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## Feeling Creative, Being Creative: An Empirical Study of Diversity and Creativity in Teams

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*ABSTRACT: Two empirical studies explored objectively measured creative fluency and subjectively perceived creativity in cognitively diverse teams. Results indicate that cognitive diversity may be beneficial for objective functioning but may damage team satisfaction, affect, and members' impressions of their creative performance. Subjective ratings diverged greatly from more objective measures and were more closely related to affective measures. The overall findings present creativity as a complex multidimensional construct, and cognitive diversity as an important predictor of both team emotions and outcomes. Arguments are presented for the value of subjectively perceived creativity, even in the absence of more concrete performance in the immediate time period.*

The concept of creativity spans a multitude of domains from art to science to literature to business and beyond (e.g. Stumpf, 1995; Tang & Leonard, 1985; Williams & Yang, 1999). Even within any one context, researchers have long recognized that creativity can refer to person, process, product, or environmental response (Rhodes, 1961). At one count, there were well over 50 definitions to be found on this ever-expanding list (Taylor, 1988). It is easy to understand, given this wide scope, why organizations often have a difficult time capturing exactly what it is they mean when they strive for creative outcomes—or how to know when they have achieved them. Current definitions of cognitive creativity (e.g., scientific or organizational) typically describe the construct as involving “the generation of novel behavior that meets a standard of quality or utility” (e.g., Eisenberger, Haskins, & Gambleton, 1999, p. 308). Traditionally, this is accomplished through quantitative measures such as fluency, flexibility, and originality counts for brainstormed lists (Guilford,

1950; Torrance, 1969); numbers of patent applications; or citation counts among research and development scientists (e.g. Griliches, 1990; Pappas & Remer, 1985). Though these measures are undoubtedly elements of creative outcomes, they may not be an exhaustive representation. This research aims to theoretically and empirically integrate some of the traditional quantitative measures of creativity with the more qualitative aspects of creativity.

Beyond precise definitions, the word *creative* is used colloquially in many other ways as well: as a job description, as a description of positive affect, of praise, of pride, of recognition of the abilities of the self or another. When people tell you that they feel they have done creative work, it is a likely indication of satisfaction with their performance. As such, the concept of creativity spans an even larger segment of our lives than pure measurements of outcomes would indicate—it is also an interactive, socially constructed, and subjective force that shapes our perceptions of ourselves and the world around us. “Creativity is not an attribute of individuals but of social systems making judgments about individuals” (Csikszentmihalyi, 1994, p. 144), and, potentially, individuals making

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judgments about themselves. Creativity can be a positive force in organizations that allows them to progress in the ever-changing marketplace (Woodman, Sawyer, & Griffin, 1993). In addition, creativity can be important for individuals in terms of job satisfaction, fulfillment, and self-esteem.

Organizations have most often sought teams as the primary means toward harnessing the creativity necessary to remain vital and effective (Mohrman, Cohen, & Mohrman, 1995). This research focuses on perceptions of creativity based on group activities, and whether or not these perceptions relate in a reliable way to more quantitative outcomes, by asking the two-part question: How is it that perceptions of creativity arise for individuals in groups, and what kinds of outcomes do they produce? As teamwork becomes an increasingly important part of creative organizational life, it is critical for managers and scholars alike to better understand the factors that lead team members to both (a) perceive themselves and their team as creative and (b) actually produce quantifiable results. The goal of the presented research is to examine the alignment between the two specifically by exploring one characteristic of creative teams: cognitive diversity.

The field of research on creativity began as the study of an individual cognitive and personality trait (Guilford, 1950), has slowly expanded to include more dynamic, interconnected social systems such as workgroups (Kurtzberg & Amabile, 2001; Paulus, Larey, & Dzindolet, 2001) and entire organizations (Woodman et al., 1993). In the move from individual to group-level study, however, the problem of defining creativity becomes exponentially more complicated as group patterns and interactions change the cognitive and affective states and perceptions of the individual team members involved. In this article, the individual and group perspectives are reviewed, after which an alternative model of interaction is proposed for more effectively understanding group-level creative potential.

### **Creativity as a Skill**

At the individual level, creative skill has been extensively measured by creativity researchers as a personality dimension and as a cognitive dimension. Personality-wise, researchers have identified various covariates with creative performance. Oldham and Cummings (1996) summarize the set of stable charac-

teristics that relate consistently and positively to measures of creative performance across a variety of domains: broad interests, attraction to complexity, intuition, aesthetic sensitivity, tolerance for ambiguity, and self-confidence. Similarly, research on creativity as an individual cognitive skill has described the trait as both inherent in the individual and distinct from other forms of intelligence (Cox, 1926; Wallach & Kogan, 1965).

Traditional research in this area often identifies the presence of this trait based on simple paper-and-pencil idea generation tests. However, this methodology has drawn some critical attention based on the context-free nature of “asking individuals how many uses they can think of for a brick or by requesting that they interpret a squiggle in as many ways as possible” (Gardner & Wolf, 1994, p. 49). Though there is certainly some validity to these procedures for measuring fluency and flexibility of thought, creativity in context—in the larger communal and professional systems of groups and organizations—is a more complex and interdependent construct with more room for social and perceptual influences.

