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(出版者 / Publisher)

Department of Global and Interdisciplinary Studies, Hosei University

(雑誌名 / Journal or Publication Title)

GIS journal : the Hosei journal of global and interdisciplinary studies /
GIS journal : the Hosei journal of global and interdisciplinary studies

(巻 / Volume)

1

(開始ページ / Start Page)

67

(終了ページ / End Page)

112

(発行年 / Year)

2015-03

(URL)

<https://doi.org/10.15002/00010893>

Acquiring Knowledge and Learning from Failure: Theory, Measurement, and Validation of Two Learning Goals

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Abstract

We report the development and validation of a measure that distinguished *knowledge goals* focused on acquiring knowledge and information from *learning from failure goals* focused on using failure as an opportunity to learn. In Study 1, the scale demonstrated a robust factor structure and adequate internal consistencies, and the two learning goals differently correlated with measures of ego-involved achievement goals. In Study 2, the goal to learn from failure interacted with academically contingent self-worth, reducing self-esteem vulnerability when people invested effort and failed. In Study 3, the goal to learn from failure reduced the effect of academic contingencies of self-worth on self-esteem, especially among the incremental theorists who invested effort prior to failure.

Introduction

Learning promotes human growth and thriving (e.g., Ryan & Deci, 2000; Pyszczynski, Greenberg, & Solomon, 2000; White, 1959). The need for competence is “a fundamental motivation that serves the evolutionary role of helping people develop and adapt to their environment” (Elliot & Dweck, 2005; p.6). Moreover, personal learning can extend beyond the self to benefit others. Cardiac surgery teams, for example, make mistakes when they adopt new technologies but their ability to learn from their mistakes can ultimately save many lives (Edmondson, 2003).

However, people often seem to resist learning, precisely at times when they most need to learn. We argue that people have difficulty learning from mistakes, setbacks, and failures because protecting and boosting self-esteem often take precedence over learning. Even people who hold learning goals may struggle to learn from failure if they also have the goal of demonstrating their ability and boosting their sense of self-worth. The present research focused on developing and validating a measure of learning goals in which failure signals a learning

opportunity instead of a threat to self-esteem.

Costs of Pursuing Self-Esteem for Learning from Failure

Pursuing self-esteem undermines learning (Crocker & Park, 2004). People who seek to prove their self-worth by validating their abilities or demonstrating their competence view mistakes, failures, and criticism as threats rather than learning opportunities. Following mistakes, failure, or setbacks, people often engage in defensive or counterproductive activities that diminish their learning opportunities (Argyris, 1992). For example, under self-esteem threat, people reject or dismiss negative feedback (e.g., Baumeister, 1998; Mischel, Ebbesen, & Zeiss, 1976), derogate the source of negative feedback (Greenberg, Pyszczynski, & Solomon, 1982), or search for explanations that diminish their own responsibility (Bradley, 1978; Greenberg & Pyszczynski, 1985; Zuckerman, 1979). They also compensate with self-enhancement in other domains (Gollwitzer & Wicklund, 1985) or with past successes (Trope & Neter, 1994), engage in downward comparisons (Crocker, Thompson, McGraw, & Ingerman, 1987), or distance themselves from others who outperform them (Tesser, 1988). When people respond to setbacks or failures by focusing on protecting self-esteem or reducing negative affect, they miss an opportunity to identify and understand their own contribution to the problem. This, in turn, diminishes the likelihood that they will address their own contribution and avoid the same problem in the future.

Self-handicapping (Jones & Berglas, 1978; Rhodewalt & Tragakis, 2002) —the proactive defense of self-esteem in advance of failures — also undermines learning. On difficult tasks that carry a risk of failure, people who worry about demonstrating their competence and protecting their self-esteem engage in behaviors that simultaneously decrease the probability of success and provide a plausible excuse for failure that does not indict competence. For example, drinking alcohol before important meetings (Jones & Berglas, 1978), listening to distracting music while studying (Rhodewalt & Davison, 1986), and acting obnoxiously on a first date all provide a compelling justification for potential failure without implicating one's fundamental competence or likeability. People who engage in self-handicapping can thus maintain their image of a competent self even after failure but fail to learn about their real strengths and weaknesses.

The most common self-handicapping strategy involves diminished effort, practice, or persistence toward a goal (Rhodewalt & Tragakis, 2002). Persistence, practice, and investment

of effort endanger self-esteem because failure after exerting high effort is perceived to imply a lack of ability (Covington, 1992). For people who involve their ego or who stake their self-esteem in a domain, lack of ability also implies low self-worth (Crocker & Wolfe, 2001; James, 1890). To avoid the esteem-threatening implications of failure, some people unconsciously reduce their investment of effort or practice, which in turn reduces their learning opportunities.

Although failure is never pleasant, some failures threaten self-esteem more than others. Failure is particularly threatening when self-esteem is contingent on succeeding in a domain (Crocker & Wolfe, 2001) and when people fail despite investing high effort. Failure in a domain of contingent self-worth causes drops in self-esteem (Crocker & Wolfe, 2001; Crocker, Sommers, & Luhtanen, 2002). The more people engage their self-worth in a domain, the more vulnerable they become to failure in that domain. When people invest effort and still fail, they cannot attribute failure to lack of effort; failure then indicates lack of ability, threatening self-esteem. In support of this idea, when highly contingent students had the opportunity to invest effort, they experienced greater self-esteem vulnerability to failure than less contingent students (Niiya & Crocker, 2008).

In sum, learning from failure is important but difficult, because honest exploration of one's own contribution to mistakes or failure threatens self-esteem, especially when failure occurs in domains that are linked to self-worth, when high effort has been expended, and when excuses for failure have not been arranged in advance by self-handicapping. To diminish the threat, people proactively create excuses for failure or find self-serving explanations for failure, undermining learning. The goal of protecting self-esteem by demonstrating competence transforms failure and setbacks from learning opportunities to self-esteem threats.

Failure as a Learning Opportunity

The difficulty of learning from failure has been addressed extensively in studies of organizational behavior. Argyris (1992) distinguished two types of learning, single-loop and double-loop. According to Argyris (1992), when people fail to obtain intended outcomes, they often engage in single-loop learning, which consists of "identifying and correcting errors in the external environment" (p.127). Argyris found that single-loop learning functions well for routine, repetitive tasks but not for more complex problems with multiple causes. Double-loop learning involves looking inward, first reflecting on one's own mistakes and how one might have contributed to the problem before changing actions. Under double-loop learning,

people use failures, errors, and problems as an opportunity to identify weaknesses within the system and within themselves to address them in the future. For example, in a health care system, single-loop learning occurs when practitioners find gaps between actual practices and guidelines and implement changes to follow the guidelines more closely (Nutley & Davies, 2001). In contrast, double-loop learning occurs when practitioners respond to a clinical audit by first reflecting on what might have caused the practices to deviate from the guidelines and how they might have contributed to the problem before engaging in remedial action. Argyris (1992) observed that double-loop learning rarely occurs, even among managers who have been extensively trained to engage in double-loop learning.

We propose that many people want to acquire knowledge and information, but few people embrace failure as a learning opportunity. Because failure threatens self-esteem, especially following high effort, in the absence of defensive strategies such as self-handicapping, and when the failure occurs in domains of contingent self-worth, most people respond defensively to failure—the desire to protect self-esteem or their self-image outweighs their desire to learn. Yet, the desire to learn from failure is crucially important on difficult tasks where failure occurs with some regularity. In the present research, we aimed to develop and validate measures that would distinguish the goal of acquiring knowledge and information from the goal of learning from failure. We expect that people who want to learn from failure also want to acquire knowledge and information, but the reverse is not necessarily true—some people want to acquire knowledge and information, but do not embrace failure as an opportunity to do so. We do not believe that people who embrace failure as a learning opportunity want to fail; rather, when they do fail, they want to learn from the experience.

We propose that people who view failure as a learning opportunity are less likely to view failure as a threat to self-esteem. Consequently when they do fail, their self-esteem should be resilient in the face of failure, even if they have exerted high effort and their self-worth is contingent. People who view failure as a learning opportunity should also be less likely to self-handicap by withholding effort on difficult tasks, even when their self-worth is contingent.

However, people who express the desire to acquire knowledge and information, but do not embrace failure as a learning opportunity, may view failure as a threat to self-worth. Consequently, we expect that the goal of acquiring knowledge, in the absence of viewing failure as an opportunity to learn, will lead to vulnerable self-esteem following failure, especially if effort has been invested and self-worth is contingent on the domain.

Relation to Achievement Goals

Existing measures of achievement goals do not adequately capture the distinction between the desire to acquire knowledge and information, and the desire to learn from failure. Researchers have typically distinguished two types of goals that influence how people approach, engage, and respond to achievement situations—performance goals and mastery goals. Performance goals focus on demonstrating competence, whereas mastery goals focus on acquiring new knowledge or developing competence (Grant & Dweck, 2003). Researchers have given different names to these goals. Performance goals have also been called ego-involved goals (Nicholls, 1984) or ability-focused goals (Maehr & Midgley, 1991), whereas mastery goals have also been called learning goals (Dweck & Leggett, 1988), task-involved goals (Middleton & Midgely, 1997; Nicholls, 1984) or task-focused goals (Maehr & Midgley, 1991).

Mastery goals. Mastery goals reflect the desire to learn, and therefore, both people who express the desire to acquire knowledge and those who express the desire to learn from failure should have mastery goals. However, some people who endorse mastery as a goal may still perceive failure as a threat to self-esteem rather than an opportunity to learn. Existing measures of mastery goals assess the desire to acquire knowledge and skills, but do not address whether people view failure in particular as a learning opportunity. Learning and mastery goals measures include items such as “I want to learn as much as possible from my classes” (Elliot & Church, 1997) or “I strive to constantly learn and improve in my courses” (Grant & Dweck, 2003). Consequently, we expect mastery goals to be more strongly related to the desire to acquire information and knowledge than to the desire to learn from failure.

