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TESTING AN ALTERNATIVE RELATIONSHIP BETWEEN INDIVIDUAL AND CONTEXTUAL PREDICTORS OF CREATIVE PERFORMANCE

HYOUN SOOK LIM
University of Connecticut, CT, USA
JIN NAM CHOI
Seoul National University, Seoul, South Korea

Existing studies have been focused mainly on the effects of individual and contextual factors on creativity, leaving unaddressed the intermediate processes through which these predictors affect creativity. Based on previous theoretical arguments, we proposed that individuals' cognitive and affective states with regard to creativity comprise the direct antecedents of creative performance. Specifically, we hypothesized that creativity efficacy and positive attitude toward creativity mediate the effects on creative performance of individual creative ability, supportive leadership, and constructive group norms. The empirical results based on multisource, longitudinal panel data clearly indicate that these cognitive and affective process variables mediate the effects of both individual and contextual variables on creative performance. These findings reveal potential psychological processes that should be targeted when educators and managers design interventions to increase creative performance of individuals.

Keywords: creativity, creative ability, leadership, group norms, creativity efficacy, positive attitude toward creativity.

In highly uncertain and rapidly changing environments, companies have come to emphasize innovation as a means to achieve sustainable competitive advantage (Amabile, 1988, 1996; Nonaka, Toyama, & Byosière, 2001; Shalley, 1995). Since creativity is a necessary condition for innovation, creativity has been recognized as a critical source of organizational adaptation and performance (Amabile, 1988;

Hyoun Sook Lim, School of Business, University of Connecticut, CT, USA; and Jin Nam Choi, College of Business Administration, Seoul National University, Seoul, South Korea.
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Please address correspondence and reprint requests to: Jin Nam Choi, College of Business Administration, Seoul National University, 599 Gwanangno, Gwanak-gu, Seoul 151-742, South Korea. Phone: +82-2-880-2527; Email: **jnchoi@snu.ac.kr**

Amabile, Conti, Coon, Lazenby, & Herron, 1996). Earlier research on creativity focused on individual characteristics that are predictive of individual creativity (e.g., personality, cognitive style, and ability; for a review, see Shalley, Zhou, & Oldham, 2004; Woodman, Sawyer, & Griffin, 1993). Realizing that individual characteristics are not the only factors that affect creativity, scholars have shifted their attention to contextual or situational factors that foster individual, team, or organizational creativity (e.g., Amabile et al., 1996; Amabile, Schatzel, Moneta, & Kramer, 2004; Shalley & Gilson, 2004). For instance, researchers have identified challenging tasks and supportive supervision as creativity-facilitating contextual elements (Oldham & Cummings, 1996) and rigid procedure and lack of autonomy as creativity-inhibiting contextual elements (Shalley, Gilson, & Blum, 2000).

Human behavior and its outcomes are products of a dynamic interchange between a person and his/her physical and social surroundings. Likewise, creativity can be understood as a function of both individual characteristics and social/contextual factors (Amabile et al., 1996; Gough, 1979; Oldham & Cummings, 1996; Scott & Bruce, 1994; Woodman et al., 1993). To further our understanding of the creative process, some researchers have proposed that individual and contextual factors may promote creativity through intermediate psychological processes such as psychological freedom and sensitivity to opportunities for improvement (e.g., Hennessey & Amabile, 1988). However, the psychological mechanisms that potentially explain the relationships between both individual and contextual factors and creativity have not been systematically examined (Choi, 2004).

The purpose of this study was to examine psychological processes that mediate the effects of individual characteristics and social influences on individual creative performance. In doing so, this study was a means to inform the creativity literature of a potential mechanism through which person and context work together to produce creative performance. We briefly reviewed the direct relationships between individual/contextual factors and creativity and then identified core psychological mechanisms that may explain how individual and social characteristics influence creative performance. We tested these mediating processes using multisource, longitudinal data collected from undergraduate business students and their instructors.

THEORETICAL BACKGROUND

Creativity scholars have proposed numerous definitions of creativity. Some researchers define creativity as an individual characteristic, while others define it as a process (Amabile, 1988). However, many theorists and researchers have agreed to adopt a definition of creativity focused on product or outcome (Amabile,

1983, 1988; Oldham & Cummings, 1996). Accordingly, we define *creativity* as *generation of (1) novel and (2) potentially relevant or useful ideas,* and we define *creative performance* as *the behavioral manifestation of creativity*.

