LEADERSHIP EMERGENCE IN AUTONOMOUS WORK TEAMS: ANTECEDENTS AND OUTCOMES

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The aim of this study was to investigate (a) personality attributes and cognitive ability (g) as determinants of leadership emergence in teams, and (b) the impact of leadership that can emerge from the team leader (operationalized as the team member with the highest leadership score) and other team members (staff) on team performance. Autonomous work team members who had been working together for 13 weeks were studied. Participants were 480 undergraduates in 94 initially leaderless teams of 5 or 6. We found that leadership emergence was associated most strongly with g, followed by conscientiousness, extraversion, and emotional stability. Teams performed best when both the team leader and staff were high in leadership. Furthermore, an effective team leader does not ameliorate the negative effects of a staff low in leadership.

Over the last 50 years, the extent to which traits explain leadership within teams has been the subject of many literature reviews. Reviews by Mann (1959) and Stogdill (1948) reported that traits do not consistently differentiate leaders from nonleaders across a variety of situations. However, more recent reviews have drawn different conclusions. A seminal review by Lord, De Vader, and Alliger (1986) supported the influence of traits on leadership. According to these researchers, early reviews made a number of theoretical and methodological errors, including, a reliance on a small number of studies, drawing too many correlations from one study, and emphasizing only median correlations rather than the consistency in results across studies. In their meta-analysis,
Lord et al. found that intelligence, masculinity-femininity, and dominance were significantly related to leadership. Research since their review supports the role of individual differences in leadership (see Kirkpatrick & Locke, 1991; Lepine, Hollenbeck, Ilgen, & Hedlund, 1997; Zaccaro, Foti, & Kenny, 1991).

The aims of this study were twofold. First, we were interested in the Five-Factor Model (FFM) and cognitive ability \( g \) traits associated with leadership emergence at the individual level of analysis. That is, the degree to which these traits are related to the leadership (as reflected in a set of behaviors that team members attribute to leadership) exhibited by each team member. Second, we were interested in how leadership that can emerge from both a team leader (operationalized here as the person in the team with the highest leadership score) and other team members, separately and jointly impact the performance of teams without a designated hierarchy.

**Leadership Emergence in the Team Context**

Teams represent an increasingly common way of structuring work to achieve a competitive advantage (Mohrman, Cohen, & Mohrman, 1995; Pfeffer, 1996; Tesluk, Farr, & Klein, 1997). In particular, autonomous work teams are becoming a popular work design strategy (Cohen, 1993; Lawler, Mohrman, & Ledford, 1995; Manz & Sims, 1993). Autonomous work teams were the focus of the present study. Such teams are characterized by the team taking responsibility for completion of a variety of tasks, including team maintenance functions (e.g., conflict resolution and team and individual performance feedback), work allocation, and identifying and solving ill-defined or poorly structured problems (Cannon-Bowers, Oser, & Flanagan, 1992).

Leadership has been linked to both individual performance within a team and to team performance (Borman, 1990; Cohen, Chang, & Ledford, 1997; Kenny & Zaccaro, 1983). Leaders differ from other team members in that they are “more likely to direct other group members’ activities” (De Souza & Klein, 1995, p. 475). Team leadership differs from more traditional forms of dyadic leadership in several ways (Zenger, Musselwhite, Hurson, & Perin, 1994). The leadership role in teams largely involves facilitating team process—initiating or formulating goals, encouraging interaction between all team members, finding necessary resources to get the job done, encouraging diverse points of view, acting as coach, clarifying team member responses, and organizing the group’s thinking (Bass, 1949, 1961; Usoff & Nixon, 1998; Zenger et al. 1994).
Emergent leaders may be just as important to the facilitation of team task completion as are designated leaders (Stogdill, 1974). The manner in which a leader comes to power—whether formally designated or emerging—may be "unimportant in comparison to the behaviors of the leader" (Firestone, Lichtman, & Colamonosca, 1975, p. 347). Schneider and Goktepe (1983) defined emergent leaders as group members who exert significant influence over other members of the group although no formal authority has been vested in them. In this study, no team member was vested with formal authority, therefore, when team members attributed leadership to the behavior of one of their peers we thought of this as emergent leadership.

The appropriateness of specific leadership behavior probably depends on the situation. For instance, Kerr, Schriesheim, Murphy, and Stogdill (1974) in their review and synthesis of the literature, concluded that when teams experience a sense of urgency to produce an output, initiating structure is not only related to superior team performance but is also perceived by others as most appropriate. That is, when a team works under a time constraint the appropriate leader role behavior would primarily attempt to organize work, work relations, and goals rather than to develop trust, respect for others, and regard for others' feelings. Zaccaro et al. (1991) found that emergent team leaders (individuals rated highest on perceived leadership by their peers) were more adept than other team members at perceiving team requirements and selecting appropriate behavior to these demands.

Seers, Petty, and Cashman, (1995) argue that due to the self-managing nature of autonomous work teams, such teams "experience more peer-directed role-making interaction" (p. 21). Applying the role development process (Hollenbeck, Lepine, & Ilgen, 1996; Seers, 1989) to the leader role, one anticipates that leadership emerges when a peer sends expectations for leadership behavior to a fellow team member who, if he or she is willing and capable, reinforces those expectations by exhibiting effective leadership behavior. Therefore, exchanges between team members may take structure not from formal job positions but from the negotiated roles or relationships between team members (Seers, 1989). This process assumes aggregation of perceptions of role episode exchanges across members of a team, leading to general role consensus within the team (Seers et al., 1995).

The role assumed by an individual depends on his or her abilities and interests, the needs of other group members, and the team task to be completed (Seers, 1989). The development process suggests that some individuals possess characteristics and exhibit behavior that is commonly perceived by other team members as indicative of leadership. Different situations may result in different team member exchange processes—a
person may emerge as a leader in one team but not in another. However, we expect that it is likely that there are certain individual differences that predispose some team members to generate in others the expectation that they are effective leaders. Furthermore, specific individual attributes may predispose some individuals to act like a leader to reinforce the role expectation.