Performance goals. We suggest that performance goals are incompatible with embracing failure as a learning opportunity, but can be compatible with the goal of acquiring knowledge. Performance goals have variously been operationalized as performance-approach goals, in which the goal is to outperform others (Elliot & Church, 1997), performance-avoidance goals, in which the goal is to avoid doing worse than others (Elliot & Church, 1997), outcome-focused goals, in which the goal is to obtain a particular outcome, such as a grade (Grant & Dweck, 2003), or ability-validation goals, in which the goal is to demonstrate or prove one’s competence (Grant & Dweck, 2003). When people have performance goals, they seek to demonstrate competence (Ames, 1992; Covington, 1984; Dweck, 1986). Acquiring knowledge and skills can help people demonstrate competence or avoid demonstrating incompetence;

therefore, we expect the goal of acquiring knowledge to be positively related to performance goals. When a task is challenging and failure is possible, however, we suggest that performance goals lead people to view failure as a threat, and interfere with viewing failure as a learning opportunity. Consequently, we expect that the goal of learning from failure is negatively related to performance goals.

Incremental theories. Incremental theories of intelligence refer to a belief that intelligence is malleable and improvable (Dweck, 2000). Incremental theories orient people toward the goal of learning and improving (Dweck & Leggett, 1988). Because people can seek improvement either by accumulating knowledge or by identifying their weaknesses and addressing them, we expect the goal to acquire knowledge and the goal to learn from failure to both be positively correlated with incremental theories of intelligence.

Fear of failure. Previous research shows that mastery goals do not correlate with fear of failure (Elliot & Church, 1997) or with state test anxiety (Elliot & McGregor, 1999). Because knowledge acquisition goals overlap with mastery goals, we expect them to be distinct from fear of failure. Learning from failure goals should be negatively related to fear of failure. However, fear of failure is not simply the inverse of the goal of learning from failure; embracing failure as a learning opportunity implies an interest in failure, not merely the absence of fear. We therefore hypothesized that fear of failure would correlate negatively, but modestly, with learning from failure goals.

Contingent self-worth. People who base their self-worth on academic competence should not endorse the goal to learn from failure because for them, failure represents a threat to their self-worth that must be avoided. Highly contingent people should therefore seek to protect their competent self-image rather than learn about their weaknesses. People with highly contingent self-worth might, however, endorse the goal to acquire knowledge because acquiring knowledge ensures success and hence protects their self-esteem.

In sum, although the goal to acquire knowledge and the goal to learn from failure should both be positively related to mastery goals and incremental theories of ability, we predict that existing measures of mastery goals have more in common with the goal to acquire knowledge than the goal to learn from failure. We also predict that the goal to acquire knowledge will be positively related to performance goals, and academically contingent self-worth, whereas the goal to learn from failure will be negatively related to these ego-involved constructs.

Relation to Self Constructs

We hypothesized that the goal of acquiring knowledge and the goal of learning from failure differently predict whether people view failure as a self-esteem threat. Consequently, we also investigated the convergent and divergent validity of the two goals with several self-related constructs, including self-esteem, public and private self-consciousness, and self-compassion.

Self-esteem. High self-esteem people are more secure and confident, and more certain of their self-views, but also more defensive, and specifically more likely to blame others for failure than low self-esteem people (see Baumeister, 1998; Crocker, Blaine, & Luhtanen, 1993, for reviews). Some high self-esteem people have fragile or unstable self-esteem, whereas others have resilient and stable self-esteem (Kernis, 2003). Consequently, we expected the goals of acquiring knowledge and learning from failure to be distinct from having high or low self-esteem.

Public and private self-consciousness. People differ in their tendency to reflect on public versus private aspects of the self (Buss, 1980; Fenigstein, 1987; Fenigstein, Scheier, & Buss, 1975). Public self-consciousness refers to awareness of how one appears to others, whereas private self-consciousness refers to awareness of one's internal states and self-reflection. Because the goal to acquire knowledge sometimes reflects concern with protecting or enhancing one's self-image by demonstrating competence, we expected knowledge goals to correlate modestly with public self-consciousness. Learning from failure goals, on the other hand, indicate a desire to learn by reflecting on failure, including one's own responsibility for the failure. Consequently, we expected that learning from failure goals would be associated with reduced public self-consciousness and with increased private self-consciousness.

Self-Compassion. We expected learning from failure goals to correlate with self-compassion to a greater extent than knowledge goals. Self-compassion involves:

being open to and aware of one's own suffering, offering kindness and understanding towards oneself, desiring the self's well-being, taking a non judgmental attitude towards one's inadequacies and failures, and framing one's own experience in light of the common human experience (Neff, 2005; p.264).

Learning from failure goals entail interest in personal weaknesses that encourages

change, rather than harsh self-criticism or condemnation. Without self-compassion, learning about one's weaknesses can cause pain and distress, which, in turn, can lead to helplessness, self-abuse, or other-blame. We hypothesized that learning from failure goals reduce the threat of failure and encourage learning because these goals correlate with self-compassion that transforms negative emotions into more positive feelings such as kindness, connectedness, and openness (Neff, 2005).

Relation to Coping and Resiliency

We also tested the discriminant validity of the scale by examining correlations with broad-minded coping styles and resiliency. Broad-minded coping involves taking a broad perspective on problems and generating multiple solutions to them (Fredrickson & Joiner, 2002). The goal of learning from failure was expected to positively correlate with broad-minded coping because learning from failure requires people to step back from the problem and understand its multiple causes, including their own contribution to it. However, we expected the two constructs to be distinct, as broad-minded coping does not necessarily require one to see failure as an opportunity.

We also expected a positive correlation between the goal of learning from failure and ego-resiliency, characterized as the ability to bounce back from negative experiences and adapt to new demands of an ever-changing world (Block & Kremen, 1996). Viewing failure as a learning opportunity should make people resilient to failures, and foster adaptation to new environments. We therefore expected a moderate correlation between the two constructs.

Finally, we conceptualized knowledge goals and learning from failure goals, not as fixed individual differences, but as contextually dependent constructs. Just as individuals' mastery and performance goals can vary depending on classroom settings and teachers' instructions (Ames, 1992; Ames & Archer, 1988; Church, Elliot, & Gable, 2001; Wolters, 2004), we hypothesized that individuals' endorsement of knowledge goals and learning from failure goals can change over time, depending on situations. We therefore expected a moderate test-retest correlation over one academic term.

Goals of Research

The present research aimed to develop and validate a psychometrically sound measure

of knowledge goals and learning from failure goals, and examine whether learning from failure goals are less compatible with ego-involvement than knowledge goals. Study 1 examined the factor structure, reliabilities, and correlates of the knowledge goals and learning from failure goals scale. Studies 2 and 3 examined whether the goal to learn from failure reduced the vulnerability of self-esteem associated with academic contingencies of self-worth among participants who invested effort before failure. Students who base their self-worth on academics and believe they can improve should be particularly vulnerable to failure when they invest effort and fail. If the goal to learn from failure can reduce people's concerns about proving self-worth, they should buffer the threat of failure more effectively than knowledge goals, adding validity to our measure of knowledge goals and learning from failure goals.

Study 1

Method

Participants

We combined the data from three samples to perform exploratory and confirmatory factor analyses. The first sample consisted of 204 first-year college students recruited at the beginning of the fall semester as part of a longitudinal survey on “goals and adjustment to college.” Among these, 194 also completed a post-test questionnaire approximately two weeks before the end of the term (11 weeks after the pretest).¹ The second sample consisted of 152 college students² recruited through flyers for a study on “coping with exam stress.” The third sample consisted of 169 college students recruited from the psychology subject pool for a study on “the effect of practice on intellectual performance.” A total of 525 participants constituted the combined sample (177 men, 345 women, and 3 unknown). Participants mostly identified themselves as “White or European American” (63.0 %) or “Asian or Asian American” (21.3%), with a smaller percentage identifying as “Black or African American” (6.1%), “Hispanic/Latino/Latina” (3.2%), and “Other / Mixed Race” (5.3%). Their age ranged from 17 to 33, with a mean of 18.8 ($SD = 1.39$).

¹ Post-test data from these participants were not included in the combined dataset because of non-independence of data.

² The initial sample consisted of 169 participants but data from 17 participants were not included in the analyses because their data were not correctly saved in the computer.

Measures

Knowledge goals and learning from failure goals scale. Ten items assessed how much one endorsed the goals of learning from failure and setback (e.g., “When I fail, I view it as a great opportunity to learn about my weaknesses and where I need to improve”) and four items assessed the extent to which one endorsed the goals of learning as a means of acquiring new information (e.g., “My main goal in my courses is to learn as much information as I can”). These items were selected from an initial pool of 21 items (eleven knowledge goals items adapted from Grant & Dweck, 2003, and 10 learning from failure goals items) from which we deleted 7 knowledge goals items that did not load on any factor in a pilot test with 55 college students.

Other goals scales. In addition, all participants completed the following scales: (1) the 5-item academic subscale of the Contingencies of Self-Worth Scale (Crocker, Luhtanen, Cooper, & Bouvrette, 2003; $\alpha = .84$), which measured the extent to which one based self-worth on academic competence (e.g., “I feel better about myself when I know I’m doing well academically”); (2) the 10-item Rosenberg’s Self-Esteem scale (Rosenberg, 1965; $\alpha = .88$), a widely used and well-validated measure of global self-esteem; (3) the 7-item Ability Validation goal scale ($\alpha = .91$) adapted from Grant and Dweck (2003), which measured the extent to which one endorsed the goal of validating intelligence (e.g., “One of my important goals is to validate that I am smart through my schoolwork”); and (4) the 8-item Theories of Intelligence scale (Dweck, 2000; $\alpha = .96$) in which we reverse-scored the entity items so that higher score indicated endorsement of incremental theories. Participants in samples 1 and 2 also completed all three subscales of Elliot and Church’s (1997) Achievement Goal scale (i.e., performance-approach, performance-avoidance, and mastery goals) whereas participants in sample 3 only completed the mastery goals subscale (α s = .92, .90, and .70, for mastery, approach, and avoidance goals respectively).

All the items from the Achievement Goal scale, Ability Validation goal scale, and Knowledge Goals and Learning from Failure Goals scale appeared in mixed order as a single scale to prevent participants from guessing the measured concepts. Response options ranged from 1 = Strongly Disagree to 7 = Strongly Agree, except in the Theories of Intelligence Scale that used a 6-point scale in samples 2 and 3. We transformed the latter scale into z-scores before computing the reliabilities and means.

