WHEN AND HOW DIVERSITY BENEFITS TEAMS: THE IMPORTANCE OF TEAM MEMBERS' NEED FOR COGNITION

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In a study of 83 teams from eight organizations, we examined team need for cognition—the tendency to engage in and enjoy effortful cognitive endeavors—as a moderator of the relationships between both age diversity and educational specialization diversity, and elaboration of task-relevant information, collective team identification and, ultimately, team performance. Age and educational diversity were positively related to these outcomes when team need for cognition was high, rather than low. Both the elaboration of task-relevant information and collective team identification mediated a moderating effect of need for cognition on the relationship between both types of diversity and team performance.

As organizations increasingly rely on teams to generate the solutions required for sustained business success, there has been a surge in research on how these teams should be composed to foster high levels of performance (Kozlowski & Bell, 2003). Team composition research is concerned with both the dispersion (e.g., demographic, cognitive, or personality diversity) and mean levels of team member characteristics (e.g., average team ability, expertise, or personality), although most studies have focused on either one or the other (Stewart, 2006). By influencing the range of available task-relevant resources as well as how well team members communicate and cooperate with one another, team composition is believed to have a strong impact on team performance (Bell, 2007).

Despite significant gains in knowledge regarding the effects of different dimensions of diversity and of mean levels of personality variables on team performance, considerable gaps in understanding of these phenomena remain. For example, there

seem to be no consistent and generalizable main effects of either demographic, cognitive, or personality diversity on team outcomes (Van Knippenberg & Schippers, 2007). Consequently, the research focus has shifted to identifying the conditions under which either the positive or the negative effects of diversity are more likely to prevail (e.g., Pelled, Eisenhardt, & Xin, 1999). Moreover, although meta-analyses (Bell, 2007; Stewart, 2006) have supported the usefulness of using mean levels of team member personality traits to predict team performance, variance across settings is considerable. In other words, certain personality traits may be important in some team settings, but not in others.

The two lines of team composition research, one examining team diversity and one examining mean levels of team member personality, have hitherto been mostly distinct; we argue that much could be gained by integrating these perspectives. Mean levels of team members' personality traits may influence—that is, act as moderators with respect to—whether different types of diversity have beneficial or detrimental effects on team performance. Conversely, the level of demographic and cognitive diversity in a team may constitute an important determinant of what particular personality traits may have an impact on team outcomes. A first, commendable step in the direction of combining these two perspectives on team composition research was a laboratory experiment by Homan, Hol-

FIGURE 1
Proposed Model
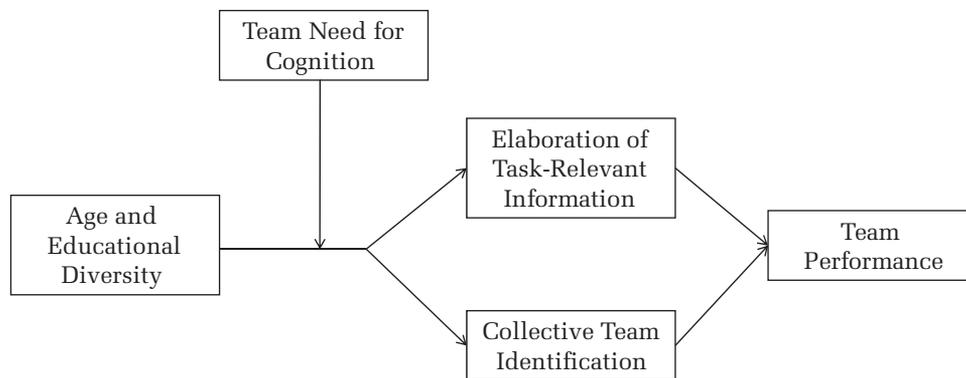
lenbeck, Humphrey, van Knippenberg, Ilgen, and van Kleef (2008). These authors found that the interactive effect of diversity salience and mean openness to experience explained differences in performance among teams that were identical in terms of gender diversity, and information elaboration mediated this interactive effect. When rewards were distributed in ways that increased gender diversity salience, mean openness to experience was positively related to team performance. This relationship was nonsignificant when reward structures emphasized a superordinate identity and thus decreased the salience of gender differences.

In the attempt to further integrate the team diversity and team personality literatures, our study builds on and extends the work of Homan et al. (2008). Importantly, our study differs from this prior research in a number of significant ways. First, Homan et al.'s (2008) lab study focused on gender diversity; we examine other diversity dimensions in real-life organizational teams. Given that different diversity dimensions may have important differential effects (Jackson, Joshi, & Erhardt, 2003; Jehn, Northcraft, & Neale, 1999), we examine age and educational specialization diversity as examples of demographic and cognitive diversity, respectively. Second, we simultaneously examine two mediating processes. Several authors have argued that the diversity–team outcome relationship can best be understood by considering both the information/decision-making perspective, which predicts positive effects of diversity, and the social categorization perspective, which posits negative effects of diversity (Van Knippenberg, De Dreu, & Homan, 2004; Williams & O'Reilly, 1998). In our model, we simultaneously consider a team process that we argue is linked to the former perspective, as well as an emergent state that we propose is linked to the latter perspective. Marks, Mathieu, and Zaccaro (2001) defined team pro-

cesses as the means whereby team members work interdependently to utilize their team resources and emergent states as team cognitive, motivational, and affective states. We examine the role of the elaboration of task-relevant information as a team process. Van Knippenberg et al. (2004) defined this variable as the exchange, discussion, and integration of ideas, knowledge, and perspectives that are relevant to a team's tasks. Moreover, we consider the role of collective team identification as an emergent state. Van der Vegt and Bunderson (2005) conceived of this construct as the emotional significance that team members attach to their membership in a team. Collective team identification reflects the motivation and commitment of the team members to overcome any disruptive tendencies spawned by dissimilarities (Van der Vegt & Bunderson, 2005). Third, we examine a different personality trait—need for cognition—which is an individual's tendency to engage in and enjoy effortful cognitive endeavors (Cacioppo, Petty, Feinstein, & Jarvis, 1996). We argue that need for cognition is a specific individual difference variable that is particularly likely to enhance the positive and obviate the negative effects of diversity.

Our main assumption is that the mean need for cognition moderates the relationship of both age and educational specialization diversity with team outcomes. We posit that, as a result of a dual effect of enhancing both the utilization of the broadened pool of task-relevant resources that diversity entails and the motivational climate to work through dissent, a high team need for cognition helps to unlock the performance potential inherent in demographically and cognitively diverse teams. Figure 1 illustrates these assumptions.

We provide a theoretical rationale for why need for cognition is a particularly important personality trait in the context of diverse teams, and we report the results of testing the posited role of need for

cognition in a field study of 83 teams that performed different types of knowledge-based tasks. Our study is aimed not only at broadening understanding of the conditions under which both demographic and cognitive diversity have either positive or negative effects, but also at shedding further light on why a diverse team composition may result in better or worse performance. By combining two thus far mostly distinct lines of research, we intend to underscore the value that studying the interaction of demographic and cognitive diversity with average team personality can add to viewing these two aspects of team composition separately. Moreover, we intend to help fill the gap identified in the diversity literature (Van Knippenberg et al., 2004) regarding the moderating role of information-processing motivation on the diversity–team outcome relationship. By focusing on a personality variable that reflects a motivational tendency that may vary depending on contextual conditions, our work could help organizational and team leaders make informed choices and take appropriate actions when assembling and managing diverse teams.

THEORETICAL BACKGROUND AND HYPOTHESES

Diversity

Diversity can be conceptualized as the distribution of differences among the members of a team with respect to a common attribute (Harrison & Klein, 2007). Commonly, a distinction is made between not directly task-related, "surface-level" diversity in demographic characteristics such as gender, age, race, and nationality on the one hand, and more directly task-related informational or cognitive diversity (in, for example, educational or functional background) on the other (e.g., Jackson et al., 2003; Jehn et al., 1999). Neither highly nor less strongly task-related diversity has been systematically linked to team performance (Webber & Donahue, 2001). Therefore, researchers have set out to identify the conditions under which different types of diversity have mainly beneficial or detrimental effects. For example, the negative effects of demographic diversity appear to diminish over time (e.g., Harrison, Price, Gavin, & Florey, 2002), and positive effects of cognitive diversity are more likely to ensue when tasks are complex and nonroutine (e.g., Pelled et al., 1999).

