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TIME, TEAMS, AND TASK PERFORMANCE: CHANGING EFFECTS OF SURFACE- AND DEEP-LEVEL DIVERSITY ON GROUP FUNCTIONING

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Time serves as a medium for collaboration in teams, allowing members to exchange personal and task-related information. We propose that stronger team reward contingencies stimulate collaboration. As time passes, increasing collaboration weakens the effects of surface-level (demographic) diversity on team outcomes but strengthens those of deep-level (psychological) diversity. Also, perceived diversity transmits the impact of actual diversity on team social integration, which in turn affects task performance. Results from four waves of data on 144 student project teams support these propositions and the strong relevance of time to research on work team diversity.

Managing diverse work groups is one of the most difficult and pressing challenges in modern organizations, part of a "grand experiment" that, by many accounts, is "not going smoothly" (Tsui & Gutek, 1999: 1). The conventional focus of diversity research has been on connecting demographic differences among team members, such as age, sex, or race, to reactions toward team-level functioning (such as team social integration) and performance (Williams & O'Reilly, 1998). These "surface-level" (Jackson, May, & Whitney, 1995) or "high-visibility" (Pelled, 1996) demographic characteristics are easily observed and measured. They are presumed to be important because of the underlying differences they are thought to reflect, and because they can evoke individual prejudices, biases, or stereotypes (Fiske & Neuberg, 1990). A complementary paradigm has begun to emerge, however, marking the start of a "new time" in research on work team diversity. This paradigm involves the investigation of *deep-level* (Harrison, Price, & Bell, 1998) or less readily apparent diversity (Riordan, 2000). This form of diversity is based on psychological features of work team members and includes individual differences involving personality traits (Barsade, Ward, Turner, & Sonnenfeld, 2000) and values (Jehn, Chadwick, & Thatcher, 1997), as well as attitudes, preferences, and beliefs (Harrison et al., 1998).

The present study furthers research on work team diversity by continuing to delve into its surface-level and deep-level forms, comparing them by examining the flow of diversity's effects from actual member differences through perceived differences and by highlighting the importance of time. We separate the effects of overt demographic differences from those of underlying psychological differences in the current study, predicting that they will have differentially salient consequences for team social integration over time, as team members collaborate and learn more about each other. Another contribution of the current research is examination of a process assumed to occur but rarely assessed in diversity research (Riordan, 2000): the transmission of effects of actual team member differences through perceptions of such differences. Finally, use of a four-wave design in the current research mitigates problems of reverse causation and common method variance, affording stronger conclusions than earlier, cross-sectional studies.

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LINKS FROM DIVERSITY TO TEAM SOCIAL INTEGRATION AND PERFORMANCE

As research accumulates, there has been growing recognition that the paths linking work team diversity to team functioning and performance outcomes are complex. These complexities are reflected in

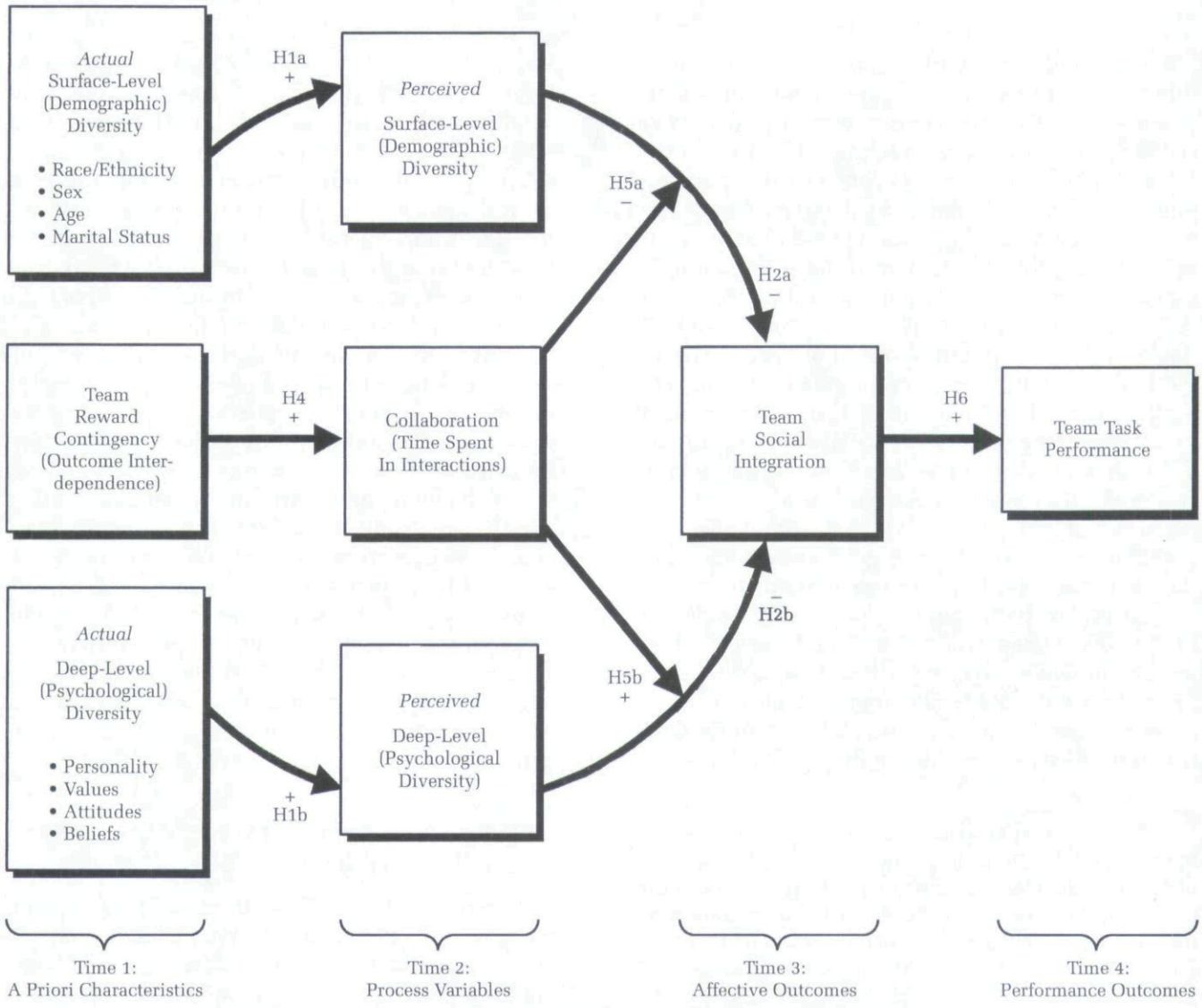
the theoretical framework guiding our research, presented in Figure 1. In the next sections, we review theory and data supporting the proposed relationships in our model.

