AN EXPLORATION OF MEMBER ROLES
AS A MULTILEVEL LINKING MECHANISM FOR
INDIVIDUAL TRAITS AND TEAM OUTCOMES

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We use data from 220 individuals in 45 teams to examine team member roles as a cross-level linking mechanism between personality traits and team-level outcomes. At the individual level, peer ratings of task role behavior relate positively with Conscientiousness and negatively with Neuroticism and Extraversion. Peer ratings of social role behavior relate positively with Agreeableness and negatively with Openness to Experience. At the team level, a composition process of aggregation operates such that the mean for social roles corresponds with social cohesion. Compilation processes of aggregation also occur, as the variance of social roles corresponds negatively with task performance, and the variance of task roles corresponds negatively with cohesion. Skew of the distribution for social roles within each team—a measure of critical mass of members individually enacting the role—also correlates with social cohesion.

Teams are a ubiquitous feature of modern organizations (Devine, Clayton, Philips, Dunford, & Melner, 1999), with purported benefits including not only higher worker satisfaction but also increased productivity (Banker, Field, Schroeder, & Sinha, 1996; Cohen & Ledford, 1994; Stewart, Manz, & Sims, 1999). Teams have been shown to synergistically combine the efforts of individual contributors in some cases, but create process losses and inefficiency in other instances (Steiner, 1972). Unfortunately, little is known about the actual process through which individual contributions amalgamate to form and interact with team-level constructs. Part of this lack of understanding stems from the amalgamation process being inherently multilevel. Individual inputs must somehow aggregate and emerge to influence collective actions and outcomes (Kozlowski &
Klein, 2000). Greater insight into the process whereby individual contributions combine in teams thus requires the explication of cross-level linking mechanisms.

One potential mechanism linking individuals and team-level characteristics is the concept of roles. A role is defined as a set of behaviors that are interrelated with the repetitive activities of others and characteristic of the person in a particular setting (Biddle, 1979; Forsyth, 1990; Katz & Kahn, 1978). From this definition we see that roles represent patterns of individual behavior resulting from interaction with other team members. These individual roles collectively combine to form aggregate constructs that represent stable patterns of group process (Kozlowski, Gully, Nason, & Smith, 1999; Morgeson & Hofmann, 1999). Roles thus reflect consistent patterns of behavior at the individual level, and role configuration reflects collective interaction at the team level (Kozlowski & Klein, 2000; Morgeson & Hofmann, 1999). As noted by Katz and Kahn (1978, p. 219) roles can therefore be seen as “the major means for linking the individual and organizational levels of research and theory.”

However, in their seminal review, Levine and Moreland (1990, p. 603) concluded that “[l]ittle is known about the psychological processes that produce roles within small groups . . . ,” and that “[f]ew researchers study the effects of roles on a group.” This paucity of research has continued, suggesting a need for the exploration of team member roles as explanations of the process through which contributions of individual team members amalgamate to form and influence team-level constructs. This study provides such an inquiry as a first step toward understanding roles as a multilevel link.

Because the concept of team member roles links individual inputs and team-level outcomes, it can be especially helpful for guiding research and practice related to team composition. Research in the area of composition examines how the inclusion or exclusion of individuals with certain characteristics affects team processes and outcomes (Guzzo & Dickson, 1996). This work acknowledges that universal high performance for individuals does not translate to a guarantee of high collective performance (Schneider, Smith, & Sipe, 2000). Rather, the influence of any team member on collective processes and outcomes depends a great deal on other members of the team (Stewart, 2003). An analysis of role formulation at the individual level combined with an analysis of role effects at the team level thus provides a multilevel perspective that benefits research and practice by providing insight into methods for optimizing team member composition.

Figure 1 presents a basic model illustrating the process of cross-level emergence associated with roles. The individual-level portion of the model represents role formation, where we focus on the influence of personality. Funder (2001, p. 2) defines personality as “an individual’s characteristic
patterns of thought, emotions, and behavior, together with the psychological mechanisms—hidden or not—behind those patterns.” Personality traits differ from roles in that they represent actions across multiple settings, whereas roles operate in a specific context and represent actions that are influenced by other people and the demands of the particular setting. Personality is, nevertheless, expected to be a strong predictor of the roles that an individual adopts within a team. Our analysis at the individual level thus focuses on assessing how personality traits influence the role behaviors of individual team members.

The team-level portion of the model suggests that the critical effects of roles occur at the collective rather than individual level. From this perspective, the collective effect of individual actions can only be understood by examining the structure—or combination—of roles within a team (Schneider et al., 2000). The notion of a collective role structure has been pursued by researchers examining the prevalence and dispersion of roles within teams (Belbin, 1993; Partington & Harris, 1999; Senior, 1997), and LePine (2003) found teams to be more effective when they adapted their role structure to fit situational needs. Yet, little work has been done to understand relationships between a team’s role structure and team-level outcomes. Our analysis at the team level thus assesses relationships between team role structures and team outcomes (i.e., social cohesion, team task performance).

In the middle of the model presented as Figure 1 is a box representing the process of cross-level emergence. Although we expect that personality influences the roles preferred by group members, the actual roles adopted and the relative importance of each of those roles are also influenced by situational demands. Factors such as the group’s task environment and the abilities, preferences, and interactions of the various members of the team will impact the team’s ultimate role structure. For example, even if all members of a team have identical personality profiles, it does not
necessarily follow that they would always adopt identical roles, especially if role diversity within the team is necessary to complete the team’s work. We expect that through an ongoing process of coordination, and perhaps even conflict, a team’s emergent role structure reflects a balance between the role tendencies of its members and the team’s role needs.