Autonomous work teams differ from traditional work situations in that the roles that people assume are flexible and dynamic (Seers, 1989). That is, there is low role differentiation. This suggests that there may be more than one team member exhibiting leadership (as reflected in a set of behavior that team members attribute to leadership) at any particular time. The individual differences perspective supports this view. This perspective suggests that all people have attributes associated with leadership, however, some people have more of the desired qualities than do others. That is, we may all exhibit leadership behavior at one time or another, but some people are more likely to exhibit behavior attributed to leadership more often than are others. Hence, although we operationalized the "emerged" team leader as the team member who had the highest leadership ratings among all team members (Usoff & Nixon, 1998; Zaccaro et al. 1991), all team members may exhibit leadership behavior and therefore leadership may emerge from a number of different people.

**Individual Differences in Leadership**

When specific traits have been selected for inclusion in leadership research, it generally has been in a fragmented fashion. As is the case with most personality research, a "broadside approach" is most prevalent in trait-based leadership research where "predictors have been hurled against criteria in the hope that they will stick" (cf. Schneider & Hough, 1995, p. 87). Consequently, it is not surprising that there is little consensus as to which individual attributes are associated with leadership. In the late 1980s, personality psychologists came to a general consensus that five robust factors of the Five-Factor Model (FFM) can serve as a meaningful and useful taxonomy for organizing the confusing array of findings in the personality literature (Costa, 1996; Digman, 1990). The FFM helped in the understanding of the relationship between personality attributes and job performance (Barrick & Mount, 1991; Tett, Jackson, & Rothstein 1991), and it may do the same for the study of individual differences in leadership. FFM traits and their potential contribution to team member leadership are described next.

Conscientiousness, which ranges from being careful, responsible, self-disciplined, and organized, to being irresponsible, disorganized, and
lacking in self-control, has been found to be important for several components of leadership, including, goal setting, motivating others, and task-orientation (Aronoff & Wilson, 1985; Barrick & Mount, 1993; Costa & McCrae, 1992; Kirkpatrick & Locke, 1991). These behaviors are expected to be especially important in autonomous work teams were the team takes responsibility for task completion. Lepine et al. (1997), found team decision accuracy was contingent on leader conscientiousness.

Extraverts are outgoing, sociable, and active (Costa & McCrae, 1992). Their social confidence and social prowess may be important for leadership in contexts that require high amounts of social interaction (Hogan, Curphy, & Hogan, 1994; Kirkpatrick & Locke, 1991; Lord et al. 1986; Mann, 1959; Shaw, 1981; Shaw & Harkey, 1976; Stogdill, 1974). For instance, emergent leaders who lack formal power, may benefit from social confidence and ability to communicate effectively when building team commitment to a common team goal. Emergent leadership tends to be related to the amount of verbal activity—the person that speaks most is likely to be perceived as the leader (Bass, 1949; Morris & Hackman, 1969; Slater, 1955).

People who are open to experience are sensitive, imaginative, and polished (Costa & McCrae, 1992). Their willingness to listen to others' opinions and explore new ideas is associated with participative leadership styles (Kirkpatric & Locke, 1991; Leathers, 1969; Rokeach, 1960; Zaccaro et al. 1991). Individuals in team leadership roles are expected to interact well with others (e.g., provide assistance, mentorship, and ethical guidance). If the leader's role is to ensure social cohesion and reduce destructive conflict, then the ability to model and foster cooperation between team members is important (see Barrick, Stewart, Neubert, & Mount, 1998). Therefore, Agreeableness which ranges from cooperative, good-natured, and hopeful to uncooperative, ruthless, and inflexible, may contribute to effective leadership in teams (Dunn, Mount, Barrick, & Ones, 1995; Kirkpatrick and Lock, 1991; Shaw, 1981).

Neurotics are excitable, angry, insecure, and depressed (Costa & McCrae, 1992). Several studies suggest Neuroticism is negatively related to effective leadership outside of teams (Greer, Galanter, & Nordlife, 1954; Haythorne, 1953; Hogan et al., 1994; Petterson, 1991) and one study found anxiousness, a facet of Neuroticism, is negatively related to effective leadership within teams (Cattell & Stice, 1954). Leaders high in Neuroticism should engage in less prosocial behavior than their counterparts and create a negative affective tone that makes it difficult for the team to work together.

From the above review, the following hypotheses at the individual level are suggested:
Hypothesis 1: Conscientiousness will be positively related to the leadership score of each team member.

Hypothesis 2: Extraversion will be positively related to the leadership score of each team member.

Hypothesis 3: Openness to Experience will be positively related to the leadership score of each team member.

Hypothesis 4: Agreeableness will be positively related to the leadership score of each team member.

Hypothesis 5: Neuroticism will be negatively related to the leadership score of each team member.

In addition to personality, cognitive ability may be indicative of an individual's leadership capacity (Kirkpatrick & Locke, 1991; Lord et al., 1986; Mann, 1959; Stogdill, 1948, 1974). Over the past 15 years or so, a great deal of research has investigated the adequacy of cognitive ability measures when predicting job performance in various occupations. There is a growing acceptance of the empirical findings that ability tests largely measure general cognitive ability (g) and that g predicts a variety of job performance criteria in a manner that is fair to ethnic and gender subpopulations (Ree & Carretta, 1998; see also Harville, 1996; Hunter, 1986; Hunter & Hunter, 1984; Ree & Earles, 1996). People high in g are better at information processing, problem solving (Schmidt, Hunter, & Perlman, 1981), prioritizing between conflicting roles, and adapting to new situations through learning quickly and better applying old learning (Hunter, 1986). They perform better on measures of originality, preference for complexity, conceptual fluency, and flexibility (Steiner, 1972). Furthermore, high g is associated with the number of activities pursued, and specifically with the pursuit of team-based activities (Reid, 1972). Lepine et al. (1997) found that the decision-making accuracy of a team depended on team leader g. Leaders high in g may be better able to develop effective systems of interaction within the team, so that information is effectively shared and considered (cf. Hollenbeck, Lepine, & Ilgen, 1996). The above literature lead us to expect:

Hypothesis 6: General cognitive ability will be positively related to the leadership score of each team member.