When studying groups, there has been little attempt to understand what a group’s creative potential would be. Group potential cannot be independent of individual skills: It is unlikely that highly creative group products will develop without any individual capacity for novel idea generation, yet aggregation alone is not the whole story. Recent research (Taggar, 2002) has analyzed the relationship between aggregated individual personality variables (agreeableness, extraversion, and conscientiousness) and team creativity-relevant processes (citizenship, communication, involvement, feedback, conflict-handling, etc.) with group creativity, as rated by outside judges. However, although it is partially informative, this summation is not sufficient because it fails to distinguish potentially relevant differences between a team with both dramatically high and low levels of a trait and a team with all average levels. Group creative potential also needs to be defined in terms of the configuration of skills, or more specifically, the heterogeneity of skills at hand.

### **Group Creativity**

Research on creativity has demonstrated both potential benefits and potential detriments to creative

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work on the group level. On the positive side, Associative theory (Mednick, 1962; Milgram & Rabkin, 1980) describes the increased likelihood of novel ideas generated based on the associations group members will have derived from the expressed thoughts and ideas of others. In other words, statements by one may inspire new ideas in another. Contrast this with extensive research in group brainstorming that demonstrates drawbacks such as social loafing, production blocking, and evaluation apprehension (see Mullen, Johnson, & Salas, 1991) to the group creative process, to the point where nominal groups are seen to produce nearly double the quantity of interacting groups in these studies.

Yet, people consistently *perceive* creative groups to be more effective (Homma, Tajima, & Hayashi, 1995; Paulus, Larey, & Ortega, 1995) and believe that groups will help to produce higher quality ideas (Rowatt, Nesselrode, Beggen, & Allison, 1997) than individuals working alone, despite experimental evidence to the contrary. Commonly held impressions indicate that there is something beneficial about the group interaction process that is clearly not being captured in experimental studies in this area (Kurtzberg & Amabile, 2001).

As a result, it seems that we do not yet have a complete understanding of how the interactions of individuals within a group affect the process. The developing body of literature on group-level creativity largely recognizes the theoretical importance of team-member interactions (Kurtzberg & Amabile, 2001; Paulus et al., 2001; Perry-Smith & Shalley, 2003) but, in terms of measurement, tends to rely primarily on traditional quantitative measures similar to those used most often on individual creativity tasks (e.g., Gallupe, Bastianutti, & Cooper, 1991; Mullen et al., 1991). Research to date has not fully explored whether the type of outcome resulting from group creativity necessarily is, or should be, an identical copy of how we tend to quantify individual creativity, namely, through categorizations of some combination of fluency, flexibility, novelty, and usefulness (Amabile, 1996; Guilford, 1950; Torrance, 1969). This research seeks to expand our conception of group-level creativity by understanding more holistically creativity in the group context. By focusing not only on the quantitative aspects of creative production but also on the qualitative, subjective impressions of the individuals involved, we can gain a richer understanding of how creativity plays a role in our everyday working lives.

## Creativity and Diversity

Previous research has indicated that, when faced with complex tasks, groups fare better when they are heterogeneous in nature. Complex tasks require a variety of skills and perspectives to execute well. Research has shown that having variety in terms of functional background, education, company tenure, and knowledge is known to have some positive effects on group decision performance (Hambrick, Cho, & Chen, 1996; Paulus, Brown, & Ortega, 1999; Simons, Palled, & Smith, 1999). There is no doubt that creativity, as a group outcome, is both complicated and elusive. Research has shown that there are links between some forms of diversity and creativity (see Milliken & Martins, 1996), primarily achieved by having a variety of opinions or perspectives in the group. For example, Rubenson and Runco (1995) have stated that “while flexibility of thinking and knowledge are both needed ... they need not be present in the same individual. What is necessary is that they both be present within the group” (p. 234). This can lead the group toward more original (Van Dyne & Saavedra, 1996), more divergent (Nemeth, 1986), and more complex (Gruenfeld, 1995) group products.

Diversity has been studied extensively through the use of teams whose members are more or less similar to each other on various dimensions. Results demonstrate that a large number of characteristics about individuals may affect the group’s processes and performance. Milliken and Martins (1996) have listed 14 different attributes potentially affecting group outcomes on which individuals differ: race/ethnic background, nationality, gender, age, personality, cultural values, socioeconomic background, educational background, functional background, occupational background, industry experience, organizational membership, organizational tenure, and group tenure. That being said, the vast majority of these dimensions are most likely clues that other, more cognitive, differences exist among teammates. Few would argue that it is actually the birth-year of an individual or the color of his or her skin that causes increased performance in a team, although Cordero, DiTomaso, and Farris (1996) found that racially balanced heterogeneous diverse teams produced more patent applications. Instead, one of two underlying mechanisms is most likely operating to create the performance differences we observe: differences in knowledge bases and differences in the

cognitive processes that people employ to accomplish their tasks. Cordero et al. (1996) present the idea that differences in race, for example, most likely provide a proxy for both different knowledge perspectives and different cognitive approaches to work. Previous research has yet to disentangle these two mechanisms.

