"Failure" in Performance Appraisal:

Explanations from Threat Rigidity and Supervisory Support Views

Abstract

Employees often experience failure as a threat and shrink from learning new things when they have failed. Even though a few qualitative studies have highlighted the positive role of error or disappointment in the workplace, research examining the specific mechanisms that facilitate learning behaviors following a failure is scant. We performed a quantitative analysis with data from 475 engineers in a large IT component manufacturing company in Korea that evaluates an individual employee's performance as a "success" or "failure" in its performance appraisal system. Relying upon discussions on *threat rigidity* and *social support*, we examined two distinct paths from failure experience to learning behaviors, both cognitive and affective, and the moderation role of supervisory support. Using a multisource method, Mplus analyses provided evidence that a perception of self-efficacy mediated the path from failure to learning behaviors, while the negative affect path was not found to be significant. Moreover, supervisory support was found to attenuate the negative impact of failure on an individual's perception of self-efficacy, but did not significantly lessen the impact of failure on negative affect. Theoretical and practical implications of these results are discussed.

Keywords: learning behaviors, threat rigidity, failure in performance appraisal, self-efficacy, negative affect, supervisory support

Scholars and CEOs have consistently praised the merits of failure, especially in innovation. For instance, Cannon and Edmondson insisted that "[organizations] should learn to fail intelligently as a deliberate strategy to promote innovation and improvement" (2005; p. 300)**,** and Amazon CEO Jeff Bezos has emphasized the role of failure in maintaining his company's edge: "We are the best place in the world to fail**,** and failure and inventions are inseparable twins" (2015 Letter to Shareholders). Farson and Keyes have also pointed out the value of failure: "You really aren't committed to innovation unless you're willing to fail …The fastest way to succeed is to double your failure rate" (2002; p. 64). In a similar vein, Clancy, Vince and Gabriel (2012) advocated "disappointment," or not meeting expectations, and Provera, Montefusco and Canato (2010) highlighted "error," or unintended deviations from planned courses of action, as sources of learning and creativity.

Despite these appealing assertions, it is notable that scholars have also insisted on the liabilities of failures; those who have experienced failure tend to perceive incompetency (Sitkin, 1992), a reduction in psychological well-being (Shepherd and Cardon, 2009), and a feeling of shame (Mascolo and Fischer, 1995; McGregor and Elliot, 2005). These negative perceptions can cause an individual's avoidance and withdrawal behaviors. Furthermore, employees in the workplace would perceive failure more severely because failure in tasks seriously jeopardizes decisions that affect their status, including pay, promotion, and employment security (Lam et al., 2002). Therefore, for most employees in the workplace, learning from failure is easier to accept in principle than to implement in practice. When perceiving psychological anxiety caused by failure in appraisals, employees would naturally shrink from learning new information or methods. *Threat rigidity* effectively explains the phenomenon. Staw and colleagues (1981) defined threat rigidity as a general tendency to behave rigidly in threatening situations or in a

crisis. When exposed to threats, individuals show defensive or conservative behaviors, adhering to existing routines rather than responding innovatively (Muurlink, Wilkinson, Peetz and Townsend, 2012). This means learning behaviors are hindered because these behaviors indicate an agentic or volitional choice of actions, including continuous reflection involving asking questions and experimenting with new approaches (Edmondson, 1999) and requiring extra time and effort (Baer and Frese, 2003; Carmeli and Gittell, 2009; Cannon and Edmondson, 2001; Wood and Bandura, 1989). Thus, employees would undergo a threat rigidity process and avoid learning behaviors after experiencing failure.

We, in the present research, attempt to search for an answer to the seemingly conflictual assertions by exploring two agenda. First, we clarify the negative psychological mechanisms occurring after failure experiences. Many influential studies have highlighted antecedents or contextual factors boosting learning from failure (Carmeli, 2007; Carmeli and Gittell, 2009; Ellis, Mendel and Nir, 2006), but have largely ignored the specific psychometric mechanisms incurred by failure. In examining the mechanism, we explore the two facets of affect and cognition. Staw and colleagues (1981) discussed these two facets in their original work, but dealt with them as a single path, i.e., moving from threat to negative psychological states, then to cognitive reactions, and finally influencing behaviors. However, we explore self-efficacy and affect as distinctively independent mediators. The assertion is supported by recent motivation studies discussing the affective and cognitive facets as distinctive constructs triggering independent impacts on employee behaviors (e.g., Kanfer and Chen, 2016). Notably, Bandura (1982) included psychological and physiological states as one of the four determinants of self-efficacy, or the perception of the ability to perform adequately in a given situation. However, he, at the same time, emphasized the purely cognitive process being influenced by enactive or vicarious learning

without necessarily being influenced by changes in affect. Furthermore, many studies thereafter have insisted and supported distinctive paths of cognitive confidence and negative affect influencing employees' behavior in the workplace (e.g., Fredrickson, 2001; Seo et al., 2004; Seo and Ilies, 2009). In addition, scholars on affect also have argued that affect triggers impacts on task behaviors regardless of interventions of efficacy (Isen, Nygren, and Ashby, 1988). Therefore, we examine the two distinct paths of efficacy and affect in explaining the threat rigidity process.

As the second agenda, we explore how to alleviate the negative psychological rigidity process by examining the effects of contextual factors. Scholars have consistently stressed the importance of considering contextual factors in order to encourage employees' learning and innovative behaviors. For instance, Wallace and colleagues (2016) argued, "Without the right context that provides opportunities to thrive in the workplace, employees' motivational predispositions may be of little circumstance" (p. 988). As for the specific contextual factors, Scott and Bruce (1994) emphasized a supportive climate, and Ng and Lucianetti (2016) highlighted trust perception. Relatedly, Carmeli and Gittell (2009) underlined the importance of relational facets such as high-quality relationships, while Provera and colleagues (2010) highlighted the importance of a highly reliable atmosphere in organizations. These assertions on the importance of a constructive or supportive work environment are highly persuasive, but still unknown is specifically which part of the psychological mechanisms of negative consequences these supportive environments influence. Relying upon the social exchange view (e.g., Kottke and Sharafinski, 1988; Wayne et al., 1997), we specifically examine how supervisory support helps to alleviate the psychologically rigid process after experiencing failure.