An Interactionist Approach to Creativity

Researchers have made both conceptual and empirical efforts to identify individual and contextual factors that predict creative performance. Several theorists have adopted an interactionist approach, in which creativity is regarded as a complex product of a person's characteristics and his/her social surroundings (Glynn, 1996; Woodman et al., 1993; Woodman & Schoenfeldt, 1989). Employing this approach, authors of several empirical studies have confirmed that both individual and contextual factors influence creativity and also interact in the creative process. For instance, Oldham and Cummings (1996) reported that employee creativity was predicted by creative personality (personal characteristic), job complexity, supportive supervision, and controlling supervision (contextual factors). They also examined the interactions among these factors and showed that employees' creative performance was highest when highly creative individuals work on complex, challenging tasks under supportive and noncontrolling supervision.

A study of shop floor innovation by machine operators revealed the possibility that individual and contextual factors play different roles at different stages of innovation (Axtell et al., 2000). In particular, the first stage of innovation, idea generation (creativity), was more strongly related to personal and job-characteristic variables (e.g., task autonomy, problem-solving demand); whereas the second stage, idea implementation, was more strongly associated with global, contextual variables (e.g., team leader support, team autonomy, participative safety, management support). Axtell et al. suggest the possibility that individuals' creative performance or idea generation is more strongly affected by proximal (or more personal) factors rather than distal (or more contextual) factors, while the pattern is reversed for the implementation of generated ideas, which may be more subject to environmental constraints.

Core Psychological Processes: Creativity Efficacy and Positive Attitude toward Creativity

According to Ajzen's (1991) theory of planned behavior, the direct antecedents of changes in individual behavior are not stimuli per se, but rather perceived behavioral control and intention with regard to the behavior. *Perceived behavioral control* refers to *people's "perception of the ease or difficulty of performing the behavior of interest"* (Ajzen, 1991, p. 183) and *intention* refers to *indications "of how hard people are willing to try, in order to perform the behavior"* (Ajzen, 1991, p. 181). In other words, perceived behavioral control is about self-efficacy

belief in the given task, whereas intention reflects motivation or attitude toward the task. For example, in a psychology course, students with a high self-efficacy belief and a positive attitude toward the course (and thus, who are willing to exert effort) are likely to perform better than those with low efficacy and/or a negative attitude toward the subject.

In the context of creative performance, creative efficacy results in individuals believing that they can perform creative behavior, and a positive attitude toward creativity results in individuals actually engaging in creative performance. Creativity efficacy and positive attitude toward creativity function as cognitive and affective bases of individual creative performance. Identifying motivation as one of the most significant aspects for individual creative action, Ford (1996) proposed that efficacy beliefs and evaluative appraisals play key roles in developing motivation for creativity. When individuals have high expectations regarding their abilities to perform creatively, they are more likely to engage in creative behavior. Personal confidence and the feeling of potency increase people's willingness to challenge themselves and to take risks by trying new ideas and solutions (Ford, 1996; Shin & Zhou, 2007). Positive evaluative judgments regarding creativity can also be a proximal motivational source for creative action (Ajzen, 1991). When people are positive and excited about achieving creative performance, they will be more likely to initiate creative processes (Ford). Thus, we hypothesized the following relationships:

Hypothesis 1: Creativity efficacy is positively related to creative performance.

Hypothesis 2: Positive attitude toward creativity is positively related to creative performance.

We further expected that creativity efficacy would increase positive attitude toward creativity. According to the theory of reasoned action, human behavior is determined by individual attitudes and subjective norms regarding the behavior, and the attitude is affected by one's belief regarding expected outcomes from the behavior (Fishbein & Ajzen, 1975). Therefore, when people are confident about their capabilities to be creative and thus expect favorable results from their creative efforts, they may develop positive evaluative judgments and emotions regarding creativity. In the context of innovation implementation, Lam, Cho, and Qu (2007) found that employees' self-efficacy regarding a new system increased their positive attitudes toward the system. In a similar vein, creativity efficacy may influence positive attitude toward creativity.

Hypothesis 3: Creativity efficacy is positively related to positive attitude toward creativity.

Mediation of the Relationships between Individual/Contextual Factors and Creative Performance by Psychological Processes

We proposed that creative performance is directly predicted by creativity

efficacy and positive attitude toward creativity, which represent cognitive and affective processes needed for individual creativity. We further proposed that these psychological processes mediate the effects of individual and contextual variables on creative performance (Ajzen, 1991). In the present study, we examined the effects of individuals' creative ability as well as the social influences of the group and the leader on creative performance (see Figure 1).

