

“My Bad!” How Internal Attribution and Ambiguity of Responsibility Affect Learning from Failure

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**“MY BAD!” HOW INTERNAL ATTRIBUTION AND AMBIGUITY OF
RESPONSIBILITY AFFECT LEARNING FROM FAILURE**

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ABSTRACT

Learning in organizations is a key determinant of individual and organizational success, and one valuable source of this learning is prior failure. Previous research finds that although individuals *can* learn from failed experiences, they do not always do so. To explain why this is true, we explore how individuals process failed experiences as a potential source of learning. Drawing on attribution theory, we conceptualize the differential impact that internal (self-focused) and external (factors outside of one's control) attributions after failure may have on individuals' learning and identify a key factor that shapes whether individuals attribute failure internally or externally, namely perceived *ambiguity of responsibility*. We hypothesize that when perceived ambiguity of responsibility is low rather than high, individuals will be more likely to attribute their failure internally and in turn devote more effort to learning and improving. We test our hypotheses using data collected in field and laboratory settings. This multi-method approach supports our theoretical model and permits us to gain further insight into how learning from failure occurs for individuals in work organizations.

Keywords: Learning, Failure, Internal Attribution, Ambiguity, Responsibility

A man can fail many times, but he is not a failure until he begins to blame somebody else.

– *John Burroughs*

Learning from our failures – transferring the lessons of a failed experience to a future experience (Argote & Todorova, 2007) – is a fundamental component of individuals' lives, particularly at work. Failure is a bedrock of workplace learning processes (Lapré & Nembhard, 2011), as the dynamism of the work environment generates a host of failed experiences to which individuals must respond and adapt, such as the failure of a new product initiative or the failure of an existing strategy to meet changing organizational and environmental demands. Managerial attention to these failures has increased dramatically in recent years, evident in the proliferation of tools and resources designed to help people to learn from failure (e.g., books like *Failing Forward* [Maxwell, 2007] and online communities like www.admittingfailure.com).

Given its importance, exploring the learning benefits of failure has been a central research question in both management and psychology for years. Studies of organizational learning have demonstrated the adaptive benefits of learning from failure (e.g., Audia & Greve, 2006, Kim & Miner, 2007, Madsen & Desai, 2010), complementing classic psychological perspectives regarding the stronger effects of failure (and other negative events) on individual memory and personal efforts toward change and growth (e.g., Kolb, 1984, Baumeister et al., 2001). As Sitkin (1992: 238) notes, failure helps “fuel a Lewinian ‘unfreezing’ process, in which old ways of perceiving, thinking, or acting are shaken and new ways can be accommodated.”

This logic suggests that those most able to learn from failed experiences will be those most likely to succeed in the future, as they take responsibility for an undesirable outcome, attempt to identify what went wrong, and test new approaches or alternative strategies for future performance (Louis & Sutton, 1991). Yet empirical evidence for the effect of failure on

individual learning has been decidedly mixed. Some studies have demonstrated significant benefits of failure, finding that individuals engage in greater information seeking, reflection, and improvement efforts following a failure or unexpected outcome (Hastie, 1984, Maheswaran & Chaiken, 1991, Zakay, Ellis, & Shevsky, 2004, Ellis & Davidi, 2005). But others have found individuals unwilling or unable to learn from these failed experiences due to significant psychological and social barriers to accepting and investigating the lessons of a failure (Staw, Sandelands, & Dutton, 1981, Cannon & Edmondson, 2005, Jordan & Audia, 2012), demonstrating that greater learning and performance improvement often follow prior successes rather than failures (e.g., Baum & Dahlin, 2007, KC, Staats, & Gino, 2013).

These contradictory results suggest that research to date may have overlooked a key factor underlying the process of learning from failure. Learning from failure is a complex, multifaceted process that involves not only the objective failure or success of an individual's effort (the predominant focus of the studies listed above) but also his or her own interpretation of that effort (Staw, 1980). In the face of an objective failure, individuals may create different subjective interpretations of the experience – for instance, revising their assessment of their performance (i.e., redefining the standard for success; Levitt & March, 1988, Greve, 1998, Jordan & Audia, 2012) in order to recast the objective failure as a subjective success and protect their self-image. However, even if individuals do accept the objective assessment of performance (i.e., they believe they failed), they may still engage in this subjective reasoning by developing different *attributions* of the performance, internalizing the failure (seeing it as internally caused) or distancing themselves from it (seeing it as externally caused; Bettman & Weitz, 1983, Ross & Nisbett, 1991, Gilbert & Malone, 1995). In other words, underlying every failure is an individual's own attribution of responsibility – namely, taking personal ownership for the

outcome or blaming it on external circumstances. We argue that this distinction in attribution can help reconcile the conflicting findings observed in prior research. By focusing on the (objective or subjective) determination of failure, prior work inadvertently masks critical variation in individuals' attributions of that failure, resulting in a lack of conceptual clarity regarding how failure impacts learning. Indeed, previous research has largely assumed, either implicitly or explicitly, that failure generally leads individuals to protect their image and distance themselves from negative performance outcomes by externally attributing their performance (for a discussion, see Jordan & Audia, 2012, KC, Staats, & Gino, 2013).

Departing from this body of work, in this paper we propose that either internal or external attributions can occur after failure (Silvia & Duval, 2001, Ellis, Mendel, & Nir, 2006) and empirically demonstrate the differential impact of these attributions on individuals' learning from failure. Following psychological research on attribution theory (Ross & Nisbett, 1991, Gilbert & Malone, 1995) that finds internal attribution a necessary condition for motivating learning and behavior change, we suggest that a failure will lead to learning and future performance gains only when an individual internally attributes the failure. At the same time, we identify a key situational perception, which we term *ambiguity of responsibility*, influencing whether individuals internally attribute a failed experience and thus expend greater effort toward improving in the future. Specifically, we hypothesize that when their responsibility is more ambiguous, individuals will be less likely to internally attribute their failures, and we further expect this greater external attribution to undermine their efforts to learn and improve their performance (as depicted in our conceptual model; Figure 1).

Our research contributes to the literature on learning in organizations in several ways. First, we offer a more nuanced view of learning from failure that resolves prior conflicting

findings and provides an integrated conceptual model for understanding individual learning from failure, a relatively underdeveloped theoretical domain (KC, Staats, & Gino, 2013). This model also more clearly articulates the role attribution of a failure plays in the learning process, moving from a view of external attribution as a relatively inevitable consequence of failure in organizational settings (with decreased learning to follow) toward a view that recognizes these attributions as more independent moderators of the effects of failure on learning. Second, we challenge and extend recent theory on the situational determinants of individuals' reactions following failure by introducing the notion of ambiguity of responsibility as a proximal predictor of individuals' attributions, clarifying prior contrasting predictions of these situational factors (i.e., those related to accountability; Tetlock, 1985, Jordan & Audia, 2012). Finally, we contribute to studies of learning by bringing increased empirical attention to the role of effort as a mechanism for the effects of learning from failure. Though earlier work has emphasized greater motivation and effort as an explanatory pathway for the learning effects of failure (e.g., broader search strategies or information seeking; Weiner, 2001, Greve, 2003), these mechanisms are seldom explicitly examined, instead being implied by positive performance change. As noted by Heider (1958), performance improvement is driven by both ability and motivation. By conceptually implicating and testing the mediating role of effort in explaining the impact of internal attributions, we are able to more precisely demonstrate the importance of this motivational mechanism in the process of learning from failure.