Exploration of the two research agenda would contribute to reconciling the existing controversies on the merits and liabilities of failures, and thus enhance understanding of the

consequences of failure experiences in the workplace, especially in predicting learning behaviors. To examine the research agenda, we performed a quantitative analysis using multi-source data. Regarding employee failure, we utilized information provided by a large IT component manufacturing company in Korea. The company has developed a unique evaluation system appraising each employee's performance as either a "success" or "failure," which allows an examination of objective failure. In addition, we conducted a survey of individual employees to collect their psychometric data, including learning behaviors, and analyzed how these psychometric facets are influenced by the failure recorded in the company's appraisal system.

Research Hypotheses

Failure, Threat Rigidity, and Learning Behavior

Failure has attracted a vast number of studies, but research has delivered mixed messages on its effects. The merits of failure have been insisted on by a number of scholars, who have argued that success gives employees overconfidence in their existing knowledge and often results in having little interest in new information and knowledge. Managers usually interpret a successful experience as important evidence that existing knowledge is correct and that additional or new knowledge acquisition is unnecessary (Lant, 1992: Levinthal and March, 1993). Thus, individuals experiencing several successes may be trapped in an illusion of having control over their environment (Levitt and March, 1988). However, failure, on the other hand, draws significant attention from individuals. Employees who experience failure acknowledge a need for new ways to find solutions and acquire new knowledge outside of their environment (Chuang and Baum, 2003). Failure can serve as a wake-up call for managers and employees (Kim and Miner, 2007) and also as a motivator because employees perceive a strong need and desire for success and achievement in the next trial (project).

The liabilities of failure, on the other hand, often include the risk perception that failed individuals are considered incompetent and failed companies have to risk termination (Sitkin, 1992). The negative mechanisms of failures include employees' failures reducing their psychological well-being as well as their ability to satisfy needs for competence, relatedness, and autonomy (e.g., Shepherd and Cardon, 2009). These negative consequences of failure are well described by the threat rigidity premise developed by Staw and colleagues (1981). The authors defined threat rigidity as a general tendency to behave rigidly in threatening situations. In a threatening situation, decision makers' flexibility is constrained, restricting information processing or reducing the number of channels used. The authors further explained that the rigidity effect occurs at all individual, group, and organizational levels. At the individual level, employees perceive a crisis when they are evaluated as having failed in projects because it influences major decisions having to do with promotions, pay raises, and termination of contracts (Lam et al., 2002). Therefore, failure in projects can incur rigidity in individuals' subsequent behaviors, such as learning new information and methods. Learning behavior is "an ongoing process of reflection and action, characterized by asking questions, seeking feedback, experimenting, reflecting on results, and discussing errors or unexpected outcomes of actions" (Edmondson, 1999; pp. 353). After experiencing failure, individuals may regard new ideas and trials as unrewarding or without merit, and because of this belief, learning behaviors occur less. In other words, as Tucker and Edmondson (2003) explained, failure impedes learning behavior by causing individuals to concentrate on routine first-order problem solving, rather than leading to learning through second-order problem solving that indicates going beyond successfully completing the current task by addressing the problem's underlying causes.

It has been noted that learning behavior is associated with efficacy and affect domains. Efficacy indicates cognitive attention, task mastery, and a preference for challenging tasks, while the affective component includes fear, anxiety, or boredom (Caraway et al., 2003). Regarding the efficacy facet, social cognitive theory provides effective explanations for why failure undermines an individual's learning behavior. Bandura (1982) emphasized that self-efficacy perception is central to the actions and performance of human agency. According to the author, efficacy involves a generative capability encompassing cognitive, social, and behavioral skills, which are organized into integrated courses of actions. Self-efficacy beliefs influence thought patterns and thus determine whether individuals think in self-enhancing or self-debilitating ways. When high in self-efficacy, individuals behave in self-enhancing ways so that they exert greater effort in setting challenging goals, triggering heavy investment of cognitive effort into learning, while low self-efficacy leads individuals to slacken their efforts (Bandura, 1982; Caraway et al., 2003; Chiaburu and Marinova, 2005; Colquitt et al., 2000). Researchers have explained that experiences of failure can ruin an individual's sense of self-efficacy (Bandura and Locke, 2003; Markman et al., 2005), and have also noted that individuals with repeated failures tend to perceive themselves as helpless and desperate (Campbell and Martinko, 1998). As a result of this learned helplessness, these individuals attribute prior failures to causes that they cannot change, which may make them underestimate their expertise and limit their ability to adopt and process new information. Considering these assertions, the following is hypothesized:

Hypothesis 1: Self-efficacy will mediate the negative effects of failure experiences on learning behavior such that:

(a) Failure experiences will reduce self-efficacy perception.

(b) A reduction in self-efficacy will reduce learning behaviors.

Studies on affect have explained the two most pronounced states of an individual's affect as positive (or pleasant) and negative (or unpleasant) (Russell, 2003; Seo and Ilies, 2009)[1]. Negative affect indicates subjective distress and the unpleasurable engagement of aversive mood states, including anger, contempt, fear, and nervousness (Watson et al., 1988). Seo and colleagues (2004) argued that the affective feelings of individuals significantly influence the direction, intensity, and persistence of their workplace behavior. Affect influences individuals' behavior: A positive affect enhances actions such as approaching, exploring, and learning, and a negative affect prompts individuals to act defensively (Fredrickson, 2001).

Staw and colleagues (1981) argued that negative affects such as stress and anxiety are aroused when individuals face threats. Those in negative affective states focus more on possible negative outcomes when considering behavioral alternatives (Seo et al., 2004). As a core negative affect after failure, scholars explain that a feeling of shame occurs, which then causes the individual's avoidance and withdrawal tendencies (Mascolo and Fischer, 1995; McGregor and Elliot, 2005). Moreover, Fredrickson (1998) has argued that negative affect, more than positive affect, is easily paired with specific action tendencies, and Forgas and George (2001) claimed that the effects of affective states on judgments and behaviors are increased in cases where tasks require elaborate and substantive processing. Learning requires substantive information processing, and therefore, the effects of negative affect should be especially notable in learning behaviors.

All in all, studies on affect and failure suggest that negative affect is triggered by failure experiences and that this negative affect decreases the ability to scan information and to learn new knowledge, interfering with the processing of information (Shepherd and Cardon, 2009).