Based on the previous discussion, creativity and groups researchers alike seem to agree that heterogeneity is the key to any group potential on a complex task; however, the question remains about what kind of heterogeneity is the best measure of that potential. Creativity, especially in groups, is primarily a thinking problem, which can benefit from an effective problem-solving process (see Kurtzberg & Amabile, 2001). Different approaches to solving problems, therefore, may be the mechanism in question for how diversity affects these tasks. This research explores the assertion that heterogeneity of individual problem-solving approaches is a more appropriate and more objective measure of group potential than simple heterogeneity on other dimensions. Traditional measures all too often conflate the knowledge that individual group members have (“what you know”) with the processes that people utilize (“how you do it”). Though other measures of diversity are no doubt valuable, they lack the specificity to identify whether variation in the knowledge bases or the processes used in the team are the key to their successes. The use of a measure that focuses on the tendency toward a particular process, or problem-solving approach, will allow for a more essential measure of one of these two dimensions.

Though an ideal measure could effectively track *both* the knowledge and the process dimensions, the proposed separation has three distinct advantages. First, focus on the process gets closer to the idea of creativity as a cognitive capacity and not based on specific knowledge, so we can understand the cognitive concept of group level creative potential as separate from any one set of knowledge. Second, it allows for a measure on the group level of analysis entirely, as it is not an aggregate of individual skills, but rather, is representative of the heterogeneity of the group — a fully emergent property of the group. Finally, this measure will help us connect the team-level properties and outcomes (the heterogeneity and the quantitative outcomes of the team) with the individual perceptual outcomes (affect and subjective creativity measures).

Having team members approach and solve problems in a variety of ways is likely to result in more

ideas being presented, considered, and combined, and is thus more likely to contribute to creative outcomes. As described above, ideational fluency is certainly one antecedent to creative outcomes, though perhaps not the only one. In terms of Kirton’s Adaptation-Innovation (KAI) theory (Kirton, 1989), individual problem solving approaches can be more focused on unstructured, broad, and idea-generation processes (termed *Innovators* in this theory), or incremental, highly-structured, process-oriented approaches (termed *Adapters*). Based on the above, effective group creative performance may need heterogeneity in terms of both generators (Innovators) of ideas and codifiers and organizers (Adapters) of ideas. This dimension provides a good theoretical tool for studying group creative potential because it is not tied to content or context, not representative of previously-held knowledge, not related to any one traditional measure of diversity, and yet is still descriptive of the relevant inputs that individuals bring to the creative group. Based on this, hypothesis 1 posits that the heterogeneity in problem solving approaches will be an effective predictor of increased ideational fluency, which in turn can lead to increased creativity.

- H1: Groups with heterogeneous problem-solving approaches will collectively generate more ideas than will their more homogeneous counterparts.

### Diversity and Affect

Members of homogeneous teams, by definition, have something in common with each other. Years of social psychological theory development and research have told us that we are attracted to others who are similar to ourselves in some way. We like them more (Newcomb, 1961), are more willing to share resources with them (Tajfel, et al. 1971), are more likely to trust, and, indeed, even to respect the decisions and business sense of others who are like us (Darr & Kurtzberg, 2000). Similarly, research has shown that culturally homogeneous groups have more equality of participation (Oetzel, 1996). Indeed, group homogeneity is thought to be linked to decreased absenteeism and turnover, and facilitates the formation of positive attitudes (Jackson, et al. 1991). Common cognitive styles, or problem-solving approaches, may also provide the

basis for such an attraction, as is proposed in hypothesis 2.

A more careful examination of the previous findings on diversity in teams reveals that what appears to be a discrepancy—sometimes homogeneous and sometimes heterogeneous teams seem to excel (Rodríguez, 1998)—is actually a result of the use of different kinds of outcome measures. Homogeneous teams seem to excel at more emotional outcomes such as trust, liking, and positive attitudes, and heterogeneous teams seem to excel at more performance-based outcomes such as originality, complexity, and decision performance. In fact, some studies have demonstrated the potential drawbacks of heterogeneity in terms of the cost on team cohesiveness and affect (see Milliken & Martins, 1996), increases in emotional conflict (Pelled, Eisenhardt, & Xin, 1999), as well as the increased likelihood of employee turnover (Jackson et al., 1991; Wagner, Pfeffer, & O'Reilly, 1984). Cordero et al. (1996) have also recognized that although racially balanced groups appeared to be more productive, both the job satisfaction and the intent to remain in the team suffered in these conditions. These authors describe the psychological discomfort that can result from being in a heterogeneous setting (DiTomaso, Cordero, & Farris, 1996). This discrepancy again indicates the need for finer distinctions to be made in terms of categorizing successful creative teams.

H2: Members of cognitively homogeneous groups will have greater levels of team cohesion and positive affect than will their heterogeneous counterparts.

Is it possible to have these two sets of mechanisms at work in the same groups? Could there exist such a discrepancy between the way the group feels and the way they actually perform? Previous research indicates that this is indeed possible, even likely, for groups. First, research has demonstrated that positive emotions can lead to assumptions of positive outcomes, whether or not these outcomes are objectively verified. Gladstein (1984) found that sales teams' impressions of their effectiveness as a team were based primarily on their communication and trust within the team, although these factors had either no effect, or a negative effect, on actual sales performance. Indeed, it does seem possible for groups to be misled about their

effectiveness based on their positive affective experiences. This is consistent with findings on the mood congruency bias (Bower & Forgas, 2000), which has demonstrated that people tend to evaluate themselves and their environments in ways that are consistent with their current moods.<sup>1</sup> Based on these results, hypothesis 3 posits:

H3: Positive affect will lead group members to perceive higher levels of creativity.