 Insert Figure 1 About Here

THE PROCESS OF LEARNING FROM FAILURE

At both individual and organizational levels, learning has emerged in recent years as a critical determinant of success in an increasingly knowledge-based economy (Edmondson, 2002,

Argote & Miron-Spektor, 2011, Staats, 2012). Though this learning can be instigated by a number of experiences and efforts (e.g., increased organizational training; Colquitt, LePine, & Noe, 2000), learning from failed experiences has been of particular interest as organizations seek to adapt and avoid repeating prior failures (Ingram & Baum, 1997, Kim & Miner, 2007, Madsen & Desai, 2010). Relative to successful experiences, failures have been seen as more effective triggers of individuals' learning efforts, because they reveal a gap in ability that stimulates efforts to "tweak" existing practices, search for new capabilities, and develop innovative solutions (Sitkin, 1992, March & Simon, 1993, Baum & Dahlin, 2007, Hora & Klassen, 2013).

Following traditional theories of individual learning (e.g., Kolb, 1984), failure can be seen as a form of unexpected event (i.e., where actual outcomes differ from expected outcomes; Allwood, 1984) that creates a sense of discomfort that triggers individuals to make sense of it, test hypotheses, and stimulate growth (Louis & Sutton, 1991, Ellis, Mendel, & Nir, 2006). At the same time, by revealing that an existing strategy is unsuccessful, failures encourage broader search for new strategies (i.e., exploration), resulting in enhanced long-term innovation (March, 1991, Audia & Goncalo, 2007). Indeed, after a successful experience, it is more difficult to detect deviations from a plan (Ellis, Mendel, & Nir, 2006), as the successful outcome confirms the validity of a prior routine (Weick, 1984, Sitkin, 1992) and builds confidence (and complacency) regarding its utility for future performance (Weick, Sutcliffe, & Obstfeld, 1999).

A number of empirical studies have generally supported this superior benefit of learning from failure (e.g., Wong & Weiner, 1981, Hastie, 1984, Maheswaran & Chaiken, 1991). For instance, the work of Shmuel Ellis and colleagues (Zakay, Ellis, & Shevsky, 2004, Ellis & Davidi, 2005, Ellis, Mendel, & Nir, 2006) on reviewing and learning from successful and failed experience demonstrates that failures promotes greater improvement in both laboratory and

training settings. Of particular note, Ellis and Davidi (2005) found that soldiers' mental models of failed training experiences (measured through cognitive maps of the experience) were far richer than their mental models of successful ones, containing a greater number of constructs and more linkages among constructs. Related research by Zakay and colleagues (2004) found that organizational managers were significantly more likely to engage in learning efforts when exposed to a negative outcome as compared to a successful one.

Yet other streams of research have articulated a contrasting view, casting learning from one's own failure as less effective than learning from success in organizational contexts (KC, Staats, & Gino, 2013). This perspective builds on the notion that failure is viewed negatively and thus represents a threat to individual well-being (Rozin & Royzman, 2001). Though this negative affective component of failure can cause it to "stick" longer in an individual's memory (Baumeister et al., 2001), it can also serve to reduce the individual's desire and ability to seek out new knowledge (that might help overcome the failure) by constricting information processing and entrenching existing reactions (i.e., a "threat rigidity" response; Staw, Sandelands, & Dutton, 1981). Experiencing failure lets individuals know that their prior performance was inadequate, creating a sense of uncertainty about the flaws in their current knowledge and how they might succeed in the future (Weiner, 1985). Compounding these psychological limitations, the organizational context can also impede individuals' learning from failure, as technical barriers may prevent any particular individual from understanding completely what went wrong in a workplace failure, and social barriers discourage workers from admitting failure for fear of negative repercussions (Cannon & Edmondson, 2005).

This perspective thus suggests that individuals would be *less* likely to learn from their failed experiences at work than from successful experiences, a hypothesis supported by empirical

evidence (Baum & Dahlin, 2007, KC, Staats, & Gino, 2013). For example, in a study of cardiac surgeons performing minimally invasive coronary artery bypass grafting, KC and colleagues (2013) found that surgeons' prior successes, but not their failures, helped them learn and improve their performance, and further that others' prior failures contributed to this learning as well. In explaining these findings, the authors implicate the role of attribution biases, suggesting that individuals may have attributed their own failures to external causes (and others' failures to internal causes, consistent with the fundamental attribution error; Ross, 1977) in order to preserve positive self-impressions. Likewise, highlighting why individuals are unlikely to learn or improve from their failures, Jordan and Audia (2012) theorize that sub-par feedback activates self-enhancing modes of information processing, motivating individuals to make a failure seem more favorable than it actually was and subsequently preventing them from addressing their problems, leading to potential escalation of commitment and future performance decline.

On the surface, these existing perspectives seem irreconcilable: failure reveals gaps in knowledge, encouraging effortful learning (i.e., broader search and greater processing of new information), yet it also presents threatening uncertainty that constricts these search and information processing efforts. This set of conflicting studies thus highlights an important tension in perspectives on learning from failure, while at the same time pointing to a potential underlying explanation for these differing findings. As recently suggested in recent studies (Jordan & Audia, 2012, KC, Staats, & Gino, 2013), it is not the objective failure itself that impairs subsequent learning and performance but rather individuals' self-enhancing attributions of the failure. However, individuals may not always engage in this external, self-enhancing attribution following failure (Ellis, Mendel, & Nir, 2006), and differences in these attributions may resolve the tension and clarify the nature of individuals' learning from a failed experience.

Internal Attribution of Failure

Attribution is the process of assigning a causal account to a given experience by identifying the factors that contributed to it (Peterson et al., 1982, Martinko, Harvey, & Dasborough, 2011). These causal attributions can vary along several dimensions, including stability and specificity, but chief among these is attribution to causes related to the person (internal attribution) or to the situation or broader environment (external attribution; Ross & Nisbett, 1991). Attribution judgments have important implications for motivated behavior, as outcomes attributed to external, uncontrollable factors of the situation are less likely to motivate action than those attributed to more internal, controllable factors (Weiner, 1974, Bandura, 1977). Moreover, individuals are particularly likely to make attribution judgments after experiencing failure, as it represents a case where outcomes did not meet expectations, stimulating further investigation and causal reasoning (Louis & Sutton, 1991). “If one expects to succeed and does, ‘*why questions*’ are not likely to follow,” notes Weiner (2000: 2), “but unexpected failure at an important exam surely will evoke attributional processes” (cf. Ellis & Davidi, 2005: 857).

In response to these unexpected failures, individuals are thought to typically attribute the unsuccessful outcome externally (i.e., to uncontrollable situational factors) in order to maintain a positive self-image (Weiner, 1974, McGill, 1989, Ross & Nisbett, 1991, Jordan & Audia, 2012, KC, Staats, & Gino, 2013). But, as noted earlier, evidence from both practice and research (Ross, Bierbrauer, & Polly, 1974, Silvia & Duval, 2001) suggest that this tendency to externally attribute is far from universal and, moreover, that attributing outcomes (either successes or failures) to internal causes may be adaptive for future performance (Wong & Weiner, 1981, Ellis, Mendel, & Nir, 2006). Indeed, clearly and accurately assessing an experience outcome is essential for learning and adapting knowledge structures (Weick & Westley, 1996), suggesting

that self-enhancing, external attributions of a failure can hinder the learning process, relative to internal attributions, as this self-enhancement involves deceiving oneself about the nature and cause of an experience (Audia & Brion, 2007, Jordan & Audia, 2012).

Thus, individuals' differing attribution (internal vs. external) of a failed experience may lie at the core of the differing findings reported in prior research (e.g., Ellis & Davidi, 2005, KC, Staats, & Gino, 2013), with the positive learning benefits of failure emerging only when individuals internally attribute this failed outcome. Interestingly, in their study of soldiers' effective learning from failure, Ellis and Davidi (2005: 860) describe their sample as follows:

It should be emphasized that the participants were soldiers in an elite military unit who were aware of the high importance of navigation training and knew that failure in the final navigation exam might lead to their dismissal from the unit...Because such individuals are less inclined to accountability biases and *do not tend to attribute their failures to situational or ad hoc causes* (weather or ground conditions as opposed to knowledge or planning), we expected that they would try to acquire information that could make a valuable and complementary contribution to their current knowledge. [emphasis added]

Although it is impossible to retroactively assess the attribution style of participants in these previous empirical studies, this description nonetheless aligns with our conceptualization of the effects of failure and attribution.