Because the link between individual roles and role structure is across organizational levels, roles do not represent a traditional mediator variable that can be tested with conventional statistical techniques (e.g., Baron & Kenny, 1986). Rather, the role emergence box represents a complex process whereby elements at the individual level (roles) combine to form a phenomenon at the higher level of the team (role structure). Kozlowski and Klein (2000, p. 59) point out that this process is often particularly difficult to describe, as “a given phenomenon or construct domain does not necessarily have to exhibit a universal form of emergence.” We thus examined different methods of aggregation representing the formation of role structure.

**Personality and Team Member Roles**

A universally accepted taxonomy of team member roles does not exist. Benne and Sheats (1948) originally developed a list of 19 potential roles in groups. More recent perspectives in the practitioner literature include lists containing varying numbers of roles (Belbin, 1993; Davis, Millburn, Murphy, & Woodhouse, 1992; Margerison & McCann, 1990; Spencer & Pruss, 1992). Perhaps the only empirically supported categorization of roles is Bales’ (1950; Bales & Slater, 1955) task and social categories. These two categories appear to underlie most other roles. Because this two-factor structure is empirically supported, and appears to represent higher-order factors for other role categorizations (Blumberg, 2001; Forsyth, 1990; Hare, 1974), we adopted it for the present study.

Task roles represent behaviors associated with work completion and problem solving (Bales, 1970). Team members who enact task roles provide inputs of knowledge and skill, and work diligently toward goal completion (Forsyth, 1990; Gladstein, 1984). Social roles represent behaviors associated with cooperation and building of group solidarity (Bales, 1970). Team members who enact this role encourage others, mediate conflict, and help satisfy the emotional needs of teammates (Forsyth, 1990; Gladstein, 1984). One benefit of focusing on broad task and social roles is the similarity in breadth between these role constructs and five-factor model (FFM) personality traits, as relationships have been shown to be strongest when predictors and criteria have similar bandwidth (Ones & Viswesvaran, 1996).
Recent research has linked FFM personality dimensions with critical work behaviors (e.g., Barrick & Mount, 1991; Hurtz & Donovan, 2000), including some studies specifically examining FFM traits in team settings (Barrick, Stewart, Neubert, & Mount, 1998; Barry & Stewart, 1997; LePine, Hollenbeck, Ilgen, & Hedlund, 1997; Mount, Barrick, & Stewart, 1998; Neuman & Wright, 1999). However, only a single study has empirically linked FFM traits and roles. Blumberg (2001) assessed relationships in self-reported data from 217 psychology students. The task role correlated positively with Agreeableness ($r = .23$) and Conscientiousness ($r = .41$). The social role correlated positively with Agreeableness ($r = .45$), Conscientiousness ($r = .24$), and Extraversion ($r = .26$), and negatively with Neuroticism ($r = - .42$). Unfortunately the self-reported role measures were not provided in reference to a specific group setting, which suggests that they do not adequately reflect roles (i.e., context-specific action in relation to others). Given the lack of a context-specific measure and the existence of a common method of measurement, these correlations are therefore difficult to accept as representative of actual relationships between general traits and context-specific roles within a team.

In this study, we explore the extent to which broad measures of personality correspond with peer-derived role measures designed to represent behavior in the particular context of a given team. We predicted that self-reported FFM trait measures correspond with conceptually similar peer assessments of task and social roles (Hypothesis 1).

People enact the social role by cooperating with others, striving for equality, and building group solidarity (Bales, 1970; Polley & Stone, 1988). FFM traits associated with cooperative, generous behavior include Agreeableness (positively; Barrick, Stewart, & Piotrowski, 2002; Costa & McCrae, 1992) and Neuroticism (negatively; Costa & McCrae, 1992). We expect these traits to be related to ratings of social role behaviors (Hypotheses 1a and 1b). Although Extraversion is a trait capturing social interaction, it is associated with status-seeking relative to others (Barrick et al., 2002; Lucas, Deiner, Grob, Suh, & Shao, 2000), thus extraverts are not necessarily expected to engage in altruistic helping behavior that comprises the social role.

Team members enact a task role when they solve problems, complete goals, and accomplish work (Polley & Stone, 1988). Conscientious people are disciplined, achievement-focused, and motivated by a desire to accomplish tasks (Barrick et al., 2002; Costa & McCrae, 1992), suggesting that they will be seen as adopting a task role in teams (Hypothesis 1c). Openness to Experience is characterized by independence of judgment, high levels of imagination, and unconventional thinking (Costa & McCrae, 1992), and Neuroticism is associated with a tendency to become overwhelmed with anxiety when faced with difficult tasks (Barrick,
Consequently, Openness and Neuroticism are expected to be negatively associated with task role behaviors in an interdependent, goal-oriented team environment (Hypotheses 1d and 1e).

Other relationships among personality traits and individual team roles may exist, but the theoretical and empirical bases for making predictions about them are less clear. We did not hypothesize any relations for the other dimensions of personality because they are not central to the roles we examine. Nevertheless, we also explore their relationships in our data analysis.

*Role Structure and Team Outcomes*

*Operationalizing role structure.* At the collective level of analysis, we predicted relationships between roles and two team-level outcomes: social cohesion and team task performance. In order for roles to link with these collective constructs, they must amalgamate to form a higher-order, group-level role structure (Kozlowski et al., 1999; Morgeson & Hofmann, 1999). Indeed, LePine (2003, p. 28) describes team role structure as “the pattern of activity among members who compose a team.” Kozlowski and Klein (2000) note that roles can form a collective structure via either composition or compilation processes.