Participants in the first and second samples completed additional scales to further validate

the knowledge goals and learning from failure goals scale. Participants in the first sample also completed the Social Desirability scale (Crowne & Marlowe, 1964; $\alpha = .77$) at Time 1, and the Self-Compassion scale (Neff, 2003; $\alpha = .83$) and the Self-Consciousness scale (Scheier & Carver, 1985; $\alpha s = .85$ for public and $.74$ for private self-consciousness) at Time 2. Both scales ranged from 1 to 5. Those in the second sample completed: (1) the Broad-Minded Coping subscale from Moos Coping Response Inventory (Moos, 1988; $\alpha = .70$) in which participants described an academic failure and rated how often they engaged in each of the 5 corresponding activities (e.g., “think of different ways to deal with the situation,” “try to find personal meaning in the situation”); (2) the Ego-Resiliency Scale (Block & Kremen, 1996; $\alpha = .82$), which measured the ability to adapt to new environments (e.g., “I enjoy dealing with new and unusual situations”); and (3) the Fear of Failure scale (Elliot & Thrash, 2003; $\alpha = .84$) consisting of 9 items such as, “I often avoid a task because I am afraid that I will make mistakes.” All the response scales ranged from 1 to 7, except for the social desirability scale in which participants indicated whether the socially desirable statements were true (1) or false (0).

Procedure

Participants in the first sample filled out the paper-and-pencil version of the questionnaires in the lab for Time 1 and an online version of the questionnaire for Time 2. Participants also filled out a weekly web-survey over the term that will not be reported in this paper. They received \$100 at the completion of the study. Participants in the second sample completed the questionnaire online and later came to the lab to complete an academic test (reported in Study 2). Participants received \$12 for their participation. Finally, those in the third sample came to the lab to fill out the questionnaire displayed on a computer screen and completed additional tasks (reported in Study 3). These participants received partial credit for their introductory psychology class. All participants were debriefed at the completion of the study.

Results and Discussion

Overview

The factor analyses were conducted in five phases. First, we divided the sample into two random halves and performed exploratory factor analyses (EFA) on the first half to refine the measure (Phase 1). Next, using EQS software, we conducted confirmatory factor

analyses (CFA) in the second random half (Phase 2) to cross-validate the factors obtained in Phase 1. In Phase 3, we used the combined sample to compare the two-factor model with a one-factor model in which we forced all items to load on a single learning factor. In Phase 4, we compared the factor structures across gender and race subgroups. Finally, in Phase 5, we tested the invariance of the model across time. After we established the factor structure of the Knowledge Goals and Learning from Failure Goals scale, we computed the means of knowledge goals and learning from failure goals and examined their correlations with other related measures.

Refinement of the Initial Model

We first performed an EFA on the first random half of the data ($n = 268$), using principal axis extraction and promax rotation, which allowed correlations among the factors, as recommended by Russell (2003). We expected correlated factors because knowledge goals and learning from failure goals both reflect learning goals. The initial scree plot indicated a 2-factor solution, explaining 39% of the variance. When a 2-factor solution was specified, four items of the knowledge goals scale loaded highly (loadings above .40) on the first factor and six items in the learning from failure goals scale loaded highly on the second factor, with cross-loadings of less than .20. The other four items of the learning from failure goals scale were found to be problematic: one item loaded on the first factor with the other knowledge goals items, and three items had either a primary loading of less than .40 or had a cross-loading greater than .20. Therefore, we dropped these four items and conducted the EFA again with four knowledge goals items and six learning from failure goals items that had clean initial loadings on the first and second factors. This time, the two factors explained 46% of variance. The four knowledge goals items loaded highly ($> .50$) on the first factor and all six learning from failure goals items loaded highly ($> .40$) on the second factor, but one learning from failure goals item also cross-loaded (.23) on the first factor. Thus, we dropped the cross-loaded item and conducted the EFA again. In this analysis, all knowledge goals items loaded highly ($> .50$) on the first factor and all except one learning from failure goals item loaded highly on the second factor, with cross-loadings of less than .20. This learning from failure goals item had only a primary loading of .34 on the second (learning from failure goals) factor, but we kept the item because it only loaded .10 on the first (knowledge goals) factor, indicating that the item could be effective in distinguishing knowledge goals and learning from failure goals. In the final model, the two

factors correlated at $r = .48$ and together explained 47.2% of variance.

Cross-Validation of the Correlated Two-Factor Model

Next, we conducted CFA to test whether the correlated two-factor model obtained in Phase 1 fit the data in the second random half ($n = 257$). First, we tested the fit of the model separately for each random half. Then, we tested two between-group models to examine the equivalence of the fit across the two samples. Specifically, we compared: (1) the factor pattern invariant model in which we specified a common factor pattern but did not constrain the factor loadings to be equivalent across samples; and (2) the factor loading invariant model in which we constrained both factor pattern and factor loadings to be equivalent across samples. Because the two models were nested, we examined the difference in χ^2 between the two models to test whether the constraints on the equivalence of factor loadings statistically reduced the model fit.

Summaries of the goodness-of-fit indices are presented in Table 1. In both halves, the correlated two-factor model had a good fit as indicated by the non-significant χ^2 , the comparative fit index (CFI) and nonnormed fit index (NNFI) above .95, and the standardized root mean-square residual (SRMR) and the root mean squared error of approximation (RMSEA) below .05. All items loaded significantly on the intended factor, with standard loadings ranging from .41 to .89 in the first half and from .43 to .87 in the second half. In both samples, the modification indices showed that allowing one item in the learning from failure goals to cross-load on the knowledge goals factor would statistically improve the fit of the model. We therefore re-ran CFA in both samples, allowing the item to load on both factors. As predicted in the modification indices, the model fit slightly improved in both samples ($\Delta \chi^2(1) = 4.37$, $p < .05$ in sample 1 and $\Delta \chi^2(1) = 4.43$, $p < .05$ in sample 2). However, the item still loaded primarily on the learning from failure goals factor (standard loadings of .42 and .48) with cross-loadings of only .17 and .16 on the knowledge goals factor. Because the cross-loadings were small (less than .20) in both samples, we concluded that the results supported our model.

As shown in lines 3 and 4 of Table 1, both the factor pattern invariant model and the factor loading invariant model had a good fit. The difference in χ^2 between the two models was not significant ($\Delta \chi^2(7) = 5.75$, *n.s.*), indicating that the factor loadings did not statistically differ across the two samples. Consistent with this conclusion, the modification indices in the factor loading invariant model did not suggest any modification that would statistically

Table 1: Goodness-of-Fit Summaries for Confirmatory Factor Models

Model	χ^2	df	CFI	NNFI	SRMR	RMSEA	90% CI
Correlated two-factor model compared across random halves ^a							
1. Sample 1 ($n = 267$)	30.92	26	.99	.98	.04	.03	(.00, .06)
2. Sample 2 ($n = 252$)	33.99	26	.98	.97	.04	.04	(.00, .06)
3. Factor pattern invariant model	66.33	55	.99	.98	.04	.02	(.00, .04)
4. Factor loading invariant model	72.08	62	.99	.99	.05	.02	(.00, .03)
Alternative model for full sample ($N = 519$)							
1. Correlated two-factor model	40.23	26	.98	.98	.06	.03	(.01, .05)
2. One-factor model	216.51*	28	.76	.69	.14	.11	(.10, .13)
Gender comparisons of correlated two-factor model ^{bc}							
1. Men ($n = 174$)	41.22	26	.95	.93	.06	.06	(.02, .09)
2. Women ($n = 342$)	28.40	26	.99	.99	.03	.02	(.00, .05)
3. Factor pattern invariant model	69.11	55	.97	.96	.06	.03	(.00, .05)
4. Factor loading invariant model	88.29*	62	.94	.93	.10	.04	(.02, .05)
5. Factor loading invariant model after allowing the variance of SLL goals to differ across gender	72.88	61	.97	.97	.07	.02	(.00, .04)
Comparisons of correlated two-factor model across time ^d							
1. Time 1 ($n = 203$)	24.41	26	1.0	1.0	.04	.01	(.00, .05)
2. Time 2 ($n = 188$)	43.40*	26	.94	.92	.06	.06	(.03, .09)
3. Factor pattern invariant model	144.26	122	.97	.96	.07	.03	(.00, .05)
4. Factor loading invariant model	149.23	129	.97	.97	.07	.03	(.00, .05)

Note. CFI = comparative fit index; NNFI = nonnormed fit index; SRMR = standardized root mean-square residual; RMSEA = root-mean square error of approximation; CI = confidence interval of RMSEA. All the n reported in the tables are after excluding cases with missing values.
^a For Model 4 - Model 3, $\Delta\chi^2(7) = 5.75$, *n.s.* ^b For Model 4 - Model 3, $\Delta\chi^2(7) = 19.18$, $p < .01$. ^c For Model 5 - Model 3, $\Delta\chi^2(6) = 3.77$, *n.s.* ^d For Model 4 - Model 3, $\Delta\chi^2(7) = 4.97$, *n.s.* * $p < .05$.

increase the model fit. In sum, the correlated two-factor models provided a good fit in both random halves with all factor loadings above .40 and with cross-loadings of less than .17, supporting the validity and generalizability of the two-factor model.

Comparison between the Two-Factor Model and the One-Factor Model

We hypothesized a positive correlation between knowledge goals and learning from failure goals because both goals focused on learning. A plausible alternative model would have all the items loaded on a single factor, capturing the overall learning orientation. In Phase 3, we compared the correlated two-factor model with the one-factor model to test which model better accounted for our data. The results of the CFA using the combined dataset ($N = 525$) are shown in Table 1. The goodness-of-fit indices showed that the correlated two-factor model had a good fit whereas the one-factor model had a poor fit. Comparison of χ^2 showed that the correlated two-factor model fit the data significantly better than the one-factor model, $\Delta \chi^2(2) = 176.28, p < .001$.³ The standardized and unstandardized factor loadings of the correlated two-factor model appear in Table 2.

Invariance across Gender and Ethnicity

We expected the correlated two-factor model to equally apply to both genders. In Phase 4, we conducted CFAs separately for each gender and then compared two between-group models, the factor pattern invariant model, and the factor loadings invariant model to directly test the equivalence of factor structure across the two groups. As shown in Table 1, the correlated two-factor model had a good fit for women ($n = 345$) and an acceptable fit for men ($n = 177$), despite the small sample size for men (Kline, 1998 suggests at least 10 observations per parameter). The standardized loadings ranged from .39 to .96 for men and from .41 to .80 for women.