Multiple Types of Diversity

Surface-level diversity: Definition. Surface-level diversity (Harrison et al., 1998) is defined as differences among team members in overt demographic characteristics (Milliken & Martins, 1996; also see Riordan 2000: 162], who described these as "surface-level, visible dimensions"). Such characteristics, including age, sex, and race/ethnicity, are often reflected in physical features. Almost immediately, individuals can make reasonable estimates of the age, gender or racial/ethnic background of someone else and, therefore, of that person's (dis)similarity to themselves (Jackson et al., 1995). Surface-level diversity is equivalent to what other researchers have labeled "social category diversity" (Jehn, Northcraft, & Neale, 1999) or "demographic diversity" (e.g., O'Reilly, Caldwell, & Barnett, 1989). Most importantly, it is well established that individuals quickly use these characteristics to assign themselves and others to social classifications involving ascribed patterns of thought, attitudes, and behaviors (e.g., Fiske, 2000).

Surface-level diversity: General theories. Several broad, deductive theories have been used to support arguments about the consequences of surface-level diversity. Some researchers (e.g., Jack-

FIGURE 1
Intervening and Interactive Temporal Mechanisms Translating Team Surface- and Deep-Level Diversity into Social Integration and Performance



son, Brett, Sessa, Cooper, Julin, & Peyronnin, 1991) have posited inverse relationships between surface-level differences and team functioning or performance outcomes using basic propositions of social identity (Tajfel, 1978) and self-categorization theories (Turner, 1982). According to these theories, group members define and differentiate themselves from others on the basis of observable differences in age, race, gender, and the like. As individuals are motivated to maintain or enhance their social identities, they are more likely to positively evaluate and identify with persons and groups whose members appear to hold the same overt features they do (Tajfel & Turner, 1986).

Another general theoretical premise used by diversity researchers (e.g., Barsade et al., 2000) is the well-supported similarity-attraction paradigm (Byrne, 1971). People are attracted to and prefer to be with similar others because they anticipate their own values, attitudes, and beliefs will be reinforced or upheld. Both categorization and similarity-attraction theories lead to the same prediction: Team members will tend to have less positive attitudes toward, and will form fewer social attachments with, those whom they perceive to be less like themselves.

Surface-level diversity: Specific elements. We chose to continue to study age, sex, and race/ethnicity as surface-level diversity variables in the current investigation. Their effects are inconsistent, but they have a fairly long history of study in this area (Riordan, 2000). They are also immediately recognizable and used by individuals to assign others to tacit social categories (Tsui & Gutek, 1999).

Although some researchers have reported null (Bantel & Jackson, 1989; Wiersema & Bird, 1993) or asymmetrical effects (Chattopadhyay, 1999), differences in age have often been negatively related to aspects of individual or within-team functioning; these have included social isolation (Kirchmeyer, 1995), reduced cohesion (O'Reilly et al., 1989), lowered communication (Zenger & Lawrence, 1989), and higher turnover (Jackson et al., 1991; O'Reilly et al., 1989; Tsui, Egan, & O'Reilly, 1992). Similar relationships exist for sex diversity in teams, where null and asymmetrical effects have been shown (Chattopadhyay, 1999; Riordan & Shore, 1997), but researchers have frequently reported negative outcomes, such as feelings of isolation, dissatisfaction, and lack of attachment in some sex-dissimilar situations for females (Konrad, Winter, & Gutek, 1992; Pelled & Xin, 1997), and reduced organizational attachment for some males (e.g., Tsui et al., 1992). The reported consequences of racial or ethnic diversity have also been somewhat inconsistent (Williams & O'Reilly, 1998) and sometimes nonlinear (Chattopadhyay, 1999). However, lower performance ratings (Kraiger & Ford, 1985), diminished communication (Larkey, 1996), and reduced commitment among majority members (Tsui et al., 1992) have been related to within-team differences in race.

Marital status was also included as a manifest difference in our study. It is a surface-level diversity variable that has not been examined in previous research, although it is both an overt and immediately recognizable demographic characteristic that is assessed from the presence or absence of a wedding ring. In pilot interviews, this demographic feature was found to be perceptually salient to a sample of undergraduate and graduate students drawn from the same population as the sample in our main study. Most importantly, marital status marks clear social categories (Tsui & Gutek, 1999) prompting attributions, stereotypes, and perhaps even different interpersonal affiliations.

Deep-level diversity: Definition. Deep-level diversity refers to differences among team members' psychological characteristics, including personalities, values, and attitudes (Jackson et al., 1995; Harrison et al., 1998). Clues to these latent individual differences are taken from members' interactions with one another as they unfold over time. Those clues are expressed in behavior patterns, verbal and nonverbal communication, and exchanges of personal information.

Deep-level diversity: General theories. Notably, the theories marshaled by authors to support surface-level diversity effects say as much, if not more, about deep-level effects (Tsui et al., 1992). That is, presumed *underlying* differences between people in their attitudes, values, and personalities are the basis of similarity-attraction or fit paradigms, including social psychological theories about similarity in attitudes (e.g., Byrne, 1971; Newcomb, 1961) and organizational behavior theories about similarity in values and personality (e.g., Schneider, 1987). The arguments are virtually identical to those presented above: people find it more pleasurable to interact with others who have similar psychological characteristics, because that interaction verifies and reinforces their own beliefs, affect, and expressed behaviors (e.g., Swann, Stein-Seroussi, & Giesler, 1992). This form of attraction occurs even when attitudes are negative ("We hate this project") or when personality dimensions are dysphoric (Locke & Horowitz, 1990).

Deep-level diversity: Personality elements. Evidence from other literatures and at other levels of analysis suggests an impact of personality differences within teams (e.g., Schneider, Goldstein, & Smith, 1995). There are innumerable personality

differences that might make up deep-level diversity. Researchers have proposed that the *job-relatedness* of differences is critical in task-performing groups (e.g., Harrison et al. 1998). The key issue here is, Does the deep-level attribute bear on fundamental purposes of the team? With that criterion in mind, we adopted *conscientiousness* as the deep-level personality difference most likely to be consequential in the teams we studied.

At the individual level, Barrick and Mount (1991) demonstrated that conscientiousness was the "Big Five" personality dimension most consistently and most strongly related to performance in a variety of task settings. However, other studies have found mixed effects of conscientiousness at the team level. Barrick, Stewart, Neubert, and Mount (1998) reported that higher mean levels of team conscientiousness were associated with team performance but that team member diversity in conscientiousness was not associated with team viability or social cohesion. LePine, Hollenbeck, Ilgen, and Hedlund (1997) found that group members low in conscientiousness were ignored by the rest of the team, but Neuman, Wagner, and Christiansen (1999) did not detect mean levels of team conscientiousness as contributors to team performance. In sum, conscientiousness is theoretically implicated in team dynamics, but the data are equivocal.