*Composition* occurs when the team-level construct represents a relatively simple linear aggregation of individual roles that collectively emerge as an isomorphic construct at the team level. The extent of role behaviors may vary among individuals, but individual contributions are all weighted equally, so from this perspective the cross-level link between individuals and teams consists of a summation of role-consistent actions for all team members. We label this *role amplitude* and operationalize its associated role structure as the mean of individual role scores (Barrick et al., 1998; Senior, 1997).

*Compilation* occurs when the team-level construct represents a more complex pattern of individual roles. This form of aggregation occurs when the lower-level constituent roles emerge upward in a discontinuous manner that creates a higher-level construct that is distinctly different from its individual-level analog. The kinds of contributions that each team member can make to the collective vary and are nonequivalent. One example of role structure from a compilation perspective is variance among team members (Kozlowski & Klein, 2000). Greater variance represents higher dispersion among individuals. From this perspective, the cross-level link between individuals and teams consists of an assessment of the extent to which team members are consistent in their role activities. We label this *role dispersion* and operationalize its associated role structure as the variance of individual role scores (Barrick et al., 1998; Barry & Stewart, 1997).
Another example of role structure from the compilation perspective focuses on the profile or pattern of individual inputs within the group (Kozlowski & Klein, 2000). For instance, studies focusing on gender and race differences typically assess compilation through determining the proportion of members who can be classified into discrete categories (Karakowsky & Siegel, 1999; Lau & Murnighan, 1998). Discrete classification is, however, difficult with continuous measures such as individual role assessments. A potential alternative to discrete classification in such cases is to focus on different moments of the distribution (i.e., skew, kurtosis) for individual roles (Edwards, Klein, Shipp, & Lim, 2003).

In particular, skew of the distribution for each team has the potential to capture a “critical mass” effect. Negative skew can represent a distribution where a majority of team members, but not all, are high on a particular role measure. Given teams of four to six members, teams with a negative skew are likely to have a single member who is low on the role measure and other members who are clustered into an above-average bloc. The cluster of team members with relatively high scores may form a “critical mass” that sets the tone and direction for the group. From this perspective, the cross-level link between individuals and teams represents a bloc of members who are relatively similar on the individual role. We label this role bloc and operationalize its associated role structure as the skew of the distribution for individual role scores within each team (Edwards et al., 2003).

Composition and compilation forms of aggregating individual characteristics have historically been justified in terms of team tasks, with composition processes being used for additive tasks and compilation processes being used for disjunctive and conjunctive tasks (Barrick et al., 1998; LePine, 2003; Neuman & Wright, 1999). However, teams operating outside laboratory settings engage in a variety of tasks that are combined in complex ways that make classification into discrete task categories difficult (McGrath, 1984). The team tasks in this study simultaneously incorporate elements of additive, disjunctive, and conjunctive processes.

An alternative approach is to think of aggregation in terms of how the aggregated construct relates to other specific team-level constructs. The nature of the other team-level constructs being associated with the aggregated construct thus becomes a critical factor in determining whether aggregation operates via composition or compilation processes. For a given team, some constructs may emerge via composition, whereas other constructs may emerge via compilation.

Although our approach is exploratory, we develop a set of hypotheses related to composition and compilation forms of aggregation. Kozlowski and Klein (2000) note that the composition form of emergence is most likely to occur when phenomena are essentially the same as they emerge.
across levels. In contrast, compilation forms of emergence are often necessary to capture the complex process of combining lower-level units that influence constructs that are distinctly different across levels. Our exploratory hypotheses thus take into account the nature of the particular team-level outcomes and build on an understanding of the extent to which the underlying phenomena are similar or different across various levels of analysis.

**Aggregation via composition.** Social roles at the individual level are expected to be conceptually similar to the team-level construct of social cohesion. Team member actions consistent with helping others and creating a positive social atmosphere simply add to the pool of positive interpersonal interactions that develop social cohesion, suggesting that team social role amplitude (i.e., mean) corresponds positively with team-level social cohesion (Hypothesis 2). Similarly, task roles for individual team members are not likely to be negated or diminished by others enacting the same role. Each individual behavior that contributes to a collective pool of task-oriented activity has a positive influence on task performance of the team. This suggests that team task role amplitude (i.e., mean) corresponds positively with increased task performance (Hypothesis 3).

**Aggregation via compilation.** Beyond the fairly straightforward predictions about role amplitude, there are reasons to expect that other forms of role emergence will also be associated with group-level outcomes. Although role configurations that go beyond the simple sum or mean level of member roles may be quite important for group outcomes, they have received little attention. In particular, group composition research that has considered the effects of variance or other compilation aggregation processes such as proportion of team members with some characteristic has been focused on individual differences like gender, race, functional background, or personality, as opposed to peer-assessed group roles. Existing research at the team level thus provides only a weak direction for hypothesis development. Nevertheless, peripheral research findings can inform exploratory hypotheses.

Much of the research that has looked at individual behaviors and skills similar to roles has tended to focus on “cross-dimension” relationships, such as the effect of task behaviors on social outcomes or of social behaviors on team task performance. For example, it has been predicted that highly task-oriented individuals become frustrated and develop conflict with teammates who are low on task orientation (Moynihan & Peterson, 2001). Consistent with this prediction, Bond and Shiu (1997) found variance on task-focused self-discipline characteristics of team members to be negatively associated with social relationships within the team. These findings suggest that task roles influence team-level social cohesion through the compilation form of emergence (Kozlowski & Klein, 2000), wherein
higher dispersion of individual task roles (i.e., variance) corresponds with lower levels of social cohesion (Hypothesis 4).