Ambiguity of Responsibility

In light of these potential moderating effects of attribution, knowing *when* individuals internally attribute their failures is important for understanding the process of learning from failure. While some people (e.g., the soldiers in Ellis & Davidi, 2005) may be generally more inclined towards internal attribution, recent theorizing (Jordan & Audia, 2012) has suggested that characteristics of the task, such as its complexity or degree of accountability, may influence individuals' tendency to engage in self-enhancing processing of an experience (e.g., external attribution of failure). Extending this perspective, we argue that task characteristics such as these

help create an intervening perceptual state that we term *ambiguity of responsibility* – the degree to which the task context provides clear information about an individual’s responsibility for performance – that subsequently influences individuals’ attributions following failure. For instance, more complex jobs have been thought to increase self-enhancing attributions after low performance (Jordan & Audia, 2012), as these jobs often involve a greater variety of subtasks, coordination of several parties, multiple (and often conflicting) information sources, and unclear standards for success (Campbell, 1988, Audia & Brion, 2007). Consistent with the findings of KC and colleagues’ (2013) study of cardiac surgery (a complex task domain), complexity results in significant ambiguity about an individual’s responsibility for a given outcome and thus increases the likelihood that he or she would attribute a failure to external causes rather than to internal effort or ability.

In their theorizing, Jordan and Audia (2012) also identify accountability as a key contextual factor, suggesting that when individuals are held accountable for the outcomes of their performance (particularly to individuals who have power over their future), they will be more likely to engage in self-enhancing responses following low performance. In line with this explanation, Morris and Moore (2000) find that accountability to superiors restricted pilots’ counterfactual thinking and reduced their learning following a near-accident, implying that accountability may increase external attributions (and decrease learning) following failure. However, other research on accountability suggests that it can actually reduce self-enhancement tendencies (e.g., Sedikides et al., 2002). Indeed, work by Tetlock (1985) specifically notes the benefits of accountability for reducing the “fundamental attribution error” and helping individuals pay more attention to their own cognitive processes and actions when reviewing an experience, consistent with a more internal form of attribution. Given these conflicting

predictions, our more specific focus on ambiguity of responsibility as an intervening perception influencing attribution may help clarify the impact of this more distal situational factor (accountability) on learning from failure. As noted by Lerner and Tetlock (1999) the accountability literature is quite diverse and often examines different forms of accountability (i.e., pre-decision vs. after decision, accountability for processes vs. outcomes, etc.) leading to these conflicting expectations for the effects of accountability. Specifically, though accountability may sometimes “raise the stakes” and increase the desire to protect self-image (e.g., when it comes after a decision is already made; Jordan & Audia, 2012), at other times it can also reduce ambiguity about an individual’s responsibility for performance, promoting internal attribution and learning from failure. In this sense, accountability and ambiguity of responsibility are related, but distinct, concepts (i.e., a person may not be held accountable for an outcome, but may still experience low ambiguity about their responsibility for the outcome), and to the extent that prior studies observed accountability driving more internal attribution, it was likely due to the informational clarity and attentional focus associated with decreased ambiguity. Focusing our attention on this more proximal perception (ambiguity of responsibility) thus helps make sense of the diverse findings related to accountability and better understand the role individuals’ perception of the situation play in their attribution processes.

Turning to the consequences of ambiguity, greater ambiguity about an individual’s responsibility for performance can generate stress reactions that cause the individual to view an experience as threatening, rather than as a challenging opportunity for learning. Indeed, in their classic work on challenge and threat appraisal, Lazarus and Folkman (1984: 106) note that “ambiguity can intensify threat by limiting the individual’s sense of control and/or increasing a sense of helplessness,” citing examples of ambiguity increasing individuals’ anxiety (a

threatened response; Lazarus & Averill, 1972). This increased perception of threat in turn triggers more rigid responses that constrict information processing and reduce learning and performance (Wine, 1971, Staw, Sandelands, & Dutton, 1981). Conversely, task contexts with less ambiguity should help an individual see a failure as a challenge that can be learned from and overcome, and engage in greater information gathering (e.g., Sitkin, 1992). This broader processing of the experience can then help the individual better understand the experience, increasing the likelihood that he or she will recognize the failure as a gap in knowledge that cannot be attributed to external or situational factors (Moore et al., 2010). In other words, in the absence of this ambiguity, individuals are less likely to engage in self-enhancing behaviors (Farh & Dobbins, 1989, Audia & Brion, 2007), instead attributing the failure more internally, promoting greater learning from the failed experience.

The Mediating Role of Effort

Consistent with our attribution theory arguments, we expect that the learning effects of internal attribution (generated, at least in part, by reduced ambiguity of responsibility) operate through a motivational mechanism (Ross, 1977, Weiner, 2001). Internal and external attributions can alter how individuals engage in reflection following an experience (as part of the action-reflection cycle of learning; Argyris & Schön, 1978), and they may differentially motivate subsequent effort for learning and improvement (Weiner, 2001). Internal attributions in particular serve as motivators of this learning effort, as they focus attention on the individual's ability and effort as causes of performance (vs. external attributions' focus on situational constraints or luck). Given that people tend to believe ability is largely innate (Weiner, 1979), internal attributions yield a primary emphasis on effort as a pathway for improvement, driving more adaptive responses to a failed experience (Dweck, 1975). In other words, individuals who

internalize their failures do not benefit primarily from gains in cognitive intelligence (i.e., ability), but rather from their increased efforts to reflect on their mistakes and avoid them in future tasks. Therefore, if motivated effort is central to drawing knowledge from a failed experience, and if attributing the failure to internal causes (i.e., those within one's control) is at the root of this increased effort, then effort should act as an explanatory mechanism for the effects of attribution on learning from failure. Integrating this mediating role of effort with our earlier arguments on learning from failure (vs. success), internal attribution, and ambiguity of responsibility, we thus hypothesize:

Hypothesis 1: In an environment of low ambiguity of responsibility, the prior failures of an individual have a greater effect on the individual's current performance than do the individual's prior successes.

Hypothesis 2: The learning effects of failure are driven by internal attribution of the failed experience. Specifically, internal attribution moderates the effect of failure on learning, such that the effect of failure on learning is more positive when the failure is attributed more internally.

Hypothesis 3: Ambiguity of responsibility decreases internal attribution and learning from failure.

Hypothesis 4: Effort mediates the effect of internal attribution on learning from failure.

Overview of Studies

We test our hypotheses in three distinct empirical contexts. Given that many prior explorations of individual learning from failure have been in a classroom or training context (for an exception, see KC, Staats, & Gino, 2013), we first use data from a non-profit, micro-work-focused data-services organization to explore our basic assertion that prior failures may be more

beneficial than prior successes for learning when ambiguity of responsibility is low. We then examine the impact of attribution on learning from failure in greater depth through a longitudinal study of individuals engaged in high-risk decision-making tasks over a two-week period. Finally, we examine our complete conceptual model, including ambiguity of responsibility and the mediating role of effort, in an experimental study of working adults engaged in an online blood-cell imaging task.