These findings also imply that people may not have accurate perceptions of their own performance. Gladstein (1984, p. 511) concludes that individuals appear to have "implicit models of how certain modes of group process should benefit performance and attribute good outcomes to the group when the appropriate process has been instituted." In fact, the true predictors of actual performance in those data were factors such as market growth and participants' experience levels, instead of the teams' interactions. Harris and Schaubroeck (1988) have also demonstrated that individual perceptions of performance may diverge from more objective measures in a meta-analysis that showed that although peers and supervisors agreed on their ratings of any one individual, that individual's own ratings of themselves diverged from both external assessments. Likely, those individual ratings were related to another, more experiential, variable such as affect.

Finally, it is important to elaborate on why perceptions of creativity and positive affect are critical organizational outcomes, even if independent from more traditional "bottom line" measures. Internal feelings of creativity can drive extraordinary behaviors in many ways. For one, there is ample evidence that when one is instructed to "be creative," creativity on more objective measures rises accordingly (Eisenberger et al., 1999). Therefore, when one maintains a self-image of creativity, this can potentially translate into higher levels of realized creative performance as individuals "instruct" themselves to be creative to live up to this image, and thereby avoid psychologically uncomfortable feelings of inconsistency (Dillehay, Insko, & Smith, 1966).

<sup>1</sup>Of course, it is also possible that moods, both positive and negative, can influence actual creative performance and not just perception. Indeed, there is previous research supporting each of these ideas (e.g. George & Zhou, 2002; Isen, 1999a).

Second, traditional measures based on quantity can make it more difficult to recognize the link between ideas and creative outcomes by inflicting a potentially inappropriate time frame of observation. Some researchers have argued that ideas may not reach optimal creative potential upon inception—instead, it may take a recombinant version of several ideas in new contexts before the creativity can be actualized (Hargadon, 2002). Researchers have described creativity as “the intersection of two ideas for the first time,” or the “process of destroying one Gestalt in favor of another,” or even “translation of knowledge and ideas into new forms” (see Taylor, 1988, for a review of definitions). The dependent measures in the majority of traditional studies of creativity rely on the presence of some definitive outcome within a set time frame (see Amabile & Mueller, in press, for a review). However, in reality it is difficult to set a time limit on *when* to judge whether something is creative. Though each original idea may indeed be creative in and of itself, sometimes the creativity is not recognized as such until the idea is reconceptualized, recombined, or placed into a new context. It could be days, weeks, months, or years later that an idea finds its home within other minds and is recognized as creative.

Next, though research on this is scant at present, there seems to be a link between self-rated creativity and confidence (Satterfield & Muehlenhard, 1997) such that confidence-destroying experiences can lead to lesser perceptions of one’s own creativity or, presumably, the opposite: positive associations between high levels of confidence and self-perceptions of creativity. Generally, people perceive creativity to be a positive end (Seligman & Csikszentmihalyi, 2000) and may feel more satisfied with their work and themselves when they feel that they have been creative. Positive affect has been associated with more creative thoughts in terms of divergent thinking (Isen, 1999a) by allowing for cognitive access to a more rich, diversified set of ideas triggered by positive associations (Isen, 1999b). Thus, creative feelings and positive affect may in turn lead to more openness to future creative thoughts. Finally, classic research in the area of teamwork has dictated that individual perceptions and growth of individual teammates are among the key criteria for team effectiveness (Hackman, 1990; Hackman & Oldham, 1976).

In addition, feeling creative may also inspire others to see one as creative based, in part, on principles of

self-fulfilling prophecies (Miller & Turnbull, 1986; Rosenthal & Jacobson, 1968). If you believe you are creative, this theory posits, you will act in ways that encourage others to see you the same way. Being considered a creative individual or team in the workplace can provide extra attention, status, opportunity, and responsibility (Perry-Smith & Shalley, 2003). Finally, when convinced of the creativity of ideas, individuals or teams may be more willing to remain committed to seeing them through. Here, the focus again is on how the cognitive diversity of the team can influence both these perceptions of creativity and the performance of the team.

### Overview of Experiment

This project engaged two samples in two alternative settings—one in an experimental setting and one in a field setting. In Study 1, groups of MBA students were created with systematically varied compositions to explore (a) the relationship between diversity and objective performance and (b) the relationship between objective performance and subjective creativity. In Study 2, the diversity and team member’s perceptions of individual affect and creativity were explored in a more natural field setting with teams engaged in ongoing work products within organizations. The two methods and results sections are followed by an overall discussion section.

### Study 1

#### Method

**Participants.** Three hundred fifty seven individuals in 119 teams of three people each participated in this study as part of a business school course in negotiations. The population from which these students were drawn was 32% female, 26% minority, and had an average age of 28.7 years. Teams were constructed randomly other than to ensure that no team was entirely composed of all men, all women, or all minority students.