The factor loading invariant model, in which we constrained the factor loadings to be equivalent across gender, had only an acceptable fit, with a significant χ^2 . The difference in χ^2 between the two nested models was significant, $\Delta \chi^2(7) = 19.18, p < .01$, indicating that

³ The two models are not nested, so they cannot be directly compared; the difference in chi-square should be interpreted with caution.

Table 2: *Confirmatory Factor Analysis Loadings and Standard Errors for the Knowledge Goals and Learning from failure Goals Scale, Full Sample (Study 1)*

Item	SL	UL	SE
<i>Knowledge Goals</i>			
My main goal in my courses is to learn as much information as I can.	.88	1.56	.17
The main point of college is to increase my knowledge.	.55	1.06	.13
The best courses are the ones in which I learn the most new information.	.54	1.08	.13
When I take an exam in a course, my main goal is to demonstrate how much I have learned.	.47	0.93	.11
<i>Learning from Failure Goals</i>			
Criticism is valuable because there might be something useful in it for me.	.65	1.04	.14
I'd rather be criticized than praised, because I can learn more about where I need to improve from criticism.	.58	1.35	.19
When I fail, I view it as a great opportunity to learn about my weaknesses and where I need to improve.	.50	1.33	.20
I seek out feedback from professors and GSIs because I want to know where my skills or strategies are lacking.	.55	1.26	.18
Becoming a better learner is more important than performing well in a class.	.42	0.80	.11

Note. SL = standardized loading; UL = unstandardized loading

the factor loading invariant model had a worse fit than the factor pattern invariant model. Examination of the modification indices suggested that the constraint on variance equivalence for the first factor (knowledge goals factor) primarily accounted for the decrement in the model fit. Freeing the constraint of variance equivalence for the first factor resulted in a good fit of the factor loading invariant model, a fit that did not differ from the factor pattern invariant model, $\Delta \chi^2(6) = 3.77, n.s.$ In this latter model, the standardized factor loadings ranged from .40 to .93 for men and from .32 to .77 for women. As our previous analysis suggested, the knowledge goals factor had a greater estimated variance for men (.31) than for women (.14). Overall, the correlated two-factor model fit the data equally well for both genders.

Our sample consisted of a majority of Whites ($n = 331$), with a smaller number of Asian / Asian Americans ($n = 112$). We did not include Black ($n = 32$), Hispanic ($n = 17$), and “other or mixed race” ($n = 28$) categories in analyses comparing the fit across racial groups due to small sample sizes. Because the sample size for Asian / Asian Americans was still too small for CFA, we conducted EFA for both White and Asian categories. We specified a two-factor solution with principal axis factoring and promax rotation. For Whites, all items loaded on the intended factor (loadings ranging from .38 to .95), with cross-loadings of less than .20. The two factors correlated at .46 and accounted for 46.6% of total variance. For Asians and Asian Americans, all items except one loaded highly on the intended factor (loadings ranging from .46 to .83), with cross-loadings of less than .20. One item from the learning from failure goals scale (“Becoming a better learner is more important than performing well in a class.”) had a loading of .30 on the learning from failure goals factor and .28 on the knowledge goals factor, suggesting that the item does not distinguish learning from failure goals and knowledge goals for Asians and Asian Americans. The two factors explained 50.4% of total variance and correlated at .42. In sum, we replicated the two-factor structure in both the White and the Asian / Asian American samples, except for one learning from failure goals item that did not load highly on either factor in the Asian sample.

Invariance across Time

Finally, in Phase 5, we examined the stability of the factor structure over time using Time 1 and Time 2 data from the longitudinal study (sample 1). First, we conducted CFAs separately

for Time 1 data ($n = 204$) and Time 2 data ($n = 194$). Then, we tested two longitudinal models with correlated error terms across time and paths from factors at Time 1 to the same factors at Time 2.⁴ Again, we compared: (1) the factor pattern invariant model in which we only specified the factor pattern at Time 1 to be identical to the factor pattern at Time 2; and (2) the factor loading invariant model in which we constrained the factor loadings to be equivalent across time. As shown in Table 1, Time 1 data fit the correlated two-factor model well but Time 2 data had only an acceptable fit. The modification indices suggested that allowing one item from the learning from failure goals scale and one item from the knowledge goals scale to cross-load on the other factor would significantly improve the fit of Time 2 data. Consistent with the suggestions, the model showed a good fit when we allowed these items to load on both factors ($\chi^2(26) = 29.74$, *n.s.*; CFI = .98; NNFI = .97; SRMR = .05; RMSEA = .04; 90% CI = .00, .07). The learning from failure goals item that could load on both factors had a standardized loading of .83 on the learning from failure goals factor and -.23 on the knowledge goals factor, indicating that the item still loaded clearly on the intended factor. The knowledge goals item that could load on both factors had a loading of .24 on the knowledge goals factor and a loading of .32 on the learning from failure goals factor, suggesting that the item did not load highly on either factor.

The comparison between the factor pattern invariant model and the factor loading invariant model indicated the stability of factor loadings across time. Constraining the equivalence of factor loadings across time did not statistically decrease the goodness of fit ($\Delta\chi^2(7) = 4.97$, *n.s.*). In the factor loading invariant model, the standardized loadings ranged from .34 to .82 at Time 1 and from .37 to .79 at Time 2. Although one knowledge goals item did not load on either factor at Time 2, the overall findings suggest stability of the factor structure across time.

In sum, the correlated two-factor structure of the Knowledge Goals and Learning from Failure Goals scale fit the data better than the one-factor model and generalized across gender and time. The factor structure remained consistent for both White and Asian / Asian American samples except for one item that did not load on either factor for the Asian / Asian American sample. The resulting scale consisted of five learning from failure goals items ($\alpha = .65$) and four knowledge goals items ($\alpha = .69$).

⁴ At Time 2, we correlated the disturbances (residuals) of the knowledge goals and learning from failure goals factors, to estimate the correlations between the two factors.

Test-Retest Correlation

Knowledge goals and learning from failure goals showed some stability, as well as change over time. In the longitudinal study (sample 1), the test-retest correlations for the knowledge goals and learning from failure goals were moderate (.48 and .54 respectively, $ps < .001$) and somewhat lower than those of mastery goals ($r = .65$), performance-approach goals ($r = .72$), performance-avoidance goals ($r = .70$), and ability-validation goals ($r = .57$). These moderate correlations suggest that these goals do not reflect stable traits but rather more malleable goals that may have shifted over the course of a few months for many students.

Convergent and Discriminant Validity of Knowledge Goals and Learning from Failure Goals

Correlations with mastery and performance goals. Table 3 summarizes the means, standard deviations, and intercorrelations of the variables measured in the study.

As expected, knowledge goals and learning from failure goals both correlated positively with mastery goals and incremental theory of intelligence, indicating that both goals reflect a learning orientation. Although learning from failure goals and knowledge goals positively correlated with each other, they showed distinct patterns of correlations with the other measures. Knowledge goals correlated positively with performance-approach, performance-avoidance, and academic ability-validation goals, as well as academic contingencies of self-worth (rs ranging from .13 to .20, $ps < .05$). Learning from failure goals, however, correlated negatively with all of these measures (rs ranging from -.12 to -.13, $p < .05$), suggesting that learning from failure goals reflect a less ego-involved learning orientation than knowledge goals.

The difference in correlations between the knowledge goals and learning from failure goals increased in magnitude when we computed partial correlations, partialling out learning from failure goals from knowledge goals and vice versa, yielding relatively “pure” indicators of the two types of learning goals. With learning from failure goals partialled out, knowledge goals positively correlated with performance-approach, performance-avoidance, and academic validation goals (rs ranging from .18 to .24, $ps < .001$), as well as with academic contingencies of self-worth ($r = .25$, $p < .001$). This again suggests that knowledge goals can be fueled by the desire to protect and enhance self-worth. In contrast, with knowledge goals partialled out, learning from failure goals negatively correlated with performance-approach, performance-

Table 3: Means, Standard Deviations, and Intercorrelations among Variables (Study 1)

	Mean	SD	Knowledge goals	Learning from failure goals	"Pure" knowledge goals ^b	"Pure" learning from failure goals ^c	Mastery goals	Incremental theories
Combined sample (n = 525)								
Knowledge goals	5.31	.91	----	----	----	----	----	----
Learning from failure goals	4.53	.87	.35**	----	----	----	----	----
Mastery goal	5.71	.80	.65**	.48**	.52**	.28**	----	----
Incremental theories ^a	0	.86	.24**	.17**	.19**	.09*	.25**	----
Approach goals	4.94	1.19	.13*	-.13*	.18**	-.18**	.03	-.01
Avoidance goals	5.02	1.07	.13*	-.13*	.18**	-.19**	-.02	.05
Validation goals	4.42	1.31	.18**	-.13**	.24**	-.21**	.02	.03
Academic CSW	5.58	.90	.20**	-.12**	.25**	-.20**	.10*	.04
Trait self-esteem	5.70	.93	.16*	.08+	.14**	.02	.16**	.16**
Sample 1, Time 1 (n = 204)								
Social desirability	.45	.16	.22**	.30**	.15*	.22**	.24**	.14*
Gender (0 = Male, 1 = Female)	.60	.49	.24**	.02	.18**	-.04	.24**	.01
Sample 1, Time 2 (n = 199)								
Self-compassion	2.96	.60	.12+	.38**	-.06	.34**	.06	.14+
Public Self-Consciousness	3.27	.79	.15*	-.18*	.26**	-.28**	.06	-.05
Private Self-Consciousness	3.29	.58	.17*	.24**	.07	.18*	.15*	.22**
Sample 2 (n = 152)								
Broad-minded coping	3.01	.66	.17*	.20*	.10	.14+	.22**	.12
Resiliency	3.06	.44	.28**	.33**	.17*	.24**	.47**	.33**
Fear of failure	2.83	.75	-.19*	-.23**	-.16*	-.17*	-.28**	-.19*

Note. CSW = Contingencies of Self-Worth

^a The individual items were standardized before computing the means because responses ranged from 1 to 7 in sample 1 and 1 to 6 in samples 2 and 3.
^b Standardized residuals when learning from failure goals were partialled out from knowledge goals. ^c Standardized residuals when knowledge goals were partialled out from learning from failure goals. ** $p < .01$; * $p < .05$; + $p < .10$

avoidance, and academic validation goals (r s ranging from $-.18$ to $-.21$, p s $< .001$), as well as with academic contingencies of self-worth ($r = -.20$, $p < .001$). These findings suggest that learning from failure goals are less compatible with the goal of protecting and enhancing self-worth than knowledge goals.⁵

In contrast to knowledge goals and learning from failure goals, mastery goals and incremental theories of intelligence did *not* show a negative correlation with the measures of ego-involvement. This lack of a negative correlation indicates that mastery goals and incremental theories are potentially compatible with ego-involvement, consistent with past findings that mastery and performance goals either positively correlated or did not correlate with each other (e.g., Harackiewicz, Barron, & Elliot, 1998). In sum, mastery goals and incremental theories do not seem to distinguish those who do and those who do not involve their egos in learning.