STUDY 1: FIELD STUDY IN MICRO-WORK DATA SERVICES

Study 1 examined learning from failure in the context of Samasource, a nonprofit data services firm that uses micro-work for economic empowerment of the poor. The company distributes data analytic tasks to disadvantaged employees around the world (e.g., women in India, slum dwellers in Kenya) and is employed by many of the world's largest companies for data and content processing. Samasource employees engage in a variety of different data-processing tasks, but common to all of these tasks are a high degree of clear responsibility (i.e., each employee "owns" the task and is solely responsible for its outcome) and a relatively straightforward assessment of the success or failure of a particular effort. For instance, employees may be asked to verify phone numbers on the Internet for an online directory of businesses. In this context, success and failure are easy to determine (i.e., the phone number is correct or not), and employees face relatively little ambiguity as to their responsibility for a particular outcome. Correspondingly, we would expect employees at Samasource to be more likely to internally rather than externally attribute their failures and thus to engage in greater improvement efforts. As such, Samasource provides a context that fits the elements of our conceptual model, and we would expect Samasource employees to learn more from their prior failures than from their prior successes.

Participants and Measures

The data consists of 233 workers performing data-entry tasks over approximately eight months from June 2012 to March 2013. Samasource secures contracts for digital work from corporations, and then uses its proprietary technology platform to share the work with partner delivery centers throughout the world. We capture eight delivery centers in our dataset. The majority of the centers are located in east Africa (e.g., Kenya, Uganda). Workers in these centers use computers to complete the work on Samasource's platform, a process that allows us to learn which tasks workers completed and when. Using this data, which is all at the level of the worker day, we construct the measures described below.

Our dependent variable is *percent failure*, or the number of tasks that an individual completed incorrectly on the given day divided by the total number of tasks completed ($M_{\text{Percent Failure}} = 21.59\%$, $SD = .24$). We then construct three different independent variables. The first, *prior cumulative volume*, is a count of the total number of transactions completed before the focal day by an individual during the time range of our data ($M_{\text{Cumulative Volume}} = 261.57$, $SD = 320.77$). We then break this cumulative experience variable down into two constituent variables, *prior cumulative successes* ($M_{\text{Prior Successes}} = 213.81$, $SD = 286.76$) and *prior cumulative failures* ($M_{\text{Prior Failures}} = 47.76$, $SD = 47.67$), which capture the total transactions completed successfully or unsuccessfully, respectively, before the focal day by an individual.

We add a number of indicator variables to serve as controls. First, we include an indicator for each individual. These variables control for time-invariant differences between workers. Given that we include individual indicators, we cannot include delivery center controls (as individuals work in only one delivery center); thus, the individual indicator controls for the worker and his/her surroundings. We also include indicators for the project being completed, as

different projects may have varying degrees of complexity and difficulty. Finally, we include an indicator for the month that the task was completed in order to control for any seasonal effects.

Results

To test Hypothesis 1, that learning from prior failed experience has a greater effect on current performance than does prior successful experience in an environment of low ambiguity of experience, we use a linear regression model with all standard errors clustered at the level of the worker. As shown in Table 1 (Model 1), workers' performance improves with prior cumulative experience, as the negative coefficient indicates that percent failure decreases. Specifically, a one standard deviation increase in cumulative experience is related to a 3.2% absolute improvement in quality performance or a 14.7% improvement when compared to the mean quality performance. Moving to Model 2 and our test of Hypothesis 1, we see that both prior cumulative successes and prior cumulative failures are related to improved quality performance. However, the coefficient on prior cumulative failures is significantly larger than the coefficient on prior cumulative successes ($p = .02$). A one standard deviation increase in success or failure experience is related to a 1.5% or 2.4% absolute increase in quality or a 6.9% or 11.2% improvement when compared to the mean quality performance, respectively.

 Insert Table 1 About Here

Discussion

Given that Samasource provided a work context with low ambiguity of responsibility, thus increasing the likelihood that individuals would internally attribute their failures, these results provide initial support for Hypothesis 1. Moreover, by empirically demonstrating that people learn from failures in an ongoing, day-to-day work setting, the results of this study extend much of the prior literature on learning from failure, which has typically examined these effects

in “one-off” educational or training contexts (often noting the difficulty of studying failure in an organizational setting; Ellis, Mendel, & Nir, 2006). Having gained real-world evidence that individuals can in fact learn from failure in an organizational setting where ambiguity of responsibility is low, we move to more controlled task settings to test our remaining hypotheses.

STUDY 2: ATTRIBUTING FAILURES IN DECISION-MAKING TASKS

Study 2 aimed to more directly test the role of attribution in individual learning after failure, using a longitudinal study of individual decision-making in risky tasks. Participants completed two different decision-making activities, the second coming one week after the first, to test the effects of failure on the first activity on individuals’ learning and subsequent performance on the second activity.

Participants

We recruited participants from a professional online research subject pool that consisted of college-educated, working adults. We used a professional subject pool so that we could re-contact the survey participants for the second activity one week later. We received a total of 534 useable responses for the first decision-making activity (Time 1). After a one-week lag, Time 1 respondents were sent a second invitation to participate in a follow-up activity. We received a total of 85 usable Time 2 responses for an effective response rate of 16%.¹ The final sample consisted of 78% women, with a mean age of 33.53 years. No significant differences in demographics (i.e., age and gender) or in our variables of interest (i.e., failure or internal attribution) were observed between Time 2 respondents and non-respondents.

¹ High attrition rates have been noted in studies using online panels, given high churn within panels and variable uptake availability for individual panel members (see Tourangeau, Conrad, & Couper, 2013). In light of this attrition, two waves of participants completed the study, in order to generate a sufficient final sample size. All analyses include a control for each batch to account for any unobserved heterogeneity between waves (e.g., due to seasonality in responses across days of the week; Ipeirotis, 2010). This indicator was non-significant in all models.

Procedures

Individuals were invited to participate in the study through an electronic posting to a professional survey pool of which they were members. Agreeing to participate led these individuals to an online survey portal, which they used to complete the first activity. Participants were told that they would be completing two decision-making activities spaced one week apart.

In the first activity, participants were asked to complete a modified version of the *Carter Racing* task (Brittain & Sitkin, 1986), an analogue for the decision-making process NASA officials engaged in during the Space Shuttle Challenger disaster in January 1986. In this task, participants take the role of members of a racecar team and need to decide whether to go ahead with a race scheduled to begin in less than one hour. Unbeknown to participants, the actual data used in the case is data on O-ring failures and air temperature obtained from the *Report of the Presidential Commission on the Space Shuttle Challenger Accident*. Thus, as noted by Kray and Galinsky (2003), individuals who decided to race make a decision parallel to the decision to proceed with the doomed Space Shuttle Challenger launch.

We chose this task because of its high likelihood for failure (see Brittain & Sitkin, 1986), and because it gives participants latitude to make either internal (“I overlooked key information”) or external (“The activity withheld information from me;” “If I had known it was a space shuttle, not a race car, of course I would have made a different decision”) attributions. Participants were asked to read through the given information and decide whether or not they should race their car in the upcoming race. The decision was to be based on information about how likely it was that the car’s engine would fail based on a gasket malfunction. While the participants had some information on the gasket issue (the number of races when a gasket had failed and the ambient temperature of each), they lacked one key piece of information: the

number of races where a gasket had *not* failed. Participants could receive this additional information by clicking a link while reviewing the facts of the case.²

After the participants made their decision to race or not race, they were debriefed on the activity and informed that if they had decided to race, they had made the same decision that NASA made in launching the Challenger, which resulted in the deaths of seven astronauts, and that if they had decided to not race, their choice represented a decision not to launch the Challenger. Participants were told that the activity highlighted the importance of seeking out all possible information relevant to the decision at hand and carefully evaluating the information they possessed. They were shown how, if they had accessed the additional information through the link, the obvious choice was to not race (since a gasket failure was 99.99% likely). After being debriefed, participants were asked about the key factor that contributed to their decision and about their attribution of this factor. Finally, participants were asked to assess their effort on the task and provided demographic information.