Moreover, Seo and Ilies (2009) provided evidence that affect triggers unique impacts on motivation in addition to the effect of self-efficacy. Considering these assertions, it is hypothesized,

Hypothesis 2: Negative affect will mediate the effects of failure experiences on learning behavior such that: (a) Failure experiences will increase negative affect.

(b) Negative affect will reduce learning behaviors.

Moderation by Supervisory Support

Relying upon the social exchange view (Blau, 1964), organizational support theory explains that employees develop beliefs concerning the extent to which the organization cares about their well-being (Eisenberger et al., 2002). The authors further argued that the equivalent perception can be developed with regard to their supervisor, i.e., a belief concerning the degree to which supervisors value their contributions and care about their well-being. This perception has been conceptualized as supervisory support. For decades, studies have consistently confirmed that support from supervisors triggers significant impacts on the attitudes, performance, and retention of employees because they have influence over resource allocation, performance evaluation and reward. (e.g., Kottke and Sharafinski, 1988; Shanock and Eisenberger, 2006; Wayne et al., 1997). Perception of supervisory support will enhance the perception of trust of failed employees, which will lead them to engage in more proactive behaviors such as learning. They are likely to display more purposeful positive behaviors due to the belief that they will not be undeservedly penalized by the supervisor if their efforts fail to result in targeted outcomes (Hughes, Rigtering, Covin, Bouncken, and Kraus, 2018).

Following the assertion by Tucker and Edmondson (2003) that supervisory intervention is essential in motivating individuals to consider the causes of their failure and to seek clues for improvement through second-order problem solving, supervisory support can be assumed to trigger significant moderating effects in the *rigidity* processes between failure and learning behaviors. Supervisors in particular can play a significant role in addressing individuals' anxieties through informal feedback about job performance and by caring for the socioemotional needs of employees (Shanock and Eisenberger, 2006). Oldham and Cummings also explained that supportive supervisors "show concern for employees feelings and needs, encourage them to voice their own concerns, provide positive informational feedback, and facilitate employee skill development" (1996; pp.611). Therefore, supervisory support can be used as an intervention for both self-efficacy and negative affect in the threat rigidity process.

Supervisory support dilutes the negative effects of failure on self-efficacy. Bandura (1982) explained that self-efficacy is a socially influenced cognitive construct, and thus social persuasion is an effective way to increase an individual's perception of self-efficacy. When people receive realistic encouragement from supervisors, their self-efficacy is enhanced, and they exert greater effort than when they are troubled by self-doubt. Supervisors can cognitively encourage subordinates to try new projects even though they have previously experienced failure. Individuals who receive support from supervisors are more likely to consider taking risks by trying a new process or project and by discussing their mistakes or failures with their supervisors (Edmondson, 1999; Oldham and Cummings, 1996). Supportive supervisors can also alleviate individuals' weakened sense of self-efficacy by assuring them that they are still competent and can obtain good results next time. Using this type of social persuasion to encourage employees to believe that they can succeed in their challenging tasks has been recognized as one of the most

effective ways supervisors can motivate employees (Wood and Bandura, 1989). Consistent with this argument, Edmondson (1999) asserted that if a leader provides a supportive message, subordinates feel safe engaging in learning behavior because they have the confidence or sense of self-efficacy that allows them to believe they will not be at a disadvantage or receive any penalty for risking mistakes or failures. Therefore, supportive supervisors will effectively prevent the reduction of individuals' efficacy perceptions.

Affect-based support from supervisors has also been consistently reported in previous studies. Rooted in the social exchange view, supervisory support includes caring about social and emotional facets in addition to providing informational or transactional support (e.g., Shanock and Eisenberger, 2006; Stinglhamber and Vandenberghe, 2003). A more specific impact of supervisory support on the negative affect experienced after failure is noted in studies on failure in educational settings. For instance, studies on children's learning highlight the importance of parental support by arguing that parents' withdrawal of affective support in response to their children's mistakes can exacerbate the children's fear of failure (McGregor and Elliot, 2005). Thus, parents' affective support attenuates the arousal of negative affect occurring in children after experiencing failure. At the workplace, studies on supervisory support consistently report that when employees perceive more support from a supervisor, their emotional and psychological resources for coping with stressors and conflicts increase, thus reducing negative consequences (Kossek et al., 2011). Therefore, supervisory support would provide a comfortable environment for subordinates who are distressed by failures in previous projects by developing an atmosphere conducive to more confidently performing other projects.

In sum, existing studies suggest that supervisors' support will moderate the effects of individuals' failures on their self-efficacy and negative affect. Therefore, it is hypothesized that,

Hypothesis 3: Supervisory support perception will moderate the effect of failure experiences on self-efficacy and negative affect such that:

(a) The effect of failure experiences on self-efficacy perceptions will be reduced as employees perceive a higher level of supervisory support.

(b) The effect of failure experiences on negative affect will be reduced as employees perceive a higher level of supervisory support.

Hypothesis 4: The indirect effects of failure experiences on learning behaviors via self-efficacy and negative affect will be moderated by supervisory support such that the indirect effects on learning behavior becomes stronger the more employees perceive supervisory support.

Research Methods

Data Collection Procedures

We collected data from an IT component manufacturing company, one of the largest electronic component companies in Korea. The company develops and manufactures various components that go into electronic end products. The chosen company is a suitable site for examining the research agenda of the present study. The company has a project management system in which every project is officially registered, and in the system, the success or failure of each project is recorded in individual performance records. We collected data at two time lags in June and September 2013. For the first step, Time 1, we collected data on engineers' projects completed during the previous 30 months and records of the failure or success of each project from the company's project management system. We were able to gather data on 1,560 engineers at this first stage. For the second step, Time 2 (10 weeks after Time 1), we conducted an online

survey. A questionnaire measuring psychometric variables such as learning behavior, supervisory support, self-efficacy, negative affect, and demographic details was distributed to the 1,560 engineers. With 632 engineers answering the survey, the response rate was 40.5 percent.

We excluded engineers who had one (or no) completed project: 32 engineers had no completed projects, and 125 engineers had only one completed project. In the end, 475 engineers were used in the analysis. Individual engineers had an average of 10.5 completed projects. In addition, 203 (42.7%) experienced no failure for the previous 30 months while 136 (28.6%) showed failure rates lower than 20%. The sample consisted of 437 males (92.0%) and 38 females (8.0%). The average participant age was 38.0 years, and the average employee tenure was 12.4 years. This sample consisted of three positions: chief engineers (25.3%), engineers in charge (39.2%), and associate engineers (35.6%). Finally, 254 engineers (53.5%) had an education higher than university level.

