and post-training. Spearman correlation and multiple regression analyses were used to determine the predictive specificity of baseline, mid-, post-training levels, and changes in SE, PC, and OE on strength gains. ANOVA results show a significant time effect, as there was a significant increase in all three variables over time, suggesting that course participation increased students' SE, OE, and PC about strength training. Baseline scores, post-training scores, and changes in SE, PC, and OE were not significant predictors of changes in strength or power scores. These results suggest that while an instructor-led STT course may increase SE, OE, and PC for individuals with varying strength training experience and positively influence college students' well-being, these psychological constructs may not predict strength gains. Future research should examine possible predictive factors for strength training outcomes in larger, more heterogeneous populations.

KEYWORDS
Strength Training; Self-Efficacy; Perceived Competence; Outcome Expectancy; Psychological Constructs; Kinesiology; Strength and Conditioning; Resistance Training

INTRODUCTION

In recent years, resistance training has been emphasized as a necessary part of a regular exercise program as its benefits have become more apparent. One form of resistance training is strength training which refers to a "systematic program of exercises designed to increase an individual's ability to exert or resist force".[1] Strength training has similar benefits for people of all ages and is an important component of a regular physical activity program.[1] A variety of benefits arise from consistently practiced resistance training: reduction in loss of muscle mass and strength, improved bone strength, hormone regulation and production associated with age, management of chronic diseases, increased ease of daily activities, decreased sports-related injuries in youth, and improvements in mental health.[1,2] Due to the challenging nature of many physical exercises, psychological constructs play a crucial role in exercise initiation and adherence and, thus, in the physical and psychological benefits of physical activity.[2] Self-efficacy (SE), perceived competence (PC), and outcome expectancy (OE) are three of these constructs that have been shown to influence physical activity and exercise as well as overall well-being.[2,3,4] Exercise SE has been shown to predict perceived wellness and wellness subscales of physical, spiritual, intellectual, psychological, and emotional dimensions, indicating that exercise may improve overall well-being that extends beyond the physical health benefits.[4]

While many studies focus solely on one psychological construct, the purpose of combining all three in this study was to identify their potential individual and combined influence on exercise outcomes and to examine further how they might work together. Furthermore, by measuring all three, the impact of exercise on each construct over time can be compared relative to one another as well as together.

Literature Review

Self-Efficacy

Self-efficacy, originating from Bandura's social-cognitive theory, is one of the most well-known and studied psychological constructs.[3] SE is an individual's belief in oneself to execute situation-specific behavior and enhances an individual's behavioral persistence.[2,3] SE is comprised of four components: performance accomplishments, vicarious experience, verbal persuasion, and emotional arousal.[3] Performance accomplishments are built on personal mastery experiences, where repeated success increases, and consistent failure lowers those mastery expectations. Due to its nature, performance accomplishment is influenced by the timing, pattern, and outcome of the experiences, where initial failure may decrease the likelihood of behavioral persistence. Vicarious experience refers to observing others' successes in a difficult situation which can enhance one's confidence in his/her abilities to complete the same task. Verbal persuasion refers to the suggestive power of others to convince a person that they can overcome past failures or fears, and while it is much easier to obtain than the other components of SE, it is not quite as effective.[3] Finally, emotional arousal, wherein an individual judges his/her capability by one's physiological state in a high-stress situation, serves as a source of information regarding personal competency and can influence future performance (*e.g.*, anxiety may hinder performance).

SE has been studied extensively as it relates to physical activity and exercise; however, little research has been done examining SE as it relates to strength training in particular. A study examining the relationship of SE and physical activity in a population of sedentary older women participating in a 12-week high-intensity strength training program found that the participants' perceptions of strength and balance efficacy capabilities were associated with better performance-based and self-reported "Activities of Daily Living." These results suggest that SE may have a mediating effect on the influence of physical activity and function in older women.[5] A more recent study in 2014 examined the effects of twice-a-week resistance training compared to flexibility training on postpartum women. Results showed that the resistance training group had greater strength gains and greater improvements in exercise SE than the flexibility training group.[6] Another study found that participants in a 10-week circuit weight training group had greater improvement in strength and endurance than did the volleyball control group. In addition, participants' baseline levels of SE predicted their post-test strength gains.[7] Finally, another study found that a strength training intervention on college women improved their SE and psychological well-being as well as strength, endurance, and body fat.[8] The research surrounding exercise suggests that SE influences the physical outcomes and benefits of exercise, including improvements in strength, daily functioning, and psychological well-being.