According to the information/decision-making perspective (Williams & O'Reilly, 1998), the broadened range of task-relevant resources (such as knowledge, skills, and perspectives) that diversity affords may enhance team outcomes. On the other

hand, however, a large body of literature within the similarity/attraction paradigm (Williams & O'Reilly, 1998) has shown that people prefer to work with similar rather than dissimilar others. Moreover, the social categorization perspective (Williams & O'Reilly, 1998) predicts that dissimilarities among team members may give rise to adverse social categorization processes that impair team functioning. Hence, theory and research are needed that explain what personality traits might simultaneously help teams tap the performance potential inherent in diversity and prevent the dysfunctional effects frequently associated with heterogeneity. We will argue that need for cognition has this dual effect in diverse teams and in turn fosters team performance in this setting.

With respect to the conceptualization proposed by Harrison and Klein (2007), we assume that both cognitive and demographic diversity can be indicative of variety—that is, differences in task-relevant resources such as knowledge, experience, and perspectives that reflect a potential for improved team performance. In this study, we focus on educational specialization and age diversity as examples of cognitive and demographic diversity, respectively. Dahlin, Weingart, and Hinds (2005) argued that differences in educational specialization are a purer indicator of informational or cognitive diversity than is functional diversity because, unlike the latter, educational diversity is not associated with membership in distinct organizational units (and their respective concerns and goals), which may cue social categorization processes. Although it is not directly task-related, we propose that age diversity, even more so than gender, ethnic, or nationality diversity, reflects potentially valuable variety in resources such as experience, perspectives, and social network ties. As does cognitive diversity, this variety may enable a cross-fertilization of ideas and a synergistic combination of resources that may ultimately enhance team performance.

The Moderating Role of Mean Need for Cognition

We posit that a high team mean need for cognition is conducive to leveraging the potential inherent in both educational and age diversity. Individuals differ in intrinsic motivation for and enjoyment of effortful cognitive activities—in, that is, their need for cognition (Cacioppo et al., 1996). Those low in need for cognition are chronic cognitive misers, whereas individuals high in need for cognition are chronic cognizers (Cacioppo et al., 1996). Persons high in need for cognition actively seek out and thoroughly process information in numerous domains; those low in need for cognition

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rely more on simple cues, cognitive heuristics, and stereotypes in interpreting situations and judging people (Petty, Briñol, Loersch, & McCaslin, 2009).

Need for cognition reflects differences in information-processing motivation rather than cognitive ability. Hence, it is only moderately related to intelligence (Cacioppo et al., 1996). By contrast, need for cognition is positively associated with, for example, attributional complexity, cognitive innovativeness, and tolerance of ambiguity (Cacioppo et al., 1996). Although the correlation between need for cognition and the broad construct "openness to experience" (Costa & McCrae, 1992), as measured by Homan et al. (2008), typically ranges between .37 and .50 (e.g., Tuten & Bosnjak, 2001),[1] the two variables have important conceptual differences. For example, some people may be particularly open to experiences that involve no thinking—perhaps precisely because these experiences do not require the expenditure of cognitive energy. Conversely, some individuals may enjoy activities that necessitate deep thinking but may not be open to other types of experiences. Thus, despite the correlation between the two constructs, each of them also uniquely predicts outcomes that are either unrelated or negatively related to the other (McCrae, 1996; Petty et al., 2009).

Different personality traits may influence the effects of team diversity. We decided to focus on a specific construct that reflects those tendencies that are directly pertinent to the experience of working in diverse teams performing knowledge-based tasks. If the elaboration of task-relevant information is indeed the main process through which diversity engenders positive effects on team performance (Homan et al., 2008), it appears sensible to focus on the dispositional motivation to process a broad range of information (i.e., the need for cognition). Moreover, team members' tendency to enjoy learning new ways to think and coming up with new solutions to problems may help curtail or even prevent negative effects of diversity. Studies showing that persons high in need for cognition are

less prone to prejudicial and stereotypical views of others than are those low in need for cognition back this assumption (e.g., Carter, Hall, Carney, & Rosip, 2006; Schaller, Boyd, Yohannes, & O'Brien, 1995).

Research has shown that whether individuals engage in an in-depth processing of information is in large part determined by their motivation to do so (Chaiken & Trope, 1999). Although this motivation has received little attention in diversity research, it is likely to be a key determinant of how well a team utilizes its pool of task-relevant knowledge bases and perspectives (Van Knippenberg et al., 2004). A high need for cognition reflects the dispositional tendency to thoroughly process a wide array of information. This tendency may be particularly valuable in diverse teams, in which the members often need to take more time to explain and try to convince their colleagues of their respective positions and to think through and discuss the options offered by the other individuals in the team. By contrast, persons low in need for cognition are more likely to view an endeavor to consider and reconcile different positions in diverse teams as tedious and annoying, as it forces them to do what they are not intrinsically motivated to do, namely, to engage in an in-depth analysis of a broad range of information. Hence, we propose that there will only be a positive relationship between diversity and the elaboration of task-relevant information when team need for cognition is high. In diverse teams with a high need for cognition, the team members enjoy learning new ways to think about problems and relish the opportunity to probe different alternatives (Cacioppo et al., 1996). By contrast, when need for cognition is low, the team members are likely to get bored or frustrated and engage in "social loafing" (Petty et al., 2009) during in-depth discussions.

In homogeneous teams, on the other hand, we do not expect need for cognition to benefit the elaboration of task-relevant information to the same degree as it does in heterogeneous teams. Henningsen and Henningsen (2004) showed that those high in need for cognition tend to focus team discussions on shared rather than unshared information. To the extent that team decisions and actions stand to benefit from a thorough consideration of different alternatives or from a combination of ideas, such behavior is dysfunctional (Brodbeck, Kerschreiter, Mojzisch, & Schulz-Hardt, 2007). In diverse teams with a high need for cognition, the risk that team members will mostly discuss shared knowledge is lower, simply because heterogeneity entails less shared and more unshared knowledge. High-need-for-cognition individuals tend to actively, elaborately, and persuasively contribute their perspec-

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[1] In a sample of 93 students at a German university, we found a correlation of .43 ($p < .01$) between need for cognition and openness to experience as measured by the 12 items of the Revised NEO Personality Inventory–short form (Costa & McCrae, 1992). It should be noted, however, that if one used the 48-item scale of the Revised NEO Personality Inventory (Costa & McCrae, 1992) and considered only the 8-item measure for the ideas facet of openness to experience, which is one of six subdimensions of the broader construct, the correlation between this subscale and need for cognition would likely be much higher (Cacioppo et al., 1996).

tives in team discussions (Petty et al., 2009). Teams can benefit from such strong contributions primarily when they pertain to unique knowledge, as is more likely to be the case in diverse teams, and teams benefit to a lesser extent when these strong contributions pertain to what all team members already know, which may be the case more frequently in homogeneous teams.

Finally, although we posit that both educational and age diversity constitute potentially valuable variety and are thus positively related to the elaboration of task-related information when team need for cognition is high, we expect different effects when team need for cognition is low. Van Knippenberg et al. (2004) argued that the association between diversity and the elaboration of task-relevant information is moderated not only by the motivation to thoroughly process information, but also by the extent to which social categorization processes impairing communication and cooperation occur. Surface-level diversity variables such as age—which may covary with important differences in interests, values, and attitudes—are more likely to trigger these adverse processes than are deep-level diversity dimensions such as educational background, which offer only weak social categorization cues (Dahlin et al., 2005). Hence, when no strong motivation to thoroughly consider all available perspectives exists (i.e., when need for cognition is low), we expect the elaboration of task-relevant information to be weakly related to educational diversity, and negatively related to age diversity. In sum, we posit:

Hypothesis 1a. Team need for cognition moderates the relationship between educational diversity and the elaboration of task-relevant information: this relationship is more strongly positive when need for cognition is high rather than low.