One of our samples (i.e., the longitudinal study at Time 1) included a measure of socially desirable responding. Because both knowledge goals and learning from failure goals correlated with social desirability and gender (see Table 3), we conducted partial correlations in this subsample, controlling for social desirability and gender. Knowledge goals still positively correlated with all the measures, including mastery goals ($r = .58$, $p < .001$), performance-approach and performance-avoidance goals (r s $= .17$, $p < .05$), ability-validation goals ($r = .22$, $p < .01$), and academic contingencies of self-worth ($r = .30$, $p < .001$). When we controlled for social desirability and gender, learning from failure goals correlated positively with mastery goals ($r = .36$, $p < .001$) but did not correlate with any other measures. Although not significant, learning from failure goals had negative correlation with the ego-involved measures, suggesting that these correlations statistically differ from the correlations between knowledge goals and ego-involved measures. When we controlled for knowledge goals in addition to gender and social desirability, all the negative correlations increased in magnitude

⁵ Learning from failure goals did not simply reflect a combination between high mastery and low performance-approach goals. When we regressed learning from failure goals on mastery goals, performance-approach goals, and the interaction term, using the data of 319 participants in samples 1 and 2 who completed both measures, mastery goals and performance goals independently predicted learning from failure goals (β s $= .47$ and $-.13$, $p < .01$, respectively) but did not interact with each other ($\beta = -.03$, *n.s.*). The absence of interaction between mastery goals and performance goals suggests that examining the interaction between mastery goals and performance goals does not serve as a proxy for learning from failure goals. Moreover, mastery and performance-approach goals only explained 24% of the variance in learning from failure goals, suggesting that learning from failure goals represent more than a mere combination of mastery and performance goals.

and the correlation between learning from failure goals and ability-validation goals became statistically significant ($r = -.14, p = .04$). In sum, social desirability and gender accounted for the correlations between learning from failure goals, performance goals, and academic contingencies of self-worth but these correlations were significantly smaller than those with knowledge goals. Moreover, when controlling for knowledge goals, learning from failure goals predicted less ability-validation goals. These findings indicate that social desirability or gender do not fully account for the difference in correlations between knowledge goals and learning from failure goals.

Correlations with self-related constructs. As shown in Table 3, learning from failure goals correlated positively with self-compassion. Our finding mirrored that of Neff, Hsieh, and Dejitterat (2005) who found that self-compassion correlated positively with mastery goals.⁶ In our study, however, self-compassion correlated with learning from failure goals to a greater extent than knowledge goals, suggesting that self-compassion does not relate to learning orientation in general but rather reflects a particular feature of learning from failure goals. Although the learning from failure goals scale captured the tendency to focus on criticism and failure, our findings suggest that people who have these goals do are not self-deprecating, but, rather, have compassion for their weaknesses. Compassion for one's own weaknesses might reduce the threat associated with setbacks which may, in turn, encourage people to view failure as a learning opportunity.

Consistent with our hypothesis that knowledge goals are more compatible with the goals of demonstrating competence than learning from failure goals, public self-consciousness (i.e. the tendency to focus attention on one's public image) correlated positively with knowledge goals and negatively with learning from failure goals (see Table 3). The magnitude of these correlations increased when we partialled out knowledge goals from learning from failure goals and vice versa. On the other hand, private self-consciousness (i.e. the tendency to focus attention on one's inner self) correlated more strongly with learning from failure goals than knowledge goals, suggesting that learning from failure goals encourage introspection more than knowledge goals. Those who endorse knowledge goals tend to devote attention to appearing competent, whereas those who endorse learning from failure goals tend to devote attention to understanding themselves rather than promoting an image of a competent self. These results support our idea that learning from failure goals should reduce one's concern

⁶ These researchers measured mastery goals using Midgley et al.'s (1997) Pattern of Adaptive Learning Survey or PALS.

about appearing competent and increase acceptance of one's flaws and weaknesses.

Finally, both learning from failure goals and knowledge goals correlated positively with broad-minded coping and ego-resilience, and negatively with fear of failure, as shown at the bottom on Table 3. The magnitude of correlations resembled those of mastery goals and incremental theories. The moderate correlations (i.e., less than .40 in absolute value) indicate that learning from failure goals and knowledge goals relate to but differ from broad-minded coping, ego-resiliency, and fear of failure.

Summary

Study 1 tested the factor structure, reliability, and correlates of the knowledge goals and learning from failure goals scale. Knowledge goals and learning from failure goals scales had a robust factor structure that remained consistent across gender and time. We replicated the factor structure for White and Asian samples, except for one learning from failure goals item that did not load on any factor in the Asian sample. The resulting scale had adequate internal consistencies and successfully distinguished learning goals that varied in their compatibility with the goals of protecting and proving self-worth. The moderate test-retest correlation over the 11-week interval suggested that the scale remains stable but not entirely captures an individual difference measure.

Study 2

Study 2 examined whether the goal to acquire knowledge and the goal to learn from failure differently predict state self-esteem following failure. In light of evidence from Study 1 that learning from failure goals are less compatible with ego-involvement than knowledge goals, we predicted that learning from failure goals, but not knowledge goals, would reduce the effect of academic contingencies on post-failure self-esteem. People whose self-esteem is contingent on academic competence respond to academic failure with greater drops in self-esteem than those with less contingent self-esteem (Crocker & Wolfe, 2001; Crocker, Sommers, Luhtanen, 2002). The goal to learn from failure, however, should reduce the effect of academic contingencies because it encourages people with highly contingent self-esteem to see failure as a learning opportunity, not as a disconfirmation of their self-worth. We did not expect knowledge goals, or any other learning goals, to reduce the effect of academic

contingencies because learning-oriented people with highly contingent self-esteem may seek to learn to prove self-worth, making them vulnerable to failure.

In Study 2, we examined how knowledge goals and learning from failure goals predict state self-esteem under conditions particularly threatening to the ego—when people fail a difficult task after investing effort in practice or preparation (Covington, 1992). We chose to examine a situation in which people fail despite investing high effort on practice because we expected the difference between knowledge goals and learning from failure goals to be particularly salient under high ego-threat. When failure occurs despite investing high effort, people who seek to learn to prove competence should experience threat to their self-esteem. Lack of improvement despite effort would suggest that they lack the requisite ability to validate their competence. In contrast, for those who seek to learn without involving their ego, failure should not threaten self-esteem even when they have invested high effort because they see failure as a learning opportunity. In the absence of effort, however, both knowledge goals and learning from failure goals could be effective in protecting self-esteem.

Method

Participants

The 152 college students in Sample 2 of Study 1 (51 men, 100 women, and 1 participant of unknown gender) participated in Study 2. Participants ranged in age from 18 to 33 years (mean age 19.7), and were recruited through flyers posted in public locations on campus offering \$12 for participating in a study on “Coping with Exam Stress.” Participants mostly identified themselves as “White or European American” (43.4 %) or “Asian or Asian American” (34.2%), with a minority of “Black or African American” (11.2%), “Hispanic” (3.3%), and “Other / Mixed Race” (6.6%).

Procedure

Participants who expressed interest in the study first completed a web survey consisting of several pretest measures. Upon completion of the web survey, participants came to the lab in groups of up to 12 and worked individually on a shortened version of the GRE analytical ability test (Stewart, 1999) programmed with Visual Basic. Before the actual GRE, all participants received four easy GRE practice questions with answers and explanations which

they could study for up to 8 minutes. To ensure that all participants spent time on the practice problems, the practice session was programmed so that participants could not see the answers and explanations until they provided the right answer. The majority of participants (71.1%) used all 8 minutes on the practice questions, suggesting that they invested some effort on the task.

When participants completed all 4 practice questions, or after 8 minutes had passed, they had 15 minutes to complete the “real” GRE analytical test, consisting of 2 problem sets (6 questions in the first problem set and 4 in the second). Both problem sets were characterized as “challenging” questions in a GRE preparatory book (Stewart, 1999). When participants finished all 10 questions or when they had used all the allotted time, the computer displayed their actual score on the GRE test. Immediately following the feedback, participants completed measures of state self-esteem and manipulation check questions about the difficulty and diagnosticity of the test. Finally, participants were probed for suspicion, provided some demographic information, and were fully debriefed.

Pre-test Measures

As noted in Study 1, the web survey consisted of a battery of questionnaires designed to examine the construct validity of the knowledge goals and learning from failure goals scale. The pretest included: (1) the academic Contingencies of Self-Worth subscale (Crocker, Luhtanen, Cooper, & Bouvrette, 2003; $\alpha = .86$); (2) the Knowledge Goals and Learning from Failure Goals scale (α s = .76 and .70 for knowledge goals and learning from failure goals); (3) Elliot and Church’s (1997) mastery goals subscale ($\alpha = .81$); (4) the Theories of Intelligence scale (Dweck, 2000; the entity items were reverse-scored so that higher scores indicated incremental theories; $\alpha = .92$), and (5) Rosenberg’s Self-Esteem scale (Rosenberg, 1965; $\alpha = .90$).

Post-test Measures

After participants completed the GRE test and received feedback indicating (correctly) that they had performed poorly, they filled out the “right now” version of the Rosenberg self-esteem scale ($\alpha = .93$). Participants also completed a manipulation check item about the difficulty of the test (“How difficult was the GRE analytical test?”) and a question about the

diagnosticity of the test (“How accurate do you think the GRE analytical test is as a measure of your intelligence?”) on 7-point scales.