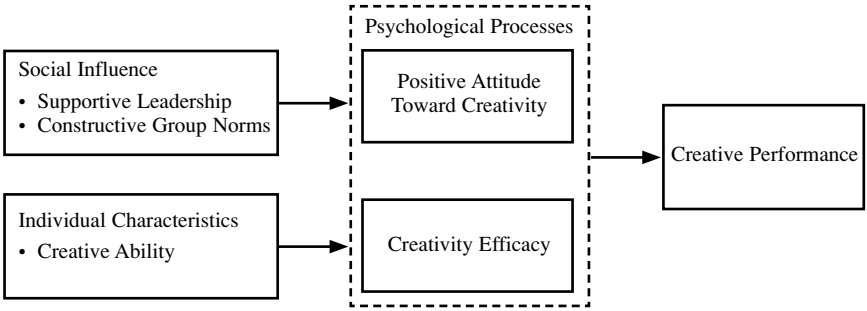

Figure 1. Hypothesized Model of Creative Performance.

Although previous studies have shown that individuals with high creative ability tend to exhibit greater creative performance (Amabile, 1988; Kirton, 1976), this may not always be the case. Even when a person possesses a high level of creativity-relevant skills, s/he may not generate new and useful ideas if s/he has a low level of creativity efficacy. Quite often, it is not actual (objective) ability, but rather confidence in the ability to perform, that determines performance level (Bandura, 1997). A lack of confidence in the ability to be creative may prevent an individual from challenging him/herself, and s/he will simply continue engaging in the activities that s/he is accustomed to, resulting in suboptimal creative performance (Choi, 2004). We therefore hypothesized that creative ability increases creativity efficacy, which in turn directly predicts creative performance.

Hypothesis 4: Creativity efficacy mediates the relationship between creative ability and creative performance.

With regard to the social context, we examined two apparent sources of social influence on individuals: the group and the leader. Deci and Ryan (1985) explored the ways in which contextual factors affect behavior through the psychological meanings that people attach to them. Similarly, we proposed that the effects of group and leader characteristics on creative performance would be mediated by the individual's attitude toward creativity, an affective process involving creative performance. Constructive group norms entail mutual openness and expectations among members for generating and sharing new ideas relevant to

the group task (Amabile et al., 1996). Constructive group norms for creativity enable people to feel supported and nonthreatened in exploring their creative ideas, thus encouraging the risk taking needed in creative processes (Edmondson, 1999; Gilson & Shalley, 2004). Social and environmental factors are likely to change an individual's attitude toward creativity (Amabile, 1983), which may be a proximal predictor of creative performance (Ford, 1996). Therefore, we proposed that social factors such as constructive group norms predict individuals' creative performance by shaping their evaluative judgments (e.g., attitudes toward creativity).

Hypothesis 5: Positive attitude toward creativity mediates the relationship between constructive group norms and creative performance.

Another contextual factor included in our model (Figure 1) is *supportive leadership*, which is defined as *expressed personal concern for followers and consideration of their needs and preferences in the decision-making process* (Rafferty & Griffin, 2006). Leadership has been considered one of the most important contextual factors promoting or hindering creativity (Redmond, Mumford, & Teach, 1993; Shalley & Gilson, 2004). A common argument regarding leadership is that effective leaders influence various aspects of group environment, such as group climate or group norms (Amabile et al., 2004; Scott & Bruce, 1994). Amabile and colleagues (1996) investigated the relationship between leader behaviors and supportive climate as perceived by members. In that study, supportive leader behavior was positively related to members' perceived support for creativity. Scott and Bruce (1994) also reported that a certain type of leadership (i.e., quality of leader-member exchange) tends to increase positive psychological climate for innovation. Thus, one of the key roles of a leader in promoting creativity is to develop trusting and constructive group norms that promote the generation and open exchange of new ideas among members (cf. participative safety, Anderson & West, 1998). Therefore, we hypothesized that supportive leadership has indirect effects on both creative process and outcome via its impact on constructive group norms, rather than having a direct effect on positive attitude toward creativity and creative performance.

Hypothesis 6: Supportive leadership is positively related to constructive group norms.

METHOD

Data Collection Procedure and Participants

The sample group for this study consisted of 430 undergraduate students enrolled in 14 sections of an introductory organizational behavior course (each section taught by two instructors; 28 instructors in total) at a North American business school. Participation in the study was voluntary, but was rewarded with

gift certificates offered through a draw to provide an incentive to participate. Throughout the semester, the class met twice a week for two-hour sessions. The majority of class time involved exercises and discussions, while less than a quarter of class time was spent on lecture. Data were collected from both students and instructors twice during the semester (the sixth week and the twelfth week - T1 and T2 respectively) using the same questionnaire (repeated measure design). Of the 430 students, 386 students (response rate = 89.8%) completed either the T1 (N = 344) or T2 questionnaire (N = 331). The sample included 51.6% females. The average age and school year at the university were 19.8 years and 2.1 (1 = Freshmen, 2 = Sophomore, 3 = Junior, 4 = Senior), respectively. At both T1 and T2, all 28 instructors provided evaluations of their students' creativity as observed during the class.