Hypothesis 1b. Team need for cognition moderates the relationship between age diversity and the elaboration of task-relevant information: this relationship is positive when need for cognition is high, but negative when need for cognition is low.

Negative effects of dissimilarities may prevent teams from leveraging the potential inherent in diversity. Team functioning may be impaired in educationally diverse teams by differences in jargon, interpretive schemata, and problem-solving approaches that impede communication and cooperation. Age diversity, as a not directly task-related, surface-level diversity dimension that is likely to covary with differences in values and attitudes, is even more likely to engender negative effects as predicted by the social categorization perspective (Williams & O'Reilly, 1998).

Hence, both cognitively and demographically diverse teams require a motivational climate that curtails these dysfunctional effects. We posit that high levels of collective team identification—which reflects a team's motivational climate to overcome disruptive tendencies (Van der Vegt & Bunderson, 2005)—are more likely to be exhibited by diverse teams that are high rather than low in need for cognition. Persons high rather than low in need for cognition are less likely to judge others on the basis of stereotypes (e.g., Carter et al., 2006) and form erroneous group stereotypes (e.g., Schaller et al., 1995), and they are more likely to correct their judgments for possible biases (Petty et al., 2009). Thus, a high mean need for cognition reduces the likelihood of adverse social categorization processes that diminish collective team identification and impair team functioning. In addition, diverse teams high in need for cognition may exhibit high levels of collective team identification as they offer their members a cognitively challenging task that they tend to seek out and enjoy, namely, the opportunity to learn new ways to think about problems (Cacioppo et al., 1996). Homogeneous teams offer such opportunities to a lesser extent. Moreover, despite being disinclined to do so, the members of diverse teams low in need for cognition frequently have to consider and discuss a broad range of perspectives. As they are likely to experience these endeavors as frustrating, levels of collective team identification are bound to be low.

Once again, we assume that, given a high need for cognition, educational and age diversity will have similar effects. In the case of low need for cognition, however, we expect differential effects due to the greater likelihood with which age diversity—in comparison to educational diversity—will engender negative social categorization effects. In sum, we posit:

Hypothesis 2a. Team need for cognition moderates the relationship between educational diversity and collective team identification: this relationship is more strongly positive when need for cognition is high rather than low.

Hypothesis 2b. Team need for cognition moderates the relationship between age diversity and collective team identification: this relationship is positive when need for cognition is high, but negative when need for cognition is low.

Figure 1 graphically presents our model. In it, the elaboration of task-relevant information is the team process, and collective team identification the emergent state, that together help to unlock the performance potential inherent in both educational and age diversity. The elaboration of task-relevant information enables positive effects of diversity through a leveraging of the increased range of knowledge and perspectives (Homan et al., 2008; Van Knippenberg et al., 2004). Collective team identification reflects both the motivation to work toward meeting common objectives and the commitment to overcome any difficulties resulting from dissimilarities (Van der Vegt & Bunderson, 2005). Thus, collective team identification holds promise with respect to preventing the negative effects of diversity. We argue that a high team need for cognition fosters both the elaboration of task-relevant information and collective team identification in diverse teams. As a result of this dual effect, we posit, the performance of diverse teams will be higher when team need for cognition is high rather than low. By contrast, we expect a high need for cognition to have a much lower impact on the performance of homogeneous teams. Even if such teams engage in an in-depth elaboration of information, the discussion is more likely to center on shared rather than unshared knowledge, which may not be enough to allow teams to attain high levels of performance on knowledge-based tasks (Brodbeck et al., 2007). In sum, we propose that team mean need for cognition moderates the diversity–team performance relationship and that this moderating effect is mediated by both the elaboration of task-relevant information and collective team identification.

Hypothesis 3. The elaboration of task-relevant information mediates the moderating effect of team need for cognition on the relationship of both educational and age diversity with team performance.

Hypothesis 4. Collective team identification mediates the moderating effect of team need for cognition on the relationship of both educational and age diversity with team performance.

METHODS

Sample and Data Collection

Our sample consisted of 83 teams from eight different German organizations. These organizations were engaged in the following industrial sectors: software development (18 teams), pharmaceuticals (17), insurance (12), telecommunications (11),

manufacturing (9), media and entertainment (6), food (5), and energy (5). Examples of the knowledge-based tasks performed by these teams include the development of new or the improvement of existing products and services, marketing and sales, knowledge management, personnel training, and customer services. In all teams, members had to interact several times per week and collaborate closely to meet team objectives. Each person was a member of only one team. With the permission of their immediate superiors, we contacted the team leaders and asked them to have their teams participate in our study, promising feedback in return. We collected data from three sources: The team members provided the data for all variables except team performance, which was rated cross-sectionally by the team leaders and longitudinally (six months later) by the team leaders' immediate supervisors (who were not themselves part of the teams). The questionnaires were in English, with a German translation of each question directly underneath the English original. For the German version of the questions, we followed Brislin's (1980) commonly used translation–back translation procedure.[2]

Out of 239 contacted team leaders, 89 agreed to have their teams participate (37%). We restricted our sample to teams with no more than 12 members, since our goal was to obtain data from all team members. Our final sample comprised 83 teams (i.e., 35 percent of the 239 contacted teams) from which we had received data from team leaders (83) and team supervisors (37; several supervisors rated more than 1 and up to 5 teams). For 73 of these teams, we had data from all members (496). For another 10 teams, we had data from at least 75

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[2] Recently, some authors (e.g., Tsui, Nifadkar, & Ou, 2007) have noted that a careful translation process is not enough to ensure construct validity across cultures. Despite the fact that we studied a German sample with some scales developed in other countries, we do not regard cross-cultural construct validity as a serious problem in our analysis. To a large extent, the measures we used appear to be decontextualized and not restricted in their utility to one particular culture. For example, a validated German translation of the need for cognition scale has been used successfully in several studies with German samples (e.g., Dickhäuser & Reinhard, 2006). When viewing the items of our scales, there is no obvious reason to expect that they carry a different meaning in a German context than they do in the United States. Two in-depth interviews we conducted with team supervisors who had managerial experience of at least five years both in the United States and in Germany confirmed this assessment.

percent of the members (53).[3] We excluded 6 out of the participating 89 teams because we did not receive data from the team supervisors and/or had data from less than 75 percent of the members. The 83 teams in our final sample ranged in size from 3 to 12 members (mean = 6.67, s.d. = 2.70). The mean age was 36.5 years (s.d. = 6.9), and 72 percent of the team members, 78 percent of the team leaders, and 84 percent of the team supervisors were male. Moreover, 74 percent of the team members had a master's degree level of education or higher.

Measures

Diversity. Harrison and Klein (2007) argued that the conceptualization of a specific diversity dimension should determine its operationalization. Since we hypothesized that age and educational specialization diversity constitute variety (i.e., heterogeneity regarding task-relevant resources) rather than separation or disparity (Harrison & Klein, 2007), we measured both dimensions using Blau's (1977) index of heterogeneity, $1 - \Sigma p_i^2$. In this formula, p is the proportion of a team in a category and i is the number of different categories represented on the team. Team members were asked to provide information on their age and the academic field in which they had obtained their highest degree. For age diversity, we categorized participants by five-year increments (i.e., 26–30, 31–35, 36–40, etc.).[4] The educational specialization categories for the most part reflected what would be expected in the different industries represented in our sample (e.g., medicine, pharmacology, and chemistry in the pharmaceutical industry; and business administration, computer science, and engineering in the telecommunications industry).

Need for cognition. We measured this variable with the 18-item need for cognition scale (Cacioppo et al., 1996). Participants were asked how much

each statement was characteristic of them. The response scale ranged from 1, "extremely uncharacteristic," to 5, "extremely characteristic." Sample items are, "I find satisfaction in deliberating hard and for long hours," "I really enjoy a task that involves coming up with new solutions to problems," and "Learning new ways to think doesn't excite me very much" (reverse-coded). Cronbach's alpha for this scale was .88. We conceptualized team need for cognition using an additive composition model (Chan, 1998), in which the team-level construct is the mean of the individual characteristics.