Results

Before examining how academic contingencies of self-worth and learning from failure goals predicted reactions to academic failure, we first checked whether participants believed they failed the GRE test. We intentionally made the GRE test difficult so all participants would experience academic failure. Indeed, participants had on average only 1.99 correct answers out of 10, a score that did not differ from chance had participants chosen random answers among the 5 answer options ($t(151) = .30, p = .77$). As intended, all participants rated the test as difficult ($M = 6.15, SD = .89$). The mean statistically differed from the scale midpoint 4 ($t(150) = 29.89, p < .001$), confirming that we successfully induced academic failure. Next, we factored out knowledge goals from learning from failure goals by regressing learning from failure goals on knowledge goals and saving the standardized residuals as an index of “pure” learning from failure goals. The residuals allowed us to examine how “pure” learning from failure goals moderated the effect of academic contingencies of self-worth on post-test self-esteem.⁷ We grand mean centered academic contingencies of self-worth following the recommendations of Aiken and West (1991). We then entered post-test state self-esteem as the dependent variable and academic contingencies of self-worth, learning from failure goals, and their interaction as predictors into the regression analysis. All subsequent analyses controlled for pre-test self-esteem, perceived diagnosticity, and perceived difficulty of the test.

As expected, academic contingencies of self-worth predicted lower post-test self-esteem ($\beta = -.27, p = .001$) but the effect was qualified by the Academic CSW X Learning from failure goals interaction ($\beta = .18, p = .02$). For participants low on learning from failure goals, higher academic contingencies predicted lower post-test self-esteem, whereas for participants high on learning from failure goals, academic contingencies of self-worth did not predict post-test self-esteem (see Figure 1). Consistent with our hypothesis that learning from failure goals attenuate the effect of academic contingencies on post-failure self-esteem, the analysis of simple slopes

⁷ Entering learning from failure goals and knowledge goals simultaneously in the regression reveals the unique contribution of learning from failure goals on post-test self-esteem but does not provide a good test for the interaction between “pure” learning from failure goals and academic contingencies of self-worth. To examine this interaction, we would have to enter Knowledge goals X CSW interaction in the regression, which would result in high multicollinearity, particularly with Learning from failure X CSW interaction.

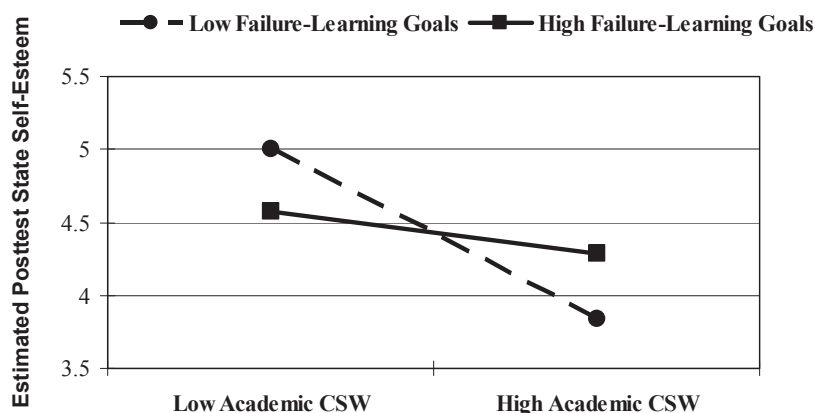


Figure 1: Estimated Post-test State Self-Esteem by Academic Contingencies of Self-Worth (CSW) for Participants Low and High on Learning from Failure Goals (Study 2).

indicated that academic contingencies significantly predicted lower self-esteem for those low on learning from failure goals ($\beta = -.44, p = .001$) but did not predict self-esteem for those high on learning from failure goals ($\beta = -.11, p = .15$).

We repeated the analysis with “pure” knowledge goals, mastery goals, and incremental theories as predictors of self-esteem in separate regressions. In all three analyses, academic contingencies of self-worth had a main effect on post-test self-esteem ($\beta s < -.19, ps < .01$) but none of the learning orientations interacted with academic contingencies ($\beta = -.07, p = .41$ for CSW X Knowledge goals; see Figure 2; $\beta = .07, p = .40$ for CSW X Mastery goals; and $\beta = .08, p = .32$ for CSW X Incremental Theories). The lack of interaction with academic contingencies of self-worth suggests that unlike learning from failure goals, knowledge goals, mastery goals, and incremental theories do not reduce the effect of academic contingencies on post-failure self-esteem.

Discussion

Study 2 provided additional evidence for the validity of the distinction between knowledge goals and learning from failure goals. As predicted, the goal to learn from failure buffered self-esteem of highly contingent participants faced with failure. Following ego-threatening failure, academic contingencies of self-worth did not predict lower self-esteem among those who endorsed the goal to learn from failure. Furthermore, neither knowledge goals, mastery goals, nor incremental theories of intelligence showed this buffering effect. Findings of Study 2 support our idea that not all learning goals are equally effective in

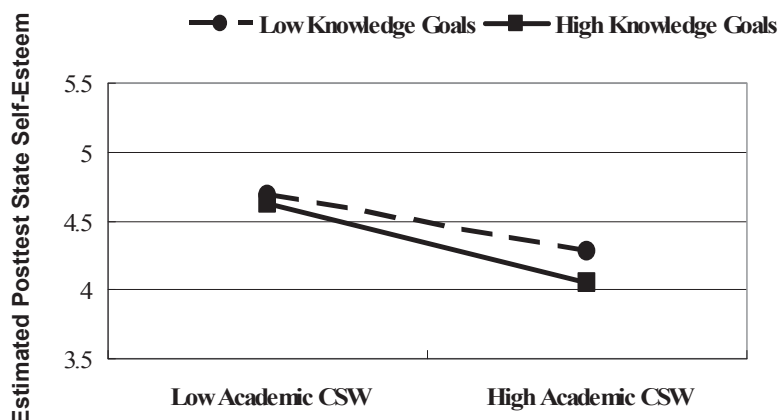


Figure 2: Estimated Post-test State Self-Esteem by Academic Contingencies of Self-Worth (CSW) for Participants Low and High on Knowledge Goals (Study 2).

reducing self-esteem vulnerability of people who have contingent self-worth even though these measures all reflect one's orientation toward learning. Only learning from failure goals, which negatively correlated with ego-involved goals in Study 1, moderated the effect of academic contingencies.

That the goal to learn from failure moderated the effect of academic contingencies when people invested effort in practice suggests that learning from failure goals may particularly help in high ego-threat situations. When highly contingent students expend effort on practice prior to failure, they may lose the possibility of attributing failure to lack of effort and practice, making their self-esteem more vulnerable. Unlike past studies, under high effort, knowledge goals, mastery goals, and incremental theories did not reduce self-esteem vulnerability. In contrast, learning from failure goals reduced the effect of academic contingencies precisely when people were most vulnerable to failure.

One limitation of Study 2 was that it did not manipulate the investment of effort. Although the goal to learn from failure buffered self-esteem in an ego-threatening situation, it is not clear from this study whether learning from failure goals more effectively buffer self-esteem in high effort than in low effort situations. We addressed this question in Study 3 by manipulating participants' opportunity to practice before an academic test. Study 3 also manipulated participants' beliefs about intelligence to examine whether the goal to learn from failure reduced the effect of contingencies of self-worth especially among those most vulnerable to failure: the incremental theorists who invested high effort but failed to improve.

Study 3

Study 3 extended Study 2 by adding two manipulations. First, we manipulated the investment of effort by having participants either practice or not practice before the academic test and examined whether the goal to learn from failure more effectively reduced the vulnerability associated with academic contingencies when people invest effort prior to failure than when they do not invest effort.

Second, we manipulated people's entity or incremental theories of intelligence prior to practice and examined whether these theories moderated the buffering effect of learning from failure goals on self-esteem among academically contingent students. We anticipated that incremental theories (i.e., the belief that one can improve with effort; Dweck, 2000) combined with high investment of effort amplify the threat to self-esteem among academically contingent students. Incremental theorists believe they can improve with effort. When highly contingent incremental theorists invest effort and still fail, they cannot attribute failure to lack of effort; failure then indicates lack of ability, threatening self-esteem. In support of this idea, previous research found that incremental theories of intelligence led highly contingent students to self-handicap by withdrawing effort prior to a difficult task (Niiya, Brook, & Crocker, 2010). We therefore expected that highly contingent incremental theorists would be particularly prone to loss of self-esteem when they practiced and failed. Study 3 tested whether learning from failure goals would effectively reduce the effect of academic contingencies among the most vulnerable group — the incremental theorists who practiced and failed.

Study 3 also tested whether academically contingent entity theorists are protected by learning from failure goals after practice. For the entity theorists, we did not expect learning from failure goals to have the same buffering effect as for the incremental theorists because priming entity theories (i.e., the belief that improvement is not possible) should override the goal to learn from failure. For the entity theorists, we, therefore only expected academic contingencies to influence their post-test self-esteem regardless of whether or not they practiced.

Finally, we replaced the GRE analytical ability test with the Remote Associate Test (RAT; McFarlin & Blascovich, 1984) to establish generalizability across multiple tasks.

Method

Participants

The 169 college students in sample 3 of Study 1 (45 men, 122 women, and 2 unknown) participated in Study 3. Participants were recruited from the psychology subject pool for a study on “the effect of practice on intellectual performance”. The majority (71.0%) identified themselves as “White or European American,” 13% as “Asian or Asian American,” and the remaining ethnicities each constituted less than 5% of the sample. The mean age was 18.7. Participants received partial credit toward their course requirement.

Research Design

The experiment was a 2 (Academic CSW: High vs. Low) X 2 (Learning from failure goals: High vs. Low) X 2 (Self-theories: Incremental vs. Entity) X 2 (Practice vs. No practice) between-subject design.

Procedure

Pre-test measures. Participants sat individually at computers and first completed the pretest measures described in Study 1, including the Academic Contingencies of Self-Worth subscale (Crocker, Luhtanen, Cooper, & Bouvrette, 2003; $\alpha = .83$), the Knowledge-Goals ($\alpha = .71$) and Learning from Failure Goals scale ($\alpha = .68$), the Rosenberg Self-Esteem scale (Rosenberg, 1965; $\alpha = .83$), and the Theories of Intelligence scale (Dweck, 2000; $\alpha = .95$).