Deep-level diversity: Value elements. There have been few empirical investigations of this aspect of deep-level diversity in ongoing work teams (e.g., Jehn et al., 1999). Still, pertinent literature suggests a negative association between value diversity and outcomes in teams. O'Reilly, Chatman, and Caldwell (1991) showed that new employees whose individual values differed from the mean values of others in their work groups or small organizations were less satisfied, demonstrated lower organizational commitment, and were more likely to quit. Jehn and Mannix (2001) reported that greater a priori consensus on work values led to effective patterns of task conflict and lower levels of relationship conflict over time.

The tasks in our study were not being done for an organization, as in the studies cited above, but were part of students' class work. Therefore, we chose to study how student team members saw their educational context as fundamental to their values, using Rokeach's (1973) terminal values as our probe of value diversity. These values have been successfully used to predict various between-group differences among students, including college major and church attendance (Schwartz & Bilsky, 1990).

Deep-level diversity: Attitude elements. Attitude similarity is an important predictor of attraction and friendship (Byrne, 1971; McGrath, 1984; Newcomb, 1961). In work situations, attitude similarity among team members has been linked to higher team cohesiveness (Harrison et al., 1998). In keeping with our job relatedness criterion, we chose to study within-team differences in two attitudes, *task meaningfulness* and *outcome importance.* Task meaningfulness refers to the personal salience and importance of a team's project. It has been associated with greater intrinsic motivation and with more pronounced attitudinal and behavioral consequences (Petty & Cacioppo, 1979). Outcome importance refers to the value for team members of getting a good project grade. It reflects valence, a central construct in theories of motivation (e.g., Vroom, 1964).

Actual and Perceived Diversity

Testing the assumption of veridical perceptions. In the preceding literature review, we discuss findings about the effects of actual diversity on team functioning and team performance. In previous work, typical measures of diversity have been relational (Euclidian distance) or compositional (standard deviation) (Williams & O'Reilly, 1998). Results of that approach have been mixed and generally weak in terms of effect sizes (R^2 = .02–.19; Riordan, 2000). One approach to explaining inconsistencies across studies, the small effect sizes, and the impacts of different facets of diversity, is to note that diversity effects rely on perceptions (Lawrence, 1997). Yet these perceptions have rarely been studied in diversity research (see Riordan [2000: 160–161] for a detailed account of theoretical statements and existing data). Our first set of hypotheses is based on the foundation that if differences are to be meaningful, they must be perceived. The first links in Figure 1 reiterate this premise.

Hypothesis 1a. Actual surface-level diversity will have positive effects on perceived surface-level diversity.

Hypothesis 1b. Actual deep-level diversity will have positive effects on perceived deep-level diversity.

Perceived diversity and team social integration. We propose that the impact of reactions to perceived diversity should be on the level of *team social integration.* Our use of this term is similar to its use by O'Reilly and his coauthors (1989) and by Smith, Smith, Olian, Sims, O'Bannon, and Scully (1994). For these researchers, team social integration is a multifaceted construct including elements

of cohesiveness, satisfaction with coworkers, positive social interaction, and enjoyment of team experiences. Elements of team social integration are the most commonly studied outcomes in diversity research (Tsui & Gutek, 1999). Consequently, our second set of hypotheses, covering the next part of the model (see Figure 1), is based on our assertion that perceived diversity reflects the psychological importance of, and carries the substantive impact of, actual diversity into team social integration (cf. Ashforth & Mael, 1989). Theory and research suggest a negative relationship between both aspects of work team diversity and team social integration.

Hypothesis 2a. Perceived surface-level diversity will have a negative effect on team social integration.

Hypothesis 2b. Perceived deep-level diversity will have a negative effect on team social integration.

Mediation by perceptions and the indirectness of actual diversity effects. If the first two hypotheses are taken to be logical premises, they necessitate a third set of hypotheses as a conclusion. Specifically, if actual diversity affects perceived diversity and perceived diversity affects team social integration, then perceptions are a mediating (intervening) construct. Actual diversity has only indirect effects on team social integration (see Figure 1).

Results from a few studies bear on this conclusion. Cleveland and Shore (1992) reported that inclusion of perceptual measures of relative age, in additional to chronological age, increased the predictability of individual outcomes such as perceived organizational support. Turban and Jones (1988) showed that perceptions of (rather than actual) attitudinal similarity between supervisors and subordinates were uniquely and positively related to subordinates' satisfaction, performance ratings, and pay ratings. These arguments and data lead to our third proposition.

Hypothesis 3. Perceived (surface- and deep-level) diversity will mediate the negative impact of actual (surface- and deep-level) diversity on team social integration.

Team reward contingency. Conspicuously absent from most diversity research is a consideration of team reward structures (e.g., Tsui & Gutek, 1999). In the current article, we define *team reward contingency* as the degree to which outcomes for individual members depend on outcomes for their team. This construct has also been referred to as shared fate (Pettigrew, 1998) and positive outcome interdependence (Kelley & Thibaut, 1978; Tjosvold, 1984; Wageman, 1995). As personal costs and benefits become more contingent on how well a team performs, individuation theory (Fiske, 2000) suggests that team members will pay more attention to one another's personal (deep-level) features and reduce stereotypic thoughts and evaluations about them. Moreover, according to interdependence theory (Kelley & Thibaut, 1978) and cooperation theory (Tjosvold, 1984), this alignment of individual and team outcomes motivates members to spend more time and effort interacting with one another, which is our definition of collaboration.

Hypothesis 4. The strength of team reward contingency will have a positive effect on team collaboration.

Moderating effects of time via collaboration. Identity theory, categorization theory, and prior evidence all support the notion that in initial interactions, team members' categorization of one another is based on surface-level features (Berger, Rosenholtz, & Zelditch, 1980; Schneider et al., 1995). Our model takes these ideas a step further. In it, we propose that over time, as team members collaborate, they have more opportunities for the exchange of personal, idiosyncratic information and larger samples of each other's behavior to observe (Gruenfeld, Mannix, Williams, & Neale, 1996). Consequently, we propose that surface-level diversity becomes less important and deep-level diversity becomes more important in determining team social integration over time, as team members learn more about each other.

Support for this proposition comes from a series of recent studies. Pelled, Eisenhardt, and Xin (1999) reported that the effects of surface-level diversity (age and member tenure) on emotional conflict diminished as a function of team longevity. Jehn et al. (1999) suggested that social category (surface-level) diversity may become less relevant over time and that other factors, such as value (deep-level) diversity, may become more salient determinants of team morale. Finally, using a cross-sectional design, Harrison and colleagues (1998) reported that the influence of sex differences on group cohesiveness diminished and the influence of attitude differences increased as a function of team tenure.

Hypothesis 5a. As team members collaborate more (spend more time performing together), the impact of perceived surface-level diversity on team social integration will diminish.