Elaboration of task-relevant information. Four items were developed based on the extant literature. These items, which had a response format ranging from 1, "strongly disagree," to 5, "strongly agree," were worded as follows: "The members of this team complement each other by openly sharing their knowledge"; "The members of this team carefully consider all perspectives in an effort to generate optimal solutions"; "The members of this team carefully consider the unique information provided by each individual team member"; "As a team, we generate ideas and solutions that are much better than those we could develop as individuals." Cronbach's alpha for this scale was .86.[5] A principal components analysis revealed that one factor with an eigenvalue of 2.93 explained 73 percent of the variance among the items. We conceptualized elaboration of task-relevant information and other variables below in line with the direct consensus model (Chan, 1998), in which individual data are aggregated to the team level based on acceptable interrater agreement scores and intraclass coefficients (Bliese, 2000). Concerning the elaboration of task-relevant information, a mean r_{wg} of .83 indicated that team members rated these items similarly. An ICC(1) of .35 showed that there was sufficient between-group variance among teams. Finally, an ICC(2) of .78 revealed a sufficient reliability of average team perceptions.

Collective team identification. We measured this variable with four items adapted from Van der Vegt and Bunderson (2005). On the same five-point scale described above (1, "strongly disagree," to 5, "strongly agree"), participants rated the degree to which, for example, members "feel emotionally attached to their team." Cronbach's alpha for this

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[3] In light of the potentially serious problems associated with incomplete sets of attribute data (Allen, Stanley, Williams, & Ross, 2007), we tested our hypotheses twice, once with the subsample of 73 teams for which we had complete data sets, and once with the sample of the 83 teams described above. Since differences were negligible, we report only the results obtained with the larger sample.

[4] The correlation between this operationalization and age diversity as measured by the coefficient of variation was .81 ($p < .01$). Since the results regarding our hypotheses did not differ, we report only those findings obtained with Blau's index, as this operationalization is more in line with our conceptualization of this diversity dimension (Harrison & Klein, 2007).

[5] In a sample of 31 three-person student teams at a German university, we found a correlation of .83 ($p < .01$) between this scale and an adapted version (using the word "team" instead of "group" and the present tense) of the scale used by Homan et al. (2008).

scale was .86. We justified averaging responses to create a team-level variable on the basis of a mean r_{wg} of .84, an ICC(1) of .25, and an ICC(2) of .69.

Team performance. We obtained ratings of four performance criteria suggested by Van der Vegt and Bunderson (2005): efficiency, quality of innovations, productivity, and overall achievement. The team leaders and the team supervisors independently provided two-item ratings of each of these criteria. However, although the team leaders rated their teams' performance in the same time period in which the team members completed their questionnaires, the supervisor ratings were collected six months later. The team leaders and supervisors were asked to compare the team they were rating with other teams that performed similar tasks. The response format ranged from 1, "far below average," to 7, "far above average." Cronbach's alpha coefficients for this eight-item scale were .73 (team leader ratings) and .79 (team supervisor ratings), respectively.

Control variables. We included several control variables that prior research has identified as associated with team outcomes. We measured *team size*, which may be related to team cohesiveness and intrateam communication (e.g., Bantel & Jackson, 1989), as the number of persons on a team. *Team longevity* has been shown to affect the salience and effects of different diversity dimensions (Harrison et al., 2002). Our team longevity measure was the average length of time the team members had been on their team (Pelled et al., 1999). We used five items adapted from Van der Vegt and Janssen (2003) to measure *task interdependence.* Levels of this variable must be high in order to be certain that one is actually studying teams rather than groups (Kozlowski & Bell, 2003). A sample item is, "The members of this team need to collaborate with colleagues to perform their jobs well" (1, "strongly disagree," to 5, "strongly agree"; α = .77). We averaged responses given a mean r_{wg} of .84, an ICC(1) of .30, and an ICC(2) of .74. *Task complexity*, which has been identified as a moderator of the relationship between diversity and team performance (Pelled et al., 1999), was measured with two items adapted from Pelled et al. (1999) (1, "strongly disagree," to 5, "strongly agree"). The items were, "The technology, required skills, or information needed by the team are constantly changing" and "During a normal work week, exceptions frequently arise that require substantially different methods or procedures for the team." The correlation between these two items was .65 ($p < .01$). We created a team-level variable on the basis of a mean r_{wg} of .86, as well as an ICC(1) of .32 and an ICC(2) of .76.

Moreover, we used Blau's index to measure *gender diversity*, *nationality diversity*, and *tenure diversity*, all of which may reflect variety (Harrison & Klein, 2007) and might influence the effects of our focal diversity variables. We used the following categories for tenure: "less than 1 year," "1–2 years," "2–5 years," "5–10 years," and "more than 10 years." Although tenure diversity in particular may constitute the same valuable variety that we posit concerning age diversity, our sample comprised many teams from young organizations as well as teams from other, more established organizations that had grown largely through acquisitions. Concerning the former, in many cases there was age diversity, but little tenure diversity. With respect to the latter, tenure diversity may not adequately capture differences in experience, social networks, and intraorganizational influence. In view of these particularities of our sample, we decided to focus on age diversity and merely include tenure diversity as a control variable. Finally, when studying mean levels of team member characteristics, it is important to control for within-team variations (Kirkman & Shapiro, 2005). We therefore operationalized team dispersion regarding need for cognition as the standard deviation among team member need for cognition scores.

Confirmatory factor analysis. We conducted a confirmatory factor analysis (CFA) to examine the distinctiveness of our scales for the elaboration of task-relevant information, collective team identification, task interdependence, and task complexity. The expected four-factor model fitted the data well (χ^2 = 174.72, df = 104; CFI = .95, TLI = .94, RMSEA = .05). Moreover, chi-square difference tests indicated that the four-factor model yielded a better fit to the data than did either a one-factor model ($\Delta\chi^2$ = 232.38, Δdf = 6, $p < .01$), a two-factor model combining elaboration of task-relevant information and collective team identification ($\Delta\chi^2$ = 91.42, Δdf = 5, $p < .01$), or other conceivable two- or three-factor models.

RESULTS

A one-way analysis of variance revealed no significant differences among organizations with respect to our focal variables (all *F*-tests were nonsignificant). We therefore used the entire sample of 83 teams to test our hypotheses. Table 1 presents the means, standard deviations, and correlations among the study variables. Neither educational nor age diversity was significantly related to team performance. Mean need for cognition was positively associated with team performance when team leaders, but not team supervisors, provided the ratings.

TABLE 1
Means, Standard Deviations, and Correlations[a]

Variables	Mean	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Team size	6.67	2.70														
2. Team longevity	0.95	0.73	.04													
3. Task interdependence	4.19	0.44	−.04	−.03												
4. Task complexity	3.05	0.57	−.02	.00	.17											
5. Tenure diversity	0.52	0.24	.20†	.00	.07	.09										
6. Gender diversity	0.36	0.16	.27*	.07	−.14	−.14	−.06									
7. Nationality diversity	0.28	0.21	.23*	.07	−.13	.01	.15	.05								
8. Need for cognition (dispersion)	0.44	0.22	.13	.03	−.10	.09	.07	−.15	−.07							
9. Age diversity	0.57	0.28	.02	−.03	.02	−.05	.22*	−.14	−.10	.21†						
10. Educational diversity	0.51	0.25	−.14	−.04	−.09	−.16	.02	−.12	.11	.07	.19†					
11. Need for cognition (mean)	3.33	0.44	−.04	−.14	.04	.18	−.12	−.05	−.11	−.11	−.01	.13				
12. Elaboration of information	3.36	0.77	−.09	.09	.00	.10	.03	−.01	−.13	−.13	−.05	.01	.27*			
13. Collective team identification	3.42	0.90	−.01	−.06	.18	.08	−.20†	−.05	.01	−.18†	−.05	.03	.39**	.42**		
14. Team performance (leader ratings)	5.14	1.18	−.07	.10	.15	.15	−.05	.13	−.19	−.22*	−.03	.11	.24*	.52**	.47**	
15. Team performance (supervisor ratings)	5.31	0.85	.09	.31**	.23*	.15	.10	.01	−.04	−.02	.06	.15	.00	.37**	.33**	.34**

[a] $n = 83$ teams.
† $p < .10$
* $p < .05$
** $p < .01$

Both the elaboration of task-relevant information and collective team identification were positively related to team performance.