Manipulation of self-theories. Next, participants took a “verbal ability test from the Academic Intelligence Examination Test” described as “a reliable measure of cognitive ability and creativity.” The verbal test had two parts: a reading comprehension test and a difficult version of the Remote Associate Tests (RAT; McFarlin & Blascovich, 1984). Following the procedures of Bergen (1992), we embedded the manipulation of self-theories in the reading comprehension section of the Academic Intelligence Examination Test (see also Niiya et al., 2004). The computer randomly displayed either the entity theory priming text or the incremental theory priming text. The entity theory priming text described intelligence as a fixed factor determined by heredity, whereas the incremental theory priming text argued that

intelligence depended heavily on environmental factors.

Three questions in the format of the GRE test served as a manipulation check. One question asked what the text inferred, and participants chose one of the following 5 responses: “Intelligence is mainly determined by a person’s genetic inheritance,” “Intelligence is mainly determined by the environment,” “Intelligence is equally determined by both genes and environment,” “Intelligence is determined by the environment at early childhood only,” and “None of the above.” The second question asked what statement the author would agree with: (I) “If a child fails on a test, the child should be encouraged to study harder,” (II) “There is nothing we can do about intelligence once we are grown up,” and (III) “Knowles’ findings are true only in Western society.” Participants chose their answer among the following 5 options: “I only,” “II only,” “III only,” “I and III only,” and “I, II, and III.” Finally, in the third question, participants indicated which question the passage tried to answer, again with 5 options: “How should we raise gifted children?,” “Why are some people smarter than others?,” “Can twins have different IQ’s when they are grown up?,” “Is it heredity or is it environment?” and “Is intelligence important to succeed in life?”

Manipulation of practice. Half of the participants took the RAT immediately after the manipulation of self-theories, while the other half worked on 8 practice RAT items before the actual word association test because “practice has been shown to increase one’s performance a lot.” In the practice session, participants received a set of 3 words from the difficult RAT (e.g., “business”, “care”, “thought”) and, for each word, they wrote down 3 words or phrases that could be associated with each of the stimulus words (e.g., *business* trip, *business* school, out of *business*; health *care*, *care* follows wealth, *care* center; *thought* balloon, *thought* process, *afterthought*). Participants could not move to the next page until they provided 3 associations for each of the 3 words. When participants completed all 9 associations, the computer displayed the list of several possible associations until participants clicked on a button to proceed to the next practice item. Participants in the practice group had to either spend all 10 minutes in practice or complete all 8 practice questions before taking the difficult version of the RAT. To ensure that all participants did poorly on the test and experienced failure, the actual RAT questions differed from the practice RAT items and participants had only 3 minutes to complete all 10 questions.

Post-test measures. Following the RAT, all participants completed the “right now” version of the Rosenberg Self-Esteem scale (1965; $\alpha = .93$). Participants also completed one manipulation check item about the difficulty of the test (“How difficult was the RAT portion of

the Academic Intelligence Examination Test?") and one question about the diagnosticity of the test ("How accurate do you think the Academic Intelligence Examination Test is as a measure of your intelligence?") on a 7-point scale. Finally, participants were probed for suspicion and fully debriefed.

Results

Manipulation Checks

Self-theories priming. The manipulation of self-theories was successful. Among the 82 participants assigned to the entity priming condition, 74 (90.2%) indicated that the text implied that "intelligence is mainly determined by a person's genetic inheritance." Similarly, among the 87 participants assigned to the incremental priming condition, 67 (77.0%) indicated that the text implied that "intelligence is mainly determined by the environment." A chi-square test showed a significant association between the priming and the answer choice, $\chi^2(4) = 143.9$, $p < .001$.

Another manipulation check question asked with which statement the author would mostly agree. Again, consistent with our intention, 79.3% of participants in the entity priming condition chose the statement, "There is nothing we can do about intelligence once we are grown up," whereas 85.1% of those in the incremental priming condition chose the statement, "If a child fails on a test, the child should be encouraged to study harder." Again, the chi-square test indicated a significant association, $\chi^2(4) = 99.4$, $p < .001$. Together, the two manipulation check items show that the priming of entity and incremental theories worked as intended.

Our last manipulation check indicated that participants in both priming conditions paid attention to the text and understood its content. When asked to indicate which question the passage answered, the majority of participants in the entity (79.3%) and in the incremental priming conditions (77.9%) chose the question, "Is it heredity or is it environment?" while 14.6% in the entity and 17.2% in the incremental priming conditions chose, "Why are some people smarter than others?" Less than 5 participants chose the other options ("How should we raise gifted children?", "Can twins have different IQ's when they are grown up?", "Is intelligence important to succeed in life?").

RAT Difficulty. The RAT test successfully implemented failure for both practice and no-practice groups. The RAT score ranged from 0 to 4 (out of 10 questions), with a mean of

0.8. Those in the practice condition ($M = 0.88$) did not perform any better than those in the no-practice condition ($M = 0.71$, $t(167) = 1.23$, $n.s.$) nor did these two groups differ in the perceived difficulty of the RAT (5.97 vs. 5.66, $t(164) = 1.72$, $n.s.$).

Post-Test State Self-Esteem

Prior to the analysis, we created a “pure” measure of learning from failure goals by regressing learning from failure goals on knowledge goals and saving the standardized residuals. We then used median split to create high and low learning from failure goals groups and academic contingent groups. To test whether high learning from failure goals reduced self-esteem vulnerability associated with practice and failure among the highly contingent incremental theorists, we conducted an ANOVA with academic contingencies of self-worth, learning from failure goals, self-theories, and practice as independent variables.⁸ All the analyses controlled for initial self-esteem, initial self-theories, and perceived diagnosticity and difficulty of the test.

As expected, we found a significant Academic CSW X Learning from failure goals X Self-theories X Practice interaction ($F(1, 149) = 2.99$, $p = .04$; see Figure 3). Separate analyses for entity and incremental groups indicated a significant Academic CSW X Learning from failure goals X Practice interaction for the incremental group ($F(1, 72) = 7.65$, $p = .01$) but no three-way interaction for the entity group ($F(1, 69) = .02$, $p = .89$, $n.s.$). To further understand the interaction among the incremental theorists, we examined how practice interacted with academic contingencies of self-worth separately for those low vs. high on learning from failure goals. Consistent with our hypothesis, we found a significant Academic CSW X Practice interaction among the incremental theorists low on learning from failure goals ($F(1, 34) = 6.60$, $p = .02$) but no interaction among the incremental theorists high on learning from failure goals ($F(1, 34) = 1.87$, $p = .18$, $n.s.$). These findings indicate that the effect of academic contingencies of self-worth on post-failure self-esteem depends on whether one has invested prior effort, but only among the incremental theorists who do not have learning from

⁸ We also conducted a regression analysis with self-theories and practice entered as dummy codes and learning from failure goals and academic contingencies entered as continuous variables. The four-way interaction was marginally significant: $\beta = .62$, $p = .09$. Regression analyses assume multiplicative relationships between variables, an assumption that is difficult to meet when the main prediction is that one group (e.g., incremental theorists who practice) will differ from the others (Blalock, 1979). We therefore chose to run ANOVAs for the main analyses.

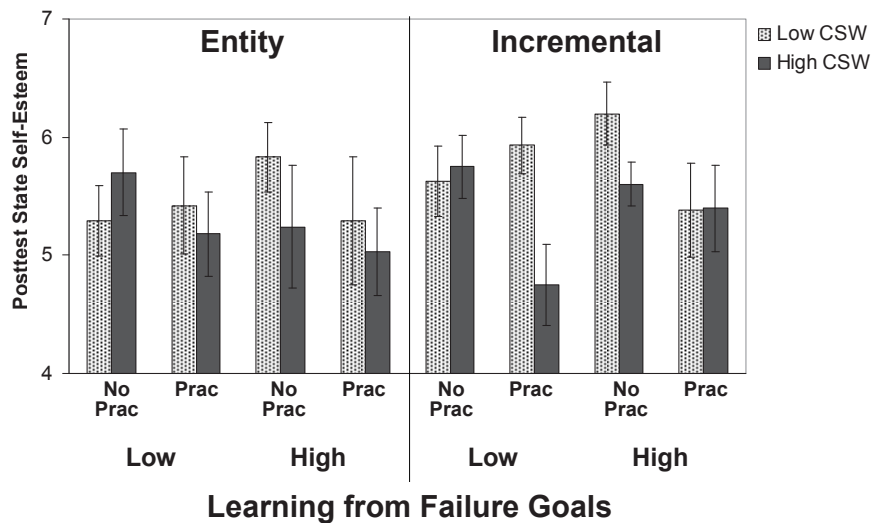


Figure 3: Post-test State Self-Esteem and Standard Errors of Means by Academic Contingencies of Self-Worth (CSW), Learning from Failure Goals, Self-Theories, and Practice (Study 3).

failure goals. Examination of the interaction showed that among the incremental theorists low on learning from failure goals, practice predicted reduced self-esteem of the highly contingent participants. In contrast, for the incremental theorists high on learning from failure goals, practice did not affect the self-esteem of highly contingent students. In other words, our results support our hypothesis that learning from failure goals attenuate the vulnerability of self-esteem for highly contingent incremental theorists who fail despite practice.

The lack of Academic CSW X Learning from failure goals X Practice interaction for the entity theorists is consistent with our prediction: because entity theorists believe that practice does not improve intelligence, failure should threaten their self-esteem regardless of practice. Although unexpected, entity theorists also showed a significant Academic CSW X Learning from failure goals interaction ($F(1, 69) = 8.32, p < .01$) with a significant effect of academic contingencies of self-worth among those high on learning from failure goals ($F(1, 35) = 6.66, p = .01$) but not among those low on learning from failure goals ($F(1, 34) = 1.97, p = .17, n.s.$). For the entity theorists, endorsing the goal to learn from failure did not reduce the effect of academic contingencies, as was the case with the incremental theorists, suggesting that the goal to learn from failure is particularly helpful for highly contingent incremental theories who invest practice and fail.