Perceived Competence

PC is a psychological construct from Ryan & Deci's self-determination theory (SDT) which suggests that motivation is created by the satisfaction of three psychological needs (competence, autonomy, and relatedness) and that individuals will pursue behaviors that fulfill these needs.[2,9] In SDT, PC is at the level of the individual's need for "innate psychological nutriments that are essential for ongoing psychological growth, integrity, and well-being."[3,9] Unlike SE which focuses on an individual's belief in their capabilities of performing a specific behavior, PC refers specifically to beliefs surrounding meaningful behaviors that provide fulfillment of one's psychological needs. Measuring PC addresses the content and pursuit of an individual's need to master challenging and meaningful tasks that will fulfill one's need for psychological growth and personal effectance on their environment.[2,9]

PC in exercise has primarily been studied as it relates to general physical activity and sports, in which many studies utilize the structured class design (*e.g.*, high school physical education classes), yet little research has focused on the role of PC specifically in strength training. In a study of 307 middle school students' enjoyment and cardiorespiratory fitness in physical education classes, regression analysis showed that PC was the only significant contributor to cardiorespiratory fitness (19.3%) and only accounted for 4.2% of the variance in physical activity.[10] These results show that students who believed they would do well in physical education obtained higher fitness levels, which suggests that PC affects fitness outcomes. In another study examining physical activity in grades 3rd to 12th, PC had a direct negative effect on students' sedentary behavior and a positive effect on physical activity, suggesting that higher levels of PC may lead to increased physical activity.[11] PC also had a stronger indirect effect on physical activity at home than physical activity at school which may be associated with the formal structure of more physical activity at school (*e.g.*, physical education classes) as compared to the more variable opportunities at home which provide more autonomy and may, therefore, lead to increased PC and attraction to physical activity. In a study of 146 women participating in community-based aerobics classes, PC was found only to have an effect on intrinsic motivation when self-determination was low.[12] In other words, when individuals participated in the classes because they wanted to, their performance perceptions were irrelevant; in contrast, when participants felt they had to participate in the classes and had low PC, their intrinsic motivation was negatively affected. These findings have strong implications for individuals who are beginning an exercise program, as it is important for perceptions of competence to be fostered when their intrinsic motivation might be exceptionally low. The literature surrounding PC suggests that the construct plays a vital role in physical activity and exercise outcomes as well as motivation.

Outcome Expectancy

OE has been referred to in literature dating back to the 1930s and is a fundamental aspect of many theories, including the theory of planned behavior, social learning theory, social cognitive theory, the theory of reasoned action, and expectancy theory.[13] OE is thought to play an important role in motivation and is defined as a person's belief that a specific behavior will lead to certain positive and negative consequences related to one's physical health or affective outcomes, such as impacts on one's mood or mental state.[3, 13] This construct differs from SE in the fact that it is not a person's belief in their ability to do the task, but rather one's belief about what will happen if they are successful at completing the task. While positive outcome expectancies (*i.e.*, perceived benefits) promote a behavior, negative outcome expectations (*e.g.*, soreness from exercise) and perceived barriers, circumstances preventing the behavior (*e.g.,* the cost of joining a gym), both impede the behavior.[13] When an individual perceives the benefits of the activity to outweigh the barriers, they are more likely to engage in the behavior because the payoff is worth the price.

Similar to SE, OE has been studied in general physical activity and exercise, but little research has been done to examine this construct specific to resistance or strength training. Several studies have shown a correlation between OE and initiation of physical activity but not necessarily the adherence to it. While positive OE may lead to an individual adopting a behavior, satisfaction becomes a contributor to continued participation.[13] In other words, because OE does not measure actual satisfaction, it might not be as effective at predicting adherence to a behavior once the individual's subjective fulfillment becomes a factor. While the relationship between OE and SE is not clear, as the two constructs are related and often overlap, some research suggests that OE may predict variance in physical activity not explained by SE and other social cognitive variables. In a telephone survey study of 3,607 adults in Hawaii, researchers found that individuals who thought they needed more than recommended amounts of moderate intensity physical activity in order to gain health benefits reported more daily amounts of physical activity than those who thought they needed equal amounts or amounts less than recommended by experts.[14] These results show that the individuals' beliefs in the amount of time they thought they needed to spend doing physical activity in order to receive the health benefits were related to how much time they spent doing it, suggesting that OE influences not just the adoption of physical activity but also the duration and frequency. In a study of 335 adults aged 60–95, affective OE was a stronger predictor of exercise at 6 months than physical health-related OE; furthermore, SE did not predict exercise but was a mediator *via* intention and affective OE.[15] These findings suggest that affective OE may be a better predictor of physical activity adherence than health-related OE and SE in some populations. Research shows that OE is related to and may predict physical activity and exercise initiation and adherence in many populations across the lifespan.