**Procedure.** Participants were divided into two groups, *Adapters* and *Innovators*, based on a modified median split of their KAI scores. Approximately 5% of

scores on either side of the median were eliminated from this study to provide a clearer distinction between Adaptive and Innovative scores (original number of participants = 375). The 33-item KAI instrument (sample items: “How easy/difficult is it for you to present yourself, consistently, over a long period of time, as a person who proliferates ideas? A person who is methodical and systematic?”) has demonstrated reliability and construct validity (Bagnozzi & Foxall, 1995), as well as a positive relationship with idea generation tests (Isaksen & Puccio, 1988). Teams of three were created into one of four categories: All Adaptive (all three people with scores below the median), Mixed Adaptive (two below the median and one above), Mixed Innovative (one below the median and two above), and All Innovative (all three people above the median.) Participants were not made aware of how their teams were created, and were not given feedback on the KAI instrument, or their individual score, until the last day of class.

Teams were assigned to one of two sides of a management–labor negotiation simulation, the “Adam Baxter Company/Local 190” (Valley & Medvec, 1996). All participants on the same team received identical information about their side of the case and were given between an hour and a half and two hours to work together to prepare their side of the negotiation. Teams were instructed to design a scoring system to aid their upcoming negotiations, which primarily required them to delineate all of the issues that they considered relevant to the upcoming negotiations based on the “fuzzy” situation presented to them (Crabbe, 1990).

**Objective performance.** The objective performance of the brainstormed lists of issues was established using a fluency measure. Each relevant idea, barring duplications, was counted as a separate point. Fluency, or quantity alone, is the primary dependent measure in a large number of studies on psychological creativity (e.g., Oxley, Dzindolet, & Paulus, 1996; Valacich, Dennis, & Connolly, 1994). Two coders agreed on these counts nearly unanimously (they arrived at the same number in 99% of the cases) and the small number of disagreements were discussed until consensus was reached. It is important to note that the fluency measure was related to flexibility and originality measures, as has been shown in previous research (Kurtzberg, 1998), as teams unanimously listed the

same ideas as the first five in their work (those that were listed in the case), and then branched out into more flexible and original ideas from there, creating a high degree of correlation between fluency, flexibility, and originality counts. However, it should be recognized that although fluency is thought to be a predictor of creativity, it is not a criterion of it, and, thus, the objective performance measured here is limited to claims about an antecedent of creativity and not creativity itself.

**Subjective perceptions.** A sub-sample of 72 individuals was given a survey to complete after they had worked with their teams on this project. They were asked to self-rate, among other things, their feelings about their teamwork and the creativity of the scoring system that they had developed in their group work on 7-point scales ranging from 1 (*not at all true*) to 7 (*very true*).

**Perceived creativity rating.** Three items from the questionnaire together comprise the creativity scale: (a) “We were insightful in our work,” (b) “I felt like we were innovative in our thinking,” and (c) “Overall, I think our scoring system was creative” (Cronbach’s  $\alpha = 0.83$ ). It is important to note that in these data, team members did not agree with each other on their ratings of the team’s creativity, providing initial evidence on the individual subjectivity of these ratings. This means, however, that analyses in this section were conducted on an individual level.

**Positive affect.** The scales for positive affect and cohesion were combined in this data set because of the strong relationship between them ( $r = .63, p = .00$ ). A 6-item scale for positive affect was thus created from items concerning the equality of team member contribution, how well the team worked together, team cohesion, smooth process, positive mood, and enjoyment (Cronbach’s  $\alpha = 0.92$ ). Other items on the questionnaire were masking questions to disguise the intent of the study. These items did not relate significantly to any of the variables of interest for this study.

## Quantitative Results

An ANOVA was used to determine if the groups were statistically different from each other on the number of issues that each group type established (see Ta-

**Table 1.** Means, Endpoints, Standard Deviations, and Correlations for All Study 1 Variables

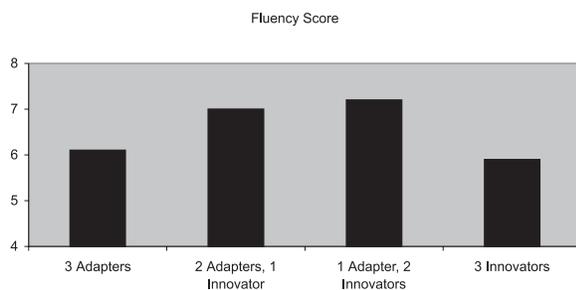
Variable	M	Min	Max	SD	1	2	3	4
1. Range of KAI scores	23.10	6.00	48.00	14.47	—			
2. Objective fluency score	6.68	3	15	2.39	-.33*	—		
3. Perceived creativity scale	5.08	2.33	7.00	1.11	-.101	.089	—	
4. Positive affect scale	5.27	1.67	7.00	1.15	.042	.089	.64***	—

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

ble 1 for descriptive statistics). The overall ANOVA was not significant ( $F = 1.77, p = .15, n.s.$ ). Next, a test of orthogonal contrasts (values  $-1, 1, 1, -1$ ) pitting the two types of homogeneous teams (all Adaptive and all Innovative) against the two types of heterogeneous teams (mixed Adaptive and mixed Innovative) was used. This test demonstrated that the heterogeneous teams produced significantly more ideas than did the homogeneous teams ( $t = 2.24, p = .027$ ). The two homogeneous types of teams (all Adaptors and all Innovators) were statistically indistinguishable from each other in terms of the number of ideas generated, and so were the two heterogeneous types of teams, providing support for H1, which predicted heterogeneous superiority in this direction (see Table 2 and Figure 1).