Relating Team Member Leadership to Team Performance

An important initial step to establishing an effective team is to consider team composition. Accumulating research on team composition has failed to provide strong and consistent results (Guzzo & Shea, 1992) partly due to the lack of consideration of task as an important boundary
condition and partly due to the lack of consideration of differences in contributions made by different members. That is, when staffing teams, the personal characteristics that are predictive of effective team member performance may vary with the nature of the tasks that must be completed and the roles adopted by team members in completing tasks.

Lepine et al. (1997) made two contributions to the study of team leadership that are useful here. First, they suggested that if a team leader has the greatest impact on team performance then the leader role might be viewed as separate from the role of other team members whom they refer to as “staff.” They found that high conscientiousness and g on the part of both leader and staff was important for team performance, thereby supporting the idea of unique roles being played by the leader and staff in the teams they studied. Second, they used Steiner’s (1972) task typology to provide useful aggregation operationalizations for staff. Steiner described tasks as additive, disjunctive, or conjunctive. For additive tasks, each team member contributes to the team output in proportion to his or her abilities. For disjunctive tasks, team performance is contingent on the performance of the best member. Lastly, for conjunctive tasks the poorest performer limits the performance of the team.

If the team leader is most likely to exhibit high amounts of facilitating behavior (e.g., co-ordinating, directing, and evaluating and synthesizing solutions), then his or her actions may have the most impact on team performance (Bass, 1949, 1961; De Souza & Klein, 1995; Lepine et al. 1997). Accordingly,

Hypothesis 7: The leadership score of the team leader (the person with the highest leadership score in the team) will be positively related to team performance.

If behaviors that are attributed to leadership can emerge from team members other than the team leader (i.e., staff), then each team member has a potential contribution to make to team performance with respect to leadership. Where staff members build on each others ideas and one team member can compensate for the failings of another team member because they possess similar domain relevant knowledge; as was the case in this study, the appropriate operationalization is additive. Therefore,

Hypothesis 8: Staff leadership score (additively operationalized) will be positively related to team performance.

If a team leader depends on staff members to take leadership on tasks or subtasks, it may be difficult for even a highly competent team leader to fully compensate for a staff incapable of exhibiting leadership behaviour. Similarly, if the leader role involves providing general guidance on staff
activities, it would be difficult for staff with high leadership scores to impact team performance in a positive manner if the team leader performs poorly in his or her role. Accordingly, if there is low substitutability between the team leader role and the staff role, then:

**Hypothesis 9:** Team performance will be an interactive function of the leadership scores of both the team leader and staff (additively defined), such that the relationship between the leadership score of the team leader and team performance will be stronger when the staff has high leadership emergence.

**Methodological Issues with Previous Studies**

Research on trait-based individual differences of group members has generally focused on the achievement of a specific task (e.g., problem solving) in contrived experimental settings (generally laboratory settings) with data collection at the group level. In “real” work settings, many teams commonly complete a variety of tasks, over an extended time. The teams in this study were required to complete numerous tasks, meeting for 50 minutes a week over 13 weeks. Because teams appear to go through different stages of development (i.e., forming and storming; Tuckman & Jensen, 1977) the study of teams that have been together for a short period of time is likely to primarily contribute to our understanding of early team interaction.

Lastly, Stevens and Campion (1994) note that the “team as the level of analysis has been the predominate focus of most previous literature” (p. 504). However, most human resource management systems are applied, at least in part, to the individual employee (Stevens & Campion, 1994). This study complements previous literature by relating individual team member leadership to overall team performance.

**Summary**

The purpose of this research was to investigate individual differences with respect to leadership and the influence of leadership emergence on team performance. Recent studies have found support for the study of individual differences associated with team leadership, however, few have taken advantage of the FFM. Fewer still have focused on the FFM and g as antecedents of leadership emergence in autonomous work teams.

All team members, to some degree, possess the traits associated with leadership and therefore numerous team members may be capable of exhibiting behaviors that team members attribute to leadership. Although
the team member rated highest in leadership by his or her peers (team
leader) may have the greatest influence on team outcomes, other team
member's leadership (staff) behavior is also expected to impact team
performance. Team leader and staff roles are expected to be low in sub-
stitutability. That is, a team needs acts of leadership from both the staff
and the team leader.

Method

Participants

Participants were 480 second-year undergraduate business students
in a midsized university. In the sample, 58% of the students were female,
and the average student age was 21 years old. Students were assigned
to nine sections of approximately 53 students each. Assignment was
done so that the allocated section did not conflict with another course
being taken by that student. Within sections, each student self-selected
membership into a team of five or six individuals, during Week 1 of a
13-week course. In all, there were 94 groups. Team leaders were not
assigned. The modal number of students in each group was five. Of
a student's overall course grade, 20% was determined by their team's
output over a 13-week period.

Measures

Personality. In Week 11 of our 13-week study, FFM traits were mea-
sured by the revised NEO Personality Inventory (NEO-PI-R; Costa &
McCrae, 1992). The NEO-PI-R has sound psychometric properties
(Costa & McCrae, 1992; Hogan, 1991; Leong & Dollinger, 1990) and
is valid and reliable when administered to college students (Costa &
McCrae, 1992). The factor structure of the NEO-PI-R has been repli-
cated in several diverse cultures (McCrae & Costa, 1997) and similar fac-
tor structures have been found for men and women, older and younger
adults, and Whites and nonwhites (see Costa, McCrae & Dye, 1991;
Piedmont, 1994). Cronbach's alpha coefficients for FFM traits ranged
from .84 to .72 in our sample. Alpha coefficients were calculated from
the six facets composing the FFM trait.

General cognitive ability. General cognitive ability was measured by
the Wonderlic Personnel Test in Week 12. Test-retest reliabilities range
from .82 to .94 (Wonderlic & Associates, 1992). The Wonderlic corre-
lates well (.60 to .70) with training program grades in industrial settings,
.92 with the Wechsler Adult Cognitive Ability Scale (Hawkins, Faraone,
Leadership. In Week 13, overall leadership was assessed by two items: (a) exemplifies strong leadership and (b) assumes leadership. Each member of a team rated every other team member on these two leadership items. Responses were made on a 5-point Likert scale, ranging from almost never (1) to almost always (5). The correlation between the two items was .79 ($p < 0.001; N = 480$, coefficient $\alpha = .72$), therefore a global measure of leadership was the average of peer-assessments on the two items above.