In summary, previous research has examined the relationship of SE, PC, and OE in physical activity (primarily aerobic) and exercise adherence, maintenance, and performance; however, there is less research examining these constructs in strength training outcomes. Furthermore, there is a gap in the literature regarding SE, PC, and OE in college-aged populations wherein these constructs may play a role in overall health and wellness. Thus, the purpose of this study was to examine the predictive power of these psychological constructs on participants' strength gains in a strength and conditioning technique course. It was hypothesized that the changes in the participants' measures of SE, PC, and OE from baseline to post-training would predict participants' strength gains (hypothesis 1) and that the independent levels at baseline and post-training would not (hypothesis 2).

METHODS AND PROCEDURES

Design

A single group design was used. The independent variables in this study were the changes in participants' SE, PC, and OE scores from baseline to post-training, and the independent scores of these psychological constructs at baseline and post-training. The dependent variables were the changes in participants' strength and power over the 15-week period for both hypotheses. The Committee for Protection of Human Subjects (CPHS), California State University, Monterey Bay's review board for research involving human subjects approved this study (#16-005).

Participants

The total population consisted of a convenience sample of twenty (three junior, 17 senior) kinesiology students enrolled in a 15-week university "Technique in Strength and Conditioning" course. Participants identified as 60% females, 40% males; 45% Caucasian, 30% Hispanic/Latino, 20% multiracial and 5% Asian/Pacific Islander. Age was reported in ranges: 50% 20-21 years old, 40% 22-24 years old, and 10% 25 years or older. Students also reported on their participation in strength training prior to the course (**Table 1**).

	Frequency	Percentage
Previous ST Experience		
Do not strength train	2	10
≤ 1 yr	6	30
1-2 yr	3	15
3-4 yr	7	35
5+ yr	2	10
Previous ST Days/Week		
0	0	0
1	4	20
2	1	5
3	2	10
4	9	45
5	2	10
6	0	0
7	2	10
Previous ST Min/Session		
Do not strength train	4	20
≤ 20 min	4	20
21 – 30 min	0	0
31 – 45 min	5	25
46 – 60 min	4	20
60 + min	3	15
Perceived Resistance Level		
Do not strength train	3	15
Light	4	20
Moderate	11	55
Heavy	2	10

Table 1. Participation in strength training prior to the course. *ST* strength training.

Measures

An introduction to the study and first questionnaire were given to the students during the first week of class, and they were informed that their participation in the study was voluntary and would not affect their grade in the course. No incentives were offered.

Questionnaires

The demographics questionnaire was administered only at baseline and contained questions regarding sex, race/ethnicity, age, academic class status, previous strength training experience, number of days per week spent strength training, and length and perceived resistance level of strength training sessions.

Lubans, Aguiar, & Callister's four-item SE and five item OE questionnaires were adapted to measure participants' SE and OE for strength training.[16] Both questionnaires were rated on five-point Likert scales (1= Strongly Disagree to 5= Strongly Agree). Example SE item: "I have the strength to complete strength training exercises." Example OE item: Strength training will improve my performance in sports and other physical activities."

Ryan & Deci's four-item PC Scale was adapted to measure participants' PC about strength training regularly and was rated on a seven-point Likert scale (1= not at all true to 7= very true).[9] Example PC item: "I am able to meet the challenge of strength training regularly."

Physical Fitness Assessments
Muscular strength was assessed using estimated one repetition maximum (1RM) test for bench press and back squat using an Olympic barbell. Participants were given a choice to use 3RM or 5RM load to measure estimated 1RM in which they performed 3 or 5 repetitions, respectively, of the given exercise with as much weight as possible. Muscular power was measured by the average of a three-trial vertical jump test. The sit-and-reach test determined flexibility.