**Table 2.** Number of Issues Delineated by Group Type: Means and Standard Deviations

Group Type	Mean Fluency Score (Objective)	Standard Deviation
3 Adapters	6.1	1.6
2 Adapters, 1 Innovator	7.0	2.1
1 Adapter, 2 Innovators	7.2	2.9
3 Innovators	5.9	2.4



**Figure 1.** Mean objective fluency score by group diversity type.

### Subjective Creativity Results

Of primary interest in this study was the relationship between the creativity rating scale and the fluency coding of the scoring system (for those individuals who completed the survey only.) As predicted, there was no significant correlation between these two sets of ratings ( $r = .089, p = .456, n.s.$ ), indicating that individuals' ratings of their team's creativity did not relate at all to the objective coding of the team's work. In other words, an individual who rated his or her team's work as highly creative was just as likely to be on a low-performing team as a high-performing one, in terms of the more objective fluency measure. Instead, the self-rated creativity scale related more strongly to the positive affect scale, ( $r = .64, p = .00$ ), providing some support for H3—positive feelings will lead to perceptions of high performance.

## Study 2

### Method

**Participants.** The data for this study were collected as part of a multi-year, longitudinal study known as the Team Events and Motivation Study.<sup>2</sup> Participants were 237 individuals on 26 teams in seven different organizations in three different industries (chemical/pharmaceutical, high-tech, and consumer products). Team size ranged from 3 to 20 people per team, and teams were studied for an entire project or project phase from start to finish. The length of time that each team participated in the study ranged from approximately 6 weeks to nearly 9 months. The average age of participants was 38.2 years, with an average of 7.7 years of experience with the current employer,

<sup>2</sup>Data were collected primarily by Teresa Amabile under the Division of Research at Harvard Business School.

and an average of 9 months with the current project team. The sample population was 24% female. Teams were identified by each company's CEO as teams where creativity was important for their work, and then participating teams voluntarily agreed to take part in the study.

**Procedure.** Team members were initially given a series of personality and cognitive style assessments, which included the KAI Inventory. Process data were collected using the Electronic Event Sampling Methodology, which collected information about all types of specific events that might influence team members' daily work and subsequent outcomes on their projects (Amabile, Weinstock, Whitney, Fallang, & Miller, 1997), using an e-mail form called the Daily Questionnaire (DQ). Team members rated both their own work and their team's work on their projects daily by responding to Likert-type scale questions on topics such as their own creative performance, their team's creative performance, their impressions of the team's unity, and their impressions of the importance of the work and events that occurred that day. Response rates on the DQ averaged 75%.

**Diversity.** The diversity of the teams was explored in two ways: (1) using the range of KAI scores on the team and (2) using the standard deviation of KAI scores on each team. Eighty-five percent of the teams naturally fell in what would have been the "mixed Innovative" condition from Study 1, and the other 15% fell in the "mixed Adaptive" condition. In other words, there were no purely homogeneous teams in this data set, but rather teams with greater and lesser degrees of variation on this KAI-based diversity dimension.

#### **Perceived creativity, affect, and team cohesion.**

Individual daily questions that asked the team members about their perceived creativity, affect, and team satisfaction were combined into scales on each of these topics. The perceived creativity scale came from three items: "Based on the team's work on the target project today, I felt the team was creative/I did creative work/I felt imaginative" (Cronbach's  $\alpha = 0.89$ ). Again here, the high level of intercorrelation between the affect and the cohesion scales ( $r = .60, p = .00$ ) led to the creation of one overall scale with 7 items, "Today, overall, I felt happy/energetic/challenged," along with the items for

"Based on the team's work on the target project today, I felt satisfied with the team/the team worked well together/I enjoyed my work/I was frustrated with the team (reverse coded)" (Cronbach's  $\alpha = 0.88$ ). To remain consistent across study, results are presented at the individual level as well here, instead of the team level.<sup>3</sup>

## **Results**

As opposed to the results seen in Study 1 for objective performance, the range of KAI scores (see Table 3 for descriptive statistics) in this data set was negatively correlated with the perceived creativity scale ( $r = -.19, p = .004$ ). The range of KAI scores was also negatively related to how positive team members felt ( $r = -.27, p = .00$ ). Similar patterns were observed using the standard deviation as the measure of diversity on teams, although the findings were more modest using this measure ( $r = -.11$  and  $-.17, p$  values of  $.09$  and  $.01$  respectively). This provides support for H2, which predicted that more homogeneous groups would surpass more heterogeneous groups on affective measures. And, as expected, affect related strongly and positively to the perceived creativity scale ( $r = .73, p = .00$ ). This provides additional partial support for H3, which predicted that positive feelings would lead groups to perceive their outcomes as high.

To help identify the causality of this relationship (whether affect caused the perceptions of creativity or vice versa), affect was explored as a possible mediator (Baron & Kenny, 1986) between diversity and creativity ratings. A statistically significant relationship emerged demonstrating that positive affect mediated the relationship between KAI range and daily team creativity ratings. Both the range of KAI scores and the affect scale were significantly related to the perceived creativity scale (see Models 1 and 2 in Table 4), as well as being significantly related to each other, as described above. Finally, when the mediating variable (the affect scale) was added to the regression equation predicting perceived creativity, it reduced the effect of the independent variable (diversity) to nonsignificance (see Model 3 in Table 4). This indicates that the portion of variation being explained by the range of KAI scores

<sup>3</sup>Variance components analysis revealed that team membership accounted for approximately 7% of the variance in the positive affect scale and 3% of the variance in the creativity scale.