Although each team leader rated the performance of only one team, 27 out of a total of 37 supervisors rated more than one and up to five teams. Thus, regarding team supervisor ratings, we had a clustered data structure in that some teams were nested under the same supervisor. Such nesting may lead to an overestimation of standard errors and reduce the level of statistical power; moreover, relationships with team outcomes may differ among supervisors (Bliese & Hanges, 2004). We therefore tested our hypotheses twice by comparing the results of hierarchical regression analysis with those obtained through random coefficient modeling (RCM). Since the results of both methods yielded similar results, we follow the approach chosen by other researchers (e.g., Van der Vegt, Van de Vliert, & Oosterhof, 2003) here and report only the results of the regression analyses.

To test for moderation, we performed separate hierarchical regression analyses with mean-centered predictor variables for the elaboration of task-relevant information, collective team identification, team performance as rated by team leaders, and team performance as rated by team supervisors. In each of these regressions, we entered the control variables in the first step, educational and age diversity as well as mean need for cognition in the second step, and the interactions of mean need for cognition with educational and age diversity in the third step. Table 2 summarizes the results. The two interactions of educational and age diversity with need for cognition explained a significant amount of variance, exceeding the variance explained by the controls and the main effects (ΔR^2s = .19, elaboration of task-relevant information; .15, collective team identification; .14, team performance, as rated by both team leaders and team supervisors; all p's < .01). Simple slope tests (Aiken & West, 1991) showed that for teams with a high need for cognition, the elaboration of task-relevant information was positively related to both educational diversity ($\beta = 0.87$, $t = 2.12$, $p < .05$) and age diversity ($\beta = 0.79$, $t = 2.03$, $p < .05$). By contrast, when need for cognition was low, the elaboration of task-relevant information was negatively associated with educational diversity ($\beta = -1.05$, $t = -2.29$, $p < .05$) and age diversity ($\beta = -1.48$, $t = -3.24$, $p < .01$). Except for the negative relationship between educational diversity and the elaboration of task-relevant information when need for cognition was low, these results, illustrated in Figure 2, are consistent with Hypotheses 1a and 1b. Results were similar for collective team identification, which was positively correlated with educational diversity ($\beta = 0.91$, $t = 2.00$, $p < .05$) and age diversity ($\beta = 1.00$, $t = 2.29$, $p < .05$) when need for cognition was high, but negatively related to both

TABLE 2
Results of Regression Analysis[a]

Independent Variables	Model 1: Elaboration of Task-Relevant Information			Model 2: Collective Team Identification			Model 3: Team Performance, Leader Ratings				Model 4: Team Performance, Supervisor Ratings			
	Step 1	Step 2	Step 3	Step 1	Step 2	Step 3	Step 1	Step 2	Step 3	Step 4	Step 1	Step 2	Step 3	Step 4
Step 1: Controls														
Team size	−.05	−.06	−.03	.08	.07	.09	−.03	.00	.02	.00	.10	.14	.16	.15
Team longevity	.10	.13	.12	−.05	−.01	−.02	.12	.15	.14	.11	.32**	.33**	.31**	.30**
Task interdependence	−.06	−.05	−.08	.16	.17	.15	.09	.11	.09	.07	.20†	.21†	.20†	.18†
Task complexity	.11	.06	.00	.08	.01	−.05	.17	.17	.12	.13	.11	.17	.12	.13
Tenure diversity	.07	.12	.07	−.23*	−.19†	−.23*	−.01	.01	−.03	.01	.08	.06	.03	.06
Gender diversity	−.01	.00	.01	−.08	−.06	−.05	.15	.17	.18†	.19†	.01	.03	.04	.04
Nationality diversity	−.15	−.13	−.09	.05	.08	.11	−.20†	−.22†	−.19†	−.19†	−.08	−.12	−.09	−.09
Need for cognition (dispersion)	−.16	−.11	−.06	−.18	−.13	−.08	−.22†	−.21†	−.16	−.13	−.04	−.07	−.03	.00
Step 2: Main effects														
Age diversity		−.06	−.12		.02	−.04		−.01	−.06	−.02		.01	−.04	−.01
Educational diversity		.01	−.03		.00	−.04		.19†	.16	.17†		.25*	.22*	.23*
Mean need for cognition		.26*	.27*		.35**	.36**		.16	.18†	.01		−.03	−.02	−.15
Step 3: Interactions														
Age diversity × mean need for cognition			.30*			.23*			.23*	.09			.23*	.13
Educational diversity × mean need for cognition			.24*			.25*			.23*	.11			.22*	.13
Step 4: Mediators														
Elaboration of information										.27*				.18
Collective team identification										.25*				.21†
R^2	.07	.13	.32	.12	.23	.39	.16	.23	.37	.48	.18	.24	.38	.44
ΔR^2	.07	.07	.19**	.12	.11*	.15**	.16†	.07	.14**	.11**	.18†	.06	.14**	.06*
F	0.64	0.97	2.55**	1.25	1.94*	3.32**	1.76†	1.91†	3.15**	4.19**	2.03†	2.01*	3.20**	3.47**

[a] $n = 83$ teams. Standardized regression coefficients are reported.

† $p < .10$

* $p < .05$

** $p < .01$

educational diversity ($\beta = -1.21$, $t = -2.41$, $p < .05$) and age diversity ($\beta = -1.24$, $t = -2.44$, $p < .05$) when need for cognition was low. Again, with the exception of the negative relationship between educational diversity and collective team identification when need for cognition was low, these findings, depicted in Figure 3, lend support to Hypotheses 2a and 2b.

Moreover, when need for cognition was high, team performance was positively related to educational diversity ($\beta = 2.06$, $t = 3.42$, $p < .01$, team leader ratings; $\beta = 1.65$, $t = 3.84$, $p < .01$, team supervisor ratings) as well as age diversity ($\beta = 1.16$, $t = 2.00$, $p < .05$, team leader ratings; $\beta = .90$, $t = 2.18$, $p < .05$, team supervisor ratings). By contrast, when need for cognition was low, team performance was not significantly related to educational diversity ($\beta = -0.62$, $t = -0.93$, n.s., team leader ratings; $\beta = -0.21$, $t = -0.44$, n.s., team supervisor ratings), but negatively related to age diversity ($\beta = -1.73$, $t = -2.56$, $p < .05$, team leader ratings; $\beta = -1.14$, $t = -2.37$, $p < .05$, team supervisor ratings). Figures 4 and 5 illustrate these results. To test whether both the elaboration of task-

relevant information and collective team identification mediated this moderating effect of need for cognition, we followed procedures outlined by Morgan-Lopez and MacKinnon (2006). Table 2 (models 1 and 2) shows that the interactions of educational and age diversity with need for cognition were significant in contributing to both posited mediators. Moreover, both mediators were significant in contributing to team performance as rated by team leaders (see Table 2, model 3, step 4). This condition of mediated moderation was not met when team supervisors provided the ratings (model 4, step 4). With respect to team leader ratings, controlling for the two mediators reduced the regression coefficients of both interactions to nonsignificant levels. The estimate of the indirect (mediated moderation) effect is the product of the path from the interaction term to the mediator and the path from the mediator to the dependent variable (Morgan-Lopez & MacKinnon, 2006). We calculated 95 percent confidence intervals derived from bias-corrected bootstrap estimates to test the significance of these indirect effects (Shrout & Bolger, 2002). A 95 percent confidence interval that ex-