Procedure
Participants were required to attend the course twice weekly for 80 minutes each session, which was held in a private gym setting on campus. Participants were divided into seven groups based on height for ease of equipment use by the instructor, a Certified Strength and Conditioning Specialist and Professor of Exercise Physiology. At the beginning of the course, participants were introduced to various strength training exercises by the instructor and were required to perform these exercises in their small groups with peer and instructor feedback. Throughout the course, the groups alternately created and taught an exercise routine to the class; all participants were then required to perform that routine utilizing proper technique under the supervision of the course instructor.

Participants completed the questionnaire at week one (baseline), week eight (mid-training), and week 15 (post-training) at the conclusion of the course. Baseline fitness levels were assessed at week four (to allow for knowledge of proper lifting technique and neural adaptations), mid-training at week nine, and post-training at week 15 using the National Strength and Conditioning Association standards: estimated 1RM for barbell bench press and barbell back squat to assess strength, vertical jump test to assess power, and sit-and-reach test to measure flexibility; however, flexibility was not used for this analysis.

Statistical Analysis
Preliminary analysis of one-way repeated measures analysis of variance (ANOVA) was used to test the effects of the strength and conditioning technique course on students' SE, PC, and OE over time. Spearman correlations were then used to assess associations of these psychological outcomes with strength and power gains. Strength gains were defined as the difference in pounds used for bench press and back squat from baseline to post-training. Power gains were defined as the difference in inches in the vertical jump from baseline to post-training. Finally, nine multiple regressions using the enter method were run to test the effect of each psychological variable (*i.e.*, SE, PC, OE) as predictors (independent variables) on changes in strength (*i.e.*, bench press, back squat) and power (*i.e.*, vertical jump) scores as an outcome (dependent variables). Specifically, to test hypothesis one, the following nine multiple regressions were run: change in psychological variable scores from baseline to post-training on bench press; change in psychological variable scores from baseline to post-training on back squat; and change in psychological variable scores from baseline to post-training on vertical jump. Next, the following six multiple regressions were run to test hypothesis two: 1) psychological variable scores at baseline on bench press; 2) psychological variable scores at baseline on back squat; 3) psychological variable scores at baseline on vertical jump; 4) psychological variable test scores at post-training on bench press; 5) psychological variable test scores at post-training on back squat; and, 6) psychological variable test scores at post-training on vertical jump.

Results
Changes in Psychological Constructs
One-way repeated measures ANOVA was used to examine differences in SE, PC, and OE at baseline, mid-, and post-training. Mauchly's test indicated that the assumption of sphericity had been violated for all three domains (SE: $\chi2(2)= 14.20$, $p= 0.001$, PC: $\chi2(2)= 11.48$, $p= 0.003$, OE: $\chi2(2)= 7.95$, $p= 0.019$), therefore degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity (SE: $\varepsilon= 0.65$, PC: $\varepsilon= 0.68$, OE: $\varepsilon= 0.74$). Results show a significant time effect, (SE: $F(1.29, 24.59)= 20.54$, $p < 0.001$, PC: $F(1.36, 25.82)= 19.72$, $p < 0.001$, OE: $F(1.47, 28.00)= 6.94$, $p < 0.01$). Follow-up comparisons indicated that each pairwise difference for SE and PC was significant, $p < 0.01$, and from pre- to post- for OE, $p < 0.01$. As demonstrated in **Table 2**, there was a significant increase in all three variables over time, suggesting that course participation increased students' SE, PC, and OE about strength training.

Measure	Pre-Test	Mid-Test	Post-Test	Pre-Post Change
Self-Efficacy	15.0 (4.1) (n = 20)	18.1 (1.6) (n = 20)	19.5 (0.8) (n = 20)	4.6 (3.7)* (n = 20)
Outcome Expectancy	23.3 (1.8) (n = 20)	24.5 (1.2) (n = 20)	24.7 (1.0) (n = 20)	1.4 (1.7)* (n = 20)
Perceived Competence	20.0 (6.4) (n = 20)	24.9 (3.0) (n = 20)	27.0 (1.7) (n = 20)	7.0 (5.5)* (n = 20)

Table 2. Psychological and performance measures before, during, and after training. Values reported as mean (SD).
Note: All significance values refer to within-group changes (*i.e.*, post-test minus pre-test) evaluated by paired t-test. *p < 0.001.