Hypothesis 5b. As team members collaborate more (spend more time performing together),

the impact of perceived deep-level diversity on team social integration will intensify.

Team social integration and task performance. In the last part of our model, we propose that team social integration is the proximal input to a more distal outcome, team task performance (see Figure 1). The rationale is that teams with a higher level of social integration are more willing to subjugate individual interests for team goals that should direct member resources toward higher team task performance. This proposed role is consistent with findings that team social integration mediated the effects of surface-level diversity on tenure (O'Reilly et al., 1989) and mediated the impact of diversity in experience on performance (Smith et al., 1994). There is also strong meta-analytic evidence that group cohesiveness (a primary dimension of social integration) facilitates performance and has consistent effects in a wide variety of settings and tasks (Gully, Devine, & Whitney, 1995). This leads us to our final proposition.

Hypothesis 6. Team social integration will have a positive effect on task performance.

METHODS

Setting, Design, and Procedures

To test our hypotheses, we tracked the development and performance of 113 graduate and 449 undergraduate business students doing team projects at a large university in the Southwest. Team members were enrolled in 23 upper-division or graduate sections of 13 different courses. The individual ages of participants ranged from 19 to 55 years; their mean age was 28 (s.d. = 7). Fifty percent of the participants were female; 65 percent were Caucasian; 9 percent, African American; 18 percent, Asian; 7 percent, Hispanic; and 1 percent were Native Americans or Pacific Islanders. Approximately 57 percent of the participants were not married. Seventy-five percent of the participants currently worked at least part-time at a paid job.

A total of 144 teams were formed, each with a minimum of 2 to a maximum of 9 members. Mean team size was 4.1 members (median = 4). Only 5 percent of the teams were dyads; 80 percent of the teams had 3–5 members. Team projects lasted from 9 to 14 weeks of the 16-week semester. Project tasks varied from industry sector analyses (for strategic management classes) to customer survey development (marketing) to corporate audits (accounting) to Web programming (information systems).

Final assignment of members to teams was determined by instructors, typically randomly, but students were able to suggest placement at the beginning of the semester. All decisions regarding team membership, projects, grading, and so on were made by each instructor with no input from us. We taught none of the classes in this research, and none of the instructors or participants involved in the study were aware of the hypotheses being tested.

Team members completed survey instruments at three different times over the course of nearly four months. The first survey (time 1) was completed and returned in the first two weeks of the semester, before individuals had been assigned to teams or had worked with other team members. The second survey (time 2) was completed and returned in the fifth to seventh week of the semester, after teams had been formed and members had worked together for approximately a third to a half of the total time they needed to complete their projects. The third and last survey (time 3) was administered in the last two weeks of the semester, when team members had just completed their assigned projects but had not yet received their project grades or final course grades. Each wave of surveys was distributed at the same (calendar) time to everyone. Finally, after the end of the semester (time 4), teacher evaluations of team performance were collected. For a team to be included, at least two-thirds of its members had to return all three waves of surveys.

At each administration, course instructors distributed the surveys to the participants. Each survey was accompanied by a sealable return envelope. Each questionnaire contained a unique identification number for tracking over time. In most classes (21 out of 23), instructors offered a nominal amount of extra credit to teams in which all members returned all three waves of our surveys.

Measures

Surface-level diversity. The characteristics of team members selected for inclusion were *age, sex, ethnicity,* and *marital status.* All surface-level demographic measures were collected via self-reports at time 1. We used within-group standard deviations (s.d.'s) to reflect diversity in the ages of team members (Bedeian & Mossholder, 2000). Blau's (1977) index was used to indicate diversity in sex, racial/ethnic background, and marital status (cf. Bantel & Jackson, 1989).

Deep-level diversity. At time 1, we administered a 24-item *conscientiousness* measure (Goldberg, 1992). Coefficient alpha at the individual level was

.89. Participants also completed Rokeach's (1973) scale, rating the extent to which their university courses would help them attain each of several *terminal values* (for instance, a comfortable life), on a format ranging from "not at all," 1, to "to a great extent," 7 (α = .93). A three-item scale assessed *task meaningfulness,* a deep-level attitudinal variable; the respondents indicated strong disagreement (1) to strong agreement (7) with the statements that they could "learn a lot from the project," that "it is more than busy work," and that "doing the project is worthwhile" (α = .89). The second measure of a deep-level difference, *outcome importance,* consisted of two items asking team members the extent to which it was "important to get an 'A' on the project," and how much they "needed to do well." Responses ranged from "not important," 1, to "extremely important," 7 (α = .87). We used the within-group standard deviation on each variable to index deep-level diversity.

Team reward contingency. Team projects contributed from 10 to 75 percent of each student's final course grade. The mean level of this shared outcome was 34 percent. The same reward contingency applied to all students enrolled in the same course, and it was known to students before their project work started. Two different members of the research team examined the course syllabi and coded the team reward contingency variable. There was 100 percent agreement.

Perceived surface-level and deep-level diversity. Time 2 indexes of perceived diversity were adopted from Harrison et al. (1998). Team members rated, on a five-point scale, how the members of their project group were "very similar," 1, to "very different," 5, on three surface-level diversity variables (age, ethnicity, and marital status). As Harrison et al. (1998) cautioned, a question about how much there were sex differences within a team would have had little face validity because of the obviousness of the sex variable. Seven questions assessed deep-level diversity, using the same response format. They included perceptions of (dis)similarity on personal values, personalities, priorities, commitment to the project, attitudes about school and education, and project goals (the latter was adapted from Jehn [1995]). Estimated reliabilities (α's) were .68 and .82 for perceived surface-level and deep-level diversity, respectively.

Collaboration. Participants were asked two open-ended questions to assess the number of times they met with some or all members of their team. Drawing on similar constructs discussed by Hambrick (1994), Campion, Medsker, and Higgs (1993), and Wageman (1995), we also included five items (scaled from 1, "not at all," to 5, "all the time") asking team members how often they engaged in collaborative interactions such as reviewing each other's work and coordinating each other's activities. The open-ended and scaled items were first standardized and then summed (α = .75).

Team social integration. Following O'Reilly et al. (1989), we administered a number of different measures to assess the extent of team social integration at time 3. Seashore's (1979) measure of cohesiveness was used to assess disagreement (1) to agreement (7) with three statements; an example is "I really like most of the other group members" (α = .82). On the same response format, satisfaction with one's team was measured with three-items, one of which was "My team is doing a good job" (α = .92). A two-item scale measuring fairness of team practices was adopted from research in procedural justice; "Team decision processes were fair" was one such item (α = 92). Additionally, team members rated their willingness to work with each of the other team members on a future class project on a seven-point response format. We averaged the ratings made by each member to obtain a measure of attraction toward the other team members. As expected, all these measures correlated highly with each other (r's = .65–.75). Therefore, we standardized each of the four original measures and summed them to create a composite measure of team social integration (α = .91).