FIGURE 2
Need for Cognition as a Moderator of the Relationship between Diversity and
**the Elaboration of Task-Relevant Information**
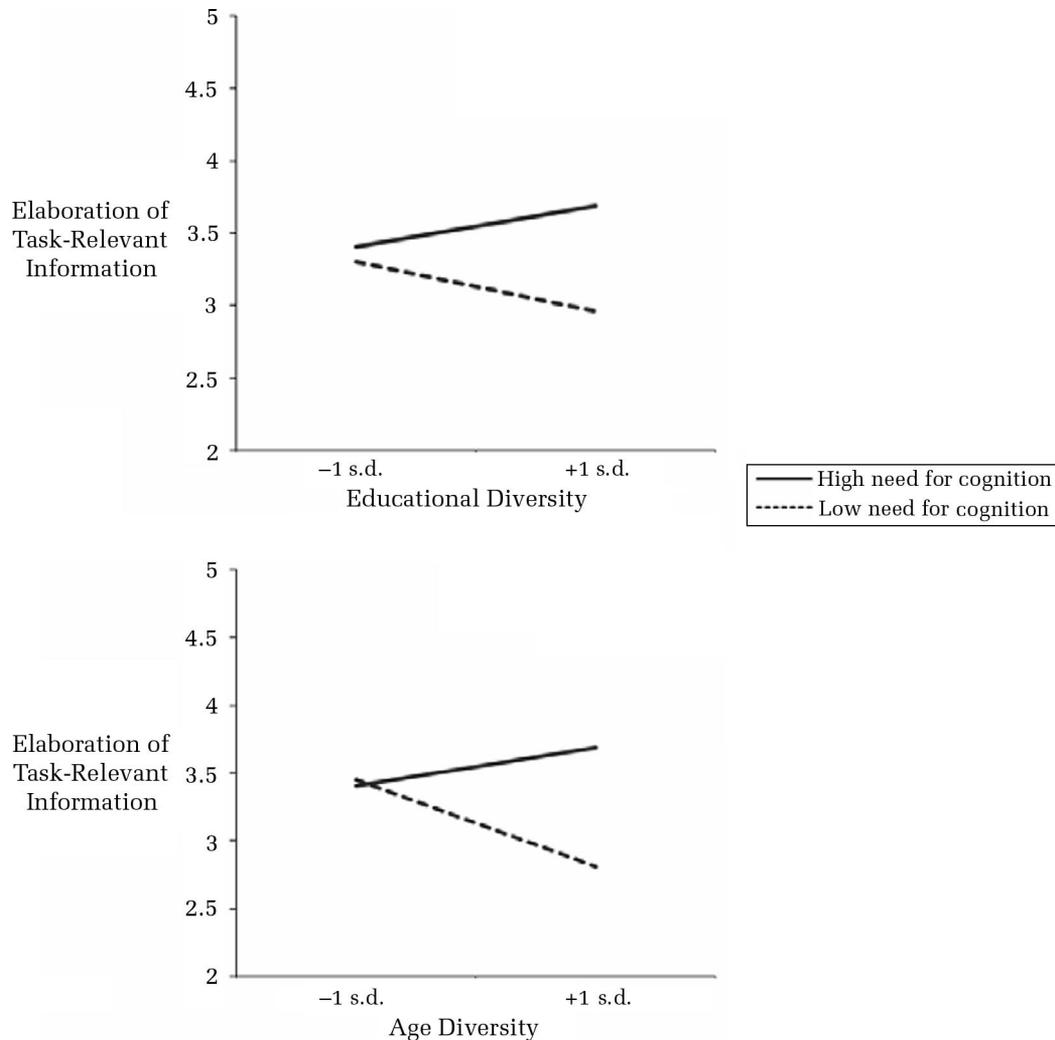
cludes zero indicates a statistically significant effect. Results showed that the elaboration of task-relevant information mediated the moderating effect of need for cognition on the relationship of team performance as rated by team leaders with both educational ($\beta = 0.59$, $p < .05$) and age diversity ($\beta = 0.79$, $p < .05$). Moreover, collective team identification likewise mediated the moderating effect of need for cognition on the relationship between team performance as rated by team leaders and both educational ($\beta = 0.56$, $p < .05$) and age diversity ($\beta = 0.57$, $p < .05$). Thus, Hypotheses 3 and 4 were confirmed when we examined team leader ratings of team performance. When we relied on team supervisor ratings, we found support for a moderating role of need for cognition on the diversity-team performance relationship, but not for the posited mediated moderation effects.

DISCUSSION

Faced with inevitably rising levels of diversity, organizations must find ways to prevent differences among employees from disrupting communication and cooperation and in turn impeding performance. Even more importantly, in the interest of bolstering their competitiveness, organizations must find ways of turning diversity into an asset. We found that the mean need for cognition in a team moderated the relationship of both educational specialization and age diversity with the elaboration of task-relevant information, collective team identification, and team performance, respectively. Both types of diversity were significantly, positively related to each of these dependent variables only when team need for cognition was high. The elaboration of task-relevant information and

FIGURE 3
Need for Cognition as a Moderator of the Relationship between Diversity and Collective Team Identification
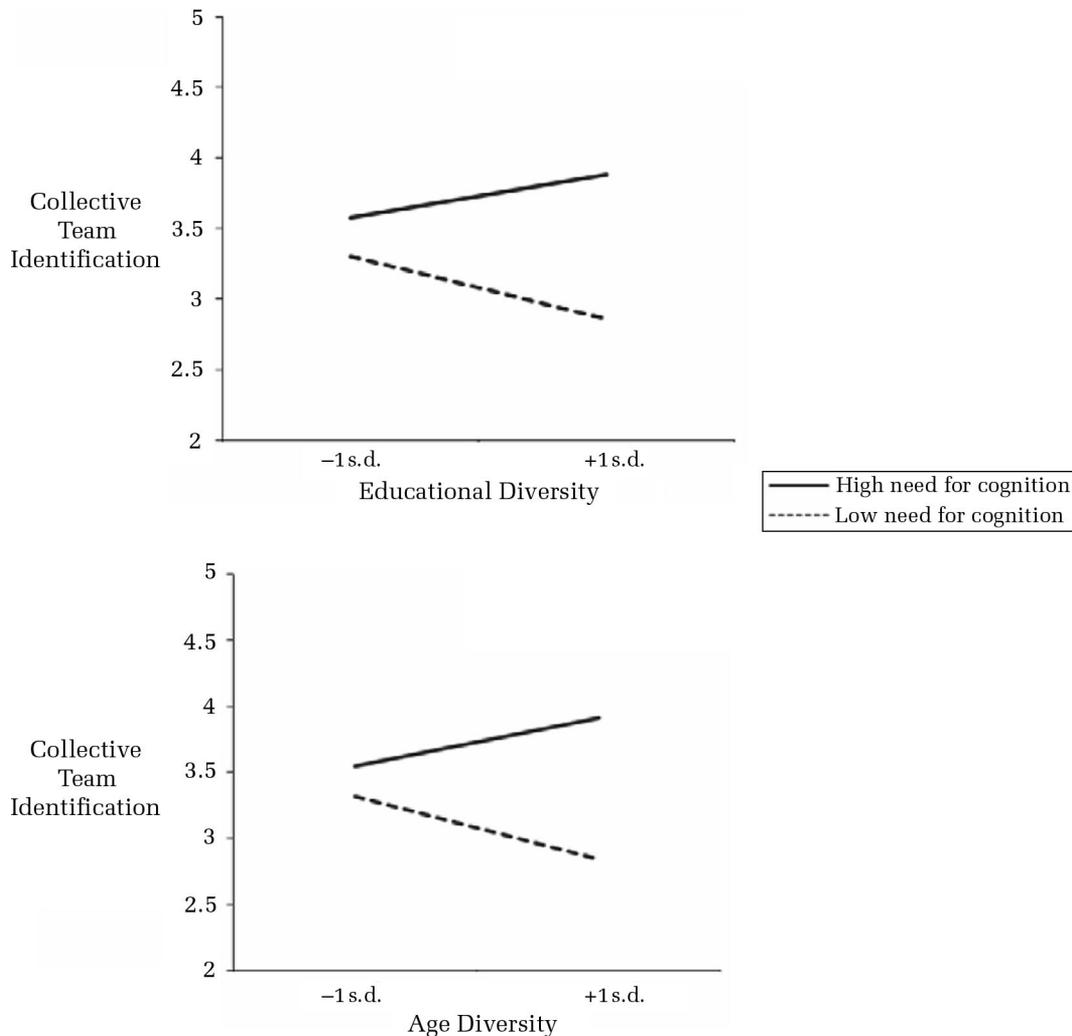

collective team identification mediated the moderating effect of need for cognition on the diversity–team performance relationship when team leaders provided cross-sectional team performance ratings, but not when team supervisors provided longitudinal ratings.