Psychological Constructs and Strength Gains Correlations

Spearman correlations were run on changes in levels of SE, PC, and OE and strength and power gains in bench press, back squat, and vertical jump (**Table 3**). Changes in the levels of these psychological constructs were not significantly correlated to strength and power gains.

		Squat	Bench	Vertical Jump
Self-Efficacy	r = sig = n =	0.276 0.302 16	-0.314 0.220 17	-0.125 0.622 18
Perceived Competence	r = sig = n =	-0.121 0.655 16	-0.052 0.843 17	-0.199 0.428 18
Outcome Expectancy	r = sig = n =	0.189 0.483 16	-0.461 0.063 17	0.064 0.801 18

Table 3. Spearman correlation of psychological change scores with performance change scores.

The overall model examining the impact of changes in SE, PC, and OE (independent variables) on bench press strength gains from baseline to post-training (dependent variable) was not significant [$F(3, 13)= .537, p = .665$] and explained none of the variance in bench press scores, $R^2 = .110$. Changes in SE ($\beta = .042, p = .918$), PC ($\beta = -.098, p = .804$), and OE ($\beta = -.324, p = .254$) were not significant predictors of changes in bench press scores.

The overall model examining the impact of changes in SE, PC, and OE on back squat strength gains from baseline to post-training was not significant [$F(3, 12)= .875, p= .481$] and explained none of the variance in back squat scores, $R^2= .179$. Changes in SE ($\beta= .524, p= .208$), PC ($\beta= -.611, p= -.137$), and OE ($\beta= -.021, p=.939$) were not significant predictors of changes in back squat scores.

The overall model examining the impact of changes in SE, PC, and OE on vertical jump power gains from baseline to post-training was not significant [$F(3, 14)= 1.312, p= .310$] and explained 5.2% of the variance in vertical jump scores, $R^2= .219$. Changes in SE ($\beta= -.038, p= .906$), PC ($\beta= -.366, p= .256$), and OE ($\beta= .297, p= .243$) were not significant predictors of changes in vertical jump scores.

The overall model examining the impact of baseline levels of SE, PC, and OE on bench press strength gains from baseline to post-training was not significant [$F(3, 13)= .485, p= .699$] and explained none of the variance in bench press scores, $R^2= .101$. Changes in SE ($\beta= .071, p= .877$), PC ($\beta= -.002, p= .997$), and OE ($\beta= .301, p= .277$) were not significant predictors of changes in bench press scores.

The overall model examining the impact of baseline levels of SE, PC, and OE on back squat strength gains from baseline to post-training was not significant [$F(3, 12)= .832, p= .502$] and explained none of the variance in back squat scores, $R^2= .172$. Changes in SE ($\beta= -.556, p= .196$), PC ($\beta= .602, p= .171$), and OE ($\beta= .056, p= .840$) were not significant predictors of changes in back squat scores.

The overall model examining the impact of baseline levels of SE, PC, and OE on vertical jump power gains from baseline to post-training was not significant [$F(3, 14)= 1.311, p= .310$] and explained 5.2% of the variance in vertical jump scores, $R^2= .219$. Changes in SE ($\beta= -.132, p= .701$), PC ($\beta= .527, p= .141$), and OE ($\beta= -.216, p= .381$) were not significant predictors of changes in vertical jump scores.

The overall model examining the impact of post-training levels of SE, PC, and OE on bench press strength gains from baseline to post-training was not significant [$F(3, 13)= .009, p= .999$] and explained none of the variance in bench press scores, $R^2= .002$. Changes in SE ($\beta= .025, p= .938$), PC ($\beta= .030, p= .928$), and OE ($\beta= -.015, p= .961$) were not significant predictors of changes in bench press scores.

The overall model examining the impact of post-training levels of SE, PC, and OE on back squat strength gains from baseline to post-training was not significant [$F(3, 12) = .390$, $p = .762$] and explained none of the variance in back squat scores, $R^2 = .089$. Changes in SE ($\beta = -.187$, $p = .571$), PC ($\beta = -.011$, $p = .973$), and OE ($\beta = .279$, $p = .360$) were not significant predictors of changes in back squat scores.