Measures

T1 and T2 questionnaires for students included a set of identical scales that was designed to assess instructor behavior, group climate of the class, and personal reports on creative ability, creativity efficacy, and attitude toward creativity. Each scale included multiple items and showed acceptable internal consistency. A 7-point Likert-type scale was used as the response format for the items.

Creative ability Drawing on previous measures of creativity-related skills (e.g., Amabile, 1988; Axtell et al., 2000), a five-item index (α = .73 and .71 for T1 and T2, respectively) of creativity was developed to measure creativity-relevant skills in the classroom setting. This scale included items such as "I am able to generate new ideas" and "I appreciate and accept different perspectives."

Creativity efficacy Participants' efficacy belief that they could achieve high creative performance in the classroom setting was assessed by a four-item measure (α = .70 and .78 for T1 and T2, respectively). Sample items were "I feel comfortable about generating new ideas and combining different views," and "I feel nervous when I present different views to classmates" (reverse coded).

Supportive leadership The degree to which instructors supported students' participation and ideas was measured by three items (α = .73 and .74 for T1 and T2, respectively). Sample items were "Instructors clearly and regularly encourage students to participate in the class" and "Instructors explicitly seek students' ideas or comments throughout the class." Each item was accompanied by a 7-point scale (1 = *not at all true*, 7 = *absolutely true*).

Constructive group norms The degree to which active participation and open sharing of ideas was expected in the classroom was assessed by a three-item measure (α = .69 and .73 for T1 and T2, respectively), including items such as "In this class, open and active participation is a norm" and "Classmates encourage each other to participate actively."

Positive attitude toward creativity A two-item measure (α = .76 and .81 for

T1 and T2, respectively) was used to assess the extent to which participants had positive evaluative judgments regarding creativity in the classroom setting. The items were "I believe that sharing different viewpoints during the class is beneficial for my learning," and "I believe that creativity really enriches our class activities and improves my learning."

Creative performance In the middle (T1) and at the end (T2) of the semester, each of the two instructors responsible for a given section of the course independently evaluated the level of creativity of each of the students. In the evaluation sheet prepared for instructors, *creativity* was operationally defined as *"the extent to which this particular student (a) is open to and actively listens to others' ideas, (b) generates and presents new/fresh ideas, alternative explanations, different perspectives, or other creative solutions, and (c) integrates multiple perspectives or combines ideas or materials from different modules in a constructive manner."* Instructors rated each student's creative performance in the class on a 7-point scale (1 = *very little*, 7 = *quite a lot*).

RESULTS

Prior to hypothesis testing, the factor structure of each scale along with its internal consistency was examined. Items comprising each of the ten scales showed one identifiable factor, indicating a single construct underlying the items of each scale. In addition, alpha coefficients of all scales were greater than .70, except for T1 constructive group norms (α = .69). Interrater agreement on the creative performance of the students was assessed by intraclass correlation (ICC; Bliese, 2000). ICC for creative performance at T1 was .71 and at T2 was .70.

Table 1 presents means, standard deviations, and intercorrelations among the study variables. Although in the present study research design features were adopted that might reduce common method variance, such as longitudinal data collection and data from multiple sources (Podsakoff & Organ, 1986), all the independent variables were based on self-report data from the same source. To examine whether or not common method variance was a substantial threat, Harman's one-factor test was performed (Podsakoff & Organ). Factor analysis of the 34 items comprising the ten independent variables measured at T1 and T2 was carried out using principal component analysis. This procedure resulted in nine factors, with the first factor explaining less than a quarter of the total variance. The results indicate that common method variance was not a serious threat in the present data.

The hypotheses were tested by confirmatory structural equation modeling (SEM) analysis using the EQS program (Bentler, 1995). SEM analysis provides simultaneous estimation of hypothesized regressions using a covariance matrix generated on the basis of the observed covariance matrix of the measured

TABLE 1
MEANS, STANDARD DEVIATIONS, AND INTERCORRELATIONS AMONG CREATIVITY VARIABLES

	M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12
1. T1 Creative Ability	5.17	.79	--											
2. T1 Creativity Efficacy	4.93	1.01	.50	--										
3. T1 Supportive Leadership	6.19	.72	.28	.24	--									
4. T1 Constructive Group Norms	5.67	.86	.19	.20	.47	--								
5. T1 Positive Attitude Toward Creativity	5.86	.96	.27	.30	.35	.30	--							
6. T1 Creative Performance	4.15	1.65	.27	.34	.19	.16	.25	--						
7. T2 Creative Ability	5.41	.76	.46	.39	.27	.19	.23	.35	--					
8. T2 Creativity Efficacy	5.11	1.12	.43	.69	.22	.20	.28	.43	.57	--				
9. T2 Supportive Leadership	6.04	.81	.09	.18	.44	.37	.35	.14	.26	.24	--			
10. T2 Constructive Group Norms	5.62	.93	.15	.22	.36	.48	.35	.12	.32	.35	.64	--		
11. T2 Positive Attitude Toward Creativity	5.73	1.08	.24	.34	.25	.21	.58	.28	.37	.45	.39	.41	--	
12. T2 Creative Performance	4.39	1.61	.19	.20	.17	.12	.20	.68	.35	.35	.24	.13	.27	--