**Table 3.** Means, Endpoints, Standard Deviations, and Correlations for All Study 2 Variables

Variable	M	Min	Max	SD	1	2	3	4	5
1. Team size	9.51	3.00	20.00	4.37	—				
2. Range of KAI scores	44.04	15.00	77.00	14.88	.42***	—			
3. Standard deviation of KAI scores	26.58	5.70	50.1	9.71	.39***	.40***	—		
4. Perceived creativity scale	3.95	1.50	6.60	0.82	-.06	-.19**	-.11	—	
5. Perceived affect scale	4.52	2.59	6.76	0.66	-.18**	-.27***	-.17*	.73***	—

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

**Table 4.** Regression Results Predicting Ratings of Perceived Team Creativity as a Function of Diversity and Affect

Values Displayed:			
B (standard error of B) Beta	Model 1 Affect	Model 2 Diversity	Model 3 Affect and Diversity
Affect	.91*** (.056) .73	—	.91*** (.058) .73
Diversity	—	-.011** (.004) -.19	.00073 (.003) .013
N	236	236	236
R <sup>2</sup>	.53	.035	.53
F	267.2	8.42	133.11

\*\* $p < .01$ . \*\*\* $p < .001$ .

is not independent of that explained by the affect ratings. This pattern of results provides stronger support for H3, that positive affect will lead to perceptions of increased performance.

### Discussion

The hypotheses were largely supported in Studies 1 and 2. Study 1 demonstrated that heterogeneous teams outperformed their homogeneous counterparts on a divergent-thinking fluency task, and that the objective and the subjective ratings of team creativity were not necessarily consistent; indeed, group members' own ratings of their creativity were statistically unrelated to more quantitative and objective measures, but instead were related to the measure of affect. Study 2 showed that more heterogeneous teams on this cognitive thinking dimension rated themselves as *lower* on both affect and creativity. Affect, in turn, related positively to the creativity ratings themselves. In addition, affect was shown to mediate the relationship between diversity and perceptions of creativity. Taken together, a picture

emerges of cognitively diverse teams with some advantages (greater diversity is related to a greater number of ideas) and some disadvantages (greater diversity is related to lesser degrees of positive affect and self-rated creativity).

### Creativity and Positive Affect

The pattern of results provides some insight into the question of what makes people *feel* as if they've been creative. It is not the case that participants uniformly rated themselves as highly creative, to blindly present themselves in the best possible light. Instead, impressions of creativity are clearly variable—and are systematically related to elements of the social and emotional context of the individual and the team context. Thus, in addition to better performance, relationship, and commitment (Pelled & Xin, 1999; Staw, Sutton, & Pelled, 1994), positive affect may also encourage feelings of creativity.

It is also possible that feeling creative can, in turn, inspire positive emotions. Given the strong association between these two constructs, they may mutually af-

fect each other. And although not directly demonstrated in these data, it is possible also that the positive feelings will indeed translate into tangible creative outcomes for organizations at some point for the reasons discussed above. This is consistent with previous research about the astonishing effects of positive affect on individual and team performance (Isen, 1999b; Seligman, 2000). Although perhaps more complicated to track and measure, future research can attempt to explore the more observable long-term ramifications of positive perceptions of creativity on production.

Similarly, it may be the case that a bad day, or a bad feeling among team members, may cloud perceptions so severely that true creativity goes unrecognized. The Study 2 results indicate that large amounts of cognitive diversity in a team can inspire just such bad feelings as well as a lack of feelings of creativity. Interestingly, this is consistent with what Kirton (1989) would likely have predicted based on the theory behind the KAI scale. A larger range of scores indicates that individuals will approach problems from very different perspectives, and the further apart the scores are on a given team, the more frustrating it may be for individuals to work together.

### Feeling Creative and Being Creative

Also of value for building a theoretical framework on affect and creativity is the finding that perceptions of creativity don't necessarily bear any relationship to more objective measures of fluency at a single point in time. The Study 1 survey data suggest that perceptions of creativity are indeed only loosely tied, if at all, to these more quantitative and objective measures.

It is possible that when we ask people about their creativity, particularly in the team setting, fluency is not the most salient measure. Instead, some more complicated interaction involving the team dynamics, the work process, and the resulting products may combine to create a holistic judgment of creativity. It may be that each of these elements does indeed influence creativity, and as such, it may be worthwhile to rely on individual impressions of creativity, even in the absence of a precise quantifiable result. Although having a multitude of ideas generated for consideration does serve as an antecedent of creativity, these other, less tangible elements may also be critical for successful end products.

Creativity is clearly a multi-dimensional construct with both objective and subjective elements. Too often people assume a common understanding of the term, when in actuality, as demonstrated above, individuals' impressions of their creativity do not always agree with the more objective system defined by a half-century of research on this topic. As past research has demonstrated, individuals and teams perform more successfully when the goals of the work are well established and clear at the outset (Weldon, Jehn, & Pradhan, 1991). Creative goals should be no exception to this wisdom; if anything, it may be more important to spell out the desired outcome because individual opinions on what makes something creative may diverge. Of primary importance is the need to be clear on what is meant by creativity in organizations.