Theoretical Implications

Our study extends the extant literature in several important ways. First, heeding Stewart's (2006) call to explore what traits influence team outcomes in what specific contexts, we provided a theoretical rationale and found empirical support for our claim that need for cognition is a particularly important variable in diverse teams. Thus, we contribute to both the team diversity and the average team personality literatures. Overall, results support the

main assumption of our model (see Figure 1) that a high team need for cognition promotes the beneficial effects of diversity predicted by the information/decision-making perspective and at the same time creates conditions that help prevent the adverse effects of heterogeneity predicted by the social categorization and the similarity/attraction perspectives. By contrast, need for cognition had less of an effect in homogeneous teams. One possible explanation is that, when members are more similar in their values and backgrounds, lengthy discussions driven by a high need for cognition may sometimes be unnecessary or even counterproductive, as they tend to focus on shared rather than unshared knowledge (Henningsen & Henningsen, 2004). What may be needed in this case is diversity—a broadened pool of task-relevant knowledge and perspectives. By identifying need for cognition

FIGURE 4
Need for Cognition as a Moderator of the Relationship between Diversity and
**Team Performance, Leader Ratings**
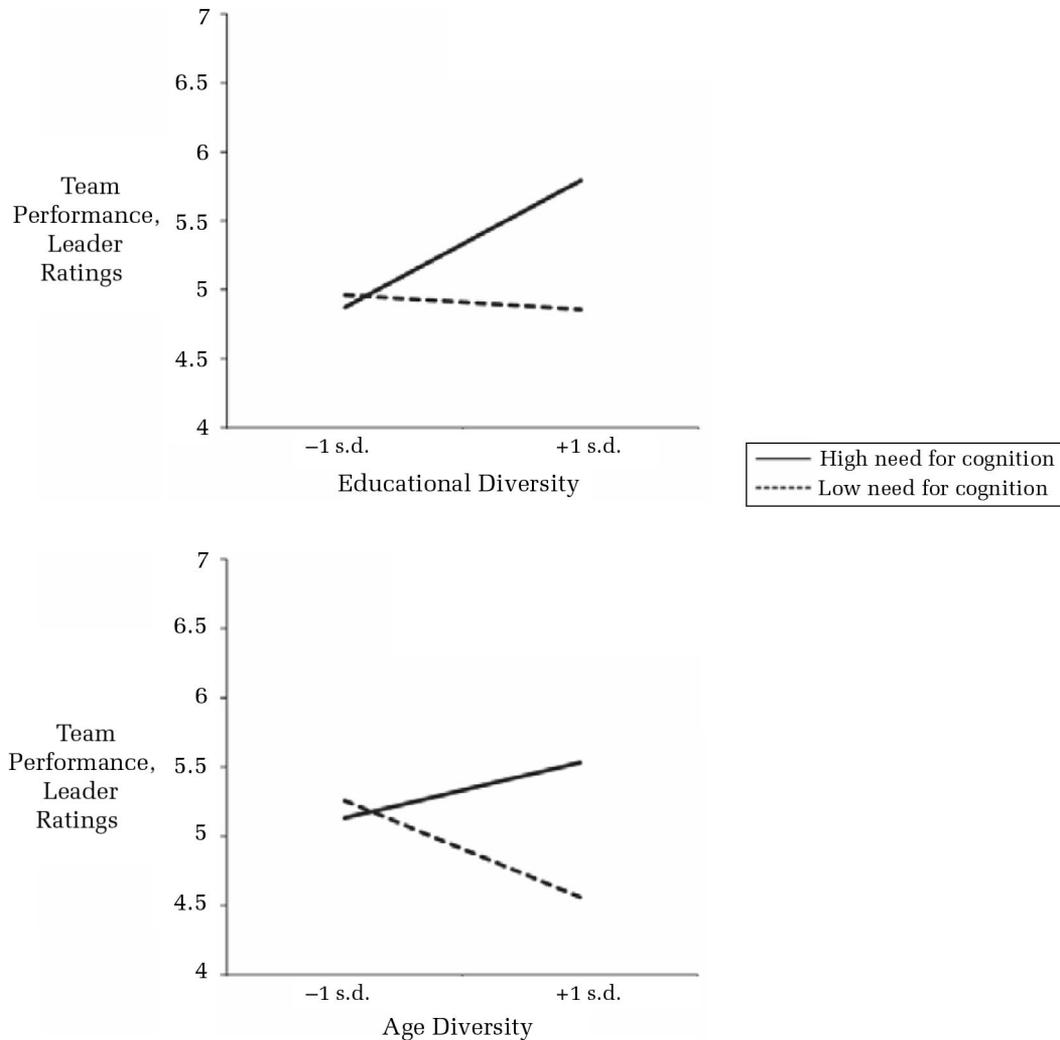
as an important moderator, our study advances knowledge of the conditions under which teams may succeed in leveraging the potential inherent in diversity. Second, by showing that team need for cognition is associated with a team process (elaboration of task-relevant information) and a team emergent state (collective team identification) that together may in large part determine the interplay of information/decision-making and social categorization processes, we also contribute to the understanding of *how* educational and age diversity affect team functioning.

Third, although the motivation to engage in information processing is likely to be a key determinant of how well a diverse team uses its full range of task-relevant resources, this motivation has received little attention in previous diversity research (Van Knippenberg & Schippers, 2007). In

order for diversity to have any beneficial effects on team performance, the members of diverse teams must actively realize the potential inherent in an enlarged pool of knowledge, experience, and perspectives (Williams & O'Reilly, 1998). With respect to knowledge-based tasks, the intrinsic motivation to thoroughly process a diverse array of information and learn new ways of thinking about problems clearly merits attention. Our study thus helps to fill this gap concerning task motivation in the diversity literature (Van Knippenberg et al., 2004) by identifying the impact of the dispositional motivation to engage in cognitive endeavors on the functioning of diverse teams.

Fourth, although it has often been theorized (e.g., Bantel & Jackson, 1989; Williams & O'Reilly, 1998) that both demographic and cognitive diversity may have potential to enhance team performance, our