$r > .11$, $p < .05$; $r > .14$, $p < .01$; $r > .19$, $p < .001$

variables. This estimated covariance matrix is also used for evaluating the goodness of fit between the actual data and the estimated model. In reporting the SEM results, we followed the guidelines suggested by Raykov, Tomer, and Nesselroade (1991), and provided three goodness-of-fit indexes (Normed Fit Index (NFI), Non-Normed Fit Index (NNFI), Comparative Fit Index (CFI)) and one measure of lack of fit: the Root Mean Squared Error of Approximation (RMSEA). Fit indexes that exceed .90, and an RMSEA that is .06 or below are indicative of acceptable model fit (Hu & Bentler, 1995; for a detailed discussion of fit indices, see Bentler, 1990 and Bollen, 1990).

All the analyses were performed separately on listwise and pairwise covariance matrices. The results were virtually identical. Therefore, we have presented the results from the pairwise matrix (which generated better goodness-of-fit indices and were based on a larger portion of the current sample). Overall missing data rates were 18% for the study variables; thus, 82% (n = 317) of the entire sample (N = 386) was used as the sample size for the SEM procedures described below.

Measurement Model

The ten predictors in this study were assessed by 34 self-report items and the two outcome variables (T1 and T2 creative performance) were assessed by two instructors' ratings. A full measurement model can be created from these 38 data points (comprising 12 latent variables). However, given the limited size of the current sample, this full measurement model was not possible. Therefore, we limited the number of indicators per latent construct to two. Thus, when a measure included more than two items, we created two subscales of the measure by combining items. We did so by conducting factor analyses using principal component analysis with varimax rotation, specifying a two-factor solution (in all cases, without this requirement, all measures produced a single factor). This procedure provided two subscales for each scale, each representing distinct within-scale variance. Finally, two creativity ratings, each provided by two instructors, constituted two subscales for creative performance. Each of the two subscales of a measure was used as an indicator of the corresponding latent variable. In each time period (T1 and T2), the same set of indicators was used to identify the corresponding latent variables in the model.

To estimate the measurement model with the latent variables specified above, we included (a) covariances between the measurement errors of the respective indicators across the two time periods (e.g., first subscale of creative ability measured as T1 and T2); (b) constraints setting the respective factor loadings as equal across the two time periods; and (c) covariances between all latent variables and other latent variables in the model. The statistical test of this measurement model is equivalent to a confirmatory factor analysis including all

study variables. This model fit the data quite well (χ^2 (165) = 298.1, $p < .001$; NFI = .91, NNFI = .93, CFI = .96, RMSEA = .051), and therefore it was used in the testing of all the structural models discussed below.

Structural Model

The present hypotheses collectively suggest that two processes combine to predict individual creative performance. One process begins with creative ability, which directly influences a person's creativity efficacy, which in turn affects positive attitude toward creativity and creative performance. The other process starts with supportive leadership, which shapes constructive group norms, which in turn leads to positive attitude toward creativity, and finally to creative performance. This process model, involving the relationships among six latent variables, was tested using the longitudinal data provided by multiple raters.

The present structural model included three types of structural paths: (a) stability paths that link the same latent variable in different time periods (e.g., T1 creative ability and T2 creative ability); (b) concurrent paths that connect different variables within the same time period (e.g., T1 creative ability and T1 creativity efficacy); and (c) longitudinal paths that reflect the effect of one variable on another in the follow-up period (e.g., T1 creative ability and T2 creativity efficacy). Figure 2 displays a structural model that incorporates these three kinds of relationships according to the hypotheses developed earlier. The figures along the paths represent standardized path coefficients (betas). This model showed a good fit to the observed data (χ^2 (216) = 370.2, $p < .001$; NFI = .89; NNFI = .94; CFI = .95; RMSEA = .048).

Testing Alternative Models

Although the results indicated that the overall model based on the present hypotheses fits the data fairly well, they do not rule out the possibility that other models may provide an equally good or better fit to the observed data (MacCallum, Wegener, Uchino, & Fabrigar, 1993). For example, we may have nonzero reverse effects (e.g., creativity efficacy to creative ability, instead of creative ability to creativity efficacy) that might require modification of the model. It is also likely that we will observe substantial direct effects after controlling for indirect effects through mediators (e.g., direct effect of creative ability on creative performance, in addition to its indirect effect through creativity efficacy). Accordingly, we identified and tested two sets of alternative structural models as presented in Table 2 based on a series of plausible alternative hypotheses.