Team performance. Each teacher had a slightly different grading scheme for the team projects. To minimize differences among the classes, we created a single standardized index, the ratio of the number of team points earned on the project to the maximum number of points that could have been earned. Theoretically, this index could have ranged from 0 to 1.00; however, no team scored below .50.

RESULTS

Preliminary Analyses

Aggregation of individual responses to the group level. Team reward contingency and team performance were measured directly at the group level. For measures that were initially taken at the individual level, it is important to show agreement or consensus among within-team responses before aggregating them to the group level. Therefore, we calculated the James, Demaree, and Wolf (1993) within-group agreement (r_{wg}) index for each measure we wished to aggregate, for each of the 144 teams in our analyses. The average r_{wg} indexes were .82, .86, .92, and .82, respectively, for perceived surface-level diversity, perceived deep-level

diversity, collaboration, and team social integration. Likewise, 88, 81, 97, and 92 percent of the teams had a within-group agreement index greater than .70 for each of the four aggregate measures. Finally, the group-level component of variance was strong in each aggregate measure, explaining more than 50 percent of the variance in all four constructs ($F_{143, 445}$ = 3.49, 1.83, 4.25, and 4.51, in the same order as listed above; all p's < .001).

Control variables. Team size (e.g., Jackson et al., 1991) and cognitive ability (Barrick et al., 1998) can influence a variety of processes, outcomes, and diversity measures. Therefore, each of these was first entered as a control variable in the analyses described below (ability was measured as mean grade point average). Also, group total or average scores on deep-level diversity measures can be confounded with within-group standard deviations (Bedeian & Mossholder, 2000). Therefore, group means on conscientiousness, value attainment, attitudes toward the project, and the importance of grades were also used as control variables in the analyses involving deep-level diversity.

Perceived Diversity: Links and Mediation

Distinction between surface- and deep-level facets of diversity. Hypotheses 1a and 1b predict that actual differences in diversity variables will be reflected in perceptions for both surface-level and deep-level variables, respectively. One of the more interesting features of the correlations in Table 1 is the empirical separation of types of actual diversity (surface versus deep), an important initial condition for the viability of our theoretical arguments. There are weak but significantly positive correlations *within* sets of actual surface-level and deep-level variables. But none of the 16 correlations *between* these sets is significant, and the pattern suggests no general positive or negative connection.

Links between actual and perceived diversity. Connections between actual and perceived diversity followed our predictions, supporting Hypothesis 1a and the implicit assumption of most relational demography research. Table 2 shows results of a regression test of that hypothesis. Actual diversity in age, race/ethnicity, and marital status each had significant regression weights in a model that explained 50 percent of the variance in (overall) perceived surface-level differences. Notably, one deep-level diversity measure, outcome (grade) importance also contributed to the perception of surface differences, suggesting that more than simple outward features might influence surface-level perceptions.

Results for Hypothesis 1b were also supportive. Although actual differences in conscientiousness and values were not uniquely related to (overall) perceived deep-level diversity, actual differences in task meaningfulness and outcome importance were, as shown in the pattern of regression weights. None of the actual surface-level diversity variables helped to predict this deep-level perception.

Links between perceived diversity and team social integration. Hypotheses 2a and 2b predict effects of perceived surface- and deep-level diversity on social integration. Strong and supportive results for these hypotheses are presented in Table 1 (r's = −.41 and −59, respectively; p < .01) and in the second column of Table 3, which presents results of regression analyses testing moderated and mediating effects of perceived diversity on team social integration. Perceptions of *both* forms of diversity are uniquely related to lower team social integration (adjusted R^2 = .35, p < .01), although the standardized regression weight for perceived surface-level diversity is less than half as large as that for perceived deep-level diversity (βs = −.18 and −.42, respectively; p < .05). In other words, early perceptions of both demographic and psychological differences among team members have important negative consequences for how well a diverse group gets along—months later—with the latter perceptions being more consequential than the former.

Mediating effects of perceived diversity. Following Baron and Kenny's (1986) suggested procedures, we used a series of hierarchical regression analyses to test Hypotheses 3a–b, which proposed intervening effects of perceived diversity. Inspection of Table 1 shows that one of the actual surface-level variables (ethnicity) and two of the actual deep-level variables (task meaningfulness and outcome importance) had significant zero-order relationships with social integration. A more rigorous test of this first premise of mediation, that the distal independent variables are related to the dependent variable, is given in the first column of Table 3. These results show a weak but detectable relationship between the entire group of actual diversity variables and team social integration (adjusted R^2 = .06, p < .05). Of these eight variables, however, only outcome importance had a significant regression weight. The second and third premises of mediation testing are that distal independent variables are related to the mediators and that the mediators are in turn related to the dependent variable. Both of these premises were satisfied through the regres-

TABLE 1
Means, Standard Deviations, and Correlations among All Group-Level Variables[a]

Variable	Mean	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Controls																					
1. Group size	4.07	1.38																			
2. Mean grade point average	2.97	0.40	.01																		
3. Conscientiousness, mean	172.29	11.93	.14	.20*	(.89)																
4. Values, mean	65.16	10.47	−.10	.17*	.02	(.93)															
5. Task meaningfulness	14.29	3.01	.42**	.01	−.08	−.03	(.89)														
6. Outcome importance, mean	12.65	1.18	.18*	−.03	.07	−.16*	.15	(.87)													
Surface-level diversity																					
7. Age, s.d.	5.06	3.20	.26**	.05	.10	.10	.18*	.02													
8. Sex, Blau's index	0.31	0.20	.08	−.12	−.13	−.04	.02	.03	−.08												
9. Race/ethnicity, Blau's index	0.32	0.24	.22**	−.09	.07	−.21*	.14	.10	.04	.12											
10. Marital status, Blau's index	0.31	0.22	.41**	.13	.10	.08	.08	.13	.19*	.18*	.06										
Deep-level diversity																					
11. Conscientiousness, s.d.	17.52	9.33	−.01	.02	−.20*	.00	.08	.08	.13	−.10	−.01	−.12									
12. Values, s.d.	16.29	8.33	.02	−.19*	−.04	.04	.02	−.11	−.07	−.03	.10	.03	.23**								
13. Task meaningfulness, s.d.	3.75	1.69	−.14	−.18*	−.02	.06	−.40**	.04	−.12	.01	.02	.04	.02	.13							
14. Outcome importance, s.d.	2.07	1.15	−.06	−.09	−.14	.10	−.15	−.78**	−.01	.09	.07	−.11	−.01	.17*	.06						
15. Team reward contingency	0.34	0.17	.37**	−.17*	−.04	.03	.30**	.09	.14	.16	.03	.23**	.02	.01	−.11	.02					
16. Perceived surface-level diversity	20.96	0.64	.19*	.06	−.14	−.04	.12	.10	.30**	.17*	.52**	.37**	.02	.03	.09	.12	.12	(.68)			
17. Perceived deep-level diversity	47.65	0.54	.05	−.14	−.28**	.01	.01	−.08	.00	.18*	.15	.09	−.01	.08	.21**	.28**	.03	.47**	(.82)		
18. Collaboration	0.00	1.76	.34**	.05	.12	.02	.25	.18*	.03	−.02	−.03	.08	−.16	−.07	−.28**	−.20*	.38**	−.12	−.30**	(.75)	
19. Team social integration	0.00	3.54	−.02	.22**	.16*	.15	−.05	.01	.01	−.09	−.18*	−.04	−.03	−.19*	−.14	−.21**	−.07	−.41**	−.57**	.29**	(.91)
20. Team task performance	0.87	0.08	.13	.25**	.16	.20*	.00	.12	.04	.00	.03	.11	−.05	−.13	.00	−.13	.07	−.02	−.14	.30**	.40**

