April 1997

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Comments
Suggested Citation
Wright, P. M., McMahan, G. C., Smart, D. & McCormick, B. (1997). *Team cognitive ability as a predictor of team performance* (CAHRS Working Paper #97-10). Ithaca, NY: Cornell University, School of Industrial and Labor Relations, Center for Advanced Human Resource Studies.
http://digitalcommons.ilr.cornell.edu/cahrswp/151

WORKING PAPER SERIES

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Working Paper 9 7 - 1 0

School of Industrial and Labor Relations

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Team Cognitive Ability as a Predictor of Team Performance

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Abstract

This manuscript presents two studies of the relationship between team cognitive ability (average Scholastic Aptitude Test score of team members) and team performance (a subjective coach's evaluation and an objective measure using Sagarin's Power Rankings) among NCAA Division 1 Men's Basketball teams. Study 1 was conducted following the 1991-92 season whereas Study 2 was conducted during the 1993-94 season. Both studies indicated that team cognitive ability was significantly related to the coach's evaluation but not to the power ranking measure, and that team strategy moderated the relationship between cognitive ability and the coach's evaluation of performance. Cognitive ability moderated the relationship between team strategy and power ranking, but the nature of the interaction was different across the two studies.

Team Cognitive Ability as a Predictor of Team Performance:

A significant amount of research supports the positive relationship of cognitive ability with job performance (Hunter & Hunter, 1984; Humphreys, 1992). Cognitive ability has been shown to predict the occupation to which an individual belongs (Austin & Hanisch, 1990), training success (Ree & Earles, 1992), and various measures of productivity or job performance (Hunter, 1986; Schmidt & Hunter, 1992). In fact, based on the substantial amount of research regarding cognitive ability tests, Ree and Earles (1992) stated that "If an employer were to use only intelligence tests and select the highest scoring applicant for each job, training results would be predicted well regardless of the job, and overall performance from the employees selected would be maximized," (p. 88).

However, past cognitive ability research has primarily focused on the individual as the unit of analysis. Most research has been concerned with examining the validity of certain tests for predicting job performance in the context of personnel selection. Thus, not surprisingly, existing research has examined the relationship between an individual's scores on a particular cognitive ability measure and measures of the individual's job performance. While this research is consistently supportive of the relationship, recent trends in the redesign of work to focus on self-managing work teams might lead to questions as to whether or not the relationship exists at higher levels of analysis.

Many of the new approaches to increasing organizational competitiveness such as Total Quality Management, Quality Circles, and Self-Managing Work Teams contain as one component the redesign of work around work teams as opposed to individuals. Increasingly organizations are moving from individually-based work toward work that requires the interdependence of a number of individuals organized as a team (Mohrman, Mohrman, & Lawler, 1991). Areas such as innovation (Kanter, 1983), quality, (Hauser & Clausing, 1988), new product development (Souder, 1988), sales and customer service (Cespedes, Doyle, and Freedman, 1989), organization change (Woodman, 1989) and high technology firms (Von Glinow & Mohrman, 1991) have addressed the importance of teams for execution.

Thus, given the increasing organizational use of work teams, whether or not the team's ability is related to its performance presents an interesting area of inquiry. This calls for examining how the cognitive ability of team members influences team performance. Thus, the purpose of this paper was to examine the role of the average cognitive ability of team members in predicting team performance among NCAA basketball teams.

NCAA basketball teams provide a unique opportunity for studying cognitive ability and team performance. First, all players are required to take an established cognitive ability test

(either the Scholastic Aptitude Test or American Collegiate Test), thus, cognitive ability scores are available for all team members. Because many highly recruited basketball players are at risk of not meeting the minimum entrance requirements and thus, precluding their eligibility, these scores are extremely important to coaches. Second, basketball is a team sport that exhibits all levels of interdependence, pooled, sequential, and reciprocal (Thompson, 1967), thus, simulating the types of interdependence that might exist among many work teams in organizations. Third, because these teams compete directly with one another, there exist some relatively strong objective assessments of performance. Finally, because these teams require frequent member interaction over long periods of time, they provide a more realistic situation for examining determinants of team performance relative to laboratory settings.