In a similar fashion, it appears likely that social roles emerge via a compilation process to form a team-level structure associated with team task performance. Because social roles are interpersonal in nature, their effects on performance often depend on the existence of complementary roles (Moreland & Levine, 1992). Given that the social role is cooperative rather than competitive, complementariness is expected to operate in the form of homogeneity. Some empirical evidence provides support for this perspective. For instance, Toquam, Macaulay, Westra, Fujita, and Murphy (1997) found that teams with homogeneous social skills perform better than teams with heterogeneous social inputs, and Barsade, Ward, Turner, and Sonnenfeld (2000) found homogeneity of team member affect to be more important than overall level of affect. The explanations for both of these findings focused on communication patterns, with the conclusion that teams are most effective when members have homogeneous desires for social interaction. If group task performance is less a function of the level of social inputs and more a function of consistency among the social actions of team members, then greater dispersion of individual social roles (i.e., variance) should correspond with lower levels of team task performance (Hypothesis 5).

A final form of compilation is the role bloc measure, which was created to capture the effect of a critical mass of individuals. In particular, teams with a negative skew are expected to have a critical mass of members high on the individual role. We based our exploratory predictions in this area on research related to demographic differences, which has found team-level constructs to correspond with the proportion of individual members falling into certain classifications. Specifically, blocs of team members who are similar have been shown to create a critical mass that forms a coalition and thereby influences group norms (Bettenhausen & Murnighan, 1985; Lau & Murnighan, 1998). Building on these findings, we expected high levels of social cohesion for teams with a bloc of members individually high on the social role. We also expected high task performance for teams with a bloc of members who are individually high on the task role. This effect differs from role amplitude in that the pattern of individual social and task roles for these teams is expected to correspond with cohesion and performance, respectively, even when the team has a member or two scoring quite low on the individual role measure, reducing the group mean. We thus predicted a role bloc (i.e., negative skew) of individual social roles to relate positively with team-level social cohesion (Hypothesis 6), and a role bloc (i.e., negative skew) of individual task roles to relate positively with collective task performance (Hypothesis 7). This assessment of role bloc as a form of compilation is a novel aspect of our research, as we are
not aware of other published studies that examine the effect of distribution skew in teams.

Method

Participant Sample

Participants were 220 executive masters of business administration students organized into 45 teams. Seventy-eight percent of the participants were male, with a mean age of 34 years, and a mean of 12 years full-time post-baccalaureate work experience. The students were organized into small study teams that interacted cooperatively over an 8-month period. The teams were permanent during the period. They were composed of four (12 teams), five (26 teams), or six (7 teams) members. The teams worked together to complete a number of projects across different courses, but performance data were collected only in a single course. The first measure of team performance was taken after the team had been together for approximately 5 months. Measures of task and social roles, as well as social cohesion were collected approximately a month later. The final measure of team performance was taken about 2 months after the first performance measure.

Measures

Personality. Personality measures were obtained via self-report measures of the NEO Five-Factor Inventory (NEO-FFI; Costa & McCrae, 1992). The NEO-FFI is a 60-item inventory that provides scores for Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness. Reliability estimates based on coefficient alpha are .86, .77, .73, .68, and .81, respectively.

Task and social roles. Team member roles were assessed via peer ratings on the SYMLOG Adjective Rating Form (Bales & Cohen, 1979). The form contains groupings of behavioral descriptors and asks participants to rate how accurately the descriptors reflect the behavior of a target individual. Response choices are “never,” “rarely,” “sometimes,” “often,” and “always.” Each of the two role dimensions is assessed by summing scores for 18 behavioral descriptors. For the 18 behavioral descriptors associated with each measure, 9 are positive indicators and 9 are negative indicators that are reverse-scored. The task role measure is obtained from ratings of behaviors demonstrating “analytical,” “task-oriented,” and “problem-solving” actions. The social measure is obtained from ratings of behavior demonstrating “cooperative,” “friendly,” and “equalitarian” actions. The
Construct validity of these dimensional ratings is well established (Cohen, 1970).

Each team member provided ratings for each teammate, meaning that each individual received ratings from between three and five peers. Cronbach’s alpha estimates of internal consistency at the team level were .65 for task roles and .87 for social roles. More importantly, we estimated reliability of the ratings by calculating two intraclass correlation coefficients (ICC) for each role measure (James, 1982). ICC(1) serves as a reliability indicator for rating from a single rater. ICC(2) serves as a reliability indicator for the ratings provided by the collective of raters. ICC(1) values were .32 for the social role and .45 for the task role. ICC(2) values were .64 and .76, respectively. These values are within expected ranges and suggest considerable interrater reliability for these peer ratings. The mean of peer ratings was thus used as an indicator of the task and social role for each team member.

Ratings for individual team member roles (mean ratings for each member) were then aggregated to form team-level constructs. Team-level role amplitude was operationalized as the team-level mean of individual role ratings. Team-level role dispersion was operationalized as the variance of member role ratings within each team. Team-level role bloc was captured by measuring the skew of the distribution of member roles within each team. Our analyses for role dispersion and role bloc also controlled for differences in role amplitude. In the case of role dispersion, controlling for the mean of role ratings assures that the dispersion measure is not simply capturing teams with all high scores and therefore low variance. In the case of role bloc, controlling for the mean allows us to determine whether a critical mass of members high on a role has an impact beyond what is captured by equally weighting all members’ scores in determining the mean.