Measures

Failure experience. This information was acquired from the company's project management system. The company practice is to record success or failure in the performance evaluation system for each individual member for each project performed. The company provided the data for their engineers, and we calculated the ratio of failed projects during the last 30 months out of the total number of completed projects for each engineer. This variable was measured at Time 1, and the ratio was used in the statistical analyses.

Self-efficacy perceptions. Self-efficacy perceptions were used as a mediating variable. We used three items from Spreitzer (1995): **"**I am confident about my ability to do my job"; **"**I am self-assured about my capabilities to perform my work activities**";** and **"**I have mastered the skills necessary for my job.**"** This variable was acquired from our online survey conducted at

Time 2. We measured the items with a 5-point scale ranging from 1, **"**not at all,**"** to 5, **"**to a large extent.**"** The reliability of the three items was 0.87.

Negative affect. To measure negative affect, we used items from the PANAS scale developed by Watson et al. (1988). We measured negative affect using **a** shortened version of five items**: "**afraid,**" "**hostile,**" "**irritable,**" "**jittery,**"** and **"**upset**."** (Wright and Staw, 1999) Subjects indicated the extent to which they experienced each affect during the current month on a 5-point scale ranging from **"**very slightly**"** to **"**extremely often.**"** The reliability of the five negative affect items was 0.91.

Learning behavior. We used Edmondson's learning behavior measures (1999). However, these measures were originally developed to evaluate team members' learning behavior and a team's learning climate. In the present study, we needed to measure individuals' self-evaluation of their learning behavior, and therefore we replaced "this team," "we," and "us" from the original version with "I" and "me." The six items used in the present research were "I regularly take time to figure out ways to improve our team's work processes"; "I go out and get all the information I possibly can from others, such as customers or other parts of the organization"; "I frequently seek new information that leads me to make important changes"; "I always make sure that I stop to reflect on the work process"; "I often speak up to test assumptions about issues under discussion"; and "I invite people to present information or have discussions with me**."** One item in the original version, "This team tends to handle differences of opinion privately or off-line rather than addressing them directly as a group," represents a facet of learning behavior unique to the team level that cannot be appropriately utilized in an individual-level analysis. Thus, we dropped this item. We measured the six items with a 5-point scale, and the reliability of the items was 0.82.

Supervisor support perception. To measure supervisory support perception, we used four items from Oldham and Cummings (1996). The items were “My supervisor helps me solve work-related problems”; “My supervisor encourages employees to participate in important decisions”; “My supervisor keeps me informed about how employees think and feel about things”; and “My supervisor praises good work.” We also measured the items with a 5-point scale, and the reliability of the four items was 0.89.

Control variables. Five variables were controlled in the analysis: gender, years of education, job tenure, position, and total number of projects engaged in. Gender was measured as a dichotomous variable coded 0 for male and 1 for female. Tenure was coded as the number of years that the employee had been in the company. Years of education were coded 12 years for high school, 14 years for college, 16 years for university with a bachelor's degree, 18 years for graduate school with a master’s degree, and 22 years for graduate school with a PhD. Position had three categories: associate engineers, engineers in charge, and chief engineers. Two dummy variables were created and controlled in the analyses. Finally, the number of total projects each engineer had engaged in was coded with a log transformation because the number varied significantly, from 2 to 90.

Results

Descriptive statistics and correlation analysis results are included in Table 1. A failure experience showed negative relationships with self-efficacy ($r = -.13$, $p < .01$) and with learning behavior ($r = -.13$, $p < .01$). Failure experience also showed a marginal positive relationship with negative affect ($r = .09$, $p < .10$). However, we found no relationship between a failure experience and supervisory support. Self-efficacy showed positive relationships with learning behavior ($r = .64$, $p < .01$) and with supervisory support ($r = .48$, $p < .01$). Negative affect

showed negative relationships with learning behavior ($r = -.18$, $p < .01$), with supervisory support ($r = -.32$, $p < .01$), and with self-efficacy ($r = -.25$, $p < .01$). Supervisory support also showed a positive relationship with learning behavior ($r = .48$, $p < .01$). Regarding the control variables, females, compared with males, showed less self-efficacy ($r = -.17$, $p<.01$) and fewer learning behaviors ($r = -.12$, $p<.01$), perceived less supervisory support ($r = -.09$, $p<.05$), and experienced fewer projects ($r = -.11$, $p<.05$). Employees with longer tenures showed higher self-efficacy ($r = .13$, $p<.01$) and more learning behaviors ($r = .15$, $p<.01$).

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To examine the research hypotheses, we employed a structural equation modeling (SEM), which permits simultaneous estimation of multiple relationships of observed variables and latent variables and suggests the fit indices of the hypothesized model. We used Mplus 7.4 Software (Muthen and Muthen, 1998-2015) for all model estimations because we were interested in figuring out the paths among the variables, especially with respect to two distinct paths and a moderation effect.

Measurement Model Analysis

The measurement model consisted of four latent constructs: self-efficacy, negative affect, learning behavior, and supervisory support. From the confirmatory factor analysis (CFA), we found that all observed variables loaded on their respective constructs significantly ($p < .001$). The model fit indices showed .95 for CFI, .94 for TLI, .07 for RMSEA, .04 for SRMR, and 403.16 for X^2(df = 129), significant at $p < .01$. Therefore, the values for the fit indices of measurement model can be regarded as acceptable. All observed variables were well loaded to

their respective latent variables at a significant level of .001, and the factor loadings were above .60 except for one item with .57. We additionally conducted thirteen alternative measurement models: six three-factor models, six two-factor models, and a single-factor model. We compared the thirteen alternative measurement models' X^2 with the original four-factor model's X^2. Table 2 shows the best six models considering the fit indices, including our four-factor model. As presented in Table 2, the chi-square difference tests showed that the original four-factor model had a significantly better fit than the other models. Therefore, it seems reasonable to confirm that our original four-factor model is the best factor structure. In addition, this research included a self-reporting design of measuring the two mediators and the dependent variable at the same time, which may incur a common method bias. Therefore, we performed the procedures suggested by Podsakoff and his colleagues (Podsakoff et al., 2003) to test for common method bias. Harman's single factor test showed that 38% of the covariance of the four variables was explained by the fixed single factor, suggesting that the model does not have a significant common method problem (i.e., lower than 50%).