Cognitive Ability and Team Performance

Bass (1980) argued that the abilities of group members should impact team performance. In reviewing the literature on team productivity, he offered as one self evident proof that "The team product will be better, the more capable the average member," (p. 433). In fact, his model of team performance notes that the abilities of team members (as measured in part by intelligence tests) affect the task performance of team members, and he argued that this accounts for 50% of the variance in team performance.

Terborg, Castore, and DeNinno (1976) found empirical support for these propositions as well. These researchers had three- and four-person undergraduate teams work on land surveying projects. They found that scores on the quantitative section of the Scholastic Aptitude Test and cumulative grade point average were related to team performance as rated by the instructor. In addition, Hill (1982) found that group performance was positively related to the abilities of individual members. Finally, Tziner and Eden (1985) found that group performance was related to members' abilities, such that a high ability member's contributions were most pronounced when other members were of high ability.

Substantial theoretical reason exists for expecting such a relationship to be observed among NCAA basketball teams. Given the nature of NCAA teams' task, individuals are in many ways reciprocally interdependent. Both offensive and defensive schemes rely on substantial on-the-spot coordination among team members. Members must be able to engage in problem solving through monitoring the environment (i.e., the time left on the shot clock, placement of the other team's members, placement of their own team's members, etc.), and making decisions about which actions to take. Many of these decisions are based on rules provided through the practice sessions (i.e., training).

Thus, the nature of the task is relatively complex, and is characterized by reciprocal interdependence (Thompson, 1967). The nature of the interdependence speaks for examining cognitive ability at the group level of analysis. Moeller, Schneider, Schoorman, and Berney (1988) recommended that researchers should collect their data at the level of analysis at which they intend to aggregate. Because our study sought to predict team performance, this required using a team measure of cognitive ability.

It is important to note that other constructs traditionally viewed at the individual level of analysis such as affect, absence, prosocial behavior, performance, and turnover have also been examined as group, as opposed to individual level, phenomena (George, 1990; George & Bettenhausen, 1990). For example, George (1990) found that negative affectivity within a group was negatively related to the extent to which the group engaged in prosocial behavior. In addition, George and Bettenhausen (1990) found that prosocial behavior measured at the group level was significantly correlated with the group's objective sales performance.

A similar movement from the individual to the group level of analysis might be of interest with regard to cognitive ability. An example of approaching cognitive ability at the group (in this case the firm) level of analysis is a recent study by Terpstra and Rozelle (1993). These authors surveyed firms as to whether or not they used some popular selection practices, one of which was cognitive ability testing. The results indicated that the use of cognitive ability tests was strongly related to firms' performance as measured by annual profit, profit growth and sales growth for service industries, but was not related to performance in other industries. It is important to note that this study assumed that firms that do use these tests should have higher average cognitive ability than firms that do not. Thus, it is apparent that the results seem to indicate some support for the notion of a group's ability being related to that group's performance.

Similarly, viewing cognitive ability at the team level, it is entirely possible theoretically that a team's average cognitive ability should be related to the team's performance. Substantial research demonstrates that cognitive ability primarily affects job performance through the acquisition of job knowledge (Hunter, 1986; Schmidt & Hunter, 1993) at the individual level. The acquisition of job knowledge at the individual level among highly interdependent individuals should be related to team performance for three reasons.

First, team performance requires that all of the individuals to acquire relevant job knowledge in terms of offensive schemes, defensive schemes, and appropriate reactions to certain game situations. Offensive schemes include set plays as part of the offense or offensive patterns while defensive schemes include both half-court (e.g., man-to-man, or 1-2-2, 2-3, or 1-

3-1 zones) and full-court (man-to-man or various zone presses) defenses. Both offensive and defensive schemes require players to have certain responsibilities, and these responsibilities depend upon where the ball is on the court and where teammates have positioned themselves. This job knowledge is usually gained through extensive in class (team meetings/playbook) and on court (practice) activities. Cognitive ability should enable team members to more quickly learn the offensive and defensive schemes and to make better on the court decisions for their own individual roles.