Team outcomes. Team cohesion was assessed with a 10-item measure developed by Rosenfeld and Gilbert (1989). Item exemplars include “There’s a feeling of group unity” and “Members of this group work together well.” Individual team members provided ratings with the collective group as the target. Cronbach’s alpha estimate of internal consistency is .94. Intraclass correlations were calculated to determine the appropriateness of aggregating these individual measures to form a team-level construct. ICC(1) is an index of agreement among ratings from members of the same team. ICC(2) indicates whether teams can be reliably differentiated on the variable of interest. ICC(1) was .46. ICC(2) was .80. Both indices suggest an adequate level of agreement among team members. We thus aggregated measures of cohesion by calculating a mean score for each team.
TABLE 1

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<th>M</th>
<th>SD</th>
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<tbody>
<tr>
<td>1. Agreeableness</td>
<td>30.60</td>
<td>6.20</td>
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<td>2. Conscientiousness</td>
<td>35.51</td>
<td>6.70</td>
<td>.05</td>
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<td>3. Extraversion</td>
<td>32.62</td>
<td>6.29</td>
<td>.23</td>
<td>.17</td>
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<td>4. Neuroticism</td>
<td>13.67</td>
<td>7.48</td>
<td>-.27</td>
<td>-.36</td>
<td>-.39</td>
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<tr>
<td>5. Openness to experience</td>
<td>29.44</td>
<td>6.54</td>
<td>.14</td>
<td>-.18</td>
<td>.13</td>
<td>-.01</td>
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<tr>
<td>6. Social role</td>
<td>17.93</td>
<td>5.63</td>
<td>.25</td>
<td>-.02</td>
<td>.06</td>
<td>-.01</td>
<td>-.10</td>
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<tr>
<td>7. Task role</td>
<td>5.78</td>
<td>3.95</td>
<td>-.02</td>
<td>.25</td>
<td>-.13</td>
<td>-.15</td>
<td>-.16</td>
<td>-.11</td>
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Note. N = 220 individuals. 95% confidence interval (.00 < .13 < .26); 90% confidence interval (.00 < .11 < .22).

Team performance was operationalized as the mean score of instructor evaluation for two team projects. The instructor was unaware of team member scores for the other variables. One project required team members to write a paper that compared and contrasted the human resource practices of the companies where they worked. Another project required team members to design a compensation plan. Both projects required integration of unique information from every team member, eliminating the possibility that the work could be done by a single individual rather than by the collective group. The projects represent additive and disjunctive tasks (Steiner, 1972), and fall predominantly in McGrath’s (1984) classification as creative, decision-making, and intellective tasks.

Results

Correlations illustrating relationships at the individual level of analysis are reported in Table 1. Regression analyses, illustrating the unique effects of each personality dimension as well as the combined effect of the set of dimensions, are reported in Table 2. Results of the regression analyses show that approximately 9% of the variance in individual social roles, and 12% of the variance in task roles, is explained by the set of personality measures. The regression results are generally consistent with the zero-order correlations, with a couple of exceptions noted below.

Consistent with Hypothesis 1a, agreeable team members were rated higher on the social role ($r = .25; 90\% \text{ CI is} .15 < .25 < .35$). Team member Neuroticism was essentially uncorrelated with the social role ($r = -.01; 90\% \text{ CI is} -.10 < -.01 < .12$), thereby failing to support Hypothesis 1b. Hypothesis 1c, which posited a relationship between Conscientiousness and the task role, was supported ($r = .25; 90\% \text{ CI is} .15 < .25 < .35$). Hypothesis 1d received mixed support. Team members higher on
Openness to Experience were rated lower on the task role \((r = −.16; 90\%\ CI is −.26 < −.16 < −.05)\), but the confidence interval for this effect included zero when the regression analysis controlled for the effects of other personality dimensions \((β = −.09, 90\%\ CI is −.20 < −.09 < .02)\). Neuroticism exhibited a negative relationship with the task role \((r = −.15; 90\%\ CI is −.26 < −.15 < −.04)\), supporting Hypothesis 1e.

Two unhypothesized relationships were also found in the data. In the regression analysis that controlled for the effects of other traits, Openness to Experience related negatively to peer-rated social role \((β = −.15, 90\%\ CI is −.26 < −.15 < −.04)\). In addition, both the zero-order correlation and the regression beta illustrate a negative relationship between Extraversion and task role \((r = −.13; 90\%\ CI is −.24 < −.13 < −.02; \ β = −.22, 90\%\ CI is −.33 < −.22 < −.10)\).

Correlations at the team level of analysis are shown in Table 3. However, relationships for role variance and role bloc require analyses that partial out mean score differences. The measure of role dispersion may be biased by mean differences, as individuals scoring very high or low on a role will not only increase the variance but also have an inordinate influence on the mean. The conceptual meaning of role bloc requires an assessment of critical mass that transcends the mean. The relationships were therefore assessed via hierarchical regression techniques that control for mean score differences between teams. We also controlled for differences in team size for all regression analyses. Results of the regression analyses are shown in Tables 4 and 5.

Hypothesis 2 predicted a relationship between social role amplitude and social cohesion, which as shown in Model 2 of Table 4, was supported. Teams with higher mean levels of individual social role reported greater cohesion \((β = .65, 90\%\ CI is .46 < .65 < .84)\). Hypothesis 3 predicted
TABLE 3