The first set of alternative models was created by adding a series of paths integrating reverse causal directions (e.g., creativity efficacy affects creative ability). The reverse paths were added to concurrent paths (e.g., T1 creativity efficacy to T1 creative ability) as well as to longitudinal paths (e.g., T1 creativity

TABLE 2
TESTING ALTERNATIVE MODELS OF FINAL STRUCTURAL MODEL

	$\chi 2$	*df*	$\Delta\chi 2$	Δdf	*p*
Final Model	370.2	216			
Reverse Paths Added to the Following Relationships					
Model 1. From Creativity Efficacy to Creative Ability	3628.2	213	-3258.0	3	n/a
Model 2. From Positive Attitude Toward Creativity to Creativity Efficacy	2684.4	213	-2314.2	3	n/a
Model 3. From Constructive Group Norms to Supportive Leadership	371.0	213	-.8	3	n/a
Model 4. From Positive Attitude Toward Creativity to Constructive Group Norms[a]	n/a	213	n/a	3	n/a
Direct Paths Added Between the Following Relationships					
Model 5. From Creative Ability to Creative Performance	3195.8	213	-2825.6	3	n/a
Model 6. From Supportive Leadership to Positive Attitude Toward Creativity	366.4	213	3.8	3	.28
Model 7. From Supportive Leadership to Creative Performance	365.8	213	4.4	3	.22
Model 8. From Constructive Group Norms to Creative Performance	366.1	213	4.1	3	.25

Note: [a] This model failed to converge after 30 iterations in the EQS program.

efficacy to T2 creative ability). Every other model specification, including extant concurrent and longitudinal paths, covariances, and constraints on factor loadings, remained the same. Thus, if we have substantial reverse causal effects between variables, adding reverse paths should significantly improve model fit. As shown in the upper half of Table 2, we tested the effects of four reverse paths independently. Since the original model was nested within each of the alternative models, the statistical significance of change in chi-square ($\Delta\chi^2$) with change in degrees of freedom was examined to determine which model better fit the data. In all four alternative models tested, none of the chi-square changes was significant, which indicated that the original model was the best fitting model.

The second set of alternative models was formed by adding direct paths between two variables that were not directly linked in the original model. The direct paths were added to concurrent paths as well as to longitudinal paths. Again, every other model specification remained the same. Thus, if there are substantial direct effects between two linked variables, adding direct paths should significantly improve the goodness of model fit. As shown in the second half of Table 2, four alternative models were identified and tested. A series of chi-square comparisons suggested that none of the added direct paths improved model fit. Thus, we concluded that the structural model displayed in Figure 2 offers a better explanation of the observed relationships among the study variables than do these plausible alternative models.

Correcting Concurrent and Longitudinal Paths

Longitudinal structural models involving panel data, such as the present one, typically produce counterintuitive signs in longitudinal coefficients. Kessler and Greenberg (1981) noted that the size of each concurrent coefficient at a follow-up period (T2 in this study) represents the combined effects of two separate sources of influence: the net effect of the change in the predictor on the outcome (longitudinal effect), and the net effect of the predictor at the subsequent period on the outcome within the same period (concurrent effect). They demonstrated that it is possible to calculate the two separate effects (the change or longitudinal effect and the concurrent effect). Using the procedure suggested by Kessler and Greenberg, the coefficients of the longitudinal paths and those of the concurrent paths at T2 were corrected in order to provide a more coherent substantive interpretation of the meaning of these coefficients. Specifically, the signs of the coefficients of the longitudinal paths were reversed to provide the estimated net effect of change in the predictor on the outcome variable. Then, the corrected (reversed) coefficients of the longitudinal paths were subtracted from the coefficients of the concurrent paths in the subsequent (T2) period to provide the net effects of the concurrent paths (Kessler & Greenberg, pp. 77-80).