Second, in addition to the generic offensive and defensive schemes, adaptations are made for each opponent during the season. Prior to each contest, team members are presented with scouting reports that indicate the opponents' plays as well as offensive and defensive tendencies. Team members watch films of their opponents, and are required to learn the things that the opposing team is likely to do (e.g., their out of bounds plays, offensive plays, likely defenses, etc.) and how the focal team will counter them. Additionally, players may be required to learn the particular tendencies of individual opponent players (e.g., where the team's leading scorer likes to get the ball, where he likes to shoot from, where and how the leading rebounder tends to position himself, etc.) and how to counteract them. All this information must be assimilated in usually 2-3 days. Further adjustments to the game plan must be made at half-time, and players must be able to quickly assimilate the knowledge and revised game plan during that time. Again, cognitive ability should increase the capacity of players to successfully assimilate this information in a short time frame.

Third, additional on-the-spot decision making takes place during the game. Players are required to recognize particular situations, and react accordingly. This requires recognizing situations and reasoning through to determine the appropriate course of action. Cognitive ability should be related to team members' ability to quickly recognize and adapt to new situations faced during the game.

Finally, in a highly interdependent situation such as a basketball team, all individuals must learn their fellow team members' preferences, tendencies, strengths, and weaknesses. For example, if one player is particularly adept and comfortable shooting from certain spots on the floor, or at certain angles, it is important for teammates to recognize this and to ensure that the player gets the ball in the places that he will be most effective. Cognitive ability should enable team members to more quickly and thoroughly acquire this type of required job knowledge.

However, in addition to the bivariate relationship that should be observed between cognitive ability and team performance, there is reason to believe that the relationship might be

moderated by team strategy. A second proposition offered by Bass (1980) is that "The greater the interdependence of the non-redundant individuals, the greater the opportunity for the group product to be more (or less) than the simple sum of their pooled performance," (p. 433). Similarly, O'Brien and Owens (1969) argued that the extent to which group member ability contributed to group performance depended on the degree of collaboration required by the task.

Empirical support for the moderating role of the task requirement in the relationship between team member ability and team performance also exists. For example, in spite of the fact that Ree and Earles (1991) found that a common prediction equation could be used for all jobs, they also found that incremental validity was gained by controlling for job type. This implies that abilities were, to some extent, different in the importance across jobs. Similarly, Hunter and Hunter (1984) present the data comparing the predictive validity of cognitive ability across job families. Their data provide evidence that although cognitive ability is a valid predictor for all jobs, in fact the predictive value increases as job complexity increases. Finally, Terpstra and Rozelle's (1993) findings that industry moderated the relationship between the use of cognitive ability tests and financial performance also provides some evidence that cognitive ability might not be equally related to team performance in all situations.

This leads to examining the ways in which certain teams might possess greater or lesser cognitive ability requirements due to the amount of cognitive complexity of the jobs as called for by the team's strategy. In NCAA teams, the jobs are ones that are relatively restricted in the range of required behaviors. However, when job requirements differ, these generally differ due to the team's chosen strategy. Wright, Smart, & McMahan (in press) examined the fit between human resources and strategy among NCAA basketball teams, and identified three potential team strategies.

According to Wright et al. (in press), the speed strategy is one with little planned playmaking. Rather this strategy entails running fast breaks and pressing defenses with very few set plays (e.g., the 1994 NCAA champion Arkansas's "40 minutes of hell"). The mindset of such a strategy is to use physical skills such as speed, quickness, and athleticism to overpower opponents, with an emphasis on making opponents adapt to the team's strategy, rather than adapting to the opponents. This type of strategy poses a great requirement for physical skills in order to successfully implement it. Because there is less emphasis on learning, execution, and adaptation, cognitive skills should be relatively irrelevant.

On the other hand, a finesse strategy is one where each member of the team must memorize a set of plays, and run them as an integrated unit (e.g., Indiana under coach Bobby Knight). These plays require exact timing and extremely accurate execution. In addition, the

finesse strategy requires greater adaptation for each opponent. A finesse strategy requires more in depth study of opponents and ability adapt offensive and defensive schemes to the idiosyncrasies of each opposing team. In fact, coaches using this strategy often refer to "outsmarting" opponents. Thus, in this strategy physical skills become less important relative to a speed strategy, and the cognitive skill requirements increase because of the need for team members to be able to adequately remember and execute the offensive and defensive schemes.

Finally, the power strategy is similar to the finesse strategy, in that it requires running a planned offense, however this usually consists of running a set of patterns, rather than specific plays. In addition, under the power strategy these patterns are designed to be run around inside players (e.g., LSU under coach Dale Brown when Shaquille O'Neal played there). Similar to the speed strategy, physical skills (e.g., strength) are important, but the need for execution and adaptation is also important. Thus, both the physical and cognitive skill requirements tend to fall between the speed and finesse strategies.