Team-Level Correlations Between Team Role Structure and Team Outcomes

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<td>1. Social role amplitude</td>
<td>17.90</td>
<td>3.87</td>
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<td>2. Social role dispersion</td>
<td>22.80</td>
<td>23.86</td>
<td>.45</td>
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<td>3. Social role bloc</td>
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<td>.93</td>
<td>-.12</td>
<td>.03</td>
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<tr>
<td>4. Task role amplitude</td>
<td>5.77</td>
<td>1.49</td>
<td>-.05</td>
<td>-.01</td>
<td>.06</td>
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<tr>
<td>5. Task role dispersion</td>
<td>17.17</td>
<td>13.39</td>
<td>.40</td>
<td>-.05</td>
<td>.24</td>
<td>-.15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Task role bloc</td>
<td>-.20</td>
<td>1.04</td>
<td>.04</td>
<td>.40</td>
<td>-.12</td>
<td>.13</td>
<td>-.44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Team size</td>
<td>4.62</td>
<td>.65</td>
<td>.07</td>
<td>-.10</td>
<td>-.13</td>
<td>-.10</td>
<td>-.08</td>
<td>.20</td>
<td></td>
</tr>
<tr>
<td>8. Social cohesion</td>
<td>42.89</td>
<td>5.43</td>
<td>.65</td>
<td>-.43</td>
<td>-.28</td>
<td>.13</td>
<td>-.45</td>
<td>.14</td>
<td>.11</td>
</tr>
<tr>
<td>9. Team performance</td>
<td>90.18</td>
<td>2.54</td>
<td>-.09</td>
<td>-.33</td>
<td>.12</td>
<td>-.08</td>
<td>.15</td>
<td>-.20</td>
<td>.03</td>
</tr>
</tbody>
</table>

Note. N = 45 teams. 95% confidence interval (.00 < .28 < .56); 90% confidence interval (.00 < .24 < .48).

TABLE 4

Hierarchical Regression Analyses With Social Cohesion as the Dependent Variable

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team size</td>
<td>11 (−.14 ↔ .40)</td>
<td>.08 (−.11 ↔ .27)</td>
<td>.14 (−.14 ↔ .23)</td>
<td>.04 (−.15 ↔ .24)</td>
</tr>
<tr>
<td>Task role amplitude</td>
<td>.17 (−.02 ↔ .36)</td>
<td>.11 (−.07 ↔ .30)</td>
<td>.17 (−.02 ↔ .36)</td>
<td></td>
</tr>
<tr>
<td>Social role amplitude</td>
<td>.65 (.46 ↔ .84)</td>
<td>.44 (.20 ↔ .67)</td>
<td>.63 (.44 ↔ .82)</td>
<td></td>
</tr>
<tr>
<td>Task role dispersion</td>
<td>−.27 (−.48 ↔ −.06)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social role dispersion</td>
<td>−.24 (−.45 ↔ −.03)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task role bloc</td>
<td>.06 (−.14 ↔ .25)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social role bloc</td>
<td>−.21 (−.39 ↔ −.01)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>.01</td>
<td>.45</td>
<td>.53</td>
<td>.50</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>−.01</td>
<td>.41</td>
<td>.47</td>
<td>.44</td>
</tr>
<tr>
<td>ΔR²</td>
<td>.44a</td>
<td>.07b</td>
<td>.05c</td>
<td></td>
</tr>
</tbody>
</table>

Note. N = 45 teams. Coefficients shown are standardized beta weights. 90% confidence intervals are shown in parentheses.

a ΔR² between Models 1 and 2.
b ΔR² between Models 2 and 3.
c ΔR² between Models 2 and 4.

a relationship between task role amplitude and team task performance, which as shown in Model 2 of Table 5, was not supported. Contrary to a priori predictions, teams with higher mean levels of individual task role did not exhibit higher performance. Although not predicted, analyses assessing relationships between task role amplitude and social cohesion, and social role amplitude and task performance, are also reported in Tables 4 and 5. Evidence does not support either relationship, meaning that the composition form of role aggregation was supported for only a single relationship between social role amplitude and cohesion.

As predicted in Hypothesis 4, the results shown in Model 3 of Table 4 show a negative relationship between task role dispersion and social cohesion (β = −.27, 90% CI is −.48 < −.27 < −.06). Although not predicted
Hierarchical Regression Analyses With Team Performance as the Dependent Variable

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team size</td>
<td>.03 (−.22 ↔ .29)</td>
<td>.03 (−.23 ↔ .29)</td>
<td>.01 (−.23 ↔ .26)</td>
<td>.08 (−.19 ↔ .34)</td>
</tr>
<tr>
<td>Task role amplitude</td>
<td>−.09 (−.34 ↔ .17)</td>
<td>−.11 (−.36 ↔ .14)</td>
<td>−.06 (−.32 ↔ .21)</td>
<td></td>
</tr>
<tr>
<td>Social role amplitude</td>
<td>−.09 (−.36 ↔ .18)</td>
<td>−.26 (−.57 ↔ .06)</td>
<td>−.09 (−.35 ↔ .18)</td>
<td></td>
</tr>
<tr>
<td>Task role dispersion</td>
<td></td>
<td>.01 (−.27 ↔ .29)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social role dispersion</td>
<td>−.44 (−.73 ↔ −.15)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task role bloc</td>
<td></td>
<td></td>
<td>−.20 (−.47 ↔ .07)</td>
<td></td>
</tr>
<tr>
<td>Social role bloc</td>
<td></td>
<td></td>
<td>.10 (−.17 ↔ .37)</td>
<td></td>
</tr>
</tbody>
</table>

$R^2$: .00 .02 .18 .07
Adjusted $R^2$: −.02 −.06 .07 −.06
$\Delta R^2$: .02$^a$ .02$^b$ .05$^c$

Note. $N =$ 45 teams. Coefficients shown are standardized beta weights. 90% confidence intervals are shown in parentheses.

$^a$ $\Delta R^2$ between Models 1 and 2.

$^b$ $\Delta R^2$ between Models 2 and 3.

$^c$ $\Delta R^2$ between Models 2 and 4.

in our exploratory hypotheses, the results also revealed lower social cohesion for teams with greater social role variance ($\beta = −.24$, 90% CI is $−.45 < −.24 < −.03$). The combination of these findings shows that teams are more cohesive when there is consistency among individual team member roles related to both task and social input.