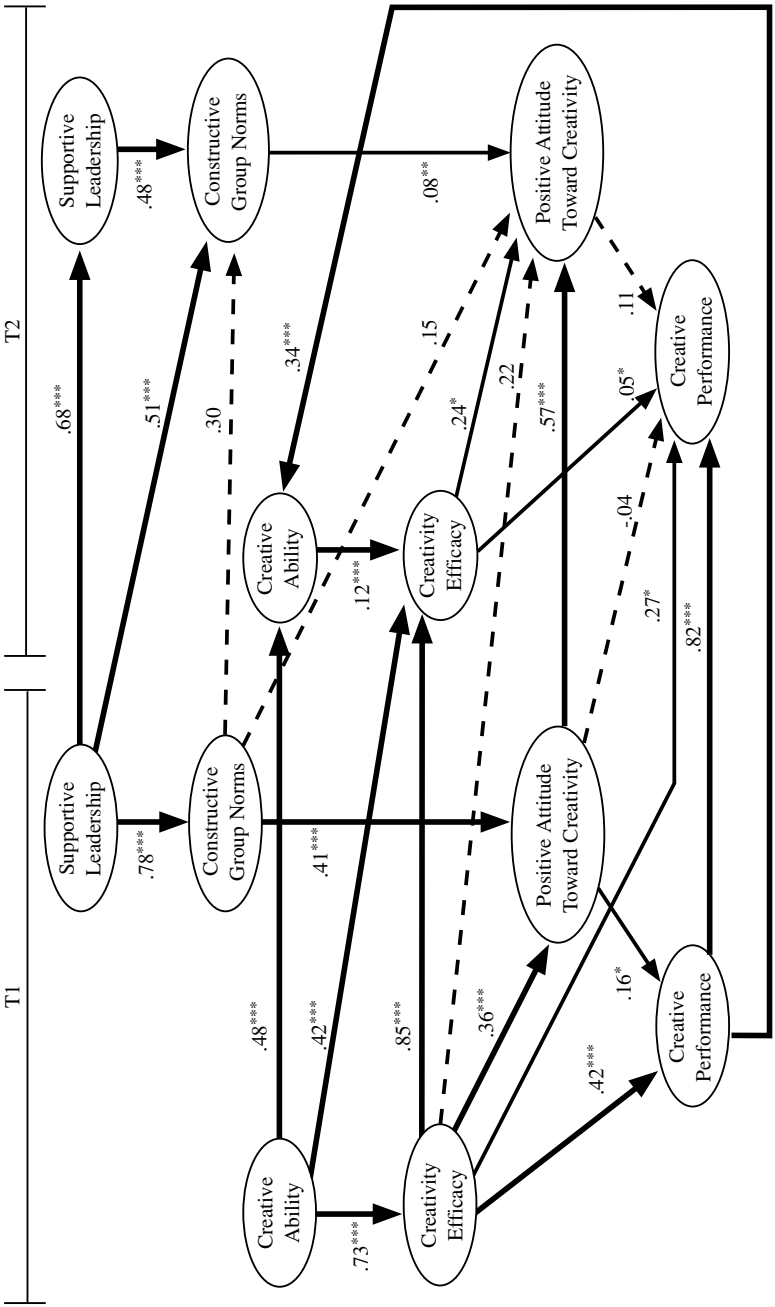

Figure 2. Longitudinal Model of Creative Performance.
Note: Thicker lines represent statistically more significant results. Dotted lines represent nonsignificant paths.
[a] Chi-Square (df = 216, N = 317) = 370.2, p < .001; NFI = .89; NNFI = .94; CFI = .95; RMSEA = .048
* p < .05; ** p < .01; *** p < .001

Figure 2 reports the structural model with corrected longitudinal and concurrent path coefficients. As might be expected, the stability coefficients of the latent variables were moderate to high (from .48 to .85, all $p < .001$), with the exception of constructive group norms ($\beta = .30$, *ns*). Confirming Hypothesis 1, creativity efficacy had statistically significant concurrent and longitudinal effects on creative performance. At both T1 and T2, creativity efficacy significantly predicted creative performance ($\beta = .42$, $p < .001$ and $\beta = .05$, $p < .05$ for T1 and T2, respectively). Moreover, the longitudinal path from T1 creativity efficacy to T2 creative performance was also significant ($\beta = .27$, $p < .05$). Positive attitude toward creativity also had a concurrent effect on creative performance at T1 ($\beta = .16$, $p < .05$), but its concurrent effect at T2 and longitudinal effect were not significant ($\beta = .11$, *ns*, $\beta = -.04$, *ns*, respectively), offering partial support for Hypothesis 2. Positive attitude toward creativity and creativity efficacy influenced creative performance in a different manner. When the above statistical figures were compared, creativity efficacy was a stronger antecedent of creative performance than attitude toward creativity.

Hypothesis 3, regarding the effect of creativity efficacy on positive attitude toward creativity was also partially supported. The results showed that only concurrent effects ($\beta = .36$, $p < .001$ and $\beta = .24$, $p < .01$ for T1 and T2, respectively) were statistically significant, while longitudinal effect ($\beta = .22$, *ns*) was not.

The results showed that creative ability influenced creative performance by shaping creativity efficacy both concurrently ($\beta = .73$, $p < .001$ and $\beta = .12$, $p < .001$ for T1 and T2, respectively) and longitudinally ($\beta = .42$, $p < .001$); therefore, the hypothesized mediation by creativity efficacy of the relationship between creative ability and creative performance was supported (Hypothesis 4).