FIGURE 5
Need for Cognition as a Moderator of the Relationship between Diversity and
Team Performance, Supervisor Ratings
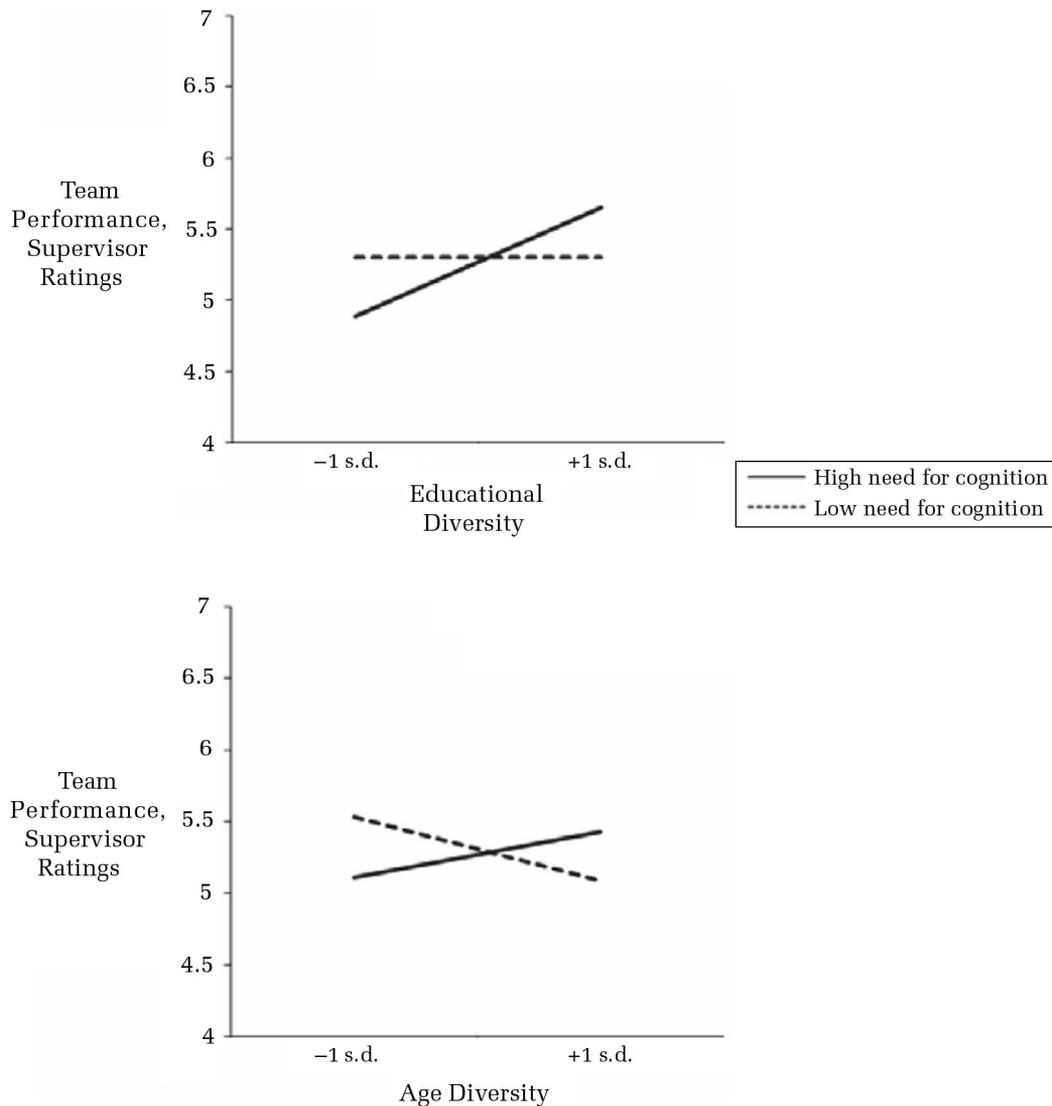
study identifies a moderator that, at high levels, almost equally affects the relationship of both demographic *and* cognitive diversity with team outcomes. Most previously examined moderators influence the effects of *either* demographic or cognitive diversity, or these moderators differentially impact the effects of these two types of diversity (e.g., Jehn et al., 1999; Simons, Pelled, & Smith, 1999). A moderator that holds promise for unlocking the performance potential inherent in both demographic and cognitive diversity signifies an important step forward for both theory and practice. However, although our results support the claim that, under favorable conditions (i.e., a high team need for cognition), educational and age diversity both constitute performance-enhancing variety, our findings also suggest that, under unfavorable conditions (i.e., a low need for cognition), age diversity seems to have more negative effects on team performance than does educational diversity.

Fifth, in a globalized world it becomes increasingly important to study the effects of diversity in different cultures. Our study contributes to the extant literature findings obtained in a German context. Sixth, our study underscores in an organizational setting the impact of personality on the effects of team diversity. In a lab study examining the effects of gender diversity salience, Homan et al. (2008) already found evidence for a moderating effect of personality (i.e., team openness to experience) and a mediating role of information processing. In sum, therefore, aside from replicating an

interactive effect of team diversity and team personality on team performance in a naturalistic setting, our study goes beyond the research by Homan et al. (2008) by examining a more specific personality trait, different dimensions of diversity (that serve as examples of demographic and cognitive diversity, respectively), and two mediating processes, one of which can be linked to the information/decision-making perspective and the other to the social categorization perspective.

Managerial Implications

As it may be difficult for managers to change the personalities of their subordinates, broad, "motley" constructs—the adjective Hampson and Goldberg (2006: 772) applied to "openness to experience"—may be rather ill-suited bases for practical interventions. Need for cognition, on the other hand, is a more specific variable that not only can be more easily linked to the demands entailed by diverse teams performing knowledge-based tasks, but also lends itself well to drawing managerial implications.[6] Need for cognition represents the stable, but not invariant, intrinsic motivation to process a broad range of information. This tendency, which says little about differences in ability, can be developed or changed (Cacioppo et al., 1996). Persons high in need for cognition naturally enjoy thinking, but persons low in need for cognition engage in cognitive endeavors mostly when there is some incentive or reason to do so (Petty et al., 2009).

Possible ways in which leaders can motivate those low in need for cognition to consider a wide array of task-relevant information include linking the information to be processed or the intended outcome of the team task to some aspect of a person's self-concept and thereby making it highly personally relevant and emotionally appealing, and creating conditions that make information processing engaging and enjoyable (Petty et al., 2009). A transformational leadership style that provides a compelling common vision as well as intellectual stimulation may not only serve these ends (Shin & Zhou, 2007), but may also foster collective team identification (Kearney & Gebert, 2009). In addition, leaders can enhance information-processing motivation by explicating the value of diverse views (Homan, Van Knippenberg, Van Kleef, & De Dreu, 2007) and by increasing accountability for decisions and outcomes (Van Knippenberg et al., 2004). Moreover, by promoting a climate of psycho-

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[6] The same may be true for the ideas subdimension of the broader construct openness to experience.

logical safety (Edmondson, 1999) and the right combination of task and goal interdependence (Van der Vegt et al., 2003), leaders may facilitate a cooperative climate conducive to both the elaboration of task-relevant information and the collective team identification that may help prevent team members from feeling threatened or annoyed by diversity. Finally, our results suggest that a high need for cognition may be less beneficial in homogeneous teams. To the degree that this is a consequence of an overreliance on shared information, leaders would do well to expand the range of unshared task-relevant knowledge.

Limitations, Future Research, and Conclusion

We acknowledge certain limitations of this study. First, we relied on subjective ratings of performance rather than objective criteria. However, we derive confidence in the robustness of our findings from the fact that we obtained ratings from two independent sources at two different points in time. In further support of our approach, Wall et al. (2004) found remarkable evidence of convergent, discriminant, and construct validity of subjective measures. Somewhat surprisingly, separate analyses for each of the four criteria included in our composite team performance measure did not reveal substantially different findings. Further research, preferably with objective measures, is needed to investigate whether there are differential effects with respect to different performance indicators. Second, with the exception of the supervisors' team performance ratings, we relied on cross-sectional data. Hence, alternative causal explanations could be derived from our data, and the interpretations we offer must be considered with caution. It may be the case that high performance facilitated the perception of high levels of both the elaboration of task-relevant information and collective team identification. Ideally, we should have collected our data at several different time points to more clearly establish the linkages among the variables. Third, since we restricted our sample to teams with no more than 12 members, we have no way of knowing if our results would also hold for larger teams.

Fourth, we measured only one personality trait. Although we argued that need for cognition is a particularly important variable—and one that is specific and lends itself to managerial interventions—in the context of diverse teams, further research is needed that not only compares the relative importance of different individual difference variables, but also analyzes the effects of specific personality profiles. For example, the moderation

effects described here may be even stronger when a high mean need for cognition is coupled with a low mean need for closure (Kruglanski, Pierro, Mannetti, & De Grada, 2006). Fifth, although our results were similar for educational and age diversity when need for cognition was high, separate analyses did not yield such findings for tenure, gender, or nationality diversity. However, given a restriction in range in our sample with respect to these variables, further research is needed to examine the generalizability of our results to other types of diversity. Our focal diversity dimensions may be somewhat special in that, among cognitive diversity variables, educational diversity offers fewer social categorization cues than does functional heterogeneity (Dahlin et al., 2005) and, among demographic diversity types, age diversity may be less likely than either ethnic/racial heterogeneity or, in some contexts, gender diversity to elicit adverse effects such as prejudice or strong relationship conflicts (e.g., Pelled et al., 1999).

In sum, we identified need for cognition as an important personality trait that broadens understanding of when and how the performance potential of diverse teams can be unlocked and what organizational and team leaders must pay attention to when assembling and managing diverse teams. Our findings suggest that the mean need for cognition in a team is an important determinant of the degree to which a team stands to benefit from age and educational diversity.

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