One week later, Time 1 participants were sent another email with a link for the second part of the study. After following the link, participants were presented with a modified version of the *Threat Target* hidden-profile activity (Thompson & Flammang, 2008). They were assigned to play the role of a security analyst, read three profiles of potential terrorist threats to American security, and make a decision about who was the most threatening. The task is engineered such that a cursory review of the individuals' own information leads them to identify one suspect as

² When this activity is conducted in-person, the facilitator usually retains this information, requiring participants to ask for it. We replicated this availability in an on-line setting by having the additional information available on a separate page, requiring individuals to click a link that they were told would provide them with, "additional information, if they needed it for their decision-making." In a pilot test of the activity, only 37% of participants actually clicked the link, suggesting that this design preserves the tendency of the activity to generate failure since individuals generally do not ask for this information.

more threatening, but when the information is reviewed more carefully and combined with other analysts' perspectives, a different (correct) suspect can be identified as most threatening. To increase the task's resemblance to the first task, we modified it such that participants could email other analysts (and provided them with email contact details) if they felt they needed additional information. If they emailed the other analysts, they were sent an automated reply that included the other analysts' notes, which allowed them to obtain the multiple perspectives necessary to correctly solve the activity. Participants had to choose who they believed to be the greatest threat, and explain their decision. We used correctly identifying the threatening individual as the primary determinant of performance improvement, reflecting participants' learning of the "lesson" of the first activity and its application to the second activity.

Measures

We measured *failure* on each task as a binary variable based on the established answer for each activity. We collected all other measures of interest through a questionnaire that participants completed after they completed the first activity. Specifically, this questionnaire assessed their attributions and task effort on the first task (so that we could determine the unique effect of failure above and beyond perceived effort).

We measured attribution style using the Attribution Style Questionnaire (ASQ; Peterson et al., 1982), asking participants to first identify what caused their performance on the task and then to assess this cause on three dimensions, as well as the overall importance of their performance. Each dimension was assessed through a single item on a six-point scale with anchors set by the extreme ends of each dimension. The ASQ measure thus provides scores on three dimensions of the possible explanations for any event: internality (internal vs. external), stability (stable vs. unstable), and pervasiveness (global vs. specific) in addition to its

importance. Given the nature of our hypotheses, in our analyses we used the measure of *internal attribution* to capture our variable of interest and included the other attribution judgments (stable, global and importance) as control variables.

Finally, we assessed *task effort* on the first activity using the five-item effort subscale of the intrinsic motivation inventory (see Ryan, Koestner, & Deci, 1991). The scale included items such as “I put a lot of effort into this task” and “I tried hard on this task” ($\alpha = .91$). We used task effort in our analyses as an additional control variable.

Results

Table 2 reports the means, standard deviations, and correlations for the measures we collected in Study 2. We predicted that failure on the first activity would be more likely to lead to learning (i.e., correctly responding on the second task) the more participants internally attributed their failure (Hypothesis 2). As expected, when asked how they would attribute their performance, we found variance in the extent to which participants made internal versus external attributions. As an example, in their responses, some participants indicated that failure on the activity could be attributed internally, stating for instance, “I attribute the outcome to me not taking it serious enough” or “I just did not take the time to read all the information and jumped to a conclusion based on what was initially presented to me, without reading everything.” Other participants attributed their failure externally, providing answers such as, “I attribute it to important information being withheld from the exercise” or

“I attribute my outcome to the fact that it was not based on all the facts... You can't expect a person to make a responsible decision on any problem when you leave out one of the major key factors in it... Plus, even if the task would have been based only on the race situation, your graphs didn't make any sense to me, so I couldn't base any of my decision on them.”

 Insert Table 2 About Here

To test our hypothesized failure x internal attribution interaction, we constructed a two-step binary logistic regression model, with performance on the second activity as our dependent measure. In step one, we entered our control variables (stable, global, and importance attributions, task effort and a dummy variable for data collection wave), and the main effects of failure and internal attribution. In step two, we entered the term created by the interaction of failure with individuals' degree of internal attribution.³ Consistent with our prediction, and as shown in Table 3, the coefficient for this interaction term was significant ($b = 1.758, p = .02$), and including this interaction significantly increased the model's ability to predict performance on the follow-up activity ($\Delta \chi^2 = 8.76, p = .003$).

 Insert Table 3 About Here

Figure 2 presents a plot of our logistic regression results, showing the probability of success on the second activity for individuals who engaged in more or less internal attribution and experienced either success or failure on the first activity. Simple slopes analysis (Aiken & West, 1991) of the interaction on the ln(odds) ratio for successful performance on the second activity revealed a significant positive slope for greater internal attribution following failure ($\beta = .42, p = .05$). Thus, Hypothesis 2 was supported, as the more individuals internally attributed their failure, the greater their ability to transfer the lessons of the first activity into successful performance on the second activity.

Although not hypothesized, results further revealed a marginally significant negative effect of greater internal attribution on the ln(odds) ratio following success ($\beta = -1.34, p < .10$).

³ As part of our robustness checks, we also tested models including the interaction of failure with other dimensions of attribution judgments (i.e., stable and global). None of these interaction terms reached significance in any of our models.

However, given the relatively small percentage of the sample who experienced success on the first activity (21%), we interpret these results cautiously.

Insert Figure 2 About Here

Discussion

Study 2 builds on the results we observed in day-to-day learning in organizations (Study 1) by providing a more controlled task context and examining individuals' improvement following their completion of the same learning activity. Further, by utilizing an activity that allowed individuals to attribute their decision to a range of different causes, Study 2 allowed us to more directly assess the effect of internal attributions on learning after failure. Finally, by introducing a one-week lag between the first and second activity, Study 2 demonstrated that the learning effects of failure (when internally attributed) can persist beyond the current task context and transfer to a similar task at a future time.

Despite these strengths, Study 2 was limited in its focus on a single hypothesis, as well as in its reliance on individuals' natural variance in success and failure (although this is mitigated somewhat by the fact that 79% of participants failed on the first activity, consistent with the design of the task; Brittain & Sitkin, 1986). Thus, in Study 3 we more critically examine the effects of failure and attribution, and test our predictions regarding ambiguity and effort, by using a repeated-task experimental paradigm, controlling for failure and manipulating the ambiguity of responsibility associated with a given task.

STUDY 3: AMBIGUITY, ATTRIBUTION, AND LEARNING IN A BLOOD-SMEAR LABELING TASK

Study 3 aimed to more directly test the antecedents (e.g., ambiguity of responsibility) and consequences (e.g., effort) of attribution in the learning process following a failed experience.

Specifically, we used a 1 (controlled performance feedback: failure) x 2 (manipulated ambiguity of responsibility: low and high) between-subjects experimental design, where participants received failure feedback after completing the first round of a task, and were exposed to either a low- or high-ambiguity of responsibility (AOR) manipulation. Participants then engaged in a second round of the task, where we assessed their effort and performance. Following our conceptual model, increased effort on a subsequent task acts as a mechanism for individuals' motivation to apply their learning from a prior experience (Weiner, 2001), with greater effort resulting from an individual's attempt to bring their prior learning to bear on the current task. Thus, we predicted that after experiencing failure, (manipulated) AOR would yield more internal attribution and enhanced effort on the second round of the task, and further that this increased effort would drive greater performance, mediating the effect of attribution on performance.

Participants

Participants were recruited through Amazon Mechanical Turk (see Buhrmester, Kwang, & Gosling, 2011 for a description), where they were provided with a brief description of the study task and elected to participate in exchange for a small amount of Amazon.com credit. To be eligible for the study, participants were required to be located in the United States and to pass a color-blindness test (necessary to effectively view the blood-smear images in the study). Excluding incomplete or otherwise ineligible responses⁴ yielded a final sample of 256 participants, consisting of 43.4% women with a mean age of 31.43 years ($SD_{Age} = 8.25$).

Procedure

⁴ In their text responses to later questions, three individuals indicated suspicion of the failure feedback given to all participants, explicitly stating that they thought the feedback was given falsely, and so were excluded from the study.