The overall model examining the impact of post-training levels of SE, PC, and OE on vertical jump power gains from baseline to post-training was not significant [$F(3, 14) = .497$, $p = .691$] and explained none of the variance in vertical jump scores, $R^2 = .096$. Changes in SE ($\beta = .055$, $p = .853$), PC ($\beta = .259$, $p = .406$), and OE ($\beta = .048$, $p = .863$) were not significant predictors of changes in vertical jump scores.

Conclusions

The purpose of this study was to examine the predictive power of SE, PC, and OE on strength gains in a strength and conditioning technique course. The results suggest that these psychological constructs are not correlated with and do not play a role in predicting strength or power gains. However, the results show evidence that these psychological constructs may be improved by a strength training technique course independent of strength and power gains which may be in part due to the structured class design and implementation of the four components of SE.

The first hypothesis was rejected as results found that changes in SE, PC, and OE from baseline to post-training did not predict and were not significantly correlated with strength or power gains. In concordance with the second hypothesis, the independent levels of SE, PC, and OE at baseline and post-training did not predict strength or power gains.

These results also showed that all three constructs increased significantly from baseline to post-training, while SE and PC increased significantly at each time point (*i.e.*, baseline to mid-training, mid-training to post-training, baseline to post-training). These improvements suggest that participation in the strength and conditioning technique course increased students' SE, PC, and OE about strength training which supports previous research suggesting that a regular physical activity routine can improve exercise-related SE, PC, and OE. These findings may have implications beyond strength training specifically and impact an individual's overall attitude and belief toward exercise in general and positively affect intrinsic motivational states.

Due to the small, homogeneous sample of this study, these results may not apply to students who do not have the physiological knowledge of junior and senior kinesiology students, which may have allowed them to progress faster or otherwise impacted their physical progress or attitudes toward strength training. Furthermore, the non-significant findings may be in part due to the small sample size and the lack of a control group.

The four primary sources of SE (performance accomplishments, vicarious experience, verbal persuasion, and emotional arousal) were all utilized in the structure of the course. Participants were able to track their performance accomplishments through their strength and power output as the 15 weeks progressed. They achieved vicarious experience by watching their instructor and peers perform and teach the exercises to the class. Furthermore, encouragement and coaching regarding proper form and technique from the instructor and peers served as verbal persuasion in addition to one-on-one coaching from the instructor when necessary. Finally, experiencing and becoming adjusted to the physiological arousal of strength training accounted for the emotional arousal aspect of SE. The structure of the strength and conditioning course was conducive to improving students' SE and may be a contributing factor to the improvements in students' PC and OE as well.

These findings have substantial implications for strength and conditioning coaches, as the experience of strength training may improve SE, which has been known to increase many facets of well-being, independent of actual performance improvements. Furthermore, both the strength training experienced and inexperienced students had improvements in their SE which suggest that hands-on experience may bridge the gap between the science and practice of strength training and play a key role in helping kinesiology students become more efficacious and competent in strength training. These competencies may extend past strength training to weight-bearing exercises in general due to the similar nature regarding form, technique, physiology, and practice. These are essential traits to have surrounding weight training, considering many of these students are preparing to become coaches and trainers.

Examining SE, PC, and OE in a college population of kinesiology students in a strength and conditioning technique course was a novel study design and topic. These preliminary findings should encourage researchers to examine these constructs in larger, more heterogeneous populations with individuals who have no kinesiology education. Furthermore, given that the analyses showed no significant correlation between these psychological constructs and strength or power gains, future researchers should examine what other factors, psychological or otherwise, play a role in strength training outcomes.

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PRESS SUMMARY

Self-efficacy, perceived competence, and outcome expectancy are related to an individual's exercise adherence, maintenance, and outcomes, as well as overall well-being. The purpose of this study was to examine if the changes in these psychological constructs from baseline to post-training was predictive of actual strength gains for participants in a fifteen-week university strength training course. A battery of psychological questionnaires and strength assessments were utilized to measure these changes. While all three of these constructs improved significantly from baseline to post-training, these changes did not predict actual strength gains, indicating that the hands-on learning experience of strength training may be more influential on self-efficacy, perceived competence, and outcome expectancy than the performance improvements. These findings have substantial implications for strength training coaches and kinesiology students entering the field.