Because the three strategies might differ in their cognitive requirements, team strategy should play a moderating role in the relationship between cognitive ability and team performance. One would expect that the relationship between SAT and performance should be strongest for the finesse strategy, followed by the power strategy, with the speed strategy exhibiting the weakest relationship to performance.

Thus, the two research questions to be addressed in this study are:

Research Question 1: Does a team's average cognitive ability predict team performance?

Research Question 2: Does a team's strategy moderate the relationship between cognitive ability and team performance?

STUDY 1

Method

Sample

The sample consisted of NCAA Division 1 men's basketball teams. The survey was sent to all 300 teams. Completed surveys were received from 143 teams for an overall response rate of 48%. Missing data resulted in a total sample of 109 teams, for a final response rate of 36% of the total population.

Measures

Team Cognitive Ability. Respondents were asked to indicate the number of their top 8 players that fell within each 50-point category (e.g., 700-750; 751-800;....1151-1200; over 1200) on the Scholastic Aptitude Test (SAT).[1] The SAT is an extremely valid measure of general cognitive ability, and have been shown to be predictive of a number of different types of intellectual performance (Jensen, 1980). In addition, based on normative samples, the reliability of the SAT has been estimated to be over .90. Team cognitive ability was assessed as the average SAT score for the top 8 players.[2] This was computed by multiplying the number of individuals who fell in each category by the midpoint of that category, summing and dividing by 8. While admittedly a rough measure of cognitive ability, the roughness of the measure would entail a random, rather than systematic error component, and thus, should provide an underestimate of the true relationship between this variable and other variables.[3]

Team Strategy. As part of a larger study on the fit between human resources and team strategy, Wright et al (in press) conducted interviews with coaches to determine the types of strategies available. These interviews indicated that teams tend to exhibit three types of strategies: Speed, power, and finesse. All teams tend to exhibit each of these strategies to some extent, therefore, the survey attempted to assess the extent to which the team used each of the three strategies by asking respondents to indicate the percentage of their team's emphasis on each of the three strategy options. However, in order to conduct the analyses, we classified each team as either a power, finesse, or speed strategy according to which strategy was emphasized the most.

Evidence of the construct validity of this measure of strategy is indicated by comparing the team statistics across teams classified as using each of the three strategies. Speed teams score more points (78.9) than either power (72.8) or finesse strategies, but they also give up more points (75.8, 69.6, and 69.9, respectively). They also force more turnovers (16.7, 14.8, and 14.4 for speed, power, and finesse strategies, respectively). Also consistent with the classification, power teams have a greater rebounding margin (3.8) than either the speed (.1) or finesse strategies (.5). The regressions computed on these variables indicated that strategies

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1 Roughly corresponding American collegiate Test (ACT) scores were placed next to each SAT category (e.g., SAT 700-750 - ACT 17) because some players take the ACT rather than SAT.
2 On most teams approximately 90% or more of the total minutes played are accounted for by the top eight players. These 8 players usually consist of the starting 5 players, and one substitute each for the guard, forward, and center positions.
3 Our interviews with coaches revealed that they would be hesitant to release exact SAT or ACT scores, but that they would be quite willing to indicate the number of individuals who fell within given ranges. Thus, in order to maximize the number of respondents, we were forced to sacrifice the specificity of the data.

explained between 8% and 22% of the variance, demonstrating significant support for our classification scheme.

Team Performance. Team performance was assessed in two ways. First, Sagarin's Power Rankings (USA Today, March, 1992) provided an objective assessment of the team's performance over the course of the season. Won-Lost records tend to ignore the quality of a team's competition and the average margin of victory. The power ratings provide a measure of performance that controls for quality of competition (as measured by won-lost records of opponents) as well as a number of other variables which confound the won-lost outcome variable (e.g., home v. away, margin of victory, etc.). According to USA Today, the power ratings are a numerical measure of a team's strength. A diminishing returns principle exists to prevent teams from building ratings by running up large victory margins against weak teams. Instead it rewards teams that do well against good opponents. Only Division 1 games are counted for rating, won-loss records, and schedule strength.