We told participants that they were participating in a trial of a new image-labeling tool that would allow non-medically trained individuals to aid medical professionals in the labeling of certain anomalies in samples of red blood cells (similar to the paradigm used by Chandler & Kapelner, 2013). The tool allowed participants to scan a red blood cell “smear” (a professionally prepared slide image of a blood sample) for a particular anomaly, Howell-Jolly bodies (HJBs), which serve as a marker of damaged spleen function and can indicate increased risk of infection and illness (Pearson, Spencer, & Cornelius, 1969). We used this task to provide a context that would be challenging and unfamiliar to participants, making it more likely that they would believe feedback indicating they had failed (described below).

After answering some demographic questions, including the red-green color blindness test mentioned earlier, we informed participants that people could be trained to recognize these HJBs and save medical professionals from having to spend time scanning the images themselves. As part of the fictitious “trial” for the tool, participants were given information on how to identify the HJBs and an opportunity to try the labeling tool (which logged the coordinates of an anomaly in the image after participants clicked on it). When they felt sufficiently prepared, participants could advance to the “real” trial of the labeling tool that would log their responses and compare them to the responses of other participants’ labeling of the image.

Participants were then presented with a blood smear that contained several HJBs (see Figure 3 for an example). After labeling the HJBs, participants submitted their responses and were directed to a page displaying their “results.” All participants received feedback that they performed poorly on the task (regardless of their actual performance, which was captured but not reported to participants) in terms of accuracy and efficiency. Specifically, participants were told that “compared to other participants who labeled the same image, you scored a 46 / 100. The

average score is 82 / 100” and then were given an additional piece of feedback that served as the AOR manipulation (described below). Participants were then allowed to review the correct labeling of the HJBs in the blood smear image (provided by two trained medical professionals) and were asked to think about their performance, how they would attribute it, and what they could do differently going into the next round.

Insert Figure 3 About Here

After responding to these questions, participants advanced to a second blood-smear labeling task – with the same parameters as the first task, but a different image – which they completed and submitted as before, although without any performance feedback. The program tracked the amount of time participants spent on this second task (reflecting task effort) as well as their actual performance (scoring their labeling against a correctly labeled image). Participants were unaware that either their time or performance were being captured during this second task round. Participants then answered questions about their experience in the task (including questions to gauge their suspicion) and were fully debriefed as to the true nature of the study.

Ambiguity of Responsibility Manipulation

When participants received performance feedback after the first round of the labeling task, all were told that they had “failed,” but the failure feedback was accompanied by one of two different statements. One hundred twenty-two individuals (48% of the sample) were told that their failed performance was the result of their own engagement and effort in the task, and thus was their responsibility (low ambiguity of responsibility). The remaining 134 participants were told that, due to an unfortunate problem with the labeling program, the browser they were using may have had difficulty displaying the images and logging the labeling coordinates correctly, meaning that their performance might have been influenced by this technical issue in addition to

their own efforts (high ambiguity of responsibility). Notably, in this second condition we did not tell participants that their performance was definitively caused by an outside factor, but simply introduced the possibility that an outside force may have affected their results, thus creating ambiguity about the participants' degree of responsibility for their performance. Indeed, in their text responses about their performance and plan for improving, participants often referred to this technical glitch, and specifically the ambiguity it caused, noting for instance, "Apparently, the browser has some difficulty with displaying/labeling these images correctly and that could have hindered my overall performance;" "[My performance was poor] maybe because I'm using Google Chrome, but I'm not sure;" and "The browser may be a factor, but as the corrected image is showing up clearly I do not think so. Perhaps I was not [identifying] those right on the border of a cell correctly, and was over analyzing it."

Measures

Performance on the second round of the task was measured by the number of HJBs that participants labeled correctly. The online labeling tool had been pre-programmed with the correct X,Y coordinate zones that represented HJBs in the image, and used the X,Y coordinates of participants' labeling to determine if their labels fell within the predefined zone. There were seven HJBs in the image, meaning scores could range from 0 to 7.

To capture the *effort* participants expended in trying to apply their learning from the first round to improve second-round performance, the online tool logged the number of seconds between when the individuals first saw the second-round blood-smear image and when they submitted their labeling and advanced to the next page (i.e., the amount of time they spent on the labeling task). Additionally, though all participants were told that they had failed, we also captured their actual *first-round score* (which we use as a control in our analyses). This first-

round performance was assessed in the same manner as second-round performance, although scores could range from 0 to 9 (as 9 HJBs were in the first image).

Internal attribution was assessed through individuals' text responses describing their attribution of the cause of their failure on the first round of labeling. Two independent coders (familiar with attribution judgments but blind to the hypotheses and manipulations of the study) assessed the degree to which participants indicated an internal cause for their performance (on a scale of 1-10). Intraclass correlation coefficients warranted aggregating the raters' responses into a single measure of internal attribution ($ICC(2) = .73$; LeBreton & Senter, 2007).

Ambiguity of responsibility (AOR) was captured as a binary variable reflecting the manipulation group to which participants were randomly assigned.

Finally, *age* was provided directly by participants and used in all analyses as a control variable (given the range of age present in our sample, and documented declines in both visual acuity and hand-eye coordination with age; Guan & Wade, 2000, Salvi, Akhtar, & Currie, 2006).

Results

Table 4 reports the means, standard deviations and correlations of Study 3 variables. To test our hypotheses, we first conducted a univariate analysis of variance (ANOVA), comparing internal attributions across the two AOR conditions (low and high ambiguity). As predicted, participants in the high-ambiguity condition ($M_{\text{Internal Attribution}} = 5.52$, $SD = 2.15$) were significantly less likely to internally attribute their performance than those in the low-ambiguity condition ($M_{\text{Internal Attribution}} = 6.11$, $SD = 2.13$; $F(1, 252) = 4.85$, $p = .03$). These results support Hypothesis 3, that ambiguity of responsibility decreases internal attribution.

 Insert Table 4 About Here

We next conducted hierarchical regression analyses (using 10,000 bootstrapped samples; Hayes, 2013) to test Hypothesis 4, that increased effort on the second round of labeling would mediate the effect of internal attribution of failure on participants' performance on the second round. As shown in Table 5, after controlling for participant age and actual first round score, internal attribution had a significant, positive effect on effort ($b = 4.08, p = .02$). In turn, this effort had a positive effect on second-round performance ($b = .01, p < .001$). Though the direct effect of internal attribution on second-round performance failed to reach significance (a criteria deemed unnecessary by recent approaches to testing mediation; Hayes, 2013), a 95% bias-corrected confidence interval for the indirect effect of internal attribution on performance indicated the presence of a significant indirect effect through effort (CI: [.01, .07]), and this mediating effect was further supported by the presence of a significant Sobel test ($z = 2.00, p < .05$). These results thus support Hypothesis 4.

Finally, to provide a parsimonious test of our entire conceptual model, we constructed a two-stage mediation model (again using 10,000 bootstrapped samples) where AOR predicted internal attribution, which in turn predicted effort and subsequent performance. We found support for this model, as indicated by a significant indirect effect of AOR on performance through internal attribution and effort (i.e., through the two-stage mediation path; CI: [-.055, -.002]). The other potential mediation pathways (i.e. through one mediator or another, but not both) did not exhibit a significant indirect effect (all confidence intervals crossed zero). These results thus support our overarching conceptual model⁵.

 Insert Table 5 About Here

⁵ Though our conceptual model in Figure 1 depicts moderated mediation, given that all Study 3 participants received failed performance feedback, we used a two-stage mediation model (with the main effect of attribution capturing the effect of internal attribution on learning from failure).