Convergence in ratings provided by peers was estimated by the intrarater agreement statistic, $r_{wg}$, (James, Demaree, & Wolf, 1984). Although an interpretation of this statistic as a reliability indicator does not strictly conform to standard measurement principles (Schmidt & Hunter, 1989), it provides a useful index of consensus among raters (James, 1982; James, Demaree, & Wolf, 1993). Values of .70 or better are considered indicators of good agreement (George & Bettenhausen, 1990). The average value of $r_{wg}$ was .72 for the global measure of team member leadership. This indicated consensus among raters, that is, a significant portion of leadership variance was due to aspects of the ratee.

Validation of leadership measure. As evidence of construct validity, our global measure of leadership was related to specific team member behavior. First, the critical incident technique (Latham & Wexley, 1994) was used to gather specific examples of (in)effective team member behavior. This was done in Week 8. The generation of a behavioural observation scale (BOS) from over 1,300 examples of (in)effective team member behavior involved the steps outlined in detail by Latham and Wexley. The final BOS contained 14 dimensions and a total of 46 behavioural items of which 16 were ineffective team member behaviours. Each team member evaluated each of his or her peers using the BOS in Week 13 of the study. LISREL 8 Confirmatory Factor Analysis with maximum-likelihood analysis (Jöreskog & Sörbom, 1993) of BOS dimensions reveal adequate fit of the data with the model developed by the judges (comparative-fit index = .98, root mean square error of approximation = .06, goodness-of-fit = .97, and normed-fit index = .96; Bagozzi & Yi, 1988; Bentler, 1990; Bentler & Bonnet, 1980; Jöreskog & Sörbom, 1993).

The frequency with which each group member engaged in each action described on the BOS was made on a Likert scale, ranging from almost never (1) to almost always (5). Peer evaluations occurred in Week 13 of the study. Table 1 reveals that our global measure of leadership correlated .73 with the “synthesis of team ideas” dimension, .63 with the
### TABLE 1

**Correlation Coefficients of BOS Dimensions with Leadership**

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<th>BOS Dimensions</th>
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<td>1. Synthesis of ideas (.77)</td>
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<td>2. Team citizenship .54*** (.73)</td>
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<td>3. Participation in team problem solving .59*** .56*** (.80)</td>
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<td>4. Involvement of others .52*** .53*** .59*** (.85)</td>
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<td>5. Goal setting/achievement .49*** .43*** .50*** .46*** (.70)</td>
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<td>6. Performance management .55*** .50*** .54*** .48*** .46*** (.82)</td>
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<td>7. Strategy to address conflict .45*** .54*** .47*** .45*** .41*** .37*** (.78)</td>
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<td>8. Focusing on the task-at-hand .39*** .37*** .35*** .35*** .45*** .31*** .31*** (.76)</td>
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<td>9. Providing feedback .36*** .40*** .35*** .35*** .29*** .25*** .36*** .27*** (.82)</td>
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<td>10. Preparation for meetings .12* .24*** .18*** .21*** .15* .17** .14* .26*** .21*** (.81)</td>
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<td>11. Communication .11* .07 .08 .08 .06 -.05 .12* .17** .31*** .18*** (.75)</td>
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<td>12. Commitment to the team .19*** .24*** .12* .13* .16** .08 .09 .16** .17** .24*** .05 (.70)</td>
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<td>13. Reaction to conflict .16** .19*** .15* .08 .04 .09 .08 .19*** .28*** .15* .29*** .13** (.71)</td>
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<td>14. Averting conflict .17** .23*** .19*** .09 .04 .02 .14* .20*** .32*** .08 .31*** .09 .21*** (.70)</td>
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<td>15. Leadershipb .73*** .71*** .70*** .64*** .63*** .61*** .53*** .50*** .41*** .32*** .25*** .17*** .13*** .03*** (.72)</td>
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*Note: A copy of the BOS is available from the first author. N = 480.

*Alpha coefficients of reliabilities are displayed in parentheses on the diagonal.

bLeadership was operationally defined as average of peer-assessments on the two items (a) exemplifies strong leadership and (b) assumes leadership.

*p < .05, 2-tailed    **p < .01, 2-tailed    ***p < .001, 2-tailed
“goal setting” dimension, and .61 with the “performance management” dimension. The goal setting dimension contained the items “does not participate in setting team goals,” (reverse scored) and “participates in developing strategies to achieve team goals” (Cronbach’s $\alpha = .70$). The performance management dimension contained the items “assigns tasks and roles to team members,” “sets time deadlines for achieving tasks,” and “tells the team how much time they have left to do a task” (Cronbach’s $\alpha = .82$). The synthesis of team ideas dimension contained the items “builds on the group’s ideas by offering solutions,” and “summarizes and organizes the group’s ideas” (Cronbach’s $\alpha = .77$). For these dimensions, average $r_{wg}$ (James, 1982; James et al. 1984, 1993) was .88, .87, and .79 respectively. Given these strong correlations, convergent validity was supported and we used only the global measure of leadership in our analysis.

Table 1 presents additional correlations between our global leadership measure and BOS dimensions. A regression analysis indicated that the six strongest correlates with the global measure of leadership emergence accounted for 81% of the variance ($R^2 = .81$, $F = 263.37$, $p < .001$). Perusal of Table 1 reveals that the BOS dimensions with the strongest correlations with leadership (as perceived by the participants in this study), reflect initiating structure (defining and organizing the task to help the team to achieve its goals) more so than consideration. Initiating structure behavior includes assigning tasks, communicating effectively, clarifying work duties and procedures, planning, and facilitating problem solving (Stogdill & Coons, 1957). These behaviors correspond with the behaviors in the “performance management,” “involving others,” and “goal setting/achievement” BOS dimensions.

Global measure of team performance. Each week teams completed different exercises. Exercises included case analyses, evaluation of common selection instruments, design and construction of a structured interview and performance appraisal instrument, and critical analysis of newspaper articles. Tasks involved creative problem solving, decision making, seeking additional information and consulting various resources (e.g., library research), critical thinking, and report generation. Minimum guidance was provided on how to complete tasks. The teams were similar to other types of work teams in that they had team goals, were evaluated in terms of the team’s outcome, and team members needed to

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1 All subsequent analyses were conducted with both the global measure of leadership emergence and with the six BOS dimensions most strongly correlating with the global measure of leadership emergence. Because the results obtained from using the global leadership measure and the six BOS dimensions were alike, for brevity we have reported analyses based on the global leadership measure only.
communicate with each other about individual and team performance, prioritizing tasks, and task and time allocation.