The mediating role of attitude toward creativity (Hypothesis 5) was only partially supported: constructive group norms showed only concurrent effects on positive attitude toward creativity ($\beta = .41$, $p < .001$ and $\beta = .08$, $p < .01$ for T1 and T2, respectively), with a nonsignificant longitudinal effect ($\beta = .15$, *ns*).

As hypothesized, the effects of supportive leadership on constructive group norms were all statistically significant in the hypothesized direction for both the concurrent ($\beta = .78$ and .48 for T1 and T2, respectively, both $p < .001$) and the longitudinal ($\beta = .51$, $p < .001$) paths (Hypothesis 6 confirmed).

DISCUSSION

In this study, we used multisource, longitudinal data to examine the underlying psychological processes that explain why and how individual characteristics and social context predict individual creative performance. In general, the results indicated that creative ability and constructive group norms influence individual

creative performance through cognitive processes such as creativity efficacy and affective processes such as positive attitude toward creativity. The present analyses suggest that various individual and contextual factors promote creative performance of individuals by changing cognitive or affective states that are pertinent to creativity.

This study provides empirical evidence that creativity efficacy, defined as employees' beliefs that they can be creative in their roles (Tierney & Farmer, 2002), indeed influences individual creative performance. According to Bandura's self-efficacy theory (1997), people with high self-efficacy are more effective performers because they are confident they can perform their tasks successfully. Likewise, people with high creativity efficacy are more likely to be high creative performers because they tend to believe themselves to be creative people. Tierney and Farmer also empirically revealed that creativity efficacy was positively related to creative performance. Extending this previous finding, our analysis clearly shows that creativity efficacy mediates the effect of creative ability on creative performance.

We also found that social influence factors indirectly affect individual creative performance through their direct effects on positive attitude toward creativity. The current set of social factors, supportive leadership and constructive group norms, may increase individual perceptions of *psychological safety*, which refers to *a person's willingness to take risks within a given context* (Edmondson, 1999). Psychological safety has been identified as a key antecedent of creative effort (cf. willingness to take risks, Dewett, 2004). Constructive group norms, influenced by supportive leadership, may increase perceived psychological safety by reducing the potential evaluative threat to new ideas. As shown in the present data, this favorable situational perception seems to induce individuals' positive inclination toward creativity.

According to the results depicted in Figure 2, the path that began with creative ability and continued through creative efficacy was more significant in predicting creative performance than was the other path, which included supportive leadership, constructive group norms, and positive attitude toward creativity. One possible explanation of this pattern may be the fact that the focus of the present study was limited to the first stage of innovation – that is, creativity. Axtell et al. (2000) showed that individual and contextual factors have differentiated effects at different stages of innovation. Individual characteristics (e.g., self-efficacy) were found to be particularly important at the early stage of innovation (creativity stage), whereas contextual factors (e.g., participative safety) were more significant at the later stage of innovation (implementation stage). It would be fruitful to further investigate this stage-dependent dynamic in various social settings.

Although a rigorous research design was employed in this study, the results should be interpreted with caution due to several limitations. First, the study was focused on a relatively small set of individual and contextual predictors of creativity. Predictors not included in this study such as creative personality, empowerment, trust, amount of resources, and other organizational facilitators might have distinct psychological mediating processes such as psychological freedom (Amabile, 1996) or increased attention to improvement or change (Zhou & George, 2001). Therefore, further research is needed to examine other psychological processes as well as additional individual and contextual predictors. Second, the study was conducted in an educational setting, and thus its generalizability to other settings (such as the workplace) is not clear. Although the current hypotheses were mostly supported, the results might have been somewhat different in an organizational setting. An examination using workplace samples of the psychological mediating mechanisms observed in the present study could be carried out in future studies.

Nevertheless, in the present study we have meaningfully extended existing studies of creativity, which have been devoted principally to the direct effects of individual and contextual variables on creativity (Amabile, 1988; Redmond et al., 1993). By demonstrating proximal psychological processes that mediate the effects of those more distal predictors on creativity, in this study we have highlighted the importance of understanding the mediating mechanisms. Moreover, unlike many existing studies, in this study we have clarified the causal direction of the proposed relationships through the use of multisource, longitudinal data. The panel data collected at two time points allowed us to compare cross-sectional as well as longitudinal relationships among variables, which offers additional confidence in the present findings. All in all, with the results of this study we have revealed the causal paths of the complex relationships between several antecedents and creative performance. In addition, through the findings of the study we have enriched the creativity literature by isolating and empirically testing the effects of cognitive and affective processes underlying individual creative performance.

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