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Mediation Analysis

To test Hypotheses 1 and 2, we conducted a mediation analysis using Mplus 7.4. The results for the standardized path coefficients are presented in Figure 1. Fit indices showed .91 for CFI, .90 for TLI, .07 for RMSEA, .08 for SRMR, and 498.23 for X^2(df=164), significant at $p < .01$. First, we compared the model with an alternative model of a full mediation without the direct path from failure experiences to learning behaviors. The fit indices of the alternative

model were also acceptable (X^2 (df=165) = 501.31, p < .01, CFI = .91, TLI = .90, RMSEA = .07, SRMR = .08), but the chi-square difference between two models was not significant (ΔX^2 (df = 1) = 3.08, non-significant). Therefore, we retained the hypothesized partial mediation model.

Hypothesis 1 predicted that an individual's self-efficacy perception would mediate the effects of failure experiences on learning behavior such that failure experiences reduce self-efficacy perceptions (H1-a) and a reduction in self-efficacy perceptions reduce learning behavior (H1-b). As shown in Figure 2, the effects of failure experiences on self-efficacy and of self-efficacy on learning behavior were both significant (β = -.13, p< .05 and β = .68, p< .01, respectively). Therefore, both Hypotheses 1-(a) and 1-(b) were supported[2].

Hypotheses 2 (a) and (b) predicted that an individual's negative affect perception would mediate the effect of failure experiences on learning behavior such that failure experiences increase negative affect (H2-a), and negative affect reduces learning behavior (H2-b). Figure 2 shows that the effect of failure experiences on negative affect was significant (β = .11, p < .05), but the effect of negative affect on learning behavior was not significant. Thus, Hypothesis 2-(a) was supported, but 2-(b) was not.

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Moderated Mediation Model Analysis

We conducted a moderated mediation analysis using Mplus7.4, and the results for the standardized path coefficients in the moderated mediation model are shown in Figure 2. Fit indices show .92 for CFI, .90 for TLI, .06 for RMSEA, .05 for SRMR, and 522.48 for x^2(188), significant at p < .01.

Hypothesis 3-(a) predicted that supervisory support would moderate the negative relationship between failure experiences and self-efficacy. As shown in Figure 2, the interaction effect between failure experience and supervisory support was significant for self-efficacy (β= .86, p< .01), but not for negative affect. To further examine the moderating effect, we conducted a simple slopes test with procedures recommended by Aiken and West (1991). In support of Hypothesis 3a, we found that the simple slope was negatively significant only when supervisory support was low (β = -.24, p<.05), while the relationship was not significant for employees who perceived high supervisory support (β = -.14, non-significant). Figure 3 graphically depicts these findings. Therefore, Hypothesis 3-(a) was supported, but 3-(b) was not.

INSERT FIGURE 2 & 3 ABOUT HERE

In addition, we used a bootstrapping approach to examine the indirect effects of failure experience on learning behavior via self-efficacy and negative affect. Bootstrapping does not impose assumptions about the distribution of a sample and thus is reported to be a better approach for testing indirect effects than the traditional Sobel test (MacKinnon *et al.,* 2002). We resampled 1,000 times, and obtained the estimates and confidence intervals (CIs) for indirect effects. The indirect effect was significant in the mediation of self-efficacy (b = -.661, $CI_{\text{lower 5\%, upper 5\%}}$ = -.966, -.317), but not significant in the mediation of negative affect (b = .000, $CI_{\text{lower 5\%, upper 5\%}}$ = -.022, .033).

Finally, Table 3 shows the direct, indirect, and conditional indirect effects of failure experiences on learning behavior. This analysis represents the moderating effects on the indirect effects in the mediation paths (Dong et al., 2014). As shown in Table 3, the indirect effect via

self-efficacy at a high level of supervisory support was not significant (b = .02, non-significant), while the indirect effect was significant at a low level of supervisory support (b = -.11, p < .01). Thus, moderation by supervisory support on the indirect effect via self-efficacy was found significant. On the other hand, moderation by supervisory support on the indirect effect via negative affect was not significant because the indirect effects at both high and low levels of supervisory support were not significant (b = -.00, or non-significant, for high supervisory support and b = .00, or non-significant, for low supervisory support). Therefore, Hypothesis 4 was partially supported for the case of self-efficacy perception.

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In sum, the results support the following: 1) Failure experience impedes learning behavior by impairing cognitive self-efficacy. 2) Mediation is not significant in the case of negative affect. 3) Supervisory support moderates the effect of failure experience on learning behavior by reducing the negative influence of failure experience on self-efficacy perception.

Discussion

In the present research, we examined how negative results in performance appraisal hamper the learning behaviors of employees and what circumstances alleviate the negative effects. Extending the *threat rigidity* premise (Staw et al., 1981) and incorporating studies on learning and social support, we developed hypotheses on two distinct paths from failure to learning behaviors, and on the further moderation effects of supervisory supports in the process. Using 475 data of engineers and Structural Equation Modeling analyses as a statistical method, we found that rigidity occurs via cognitive self-efficacy, but not via negative affect. In addition,

results supported our hypotheses regarding the moderating effect of supervisory support in the relationship between failure experiences and reduction of self-efficacy perception, but not on the relationship between failure and negative affect.

The present research provides several contributions. First, it extended the *threat rigidity* view at the individual level by incorporating views on social learning and social support. Staw and colleagues persuasively presented threat rigidity as a general tendency to behave rigidly in threatening situations (Staw et al., 1981), but most of the studies have been performed at a team level (e.g., Gladstein and Reilly, 1985) or an organizational level (e.g., D'Aunno and Sutton, 1992; D'Aveni, 1989), while individual-level studies are very rare. Aligning the threat rigidity premise with an employee's performance evaluation results, the present research effectively explored the threat rigidity process at the individual level.