[a] $n = 144$. Values in parentheses are reliability coefficients.
* $p < .05$
** $p < .01$

TABLE 2
Results of Regression Analyses Testing Effects of Actual Diversity on Perceived Diversity[a]

Independent Variable	Perceived Surface-Level Diversity	Perceived Deep-Level Diversity
Control		
Group size	−.16*	−.03
Mean grade point average	.00	.01
Means of deep-level variables		
Conscientiousness	−.18**	−.25**
Values	−.02	.00
Task meaningfulness	.06	.11
Outcome importance	.29	.25
Actual diversity		
Surface-level		
Age, s.d.	.26**	.00
Sex, Blau's index	.00	.02
Race/ethnicity, Blau's index	.47**	.06
Marital status, Blau's index	.37**	.08
Deep-level		
Conscientiousness, s.d.	.00	−.05
Values, s.d.	−.06	−.02
Task meaningfulness, s.d.	.06	.23**
Outcome importance, s.d.	.34**	.45**
Adjusted R^2	.48**	.16**
F		
All (actual) surface-level	25.32**	0.41
All (actual) deep-level	2.80*	4.71**
df	4, 129	4, 129

[a] Actual diversity was measured at time 1, and perceived diversity was measured at time 2. Values are standardized regression coefficients.

* $p < .05$
** $p < .01$

sion tests for Hypotheses 1a and 1b and 2a and 2b referenced above.

The fourth and final step of mediation testing is shown in the third column of Table 3. All the measures of perceived diversity and actual diversity were entered into the same regression equation predicting team social integration. In this overall equation, both perceived surface-level ($\beta = -.25$, $p < .05$) and perceived deep-level ($\beta = -.38$, $p < .01$) diversity had significant, negative impacts on team social integration. The overall (as a set) unique contribution of actual diversity variables to team social integration was nonsignificant ($F_{8, 123} = 1.00$, $p > .10$). In this last equation, the lack of significant regression coefficients for actual diversity variables also supports a statistical interpretation of complete mediation. Yet only one actual diversity variable had a significant weight to begin with, making it difficult to argue the data warrant a strong substantive conclusion in that regard. Indeed, the weak and inconsistent relationships between actual diversity and team social integration were part of the motivation for the current study. Therefore, a more descriptive conclusion from these analyses might be to regard perceived diversity variables as *intervening* variables, and the effects of actual diversity as *indirect* (James & Brett, 1984).

Collaboration: Links and Moderation

Link between team reward contingency and collaboration. Hypothesis 4 predicts that a stronger team reward contingency will lead to greater collaboration. It is supported by a positive correlation ($r = .38$, $p < .05$). In more rigorous tests of this link, we regressed collaboration on all the other control and actual diversity variables measured at time 1. In each case, team reward contingency was the strongest predictor, uniquely explaining at least 10 percent of the variance in collaboration ($p < .01$). Reinforcing its place in our model, team reward contingency had no direct or moderating relationships with either form of perceived diversity, or with team social integration (see Table 1 for correlations).

Moderating effects of collaboration. Hypotheses 5a and 5b predict that as time spent in collaboration increases, the negative impact of perceived surface-level diversity diminishes and the

TABLE 3
Results of Regression Analyses Testing Moderated and Mediating Effects of Perceived Diversity on Team Social Integration[a]

Variable	Distal Effects	Main Effects	Mediated Effects	Moderated Effects
Controls				
Group size	.01	−.02	.00	−.09
Mean grade point average	.13	.15*	.07	.16*
Actual diversity				
Surface-level				
Age, s.d.	.02		.07	
Sex, Blau's index	.01		.07	
Race/ethnicity, Blau's index	−.06		.10	
Marital status, Blau's index	−.13		.04	
Deep-level				
Conscientiousness, s.d.	−.02		.03	
Values, s.d.	−.09		−.12	
Task meaningfulness, s.d.	−.12		−.04	
Outcome importance, s.d.	−.18*		−.18	
Perceived diversity				
Surface-level		−.18*	−.25*	−.15*
Deep-level		−.42**	−.38**	−.37**
Collaboration		.14	.15	−.05
Interaction terms				
Collaboration × surface-level				.84*
Collaboration × deep-level				−1.15**
Adjusted R^2	.06*	.35**	.40**	.41**
Overall F	1.89*	16.67**	5.47**	15.40**
df	10, 133	5, 138	13, 130	7, 136
F for ΔR^2	27.10**	27.10**	1.00	7.99**
df	2, 138	2, 138	8, 123	2, 136

[a] Perceived diversity was measured at time 2, and team social integration was measured at time 3. Values are standardized regression coefficients.