Discussion

Study 3 showed that the goal to learn from failure reduces the effect of academic contingencies of self-worth, especially among the incremental theorists who invest effort prior to failure. Failure despite effort threatens the self-esteem of students with contingent self-worth who believe in the malleability of intelligence because poor performance following effort indicates incompetence and lack of self-worth. We found, however, that the goal to learn from failure buffers the threat to self-esteem among this otherwise most vulnerable group. The highly contingent incremental theorists who did not have the goal to learn from failure may have seen effort and practice as a way to improve their performance, demonstrate their competence, and, hence, self-worth. Because their desire to learn originated from the desire to prove competence, failure following practice might have indicated incompetence and threatened their self-esteem. In contrast, highly contingent incremental theorists who had the goal to learn from failure might have seen failure as a learning opportunity and thus could have maintained self-esteem despite practice.

Study 3 makes three important contributions. First, whereas Study 2 assumed that the goal to learn from failure reduces the effect of contingencies of self-worth especially when people invest effort prior to failure, Study 3 directly compared how learning from failure goals interact with contingencies of self-worth under effort and no effort conditions and confirmed that learning from failure goals benefit people, particularly when they fail despite investing effort. College students grapple with increasingly complex academic tasks such as writing papers or solving mathematical problems in which progress does not immediately follow effort. Often, students get discouraged when they do not see improvement from one exam to the next and, due to the accumulating threat of failure, they take defensive actions such as self-handicapping, procrastinating, or disengaging from the subject. The goal to learn from failure might contribute to sustained learning and persistence on challenging tasks and projects.

Second, although researchers have associated incremental theories with positive academic outcomes (Dweck & Molden, 2006), our study shows that incremental theories predict increased self-esteem vulnerability when people have contingent self-esteem and when failure occurs despite effort. Incremental theories encourage people to invest effort, which is crucial for learning new skills or mastering difficult tasks. However, if people do not endorse the goal to learn from failure, effort and learning can fuel the desire to prove competence and self-worth, threatening their self-worth when failure occurs despite effort. Our study suggests that

promoting incremental beliefs does not reduce the vulnerability of self-esteem among students who have contingent self-worth, especially when failure involves investment of prior effort.

Finally, Study 3 found that the goal to learn from failure reduces vulnerability associated with academically contingent self-worth following practice and failure among the incremental theorists but not among the entity theorists. This lack of interaction among the entity theorists implies that when people believe that improvement is not possible, the goal of learning from failure does not protect their self-esteem.

General Discussion

Building on Argyris's (1992) distinction between single- and double-loop learning, we created a scale that successfully measures the goals to acquire knowledge and the goals to learn from failure. To validate the scale, we presented evidence of the convergent and discriminant validity of the measures, and showed that each goal differently predicts people's vulnerability of self-esteem to failure, especially in an ego-threatening situation. Knowledge goals, which involve the desire to acquire new information, related to the goals of proving competence and self-worth and were not effective in buffering the threat of failure. In contrast, learning from failure goals, which involve using the results of one's efforts, and particularly failure or criticism, as a learning opportunity predicted reduced egoistic concerns and more effectively buffered failure than knowledge goals.

Study 1 presented a measure of knowledge goals and learning from failure goals in academic contexts. The scale had good psychometric properties and successfully distinguished the goal to acquire knowledge and the goal to learn from failure. The correlated two-factor structure was consistent across time and across gender, and fit our data better than a one-factor model, indicating that the scale distinguishes the two types of learning goals. Moreover, ego-involved measures such as performance-approach goals, performance-avoidance goals, ability-validation goals, and academic contingencies of self-worth positively correlated with knowledge goals but negatively correlated with learning from failure goals. These findings support our contention that knowledge goals reflect a more ego-involved orientation to learning than do learning from failure goals. Study 2 showed that the goal to learn from failure reduces the vulnerability of self-esteem associated with academic contingencies of self-worth following practice and subsequent failure, whereas knowledge goals, mastery goals, or incremental theories do not. Finally Study 3 showed that the goal to learn from failure reduced

the vulnerability of self-esteem associated with academically contingent self-worth, especially among incremental theorists who invested effort prior to failure, the group otherwise most vulnerable to failure. Studies 2 and 3 together confirmed the validity of the learning from failure goals measure as reflecting less ego-involved learning goals.

Our new knowledge goals and learning from failure goals scale has the benefit of differentiating ego-involved from less ego-involved learning goals, a distinction left ambiguous in past measures of mastery goals (Elliot & Church, 1997). In previous research, mastery goals either did not correlate (e.g., Senko & Harackiewicz, 2005; Elliot, McGregor, & Gable, 1999, Study 2; Middleton & Midgley, 1997) or positively correlated with performance goals (e.g., Barron & Harackiewicz, 2001; Elliot, et al., 1999, Study 1; Church, Elliot, & Gable, 2001; Elliot & Church, 1997; Grant & Dweck, 2003). Consistent with these past findings, Study 1 showed that mastery goals did not correlate with performance and ability-validation goals, and positively correlated with academic contingencies of self-worth. In contrast, our learning from failure goals negatively correlated with these ego-involved goals. Moreover, mastery goals correlated more strongly with “pure” knowledge goals (with learning from failure goals partialled out) than with “pure” learning from failure goals, suggesting that mastery goals do not primarily reflect the desire to use failure as a learning opportunity.

Our research also found that not all learning goals equally predict successful coping with failure. Decades of research on learning and mastery goals have found that mastery goals lead to positive academic outcomes such as persistence, intrinsic motivation, challenge-seeking, and deeper processing of information, whereas performance goals lead to negative outcomes such as disengagement, self-handicapping, and surface processing (e.g., Ames, 1992; Elliot, McGregor, & Gable, 1999; Rawsthorne & Elliot, 1999). However, our findings suggest that mastery goals do not provide immunity from ego-involvement in the learning process and could, under ego-threatening circumstances, derail people from learning and increase their self-esteem vulnerability. Our previous research supports the idea that ego-involvement in the learning process can foster vulnerability of self-esteem among mastery-oriented people. For example, mastery-oriented students who staked their self-worth on academic competence (and, hence, were highly ego-involved in their learning) avoided investing effort in face of difficulty and had vulnerable self-esteem when they failed on a task that required high effort (Niiya, Brook, & Crocker, 2010). Consistent with our past findings, Study 2 found that knowledge goals do not reduce self-esteem vulnerability of those who have highly contingent self-worth. People who have mastery goals or knowledge goals can have the desire to maintain or achieve

high self-esteem but, because of their concerns about self-worth, they may become vulnerable to failure and miss learning opportunities. Just as pursuing self-esteem paradoxically undermines self-esteem (Crocker & Park, 2004), learning goals, combined with the pursuit of self-esteem, may paradoxically ruin learning opportunities.

Finally, our research suggests that failure need not be threatening to the self if people view failure as a learning opportunity. When people have the goal to learn from failure, success and failure represent tools for growth rather than endpoints. If people have the goal to prove self-worth by demonstrating how much or how fast they can learn, they may see failure and criticisms as obstacles to avoid or overcome (Carver & Scheier, 2005). However, if people have the goal to learn from failure, they may see failure and criticisms as a useful source of information that supports their goal.

Future Directions

Future research should examine whether the goal to learn from failure promotes adaptive academic behaviors such as persistence, deeper processing of information, and higher performance in ego-threatening situations. Because people with the goal to learn from failure appraise failure and setbacks differently, we expect their academic behaviors to also differ. For example, people who are high on knowledge goals but low on learning from failure goals may want to learn quickly and spend more time on areas they can quickly improve than on difficult areas that may take more time to improve. On the other hand, people high on learning from failure goals may feel less constrained by time pressure and may persist through challenging tasks even when they do not see immediate signs of improvement. Differences in the allocation of time and effort may result in higher performance, both short-term and long-term, among those who endorse the goal to learn from failure.

Future studies should also explore contextual factors that encourage people to endorse the goal to learn from failure. Moderate test-retest correlations for these goals suggest that they do not reflect fixed individual differences. Priming knowledge goals or learning from failure goals will allow researchers to examine causality and practitioners to design educational programs to reduce people's vulnerability to failure.

Knowledge Goals and Learning from Failure Goals beyond Academia

Although we have created a measure of knowledge goals and learning from failure goals in the academic context, we believe that the idea of knowledge goals and learning from failure goals broadly applies to every area of life. Learning from failure is important in all activities but rarely do people view failure as an opportunity and criticism as a gift. Learning from failure goals may minimize threats and encourage learning in all areas, including romantic relationships, raising children, self-improvement efforts such as weight loss or quitting smoking, political campaigns, receiving feedback at work, reporting errors to one's supervisor, and experimenting with new technologies in an organization.

We also believe that the goals to acquire knowledge and the goals to learn from failure can be conceptualized not only at the individual level, but also at the organizational level. Classrooms, hospitals, cockpits, and work settings could have a structure that encourages the goal to learn from failure among their members. Research on organizational behavior has long examined group and institutional factors that encourage team learning and noted the importance of learning from setbacks (e.g., Edmondson, 1999; Lee, Edmondson, Thomke, & Worline, 2004; vanDyck, Frese, Baer, & Sonnentag, 2005). Social psychologists may have a lot to learn from these adjacent disciplines.

Conclusion

In this research, we distinguished the goals of acquiring knowledge and the goal of learning from failure and showed that they are differently connected to ego-involvement in learning. We introduced a scale that successfully captured the two learning goals and reported two studies in which learning from failure goals interacted with academic contingencies of self-worth to reduce self-esteem vulnerability following failure, especially when people invested effort and fail. The findings support the idea that the goal to learn from failure enables people to shift from viewing failure as a self-esteem threat to viewing it as a learning opportunity.

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Author Note

This research was supported by National Science Foundation grant BCS 0446567. Yu Niiya was supported by a Fulbright graduate fellowship and the Innovation in Social Research Fellowship from the Institute of Social Research, and Jennifer Crocker was supported by National Institute of Mental Health grant K02 MH01747. We thank Juliana Breines, Paul Denning, Sarah Franz, Riia Luhtanen, and Lilita Matison for collecting and managing the data of the longitudinal study, Katarzyna Bundyra and Kristin Neff for their comments on earlier drafts of this article, and Nobuyuki Futai for developing the computer programs used in Studies 2 and 3.