Hypothesis 5 was supported, as the results reported in Model 3 of Table 5 show a negative relationship between variance on social roles and team performance ($\beta = −.44$, 90% CI is $−.73 < −.44 < −.15$). No relationship was predicted between task role dispersion and performance. The results in Table 5 are consistent with this expectation, as there is no evidence of a relationship between task role variance and collective performance.

As a whole, the results provide relatively strong support for a compilation effect of aggregation based on variance of member roles. Teams are more cohesive when the pattern of individual task and social roles demonstrates consistency. Moreover, teams exhibit higher task performance when members are consistent on social roles.

Hypotheses 6 and 7 focused on the role bloc form of compilation. Consistent with expectations, the results reported in Model 4 of Table 4 suggest that the skew of individual social roles is negatively related to social cohesion, or to state it another way, the negative skew of social roles in the group is positively related to social cohesion ($\beta = −.21$, 90% CI is $−.39 < −.21 < −.01$). This suggests that a critical mass of team members relatively high on the social role has an effect on cohesion that transcends the mean. However, caution is necessary when interpreting the effects of skew in cases where the number of data points in the distribution is...
small (Edwards et al., 2003). This is the case in this study, as measures of skew are based on distributions of between four and six members. To aid interpretation, we thus identified teams with large negative skew for social roles and plotted their distributions. The plots supported our interpretation of skew as an indicator of critical mass. Teams with large negative skew were primarily composed of a single individual low on the social role and the rest of the team clustered in the high range of the distribution.

Hypothesis 7 was not supported, as a significant relationship between skew of task roles and team task performance was not found (Table 5, Model 4). As expected, the results in Tables 4 and 5 do not support a relationship between either task role skew and cohesion or social role skew and performance. Taken as a whole, the results thus provide limited support for the usefulness of skew as an operationalization capturing a compilation form of aggregation.

Discussion

Our findings support roles as a multilevel linking mechanism between individual traits and team outcomes. We find evidence at the individual level that relevant personality traits relate to important team member role behaviors. Our results also demonstrate team-level effects whereby individual roles aggregate via both composition and compilation processes to predict team-level cohesion and performance.

The behavioral link at the individual level is critical because, although psychologists have long talked about the importance of relating personality to specific behavior, few empirical studies have actually demonstrated this linkage (Kenrick & Funder, 1988). The cross-level effect of task and social roles thus helps us understand the process whereby personality traits are related to important work outcomes. In particular, our exploration of task and social roles at the individual level adds to existing research that highlights the importance of work-related behaviors focused on both task and social demands. The task and social distinction are consistent with leadership findings (Judge, Piccolo, & Ilies, 2004) supporting two sets of critical behavior: consideration (social and influence seeking) and initiating structure (task). The distinction is also consistent with organization-level perspectives that demonstrate the importance of vertical (authority systems or influence seeking) and lateral (peer systems or social) relationships, as well as task inputs (e.g., Burns & Stalker, 1961). Moreover, recent work by Barrick et al. (2002) has demonstrated three fundamental cognitive–motivational goals that employees pursue at work: accomplishment striving (task roles), communion striving (social roles), and status striving (influence seeking). Our findings converge with these perspectives.
to suggest task and social grouping as critical categorizations that can be used to classify fundamental work goals and behavioral roles.

This is only the second study that has empirically linked FFM traits to roles. Our findings confirm some of the results reported by Blumberg (2001), but there are differences as well. In terms of differences, Blumberg found Agreeableness to correspond positively with the task role, and Conscientiousness and Extraversion to correspond positively with the social role. We did not detect such relationships. As noted earlier, a possible explanation for these conflicting results is that Blumberg’s measures were not provided in a specific team context, whereas ours focus on behavior in a specific team. Consistent with Blumberg’s (2001) findings, we found Conscientiousness to link with task roles and Agreeableness with social roles. These relationships thus appear to be rather robust and combine with the work of Barrick et al. (2002) to demonstrate a critical pattern of relationships between behavioral categories and personality traits. Barrick et al. (2002) focused on goals, whereas we focus on roles. Nevertheless, the results are highly similar, which is to be expected because personality likely influences success at work through mechanisms such as individual goals and group roles. Both studies found the task category to correspond with Conscientiousness and Emotional Stability (Neuroticism reversed), and the social category to correspond with Agreeableness. Taken together these findings demonstrate that whether one is predicting observed role behavior or the goals motivating the person, personality traits predictably relate to these fundamental areas. Specifically, Conscientiousness and (low) Neuroticism lead to getting things done (exhibiting task role behaviors or accomplishment striving), whereas Agreeableness relates to getting along with others (social role behaviors or communion striving).

Finding this specific pattern of relationships is helpful in further establishing a theoretical framework that can be used to develop a priori reasons for relationships between personality traits and specific work-related outcomes (Tett, Jackson, & Rothstein, 1991). Combined with other research (Barrick et al., 2002; Hogan & Holland, 2003; Tett & Burnett, 2003), our results make an important contribution toward developing theory that can be applied to systematically predict when specific personality traits are likely to relate to behaviors that are required to achieve high performance. Future research must continue to clarify when traits such as Conscientiousness, Neuroticism, and Agreeableness are linked to specific behaviors, and in turn, when those behaviors are critical for high work performance.

At the team level, our results show that individual task and social roles do indeed aggregate to form team-level constructs that predict important team outcomes. Consistent with the basic form of composition aggregation, the mean level of social roles corresponds with social cohesion, suggesting that social inputs from individual members operate in an additive
fashion to form a similar team-level construct. Individual social role behaviors thus aggregate through a process wherein each positive individual role behavior provides a contribution toward team-level feelings of unity and support. Combining the individual and team-level results suggests that social cohesion can thus be improved by including team members high on Agreeableness, who in turn enact social roles.