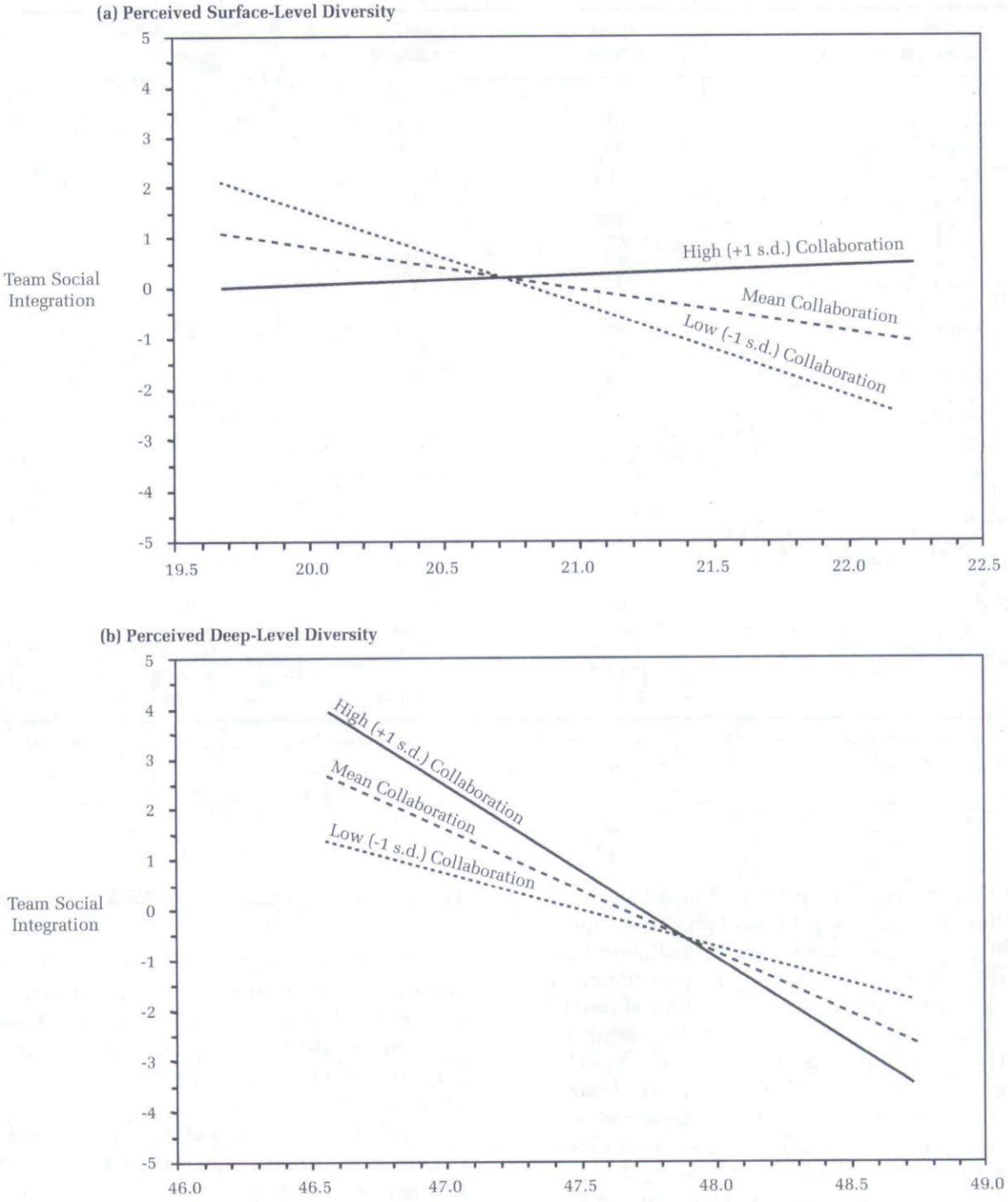
* $p < .05$
** $p < .01$

impact of perceived deep-level diversity grows. To test these hypotheses, control variables, measures of perceived diversity, and collaboration were first entered as main effect predictors of team social integration (see the second column of Table 3). Next, we created moderator terms by multiplying each of the perceived diversity measures by collaboration. When the moderator terms were entered into the equation (see the final column of Table 3), there was a significant increase in model fit ($\Delta R^2 = .06$, $F_{2, 136} = 7.99$, $p < .01$). The negative effect of perceived surface-level diversity flattened toward zero; the coefficient for the multiplicative interaction of perceived surface-level diversity and collaboration is .84 ($p < .05$). In contrast, the negative effect of perceived deep-level diversity became steeper; for perceived deep-level diversity crossed with collaboration, the beta is −1.15 ($p < .01$). Figure 2 illustrates these relationships for three levels of collaboration and confirms this interpretation.

Team Social Integration and Task Performance

To test Hypothesis 6, which states that team social integration positively affects performance, we first entered control variables into a regression equation predicting team performance, followed by team social integration and collaboration. Table 4 shows the results of these regression analyses. Consistent with our proposition (see the first results column of Table 4), social integration had a strong, positive impact on task performance ($\beta = .32$, $p < .01$). Along with team ability and collaboration, it helped to explain substantial variance (adjusted $R^2 = .23$, $p < .01$) in how well the teams carried out their projects. The second and third columns of Table 4 also show that this relationship between team affect and team performance remains strong even when perceived and actual diversity variables are added as possible predictors. Another noteworthy feature in the Table 4 results is that none of the diversity vari-

FIGURE 2
Interactive Effects of Time Spent in Collaboration and Two Forms of Diversity on Team Social Integration



ables has a unique effect on performance as long as team social integration is accounted for.

DISCUSSION

The present study continues an emerging trend in diversity research (e.g., Riordan & Shore, 1997), by (1) separately assessing the impacts of surface-level and deep-level types of diversity, (2) specifying and testing the presumed but unexamined mediating role of diversity perceptions, (3) proposing and testing the moderating influence of temporal constructs (such as collaboration) on the consequences of diversity, and (4) showing how diversity perceptions first travel through team social integration before having an effect on performance.

TABLE 4
Results of Regression Analyses Testing Main and Mediating Effects of Team Social Integration on Team Task Performance[a]

Variable	Main Effects	Potential Effects of Perceived Diversity	Potential Effects of Actual Diversity
Controls			
Group size	.05	.02	.00
Mean grade point average	.18*	.17*	.17*
Team social integration	.32**	.43**	.41**
Collaboration	.21*	.23**	.27**
Perceived diversity			
Surface-level		.11	.07
Deep-level		.12	.11
Actual diversity			
Surface-level			
Age, s.d.			−.05
Sex, Blau's index			−.01
Race/ethnicity, Blau's index			.05
Marital status, Blau's index			.02
Deep-level			
Conscientiousness, s.d.			.06
Values, s.d.			−.08
Task meaningfulness, s.d.			.13
Outcome importance, s.d.			.13
Adjusted R^2	.23	.25	.22
Overall F	11.56**	8.61**	3.21**
df	4, 139	6, 137	14, 129
F for ΔR^2	11.56**	2.23	0.56
df	4, 139	2, 137	8, 129

[a] Team social integration was measured at time 3, and team task performance was measured at time 4. Values are standardized regression coefficients.

* $p < .05$

** $p < .01$

Distinctions among Surface-Level, Deep-Level, Actual, and Perceived Diversity

We tried to include a broad range of potential forms of diversity in this study, from conventional demographic facets such as age, sex, and so on, to facets of deep-level diversity such as personality, values, and attitudes (e.g., Harrison et al., 1998). The association of actual surface- and deep-level measures to their perceptual counterparts attests to the salience of these actual differences in the shared cognitive frameworks of team members. Findings indicated that the actual measures of surface-level diversity did not contribute to perceptions of psychological diversity, suggesting that categorical or overt differences have little impact on the deep-level inferences we studied (team member differences in task meaningfulness, for instance).