Discussion

The results of Study 3 extend those of our earlier studies by empirically demonstrating the effects of AOR and effort in the process of learning from failure, while replicating the role of internal attribution as a facilitator of learning after failure. More specifically, by manipulating ambiguity of responsibility, in Study 3 we can make stronger claims about the causal role of this situated perception on individuals' attribution judgments, while also strengthening our arguments about internal attribution by assessing this attribution with more nuanced external ratings (rather than the single-item measure used in Study 2). Finally, by controlling for participants' actual first round score, Study 3 more clearly isolates the effects of individuals' reactions to failure, controlling for extraneous variance in individuals' abilities and presenting a more clear measure of learning and improvement from one round to the next.

GENERAL DISCUSSION

A growing body of work seeks to understand how learning from failure occurs within organizations (e.g., Kim & Miner, 2007, Madsen & Desai, 2010, Jordan & Audia, 2012, KC, Staats, & Gino, 2013). As noted by Lapré and Nembhard (2011) in their review of the learning literature, though learning from prior experience has received significant attention, the division of this experience into its constituent parts – prior successes and prior failures – has not. Although learning from failure is often heralded in practice, prior studies on the topic suggest that, perhaps ironically, such learning often fails to occur. In this paper, we help to resolve these conflicting findings by presenting evidence from three studies that support a conceptual model of learning from failure as operating through individuals' internal attributions of failure, driven in part by ambiguity of responsibility, that lead to increased learning effort and subsequent improvement (see Figure 1).

Our research makes three primary contributions to the literature. First, we focus attention on the role of attribution in learning from failure. Recent work has considered the critical role that self-enhancing responses can play in failed experiences (e.g., Audia & Brion, 2007, Jordan & Audia, 2012), noting that the determination of an outcome as a success or failure is often subjective. While not disputing this point, we note that individuals may not (only) attempt to cognitively redefine a subpar performance as a “success,” but can, in fact, accept the outcome as a failure and still engage in differential attribution, providing an alternate subjective response to failure. In other words, an individual may argue that he or she didn’t *really* fail (self-enhancement) or may accept the failure but blame it on an external cause. The current study provides a more nuanced examination of learning from failure by theorizing and empirically demonstrating that not only is the type of attribution an important determinant of whether or not an individual learns from failure, but also that this attribution type is not fixed (i.e., external attributions do not always follow failures, as prior work has suggested). We thus show that attribution style is an important moderator of the relationship between failure and learning.

Second, we identify a key situational determinant of individuals’ responses to failure. Prior research suggests that different forms of accountability may lead to either a willingness to take internalize negative outcomes (Tetlock, 1985) or a desire to avoid responsibility for them (Audia & Brion, 2007, Jordan & Audia, 2012). By introducing the notion of ambiguity of responsibility as a more proximal predictor of individuals’ attributions, we hope to help clarify these prior contrasting predictions. We suggest that ambiguity of responsibility and accountability are related, but fundamentally distinct concepts, and that to the extent that accountability has been found to help internal attribution in the past, it may have been because of a reduction in ambiguity. Nonetheless, sometimes accountability may not alter ambiguity of

responsibility – as in the case of a surgeon who is accountable to the hospital for the outcome of a surgery, but may still face significant ambiguity when trying to determine who or what was responsible for causing the outcome – and in these cases we might expect individuals to succumb to self-enhancement strategies such as turning to a secondary performance outcome (Audia & Brion, 2007).

Finally, our research model highlights the key role of effort in learning, as our research design allow us to isolate the role of effort as a mechanism for the effects of learning from failure. Prior work has implicated the important role of learning effort in response to failure – for example, through broader search strategies or information seeking (Weiner, 2001, Greve, 2003) – however, these mechanisms rarely have been identified empirically. Because learning and performance improvement can be driven by both ability and effort (Heider, 1958, Staats & Gino, 2012), by both theorizing and testing the mediating role of effort in explaining the impact of internal attributions, we are able to more precisely demonstrate the importance of this motivational mechanism in the process of learning from failure.

Practical Implications

Our paper not only advances theories of learning from failure but also offers implications for managers and leaders in organizations. Prior work highlights that organizational culture (Cannon & Edmondson, 2001) and encouragement that mistakes are permissible (Heimbeck et al., 2003, Maxwell, 2007, Keith & Frese, 2008) may help individuals cope with failure. For instance, Ellis and colleagues (2006) highlight the use of after-event reviews (careful debriefing of a task experience) as a means for generating greater internal attribution and learning following failure. Complementing these cultural norms or post-event interventions, our results emphasize a specific measure that organizational leaders might take *before* an experience to enhance learning:

actively managing perceptions of ambiguity of responsibility. Managers in organizations should think carefully about how ambiguity of responsibility is likely to play out in their context, utilizing strategies such as job design to help to limit this AOR. Moreover, in many contexts, upfront planning might remove possible barriers that would increase AOR. For example, had our cell-labeling task (Study 3) been a real work assignment with genuine browser difficulty, then awareness of this problem beforehand and proper adjustment could have significant performance implications. Beyond these pre-emptive structural design elements (i.e., job or tool design) affecting AOR, it seems likely that feedback could influence these ambiguity perceptions as well. Managers may need to be careful to not provide alternative explanations that heighten AOR for a task, but instead focus specific attention on what happened and how failure is an activity from which individuals and organizations can learn and improve with effort (Nussbaum & Dweck, 2008). This developmental feedback can allow individuals to develop a mindset of growing from failure, without introducing alternative explanations (e.g., excuses or scapegoats) for the failed experience.

Limitations and Future Directions

As with any study, ours has limitations. Although examining our research model in a field site and two controlled studies provides both internal and external validity, there is a need to investigate these topics in additional contexts. For instance, in addition to contexts that vary in their ambiguity of responsibility, characteristics like time pressure or magnitude of failure may influence individuals' attribution processes (i.e., large and small failures may have differential effects on threat rigidity and self-enhancement efforts). Similarly, we test our hypotheses in task contexts that are comparatively straightforward, permitting us to isolate each of the effects under study. However, future work could examine failure, attribution and ambiguity of responsibility in

contexts with higher-end knowledge work or in work where performance feedback is less clear or frequent. Although we believe our theoretical model should still hold in these contexts, as individuals' underlying judgments and assignment of responsibility is still central to their experience of the work, future research exploring the contextual boundary conditions of these effects is certainly warranted.

An additional direction for future research might be to explore general individual differences in attribution styles, and how these affect learning and performance following failure. In our studies, we examined individuals' attributions of a single task or event, and in our laboratory study we use random assignment to study attribution states following different exposure to ambiguity of responsibility. Yet future work might explore the interesting question of how individuals' attribution judgments function across multiple different events, to see how these general patterns of attribution (i.e., more trait-like attribution styles; Martinko, Harvey, & Dasborough, 2011) lead to different interpretations of ambiguity of responsibility and subsequent performance changes.

Finally, we note three additional areas of potential exploration for future studies. First, to complement this paper's focus on the effect of failure on learning, future research could explore the impact of attributions after success. Our Study 1 results suggested that individuals do learn from success (just less than failure), and Study 2 provided initial, marginal evidence that after success, internal attribution may actually harm performance, reversing the trend observed for failure. These results suggest that understanding attributions after successes may reveal promising insight for learning in organizations as well. Second, beyond internal/external attributions, self-enhancing motives have also been theorized to affect learning from failure (Jordan & Audia, 2012). Although these concepts are related, additional work is needed to

clarify the complex interactions between self-enhancement and attribution style. For instance, are there situations where internally attributing a failure actually contributes to self-enhancement efforts? Third, our research design provides empirical support for the critical role of effort in learning from failure. Though effort is frequently used as an explanatory mechanism in learning research, it typically goes unmeasured (e.g., Staats & Gino, 2012) due to challenges in research design. The paradigm we present here may thus create opportunities to test these previously theorized effects of effort – exploring, for instance, whether standardization of tasks decreases motivation motivated effort and less learning – while also exploring new questions and theories.

Considering our present findings and these future directions, failure clearly presents a valuable opportunity for learning, but all too often, that opportunity is lost. Our study thus begins to uncover when and why individuals are more likely to learn from these failed experiences, providing a foundation for a more nuanced understanding of individual learning in organizations.