Second, the present research extended the original threat rigidity premise to an examination of the two distinct mechanisms of self-efficacy and negative affect processes. The attempt also contributed to the existing studies on failure and learning because most studies on the subjects have considered just one of the two facets but have not taken both into account simultaneously (e.g., Bandura and Locke, 2003; Mascolo and Fischer, 1995; McGregor and Elliot, 2005; Shepherd and Cardon, 2009). By comparing efficacy and affective paths, we offered the important insight that failure effects occur more significantly through the cognitive facet. When the two facets were considered together, the reactions to failure were more notable in the reduction in self-efficacy perception than in an arousal of negative affect. The result is quite persuasive because learning, *per se,* is connected to efficacy processes rather than affective states (Edmondson, 1999).

In addition, the present research provided results that the negative effect of failure on self-efficacy became insignificant when failed employees perceived supervisory support. The results seem to contribute to expanding the realm of social support studies by incorporating failure and learning because social support has mainly been examined in the context of task performance or employee retention (e.g., Shanock and Eisenberger, 2006; Van Yperen and Hagedoorn, 2003). Moreover, while the existing studies on failure and learning at the individual level have been mostly undertaken in classroom or lab settings (e.g., Caraway et al., 2003; Mascolo and Fischer, 1995; Testa and Major, 1990; Whitley Jr, 1986), we analyzed the issue by looking at professional engineers, and thus added generalizability to the results. The findings further support the importance of developing a "no-blame approach" in managing errors at the workplace. Using a qualitative method, Provera and colleagues (2010) insisted that unlike traditional organizations where those who made errors are not willing to discuss them with colleagues or supervisors, a no-blame approach allows constructive feedback in response to errors, thus making the organization flexible and variable. Using a quantitative frame, the present research further strengthened these assertions.

Finally, it should be noted that we examined the effects of failure by measuring objective measures of individual failure. The company of the present research setting developed a performance appraisal system evaluating an individual's performance as a success or failure, which provided a unique setting for examining the failure issue at the individual level. The measurement should add value to the existing studies on individuals' failures that have measured failure with perceptual information and interpretation (e.g., Carmeli and Gittell, 2009; Cannon and Edmondson, 2001). Moreover, it should be noted that the causality from failure experience

to self-efficacy and negative affect is persuasively demonstrated by the use of a multisource research design.

In a practical sense, the results on the moderating effect of supervisory support highlight the importance of supervisors in managing employees who have undergone failure. In the workplace, employees are assessed under tight performance evaluation systems in which those who have failed often find themselves devalued and unrewarded. However, it has also been argued that the utilization of failure along with the provision of supervisory support can be regarded as a rewarding task for leaders (Cannon and Edmondson, 2005). The present research has strengthened the assertion that supervisors need to encourage members not to lose confidence after an experience of failure and to support them in trying new projects by providing help and useful information. These supportive behaviors may not prevent failed employees from experiencing negative affect, but they can effectively allay a sense of reduced efficacy. Because negative affect does not appear to influence learning behavior when considered with self-efficacy, supervisors should focus on offering support to employees to restore a perception of self-efficacy.

Limitations and Suggestions for Future Research

Despite theoretical, practical, and methodological contributions, the present research has several limitations. First, the study did not consider the specific characteristics of failure that employees might experience. Failures vary in nature; some are major, while others are minor (Cannon and Edmondson, 2001). Moreover, certain failures may be more closely associated with learning behavior than others. The present study did not differentiate between types of failure, and future studies should consider the diverse types of failure, including the reasons for failure and the size of a given failure (Sitkin, 1992; Cannon and Edmondson, 2005; Madsen and Desai, 2010). For instance, the magnitude of a failure had an influence on employees' ability to learn,

and larger failures may be more conducive to learning than minor failures (Madsen and Desai, 2010). Debates exist on the issue: Cannon and Edmondson (2005) have insisted that employees' learning behavior may not be enhanced or visibly stimulated in the case of perceived small-scale failures, while other researchers have suggested that small failures could be more valuable for learning because people accept such failures with less affective pain (Sitkin, 1992; Staw and Ross, 1987). Therefore, more research is needed to solve this interesting discrepancy.

In addition, the present study included only direct experiences of failure. Researchers have argued that vicarious learning from others' failures can be a good source of knowledge acquisition for individuals, and there can be advantages to learning from others' failures (Argote et al., 1990; Levinthal and March, 1993; Levitt and March, 1988). Applying this logic, observers of peers' failures could also experience efficacy and affective consequences in addition to or separate from their own failure experiences. Therefore, consideration of vicarious failure perceptions deserves future research attention.

Drawing upon *threat rigidity*, the present research focused only on the negative effects of failure on learning behavior. However, it should be noted that many studies have reported that failure has unique benefits for performance, and also that failure experiences can be viewed as assets for employees as well as for organizations (Baum and Ingram, 1998; Cannon and Edmondson, 2005; Madsen and Desai, 2010; Sitkin, 1992). Failure may enhance a "nonlocal search" and encourages new approaches (Madsen and Desai, 2010), and acting as a wake-up call, may elicit significant attention from managers (Baum and Dahlin, 2007; Cannon and Edmondson, 2001; Chuang and Baum, 2003; Kim and Miner, 2007). Accordingly, more studies are needed to incorporate the two opposite outcomes and also to determine the situational factors differentiating the outcomes. Moreover, in considering the positive outcomes of failures, we can

assume an adequate or optimal level of failure experience. For instance, Yamakawa, Peng, and Deeds (2010) argued that the relationship between prior business failures and an entrepreneur's next growth venture could be represented by an inverted-U shape, where the number of prior business failures would be positively related to the next successful venture until reaching a threshold point. An **e**xamination of inverted U-shaped effects of failure on learning behavior presents a compelling research objective. In examining the premise, future research should include diverse situational variables because organization scholars on *threat rigidity* also contend that the phenomena vary along with changes in environments (Staw et al., 1981).

In addition, there have been debates regarding the effects of self-efficacy on performance. Despite the strong assertion that self-efficacy is a dominant determinant of performance (e.g., Bandura, 1986; Bandura and Locke, 2003), recent studies have also commented on its negative impact on performance within an individual frame (e.g., Vancouver, 2005; Vancouver and Kendall, 2006). The negative effects occur because, when a goal level is held constant, high levels of self-efficacy may create overconfidence regarding the discrepancies between current and desired states, which in turn, lead to reduced effort and decreasing levels of performance. This logic can also be applied to learning behaviors; overly high self-efficacy may prevent employees' learning behaviors. We, in the present research, assume a positive relationship between self-efficacy and learning behaviors relying upon the former view, but the second view surely needs further research.