Two actual, deep-level diversity variables, Rokeachian values and conscientiousness, were not linked with corresponding perceptual measures of diversity, while differences in deep-level attitudes (task meaningfulness and outcome importance) were strongly related to their corresponding perceptual measures. As measures of perceived diversity were assessed early in the teams' development, participants may not have had enough time to learn about these deeper-level personality or value differences, or they may have suspended their judgments until larger samples of one another's behaviors could be obtained. An additional possibility is that participants wanted to mask certain types of deep-level differences to appear to fit in with the other members of their teams. Yet another possible explanation is that, in the relatively short life spans of our teams, task-related attitude diversity was more salient than value-based diversity. As the members of a team continue to work together, it may be harder to mask deep-level value differences, and such differences might become more salient to the team members. These arguments are consistent with the findings of personality theorists who have reported that, over longer aggregation periods, there is a greater portion of the variance in behavior that can be accurately attributed to personality or value differences (Epstein, 1980).

Our inclusion of perceptual measures as markers of the salience of actual amounts of diversity might help researchers in two ways. First, such markers can assist in determining which elements of diversity are relevant to participants. For example, the task-related attitudes of team members in other settings might be more homogeneous (for instance, all members might be strongly committed to attaining the same goal, reward, or outcome). Consequently, the inclusion of perceptual measures of diversity could provide a critical check on the salience of this specific deep-level facet. Second, our results indicate perceptual measures of diversity carry the indirect impact of a priori or actual differences among team members. These findings provide support for researchers who have argued that perceptual measures can enhance the ability to account for diversity-related outcomes and reconcile inconsistencies among studies (e.g., Lawrence, 1997).

Uncovering differences between surface- and deep-level facets of diversity also served as something of an assumption check in our model. In addition, in supplementary data, ratings of how much the participants said they knew about other team members increased significantly from time 2 to time 3—the only occasions at which they were measured—for surface- and deep-level characteristics. More importantly, the increase in knowledge for the deep-level features was significantly greater than that for surface-level features. These findings imply that time did serve as a medium through which team

members exchanged personal information and exhibited behaviors reflecting (at least in team members' minds) more fundamental psychological features.

Social Integration

Time and the consequences of getting together. In one way, our findings support the general assumption of relational demography that outward differences in groups are *quickly* perceived and used to make judgments (Tsui et al., 1992). Those judgments affect later interactions. On the other hand, our data suggest that collaborating or getting together frequently to perform tasks can reduce the impact of demographic differences, as suggested by various organizational theories (e.g., Elsass & Graves, 1997).

Accounting for collaboration might also help to explain previous research reporting surface-level diversity as having no impact or a small impact on team outcomes (Riordan, 2000). It is possible that when researchers examine work groups that are psychologically meaningful to their members (groups such as top management teams), they are capturing teams at a developmental stage at which they have collaborated enough to have sufficient information to make judgments of deep-level diversity. Our research suggests that under these circumstances, personality conflicts, disagreements about strategic goals, and differential levels of commitment to the organization might be more crucial than surface-level differences—to communication, team cohesion and, perhaps, firm performance (Zenger & Lawrence, 1989).

Our findings do sound an optimistic note. For managers, the effects of demographic diversity might play a less significant role in team outcomes than may have been thought. Our results do not suggest, however, that the path to team social integration is necessarily an easy one. The challenge managers have is to find a way to integrate team members who differ in underlying but fundamental ways. One step in the development of such programs is to look beyond the presumed negative impact of surface-level diversity to its possible positive effects (e.g., Jehn, 1999), as well as to assess the deep-level differences that might erupt into negative affect and relationship conflict. In that sense, managing diverse teams might be akin to doing a tacit job analysis. Maximizing differences in knowledge, skills, and abilities, while minimizing differences in job-related beliefs, attitudes, and values, might create especially effective teams.

Another step in programs for managing surface-level diversity might be to structure rewards that foster greater collaboration. Our findings fit with those of research (DeMatteo, Eby, & Sundstrom, 1998) showing that when members' individual outcomes depend more on team performance, they collaborate more frequently. This collaboration brings important deep-level similarities and differences to the foreground and pushes surface-level features to the background.

The importance of team social integration. Team social integration was a strong predictor of team performance, even after we controlled for potential confounds. This link between social integration and performance converges with other diversity research (e.g., O'Reilly et al., 1989) and a wealth of studies in the groups literature, in that the correlation we obtained is within the confidence interval of the meta-analytic rho reported by Gully and colleagues (1995). Team social integration also absorbed the effects of perceived or actual diversity, which had no unique impact on performance. These findings suggest that the forms of diversity we studied are mainly important to the extent they play into team social integration.

Limitations and Research Directions

We designed our study to guard against several common limitations. Given the time separation between questionnaires and the widely held notion that common method variance is primarily a transient, memory-based systematic error, it cannot provide an explanation for our results. Additionally, because common method variance is itself a type of main effect or correlated error, it cannot explain the moderating effects of collaboration (Harrison, McLaughlin, & Coalter, 1996).

Although our measures of actual diversity, social integration, and collaboration had good psychometric properties, the perceived diversity measures require further construct validation work. In exploratory factor analyses, perceived surface- and deep-level diversity did form a separable factor. However, the deep-level items contained fairly generic perceptions (for example, differences in priorities and personalities) that did not provide the same one-to-one mapping to actual diversity measures as the surface-level items (differences in age and ethnic background). It will be important to see if perceptual measures can be developed that have the same level of specificity as actual deep-level differences.

The use of student teams working on class projects as research participants also raises serious questions about the external validity of our findings. On the positive side, the team members were not role playing; they were "field" teams in the sense that they would have existed whether or not we were doing this research. They would fall under

the rubric of *task forces* in McGrath's (1984) typology, in that they each had an assigned project with a fixed duration. In addition, team task performance had meaningful outcomes (determining 10–75 percent of course grades) for all of the participants. On the negative side, the teams we studied were together for only 9–14 weeks. Despite our own emphasis on the importance of time, the brief lifetime of these teams limits the generalizability of our results to newly formed and short-term task forces and argues for work on long-term groups, perhaps with changing tasks or membership. Although we examined time, we did so ordinally and in the compressed context of student project teams—not in the natural or "system time" of most organizational teams (Kelly & McGrath, 1988).

Conclusion

We tested a comprehensive model of the effects of work team diversity, providing possible explanations for previous inconsistencies and small effect sizes in diversity research. Consideration of perceived diversity and of the moderating role of collaboration made possible by the passage of time are important for understanding the consequences of diversity. We think that bringing time more fully into the open provides a compelling medium and conceptual lever for theorizing about diversity's effects in teams, minimizing its potentially negative consequences, and developing mechanisms to capitalize on it.

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