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TABLES & FIGURES

TABLE 1
Study 1 Hierarchical Regression Analyses Predicting Percent Failure^a

Variables	Model 1		Model 2	
	Coefficient	SE	Coefficient	SE
Constant	.3941***	.0825	.4072***	.0822
Prior Cumulative Volume	-.0001***	.0000		
Prior Cumulative Successes			-.0001*	.0000
Prior Cumulative Failures			-.0005**	.0002
Controls Included	YES		YES	
R ²	.1114***		.1015***	

^a Reported values are unstandardized regression coefficients, with robust standard errors (clustered at the individual level). Values in bold represent hypothesized effects. $n = 4,762$ worker-days (233 individual workers).

* $p < .05$ ** $p < .01$ *** $p < .001$ (Two-tailed tests)

TABLE 2
Study 2 Means, Standard Deviations and Correlations^a

Variables	Mean	SD	1	2	3	4	5	6
1. First Task Failure	.79	.41						
2. First Task Effort	5.14	1.21	.04					
3. Internal Attribution	4.13	1.56	-.03	-.04				
4. Stable Attribution	4.00	1.23	-.26 [*]	-.03	.03			
5. Global Attribution	3.95	1.32	-.35 ^{**}	-.02	.07	.50 ^{**}		
6. Importance Attribution	5.11	1.25	.00	.18 [†]	.14	.24 [*]	.16	
7. Second Task Success	.25	.43	.16	-.06	.08	.07	-.19 [†]	.06

^a $n = 85$. [†] $p < .10$ * $p < .05$ ** $p < .01$ (Two-tailed tests)

TABLE 3
Study 2 Hierarchical Logistic Regression Analyses Predicting Second Task Success^a

Variables	Step 1		Step 2	
	Coefficient	SE	Coefficient	SE
Constant	-2.90	2.29	1.47	2.54
First Task Failure	1.11	.88	-5.17*	2.35
First Task Effort	-.16	.22	-.21	.24
Internal Attribution	.16	.18	-1.34 [†]	.72
Stable Attribution	.49 [†]	.28	.62*	.28
Global Attribution	-.48*	.25	-.48 [†]	.25
Importance Attribution	.16	.26	.29	.26
First Task Failure X Internal Attribution			1.76*	.77
χ^2	9.33		18.10*	
$\Delta\chi^2$			8.76**	

^aReported values are unstandardized regression coefficients. Values in bold represent hypothesized effects. $n = 85$. [†] $p < .10$ * $p < .05$ ** $p < .01$ (Two-tailed tests)

TABLE 4
Study 3 Means, Standard Deviations and Correlations^a

Variables	Mean	SD	1	2	3	4	5
1. Age	31.43	8.25					
2. First Round Score	4.62	2.43	.03				
3. Ambiguity of Responsibility ^b	.52	.50	-.02	.01			
4. Internal Attribution	5.80	2.16	-.04	-.04	-.14 [*]		
5. Second Round Effort ^c	95.28	63.03	.23 ^{**}	.19 ^{**}	-.12 [†]	.12 [*]	
6. Second Round Score	4.40	1.96	-.05	.43 ^{**}	-.02	.03	.29 ^{**}

^a $n = 256$. [†] $p < .10$ ^{*} $p < .05$ ^{**} $p < .01$ (Two-tailed tests).

^b Dummy variable (1 = High Ambiguity of Responsibility Condition).

^c Measured as seconds spent coding second image.

TABLE 5
Study 3 Hierarchical Regression Analyses^a

Variables	Model 1		Model 2		Model 3	
	Second Round Effort ^b		Second Round Score		Second Round Score	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
Constant	-5.93	19.59	2.96**	.58	3.01**	.56
Age	1.76**	.46	-.01	.01	-.03*	.01
First Round Score	4.84**	1.55	.35**	.05	.31**	.05
Internal Attribution	4.08*	1.74	.04	.05	.01	.05
Second Round					.01**	.00
R ²	.11**		.19**		.24**	
ΔR ²					.05**	

^a Reported values are unstandardized regression coefficients. Values in bold represent hypothesized effects. $n = 256$. † $p < .10$ * $p < .05$ ** $p < .01$ (Two-tailed tests).

^b Measured as seconds spent coding second image.

FIGURE 1
Conceptual Model

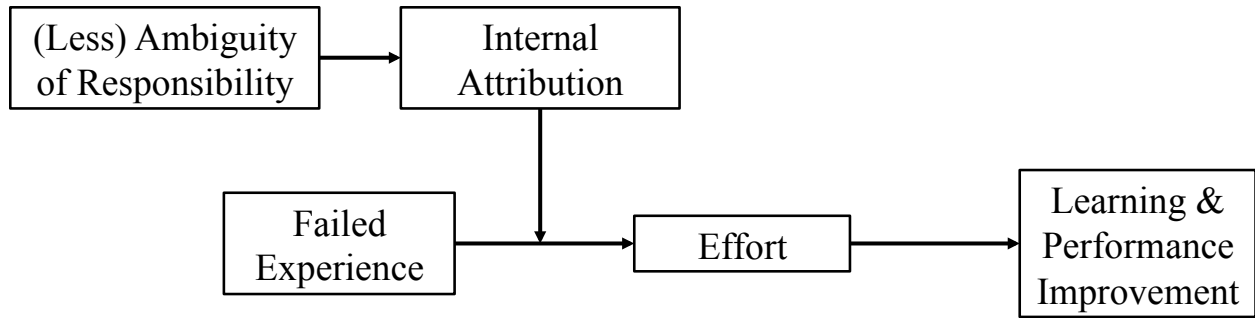


FIGURE 2
Study 2 Logistic Regression Plot

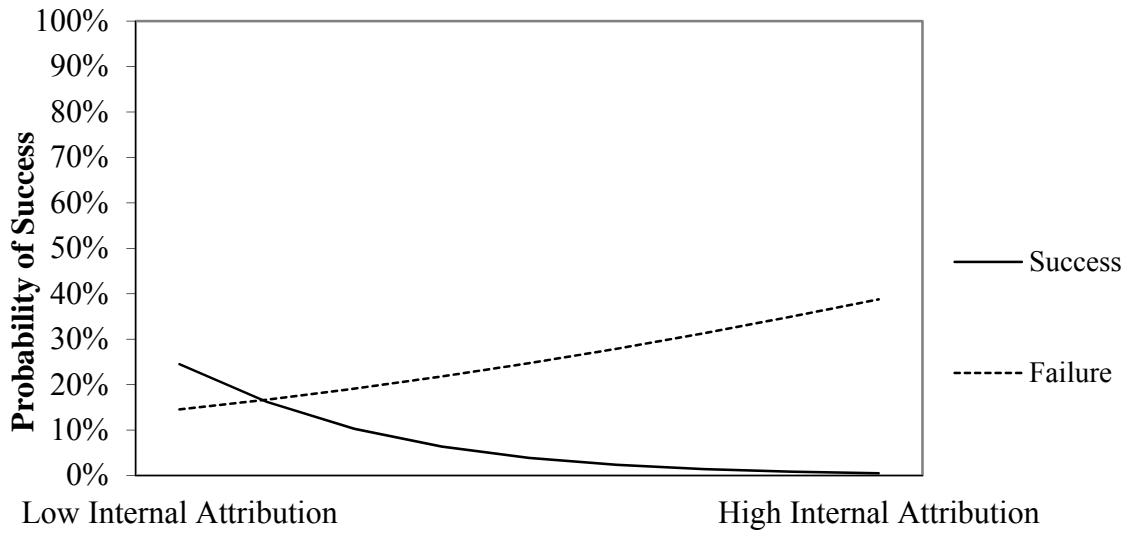


FIGURE 3
Study 3 Sample Blood Smear Image