All but one exercise had to be completed during an in-class 50-minute session. Reports were generally submitted prior to a team leaving the session. An independent evaluator who was blind to the study's purpose, scored reports submitted by the teams each week. The average team score over the 13-week period served as the measure of overall team performance. Average team scores ranged from 9.65 to 19.69, out of a total possible score of 20 ($SD = 1.42$ and coefficient of variation was .09). Average Cronbach's $\alpha$ for the 13 submissions was .87.

**Data Analyses**

Ree and Earles (1996) warn that university students may make a censored sample and therefore correction for range restriction may be necessary. Hence, to estimate validities for the adult working population, corrections for range restriction were made to supplement uncorrected validities. Because censoring may have occurred on personality variables and on $g$, multivariate corrections for range restriction were made using the procedure and program (RANGEJ) recommended by Johnson and Ree (1994). RANGEJ utilizes formulas by Lawley (1943). Normative data from which corrections were made were obtained from the NEO-PI-R manual and Wonderlic Personnel Test manual.² A two-step process was used to correct the restricted FFM, $g$, and leadership matrix.³ First, starting from the observed (restricted) correlation matrix between FFM traits and $g$, the FFM traits were corrected for range restriction using unrestricted means, standard deviations, and correlations obtained from the NEO-PI-R publisher's manual. Next, the resulting correlation matrix was used as the unrestricted matrix in the correction for range restriction in cognitive ability. In addition, leadership was added to the analysis. The output of this analysis was the final corrected correlation matrix.

Hypotheses 1 through 6 were assessed through a simultaneous regression. Both corrected and uncorrected analyses were conducted. In

²The average performance of working adults on the Wonderlic Personnel Test is 21.75 ($SD = 7.60$; Wonderlic & Associates, 1992, p. 25). Average score of adults on Form S of the NEO-PI-R for Neuroticism is 79.1 ($SD = 21.2$), Extraversion is 109.4 ($SD = 18.4$), Openness to Experience is 110.6 ($SD = 17.3$), Agreeableness is 124.3 ($SD = 15.8$), and for Conscientiousness is 123.1 ($SD = 17.6$) (Cost & McCrae, 1992, p. 75). Also available in the NEO-PI-R manual are intercorrelations between the FFM variables (Cost & McCrae, 1992, p. 100).

³The authors thank Malcolm Ree for his guidance on this analysis.
the corrected analysis, variables were corrected for range restriction using RANGEJ (Johnson & Ree, 1994). To test Hypotheses 7 through 9 we performed a hierarchical regression with three steps. RANGEJ does not provide a hierarchical regression option; therefore, only uncorrected variables were used in the analysis. Because we were concerned with the exploratory power of the team leader's score over and above the staff's score, the staff's score was entered in Step 1 and the team leader's score was entered in Step 2. The interaction was entered in Step 3. Statistical significance at each step was assessed by the change in $F$ statistic associated with the incremental increase in variance in team performance accounted for by the variable entered at that step.

Results

Table 2 shows correlations and descriptive statistics for variables at the individual team member level of analysis. The intercorrelations among personality traits are common (Costa & McCrae, 1992), and correlations between personality traits and $g$ are not unusual (Ree & Earles, 1994). Corrected correlations are above the diagonal in Table 2. Leadership correlated significantly with Extraversion (corrected $r = .32$, uncorrected $r = .22$, $p < .001$), Openness to Experience (corrected $r = .22$, uncorrected $r = .17$, $p < .01$), Conscientiousness (corrected $r = .21$, uncorrected $r = .20$, $p < .001$), and most strongly with $g$ (corrected $r = .44$, uncorrected $r = .33$, $p < .001$).

Table 3 reveals results of a simultaneous regression that tests Hypotheses 1 to 6. In the regression equation using corrected variables, about 31% of the variation in individual team member leadership was accounted for by personality and $g$ (corrected $R^2 = .31$, uncorrected $R^2 = .18$, $p < .001$). Beta weights showed that $g$ (Hypotheses 6) contributed most to explaining team member leadership, followed by Conscientiousness (Hypotheses 1) and Extraversion (Hypotheses 2), and lastly, Neuroticism (Hypotheses 5). Hypotheses 3 (Openness to Experience) and Hypotheses 4 (Agreeableness) were not supported.

Results of the hierarchical regressions that tested the additive operationalization of team tasks, appear in Table 4. First, with respect to the additive model (using the average of the four or five staff members' scores as the staff's score), staff score had a main effect on team performance (Hypotheses 8; $\Delta R^2 = .27$, $p < .001$). The team leader (team member with the highest leadership score) did not significantly impact team performance over and above other team members (Hypotheses 7; $\Delta R^2 = .03$). There was, however, a statistically significant staff score (additive) $\times$ team leader score interaction (Hypotheses 9; $\Delta R^2 = .06$, $p < .01$). The nature of this interaction is shown in Figure 1, where
TABLE 2

Observed Correlations among Leadership and Traits with RANGEJ
Multivariate Correction for Range Restriction (N = 480)

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Leadership*</td>
<td>(.72)*</td>
<td>−0.09</td>
<td>.32</td>
<td>.22</td>
<td>.00</td>
<td>.21</td>
<td>.44</td>
</tr>
<tr>
<td>2. Neuroticism</td>
<td>−.10</td>
<td>(.84)</td>
<td>−.21</td>
<td>.02</td>
<td>−.25</td>
<td>−.53</td>
<td>−.07</td>
</tr>
<tr>
<td>3. Extraversion</td>
<td>.22***</td>
<td>−.06</td>
<td>(.79)</td>
<td>.40</td>
<td>.04</td>
<td>.27</td>
<td>.07</td>
</tr>
<tr>
<td>4. Openness to experience</td>
<td>.17**</td>
<td>−.09</td>
<td>.02</td>
<td>(.72)</td>
<td>−.02</td>
<td>−.02</td>
<td>.13</td>
</tr>
<tr>
<td>5. Agreeableness</td>
<td>−.01</td>
<td>.15**</td>
<td>.08</td>
<td>.06</td>
<td>(.79)</td>
<td>.24</td>
<td>−.12</td>
</tr>
<tr>
<td>6. Conscientiousness</td>
<td>.20***</td>
<td>−.22***</td>
<td>−.15**</td>
<td>.16***</td>
<td>−.10</td>
<td>(.82)</td>
<td>−.04</td>
</tr>
<tr>
<td>7. g</td>
<td>.33***</td>
<td>−.18***</td>
<td>.04</td>
<td>.12*</td>
<td>−.17***</td>
<td>−.03</td>
<td>(.89)</td>
</tr>
</tbody>
</table>