Finally, limitations regarding the sample and measurement should be noted. We utilized a sample of engineers from a company, which limits the generalizability of the results. Moreover, when we compared the demographic factors between respondents and non-respondents, no significant difference was found for tenure, but significant differences were detected for gender

and years of education. Thus, the results are bound by the sample characteristics being largely composed of male and those with relatively long years of education. The difference in gender can be explained by Korean work environments where female employees tend to occupy peripheral roles, and thus have less interest in participating in the research. A similar interpretation is possible for the case of less educated employees (i.e., more peripheral work with less educated engineers). Therefore, future research needs to consider diverse occupations, gender, and length of education to generalize the research findings. Regarding measurements, we used an overall measure for the negative affects in the analyses, which did not seem to cause a problem in our research because the five negative affects were classified as one factor with an Eigenvalue of 3.68. However, there is a possibility that any single affect can trigger a dominant impact on learning behaviors. Thus, we examined models for each individual affect, and no mediation processes were found which is consistent with the case of using five affects overall. One interesting result, though, was that only "jittery" was significantly influenced by failure experience, but "jittery" did not show a significant effect on learning behavior. Therefore, future research will benefit from comparing results using overall and individual affect measurements. Finally, it should be noted that, in measuring the failure of employees, we used failure records for the previous 30 months. The decision was made in a consideration of the company's having started the unique appraisal system in 2010. For the present research, we believed that the performance appraisal information for 30 months would be appropriate for exploring the research agenda, but the cut is bound purely by the sample and cannot be theoretically supported. Even though consistent results were found from the analyses with the cases of failures for 12 months and 24 months respectively, the measurement should be noted as a limitation.

Initiated by Staw and colleagues (1981), the threat rigidity thesis has been widely examined at the team level (Harrington et al., 2002) and the organizational level (e.g., D'Aunno and Sutton, 1992; D'Aveni, 1989), but individual-level studies have been notably rare. Using a multisource frame, we explored the threat rigidity processes occurring after failure experiences in a real workplace setting. We found that past experiences of failure reduce learning behavior, which was mediated by self-efficacy perceptions. However, the effect of negative affect on learning behavior was not significant when considered with self-efficacy perception. Furthermore, this study showed the importance of supervisory support in managing employees who have failed. In uncertain, competitive workplaces and markets, individuals and companies are never immune from failure. Instead of trying to avoid failure, understanding how to effectively manage its consequences seems more advisable. That is, as uncertainty and competition in the global market increase, so too does the importance of appropriately managing the effects of failure on employees' behaviors.

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Table 1. Descriptive statistics and Pearson correlation analysis

Variables	M	SD	1	2	3	4	5	6	7	8	9	10
1.Failure Experience	.14			.16								
2.Self-efficacy	3.70		.65	-.13**								
3.Negative Affect	2.49	.93	.09	(.82)	-.27**	(.91)						
4.Learning Behavior	3.72	.56	-.13**	.64**	-.18**	(.82)						
5.Supervisory Support	3.68	.67	-.05	.48**	-.32**	.48**	(.89)					
6.Gender [a]	.08	.27	-.01	-.17**	.04	-.12**	-.09*					
7.Tenure	12.34	7.80	.07	.13**	.08	.15**	.03	-.13**				
8.Education Years	15.24	2.61	.19**	.07	.02	.08	-.03	-.16**	-.35**			
9.Position1[a)]	.39	.49	.05	.01	.03	.07	-.08	-.14**	.07		.15**	
10.Position2[a)]	.25	.43	.01	.21**	.02	.18**	.12**	-.15**	.37**	.22**	-.47**	
11.Number of Projects[b)]	1.96	.88	.06	.05	-.06	.06	.05	-.11*	.19**	.02	.01	.11*

* P < .05 ** P < .01

n=475

Internal consistency reliabilities are in parentheses

a) Dummy variables

b) Log transformation

Table 2. Measurement model comparisons [a)]

Path	X^2	Df	CFI	TLI	RMSEA	SRMR	ΔX^2(df)[b)]
Model 1: Four factors (hypothesized model)	403.16	129	.95	.94	.07	.04	-
Model 2: Three factors(LB & SE Combined)	662.63	132	.89	.88	.09	.05	259.47(3)
Model 3: Three factors(LB & SS Combined)	967.32	132	.83	.81	.12	.08	564.16(3)
Model 4: Three factors(NA & SE Combined)	1391.92	132	.75	.71	.14	.16	988.76(3)
Model 5: Three factors(SE & SS Combined)	1059.97	132	.82	.79	.12	.08	656.81(3)
Model 6: Two factors(LB, SE, & SS Combined)	1301.85	134	.77	.73	.14	.08	898.69(5)

* P < .05, ** P < .01.

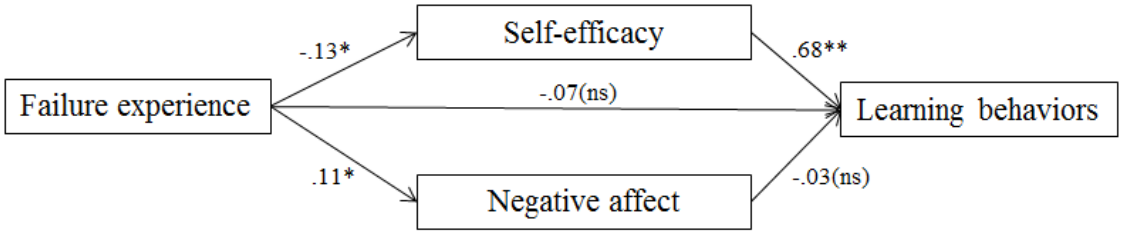
a) LB = Learning Behaviors; NA = Negative Affect; SE = Self-efficacy; SS = Supervisory Support.

b) ΔX^2 tests relative model 1. All X^2 and ΔX^2 values are $p < .001$.