Given that this research was done entirely with individuals working in project teams, we do not know whether or not the observed affect-to-creative-perception link is particularly inspired by being on a team or not. In other words, it may be the case that the kind of affect that was measured in these two studies was particularly generated by team interaction, and more general, individual feelings of positivism may not translate as directly into feelings of high creativity. What we do know is that at least some forms of team composition seem to inspire affective reactions that can in turn influence perceptions of creativity.

### Cognitive Diversity and Creativity

Cognitive diversity seems to act in ways that are consistent with other kinds of diversity: Although there may be benefits to heterogeneity for certain task-outcomes, the emotional well-being of the team members may suffer in the process. Being on a heterogeneous team seems to be hard work—and seems to take its toll on the emotions and the satisfaction of the team members. There are a number of plausible explanations for why heterogeneous teams outperformed their homogeneous counterparts in Study 1, including the presence of a wider variety of skills and presence of a minority influence (Nemeth, 1986), because each heterogeneous team in this study had at least one member with an opposing cognitive approach.

In sum, the Study 1 findings indicate that there may well be an optimal combination of creative talent on a team, and that trying to maximize the creativity on any one team by having every person be highly creative

may not be the most effective way to optimize creative performance. Indeed, previous research has shown (Kurtzberg, 1998) that having one creative member of a negotiating dyad can reap as much benefit for the pair as having two highly creative individuals. This is consistent with the psychoeconomic theory presented by Rubenson and Runco (1995) that advocates an optimal degree of heterogeneity in teams for the greatest degree of creative functioning. Clearly, there are important interactive dynamics stemming from the cognitive diversity of team members that are affecting the team's interaction and creative production.

Finally, results indicate that having extreme highs and lows on one team is not at all the same as having all middle-range scores on a team. Thus, both perceptual and quantitative measures do not appear to be additive in this way. The results using the standard deviation as the measure of diversity in Study 2 yielded similar, but less strong, results than did using the endpoint data (and, as an aside, tests using the average score yielded no results at all). Regardless of team size, it seems that having extreme differences in cognitive styles on a team has an important impact on the affect, and perceived creativity, of each team member.

#### **Comparing Field Data With Experimental Data**

One important difference between the studies is the fact that the Study 2 participants engaged in real projects, with real deadlines, real pressures, and real consequences if things did not get accomplished. Study 1 participants may have had a much lower sense of urgency about their project because their assignment was specifically created as a learning experience for them and there was no lasting consequence for poor performance, beyond the potentially negative effect on their course grade. The pressure that Study 2 participants experienced may have magnified the tensions that they felt in their teams and may have affected their impressions of their overall work.

It is also possible that creativity really did suffer for the heterogeneous Study 2 teams as a result of the real circumstances in which they operated, and this wasn't just a biased perception. For example, Study 2's complex long-term projects may have required clear ongoing communication and cooperation between team members, which may have diminished as diversity in-

creased. The shorter task in Study 1 might have been more resistant to these effects, allowing teams with greater diversity to capitalize on the benefits of multiple perspectives and styles more effectively, given their more limited time frame. However, other research has shown that the negative effects of diversity tend to diminish over time, as team members get to know each other's work styles, and work out their "creative differences" (Watson, Kumar, & Michaelson, 1993).

It may also be the case that the particular task used in Study 1 contained elements that required separate skills at which each Adapters and Innovators tend to excel. This would clearly provide a benefit to teams with some of each type of member. Creative diversity, therefore, may allow for higher performance with some tasks than with others.

#### **Implications and Future Research Directions**

Given that many modern organizations use project and problem-solving teams and also strive for creativity from their employees, there are several valuable lessons to be learned from this research. First, selecting team members for creative products might not be as straightforward as choosing the best original or divergent thinkers in the organization and putting them together on one team. Even the creation of novel end products requires a good deal of other steps, beside the initial insight, before any idea is usable. Other types of cognitive skills, including synthesis, organization, procedure, or even political savvy and network access (Perry-Smith & Shalley, 2003), can encourage the success of an idea. Understanding the steps toward a successful end product can help clarify the staffing needs of the team.

Finally, although diversity can be beneficial, it may also come with a cost in terms of the experiences and perceptions of the team members. Having clear goals may alleviate some of this problem inasmuch as individuals can potentially recognize their successes as independent from their emotions. There may be, however, additional real costs to the individual employees in terms of motivation and commitment to their teams and their jobs if diversity issues cause too much strife in teamwork.

It would be useful for future researchers to tease apart the relationship between the individual and the group level affect that potentially results in positive

perceptions of creativity. Future research can also examine the link between feelings of creativity, emotion, and satisfaction with the “creativity-relevant processes” previously demonstrated in teams: team citizenship, performance management, effective communication, involvement, feedback, and handling of conflict (Taggar, 2002).

Overall, previous research has demonstrated that diversity in organizations must be actively managed to avoid potential negative consequences. This research extends this conclusion by adding creative teamwork as an area where cognitive diversity can be both potentially beneficial and problematic.

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