Note: Observed correlations appear below the diagonal and correlations corrected for range restriction appear above the diagonal (Lawley, 1943). Corrected correlations do not have a known sampling distribution. The standard error of a corrected correlation is unknown, therefore statistical tests are not possible with corrected correlations (Ree, Carretta, Earles, & Albert, 1994). Reported means and standard deviations were also corrected for range restriction. Personality scores were factor scores expressed as T scores based on formulas provided by the inventory publisher (Costa & McCrae, 1992, pp. 7-8).

*Leadership was operationally defined as average of peer-assessments on the two items (a) exemplifies strong leadership and (b) assumes leadership.

Alpha coefficients of reliabilities are displayed in parentheses on the diagonal. For personality variables, alpha coefficients were calculated from the six facets composing the FFM trait.

*p < .05, 1-tailed  **p < .01, 1-tailed  ***p < .001, 1-tailed

TABLE 3

Summary of Simultaneous Regression of Individual Member Leadership on Team Member Attributes (N = 480)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Correctedα</th>
<th>Uncorrected</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>β</td>
<td>R²</td>
</tr>
<tr>
<td>(Hypothesis 1) Conscientiousness</td>
<td>.22</td>
<td>.31</td>
</tr>
<tr>
<td>(Hypothesis 2) Extraversion</td>
<td>.22</td>
<td>.14**</td>
</tr>
<tr>
<td>(Hypothesis 3) Openness to Experience</td>
<td>.08</td>
<td>.06</td>
</tr>
<tr>
<td>(Hypothesis 4) Agreeableness</td>
<td>.02</td>
<td>.02</td>
</tr>
<tr>
<td>(Hypothesis 5) Neuroticism</td>
<td>−.11</td>
<td>−.08*</td>
</tr>
<tr>
<td>(Hypothesis 6) g</td>
<td>.43</td>
<td>.32***</td>
</tr>
</tbody>
</table>

Note: β is the standardized regression coefficient.

αCorrelations of g and FFM traits with the criterion corrected for range restriction (Lawley, 1943). The standard error of a corrected correlation is unknown, therefore statistical tests are not possible with corrected correlations (Ree, Carretta, Earles, & Albert, 1994).

*p < .05  **p < .01  ***p < .001

it is evident that a high leadership score on the part of both the team leader and staff (additive) yielded high team performance. A low staff leadership score neutralized the effect of a high team leader. Similarly,
### TABLE 4
Effects of Leadership on Team Performance ($N = 94$)

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Additive</th>
<th>Conjunctive</th>
<th>Disjunctive</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$R^2$</td>
<td>$\Delta R^2$</td>
<td>$R^2$</td>
</tr>
<tr>
<td>Step 1. Staff score</td>
<td>.27</td>
<td>.27***</td>
<td>.12</td>
</tr>
<tr>
<td>Step 2. Leader score</td>
<td>.30</td>
<td>.03</td>
<td>.16</td>
</tr>
<tr>
<td>Step 3. Interaction</td>
<td>.36</td>
<td>.06**</td>
<td>.24</td>
</tr>
</tbody>
</table>

*Note: Variables not corrected for range restriction were used in this analysis.*

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

---

**Figure 1:** Plot of the Interaction Between the Highest Scoring Member's Leadership Score × Staff Leadership (Additively Defined) on Team Performance.

Emergent team leaders with low leadership scores relative to other team leaders, neutralize the effects of a staff high in leadership. A high leadership score on the part of the team leader or the staff alone was insufficient for bringing about higher team performance. This suggests that
a team leader is a facilitator of team performance rather than being the dominant contributor to team performance.

Post Hoc Analyses

Although, theoretically, the additive model seems most appropriate, recently Barrick et al. (1998) found support for conjunctive models even in contexts that may not look conjunctive a priori. That is, each team member must perform at a minimally acceptable level in order for the team to perform well. Moreover, both Lepine et al. (1997) and Barrick et al. found that, at least for some variables, both additive and conjunctive models explain team outcomes. We checked the conjunctive model in an exploratory analysis.

With respect to the conjunctive operationalization (using the lowest score as the staff's score), Table 4 reveals that there was again a main...
effect for staff ($\Delta R^2 = .12, p < .001$) but not the emergent team leader ($\Delta R^2 = .04$). As well, there was a statistically significant staff score (conjunctive) $\times$ team leader score interaction ($\Delta R^2 = .08, p < .01$).

This interaction, illustrated in Figure 2, revealed that a staff member's low leadership score neutralized the effects of a relatively high leadership score emergent team leader. The results supported the conclusion drawn from the additive model—high leadership scores on the part of both the leader and staff are necessary for achieving high team performance. The "weakest link" with respect to leadership significantly impacts team performance.

Some tasks may require the contribution of only one intelligent and talented individual and therefore the disjunctive operationalization may be appropriate. That is, task performance does not require a high degree of cooperation and interdependence between team members. As a post hoc check of the viability of the additive and conjunctive models, we repeated the hierarchical regression analysis with the disjunctive model. With respect to the disjunctive operationalization (using the highest score as the staff's score), Table 3 revealed no significant main effects or interaction. This suggests that the tasks performed by the teams in this study did not require the contribution of only one bright team member to succeed.