Table 3. Direct, indirect, and conditional indirect effects of failure experiences on learning behaviors

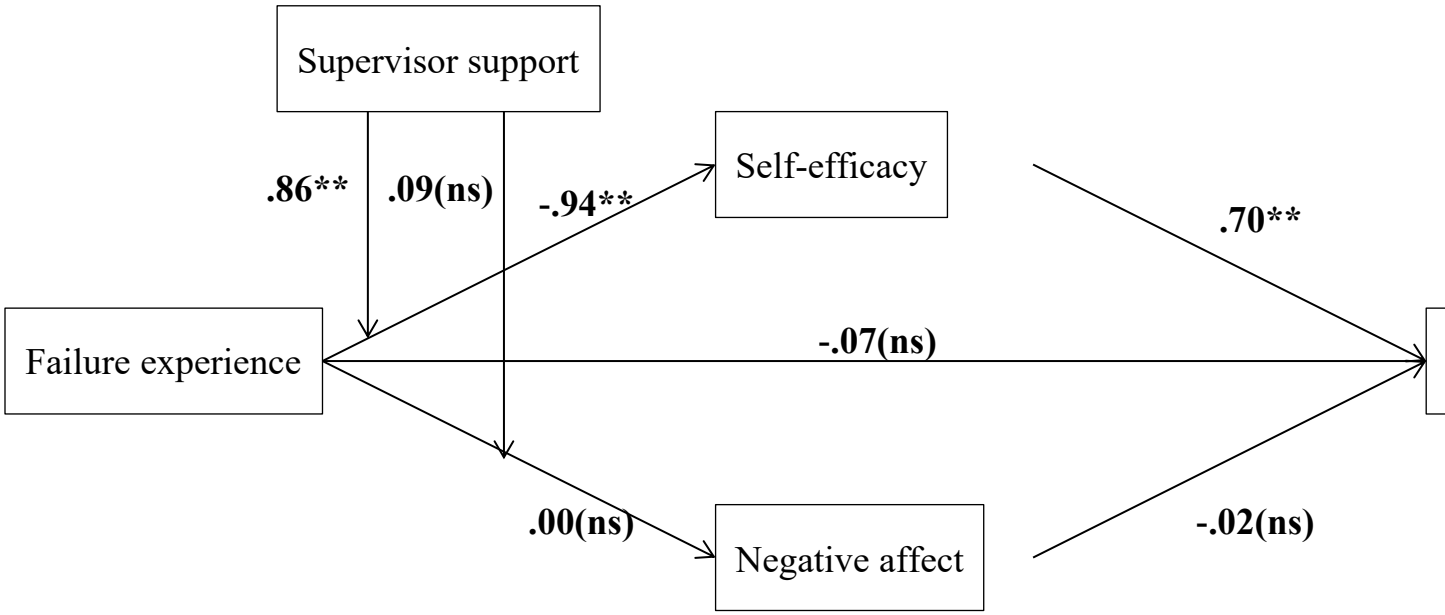
Supervisory Support	Failure → Self-efficacy	Failure → Negative Affect	Self-efficacy → Learning Behavior	Negative Affect → Learning Behavior	Indirect Effect Via Self-efficacy	Indirect Effect Via Negative Affect	Direct Effect	Total Effect[a)]
High	-.03	.16*	.72**	-.03	**-.02**	-.00	-.09	-.11
Low	-.22**	.01	.48**	.03	**-.11****	.00	-.10	-.21

* P < .05, ** P < .01.
a) Total effect = Indirect Effect Via Self-efficacy + Indirect Effect Via Negative Affect + Direct Effect



*p<.05 ** p<.01 ns: non-significant
Control variables were included in the model but omitted in this figure because of complexity of the model.

Figure 1. Mediation paths of failure to learning behaviors



* p < .05, ** p < .01, ns: non-significant
Control variables were included in the model but omitted in the figure because of complexity of the model.

Figure 2. Moderated mediation analysis

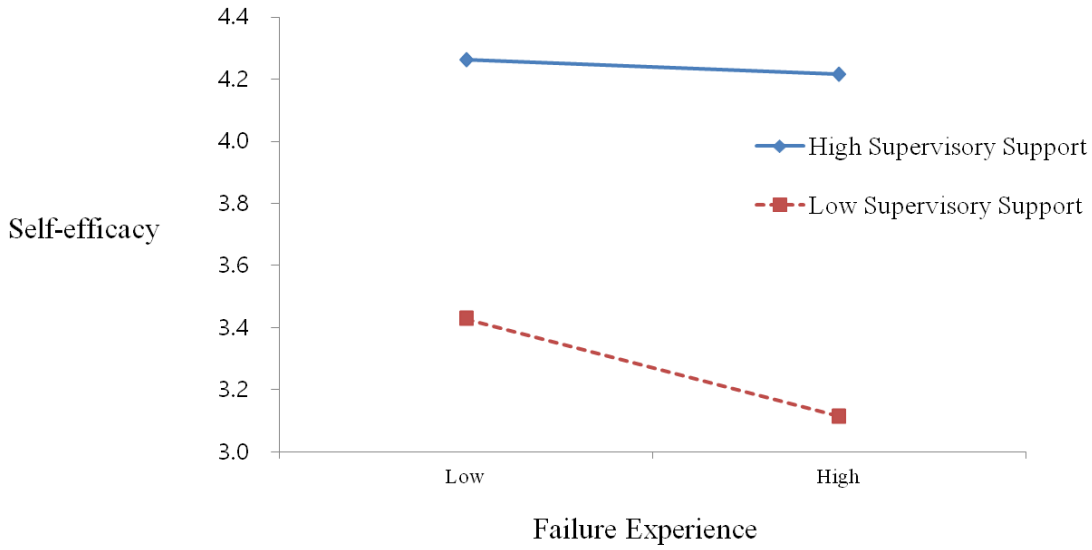


Figure 3. Moderating effect of supervisory support on the relationship between failure experience and self-efficacy

Endnotes

[1]Debates exist regarding whether affect conveys traits and disposition (e.g., Cropanzano et al., 1993; Staw and Barsade 1993) or states (Brockner and Higgins, 2001; Seo and Ilies, 2009). In the present research, we take the second view because it is more equivalent to not only Staw and colleagues' (1981) assertions but also to the malleable nature of the self-efficacy construct.

[2]Due to cross-sectional data, there is a possibility of a reversal effect of learning behavior on self-efficacy. Thus, we compared results of the two directions between self-efficacy and learning behaviors. The **c**hi-square values, TLI, and CFI supported a slightly better fit of self-efficacy effect on learning behavior than the other (X^2(df = 81) = 223.437, TLI = .916, CFI = .931 for 'self-efficacy → learning behaviors' vs. X^2(df = 81) = 232.187, TLI = .910, CFI = .927 for 'learning behaviors → self-efficacy').