We also found social cohesion to be predicted by a within-team skew of individual social roles. This is an exploratory finding but provides an illustration of how a relatively unique form of compilation links to critical team outcomes. Less frequently used moments of the distribution of roles within teams, such as skew, can provide additional insight into aggregation processes. Specifically, once mean differences were controlled, performance was highest for teams that included a critical mass of members individually high on the social role. The social inputs of these members appear to go beyond their contribution through the mean. This suggests that cohesion is related not just to the overall level of social inputs but also to the extent to which a bloc of team members individually enact social roles. Teams with a strong bloc of individually agreeable members appear to develop a sense of cohesion, even if the traits of a member or two are less predictive of high social input. Taken together, the mean form of composition and the skew form of compilation illustrate how social roles combine to influence cohesion. The contribution of each person is important, but including a bloc of agreeable members who enact positive social roles can even extend the benefits of social role behavior.

Our results also provide support for the variance form of compilation as a particularly useful method for linking role behavior with team-level outcomes that are not conceptually similar. These compilation links differ from the composition form of aggregation, as the aggregated variables and their associated outcomes represent dissimilar constructs. Specifically, social role variance predicted task outcomes, and task role variance predicted social outcomes. Similar to other recent research (Barsade et al., 2000; Toquam et al., 1997), our findings suggest that consistency of roles often matters more than the overall level of those roles.

Typical research that does not include “cross-dimensional” relationships between dissimilar constructs may not detect critical relationships between individual behaviors and team outcomes. Within the context of the teams in this study, the reciprocal nature of social roles appears to operate such that performance is enhanced when social roles are consistent, regardless of whether the overall level of roles is high or low. In a similar fashion, task roles correspond with greater cohesion, such that consistency of task behavior is more critical for unity than is overall level. Teams can
be quite happy as long as some members do not provide substantially more task inputs than others.

Overall, the variance form of compilation suggests that teams can be improved by including members who fit together well. In particular, teams with members similar on Conscientiousness and Neuroticism should have higher cohesion, and teams with members similar in Agreeableness—regardless of whether members are high or low—should have higher task performance.

From a theoretical perspective, a contribution of this study is greater insight into the process whereby individual-level constructs emerge to create and influence team-level constructs. We found the form of emergence to differ depending on how the team-level role variable being created was expected to relate to other team-level variables. This underscores the need for researchers to go beyond simple task descriptions when forming composites of individual-level variables. Various existing theories of group process and social influence, such as theories of group polarization and minority influence (e.g., Turner, 1991), for example, offer insights that are likely to be useful for formulating hypotheses and operationalizing group-level aggregations of individual-level variables.

The combination of individual- and team-level findings also highlights the practical importance of effectively selecting and socializing team members. The benefit of including individuals whose traits predispose them to enact functional roles extends beyond their influence on individual performance. The importance of including highly conscientious or agreeable team members may be underestimated if their contribution is measured only in terms of individual performance and not in terms of their effect on collective performance via the enactment of individual task roles. The inclusion of individuals high or low on given traits thus has an impact on group performance that may oftentimes go undetected with traditional approaches for validating personality traits as performance predictors. Nevertheless, factors other than personality also have an influence on roles. Thus, where group composition is not entirely controllable, organizational leaders may be able to influence the socialization process for new members so that adoption of certain roles is controlled in order to preserve a desirable role mix within the group. The formal mechanisms for “role control” are somewhat less clear, however, than for selection. This suggests that researchers and practitioners alike can benefit from more clearly assessing the influence of both individual traits and environments on not only individual performance, but also team-level outcomes.

A specific avenue for future research is to explore more specific, specialized roles. The presence of certain roles such as devil’s advocate or conflict mediator may be functional for groups but only in small numbers.
Analogous to the research here, an interesting study or series of studies might explore the personality antecedents of adoption of these specific roles, perhaps using facet-level personality dimensions in order to more appropriately match the breadth of the role being studied (Ones & Viswesvaran, 1996). At the group level, the role amalgamation process would be of interest for these narrow roles, particularly with respect to relevant outcomes such as group conflict or group problem-solving characteristics.

Although the pattern of results obtained provides general support for the proposed personality–behavior–performance framework, a few potential limitations of this study should be noted. First, the teams included in our study were created expressly for the purpose of task completion, suggesting that teams with other purposes may show different relationships with a team’s role structure, particularly when performance is the dependent variable of interest. In addition, these teams were fairly well established (most had been together for several months), stable in terms of membership, were able to meet in person on a regular basis, and established as relatively permanent, ongoing teams to accomplish many tasks in addition to those in this particular class. So as teams go, these teams probably represented somewhat stronger situations than might exist, for example, in ad hoc teams, teams with fluid membership, or in virtual teams. Future research should thus examine aggregation processes and role structures in different contexts, particularly across teams that vary in situational strength.

Another limitation is that our measure of team performance consists of an instructor’s evaluation of two products that the team produced. This measure does not capture all aspects of performance. Additional studies should use other measures of performance; however, the imperfect nature of our performance measure actually makes this a somewhat conservative test of the predicted relationships.

In conclusion, this study contributes at the individual level of analysis by adding to a growing body of evidence demonstrating that relevant personality traits predict work-related outcomes through task and social behaviors and goals. A primary contribution of this study is in its illustration that personality influences how individuals contribute to work roles in a team setting. Our findings also contribute at the team level of analysis by demonstrating how these individual roles aggregate to create a team role structure. Thus, a second important contribution lies in illustrating both composition and compilation processes. From a practice perspective, our examination of roles as a multilevel linking mechanism also suggests that composing teams of individuals with desirable personality traits can indeed influence role formation, which in turn influences team outcomes such as social cohesion and team task performance.
REFERENCES


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