**Discussion**

We proposed that individual differences are associated with leadership emergence and expected many acts of leadership are necessary for high team performance. This study contributes to our knowledge about teamwork in the following ways: (a) it considered the performance of intact autonomous work teams executing a variety of different tasks over 13 weeks, (b) it used the FFM and $g$ as predictors of team member leadership, and (c) it made several methodological improvements over past studies. For example, we created task environments more closely approximating an applied work setting. Our analysis of the BOS dimensions associated with leadership emergence revealed that leadership behavior exemplified initiating structure. Our findings should therefore be interpreted with this in mind. We found that $g$ was the most potent predictor of a team member's leadership rating, followed by Conscientiousness, Extraversion, and Neuroticism. Moreover, we showed that although it is important for the team leader to be high in leadership, leadership that can emerge from staff is also important. Indeed, without this latter type of leadership, the effects of the team leaders' leadership are neutralized.
Individual Differences in Leadership

We found that $g$ and Conscientiousness were important antecedents of leadership emergence. The results with respect to $g$ and Conscientiousness are consistent with the findings that people perceive a core set of characteristics related to leadership—these include intelligence, determination, and decisiveness (Foti, Fraser, & Lord, 1982; Lord et al. 1986). Our results with respect to $g$ and Conscientiousness also correspond with those reported by Lepine et al. (1997) in their study of hierarchical decision-making teams (i.e., the importance of $g$ and Conscientiousness as essential resources for the leadership of teams).

Extraversion was expected to be important in team leadership emergence because of the high amounts of social interaction involved in teamwork. Barry and Stewart (1997) found that extraverts are perceived by others as having greater effect on group outcomes than are introverts. Extraverts induce this perception through both task-related and socio-emotional behavior (Barry & Stewart, 1997). Our findings indicate that Extraversion is an important antecedent of initiating structure leadership emergence in teams.

Although the above hypotheses were supported, the hypotheses dealing with Openness to Experience and Agreeableness were not supported. The result with respect to Openness to Experience is consistent with Kirkpatrick and Locke’s (1991) review of earlier studies where they found weak support for creativity/originality as a predictor of leadership (creativity/originality are associated with Openness to Experience; McCrae, 1987). Our finding with respect to Agreeableness corresponds with Barrick and Mount’s (1991) meta-analysis, which found that Agreeableness was generally not predictive of different performance criteria.

Whereas $g$, Conscientiousness, Extraversion, and Neuroticism appear to contribute to initiating structure, Openness to Experience and Agreeableness may contribute mostly to the consideration dimension of leadership. These traits are associated with willingness to share ideas and information freely, tolerance, and sympathy-behaviors characterizing the consideration leadership orientation (i.e., concern for people; Stogdill & Coons, 1957). In situations that call for consideration leadership, Openness to Experience and Agreeableness may be a more important antecedent to effective leadership than observed here.

Zaccaro et al. (1991) found that 59% of the variance in leadership emergence was trait-based. In this study, we found that about 31% of variance in leadership emergence (using corrected variables) was trait-based. The difference in variance explained in leadership emergence between the Zaccaro et al. study and this study may be due to the level of personality measurement. This study is unique in that it focused at the
FFM level. Zaccaro et al. measured personality at levels below the FFM (facet level of the hierarchy). There is a fervent debate over the best level at which to measure personality (Adler, 1996). Costa (1996) notes that "for many applied purposes, the detailed information provided from first-order facets is crucial" (p. 227). For leadership, measurement of personality at levels below the FFM may yield better predictive validity. This requires additional study.

**Operationalizations of Staff Attributes**

Lepine et al. (1997) argued that in hierarchical decision-making teams, the appropriate staff composition model was conjunctive. This is because "lack of horizontal redundancy implies that if one team member fails, other members will not be able to compensate" (p. 805). However, they found that for g, a task could take on additive characteristics as well as conjunctive. This is because other team members may engage in helping behaviors that may partially reduce the negative effects of a low-g member.

Given that g contributes significantly to leadership emergence, our findings correspond with those of Lepine et al. (1997). Specifically, the lack of main effects with respect to the highest scoring team member on leadership emergence (team leader) replicates Lepine et al. (1997) who found no main effect for leader g. Similarly, our findings with respect to the interaction effects between leader and staff attributes with both the additive and conjunctive operationalizations, corresponds to Lepine et al. who found cross-level interactions for g on additive and conjunctive models. Thus, high leadership emergence on the part of one or two other staff was partially able to compensate for the staff's worst member. Our findings also correspond with Barrick et al. (1998) who found that high average team g is required for high team performance—we found that high staff leadership emergence is required for high team performance.

With g as the predictor, Lepine et al. (1997) found statistically significant main effects for the staff on the additive and disjunctive models but not the conjunctive model. Using our summary leadership measure, we found statistically significant main effects for the staff on the conjunctive model. This may be because Conscientiousness and Extraversion also contribute significantly to leadership emergence (corrected $r = .22$ for both traits). Besides finding average Conscientiousness of a team predicted team performance, Barrick et al. (1998) found that the team member with the lowest Conscientiousness and Extraversion score significantly impacted team performance. That is, they found support for the conjunctive model of the impact of Conscientiousness and Extraversion.
Taken together, our results along with those reported in prior studies by Lepine et al. (1997) and Barrick et al. (1998) paint a consistent picture about the influence that the worst team member can have on overall team performance. That is, each team member must perform at minimal acceptable levels for the team to succeed and therefore must possess the required resources—Conscientiousness, Extraversion, and Neuroticism—to draw on. Our results indicate that each team member makes a unique contribution to team effectiveness and the failure of one member to exhibit leadership behavior is detrimental to team performance. Moreover, other team members may not be able to, or wish to, compensate for the absent behavior. Future research is required to determine how the lack of leadership in staff members impacts team performance. Possibly, the lack of leadership behavior exhibited by one team member may be perceived by his or her peers as social loafing. For example, Lepine et al. note that a team member is less inclined to assist another team member needing help, when the perceived contribution of the other member is attributed to low Conscientiousness rather than low ability. If team members do compensate for peers that are perceived to be low in Conscientiousness then feelings of inequity may result in a decline in the continued viability of the team (Barrick et al. 1998). That is, the decline in group cohesiveness because of perceived social loafing may explain declines in team performance.

In the initially leaderless teams we studied, by the end of the 13-week period over which the teams had worked together, there was general consensus as to who was the team leader. The process of role making and role taking may result in development of an informal hierarchy of relationships. That is, once a person has assumed the team leadership role in an initially leaderless team, that person may function in much the same way as a designated leader. Although the emerged team leader may have no formal authority, he or she may have informal authority granted from the role negotiation process. This may be one explanation for the similarity of the results reported here and those reported by Lepine et al. (1997) in their study of hierarchical teams.

How can we reconcile (a) the finding that there was general consensus on each team member’s leadership score, including the score of the highest scoring team member (team leader), (b) the possibility that almost all team members can display some leadership behavior, and (c) the failure of one member to exhibit leadership behavior is detrimental to team performance? There are two possible explanations. The first assumes cross-situational consistency in who emerges as the team leader on a task. In this case, the team leader exhibits greater amounts of behavior that peers attribute to leadership on each of the team exercises. Staff may be responsible for leadership on subtasks. However, if there
TABLE 5
Summary of Stepwise Discriminant Function Analysis of the Team Leader on BOS Dimensions ($N = 480$)

<table>
<thead>
<tr>
<th>Step</th>
<th>Standardized canonical discriminant function coefficients</th>
<th>$F$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Performance management</td>
<td>.83</td>
<td>287.64***</td>
</tr>
<tr>
<td>2. Goal setting/achievement</td>
<td>.41</td>
<td>155.18***</td>
</tr>
<tr>
<td>3. Synthesis of team ideas</td>
<td>.27</td>
<td>107.92***</td>
</tr>
<tr>
<td>Canonal $R$</td>
<td>.64</td>
<td></td>
</tr>
<tr>
<td>Eigenvalue</td>
<td>.68</td>
<td></td>
</tr>
</tbody>
</table>

***$p < .001$

is little cross-situational consistency in who emerges as the team leader, different team members may take leadership on different exercises. The person perceived to be leader might be the one that took leadership on most of the team exercises. These two explanations require that team leaders differ significantly from other team members in the amount of leadership behavior that they exhibit.

A post hoc exploratory discriminant analysis presented in Table 5 confirms that team leaders do indeed differ significantly from other team members in the amount of leadership behavior that they exhibit. In this analysis, three BOS dimensions were predictors of membership in two groups—staff ($N = 386$) and team leaders ($N = 94$). Team leaders exhibit BOS dimension behaviours associated with initiating structure more often than other team members. Although it is too early to rule out either explanation, several researchers have suggested cross-situational consistency in leader emergence, and some studies have found empirical support for this (e.g., Kenny & Zaccaro, 1983; Zaccaro et al. 1991). Taken together, our results support the transactional approach to leadership—the leader provides a resource to the group by facilitating leadership functions, among which is directing the task (cf. Zaccaro et al. 1991). Where the emerged team leader may set goals and allocate responsibilities on the larger task, staff members may engage in similar behavior on sub-tasks. Both levels of task coordination may be necessary, thus the lack of substitutability between leader and staff.

Hollenbeck et al. (1995) suggested that part of the designated leader's job might be to weigh each staff member's opinion in coming up with a single overall decision from the team as a whole. In Table 5, we found that the team leader is likely to build on the team's ideas by offering solutions, summarizing, and organizing the team's ideas. In this way the emerged team leader has greater impact on team performance by facilitating problem solving in his or her peers. Low substitutability with
respect to the leadership and staff roles indicates that although the main purpose of leadership is to organize and direct the group toward the attainment of mutual goals on a particular task (Hollander, 1985) it appears that a team performs best when such behavior is the responsibility of staff members as well as the team leader. This is supported by the significance of the additive staff operationalization. There was no support for the disjunctive operationalization, thus suggesting task performance required cooperation between team members.

Limitations

In this study, we attempted to approximate genuine work environments while benefiting from a relatively large sample with fairly equivalent teamwork experiences, task knowledge, and resource constraints. Our teams are similar to teams in applied work settings in task interdependence—this is supported by the emergence of “performance management,” “participation in team problem solving,” “synthesis of the team’s ideas,” and “involvement of others” type behaviors in the validation of the leadership measure. Moreover, the tasks on which teams worked were not contrived but contributed substantially to team members’ course grades. There are two major reasons why future studies of functioning intact autonomous work teams within applied work settings are needed to establish the generalizability of our findings. First, although the teams in this study were more like “real” teams in that they had a history of working together, they were still only engaged in a series of short tasks. Second, although there is some support for using students as participants (Greenberg, 1987), our findings require replication in a nonstudent sample and with teams engaged in on-going tasks.

In establishing the convergent validity of our global measure of leadership emergence, a measurement concern may stem from assessing group member behavior and global leadership on the same instrument. Because leadership and behavior were determined by averaging the ratings of several assessors, the impact of common method variance was expected to be minimal. Peer appraisals have been shown to be a good method of assessing performance—they are among the most reliable sources of appraisal and they are also accurate indicators of job performance (Latham & Wexley, 1994). Empirical evidence does not support treating likability or other criterion bias as a significant problem when peer assessments are used (Barry & Stewart, 1997; Schmitt, Pulakos, Nason, & Whitney, 1996). In addition, in order to address the common method variance problem the proposed models were run using project grades as a secondary supplemental criterion. The analyses provided further support for the results reported here.
Subjects were not randomly assigned to groups so there was a concern that they picked group membership based on the attributes of others (e.g., how much they liked other group members). However, group level analysis revealed that there was no evidence of restriction of range, or significant skewness or kurtosis on any of the variables in this study (e.g., there was no evidence that extraverts chose other extraverts as group members). Nevertheless, future studies need to address the possibility of a selection bias on variables not measured in this study.

Conclusions

We confirmed hypotheses related to individual differences that are associated with leadership emergence. Our results suggest that human resource practitioners should seek to maximize the number of people in a team who exhibit leadership behavior, such as performance management, goal setting, and synthesis of ideas. For instance, Cohen et al. (1997) have recommended management development programs that are tailored to training individuals in self-managing leadership behavior. An important finding is that although one individual may clearly exhibit leadership behavior more than his or her peers may, this individual can not compensate for lack of leadership behavior in other team members. As suggested by Rubin and Beckhard (1972), a team needs many acts of leadership, contributed from all members of a team.

REFERENCES