These ratings form the basis for ranking the 300 NCAA Men's teams. Thus, Sagarin's final rankings for the 1991-92 season were used as an objective measure of team performance. It is important to note that because this measure consists of rankings, the highest performers have the lowest ranking, thus, one would expect to find negative correlations when high scores on the predictor are related to high performance using this measure.

While the rankings provide an external measure of team success, they ignore the day-to-day performance of the team. For example, teams can exhibit conflict among players, between players and coaches, disciplinary problems, or problems in learning the system in terms of the behaviors required within the particular offensive and defensive schemes as dictated by the team's strategy. Thus, a subjective assessment of the team's performance was obtained by asking the respondents to indicate their agreement with seven statements regarding the day-to-day workings of the team (see Appendix A). These items were summed, and exhibited a coefficient alpha internal consistency reliability estimate of .91. In essence, this measure could be compared to the type of supervisory evaluation of performance that has been used in validation research.

Procedure

Surveys were mailed to all 300 NCAA Division 1 Men's Basketball teams during the summer of 1992. The survey was mailed to a school along with a self-addressed postage paid return envelope. A cover letter explained that the purpose of the survey was to examine how an organization's people are linked to its strategy and how that link affects performance.

Respondents were assured that their responses would remain confidential. Approximately 6 weeks after the initial survey was sent out, a follow up letter and set of surveys was sent to those schools that had not yet responded.

Results

Due to missing data, useable data was available for 109 of the 134 teams that responded. The means, standard deviations, and intercorrelations among the variables are presented in Table 1. Team strategy was dummy coded as two variables with the speed, finesse, and power strategies coded 1,0; 0,1; and 0,0, respectively.

Table 1

Table of Means, Standard Deviations, and Intercorrelations Among the Study 1 Variables.

Variable	Mean	SD	1	2	3	4	5
1. Team SAT	864.1	192.2	-				
2. Speed Strategy	.42	.50	-.09	-			
3. Finesse Strategy	.34	.47	.04	-.66**-			
4. Performance (Coach)	4.43	1.10	.24*	.09	.01	-	
5. Performance (Ranking)	137.2	84.4	-.04	-.13	.19*	-.35**	-

* p <.05; ** p <.01

To test the first research question, we examined the bivariate correlations between the average SAT of team members and each of the performance measures. As can be seen in Table 1, the cognitive ability of team members was significantly correlated (r = .24; p < .05) with the coach's assessment of performance, but not the power rankings (r = -.04; n.s.). Thus, the answer to the first research question is a qualified yes, as the team SAT was significantly related to only one of the performance measures.

In order to test the second research question, two hierarchical regression equations were computed. The first equation regressed the coach's evaluation of performance on the team SAT and dummy coded strategy variables in the first step, and the SAT by strategy interaction variables in the second step. The second equation was similar, except that the power ranking was used as the dependent variable. If the relationship between SAT in performance was moderated by team strategy, then a significant amount of incremental

variance would be explained in the second step of each of the equations. These results are presented in Table 2.

Table 2

Results of Regression Equations Regressing Performance on Team SAT, Strategy, and the Interactions From Study 1

Variable	R^2 Change	Beta[a]	R^2 Change	Beta[a]
	Performance (Coach)		Performance (Rank)	
Step 1	.08*		.04	
SAT		-.01		-1.30
Speed Strategy		-.39		-3.88
Finesse Strategy		-1.94		-4.02
Step 2	.06*		.19**	
SAT X Speed Strategy		.49		3.63
SAT X Finesse Strategy		2.01*		3.91
Total	.14*		.23**	
	F = 2.91*; d.f. = 5, 91		F = 5.48**; d.f. = 5, 91	

*p <.05; **p <.01*

[a] *Beta's for each variable are from the full regression model.*

As can be seen in Table 2, significant variance was explained by the SAT by Strategy interaction terms for both the coach's evaluation of performance (R^2=.06, p<.05) and the power rankings (R^2=.19, p<.01). Thus, the answer to the second research question is a definitive yes. The nature of the moderating relationship for the coach's and power ranking performance measures are illustrated in Figures 1 and 2, respectively. These figures illustrate the relationship between Team SAT and performance is consistently strong among teams using a finesse strategy, consistently weak for teams using a speed strategy, and differs depending upon the performance measure for teams using a power strategy.

Figure 1.

Depiction of the Interaction between Team Cognitive Ability and Strategy in

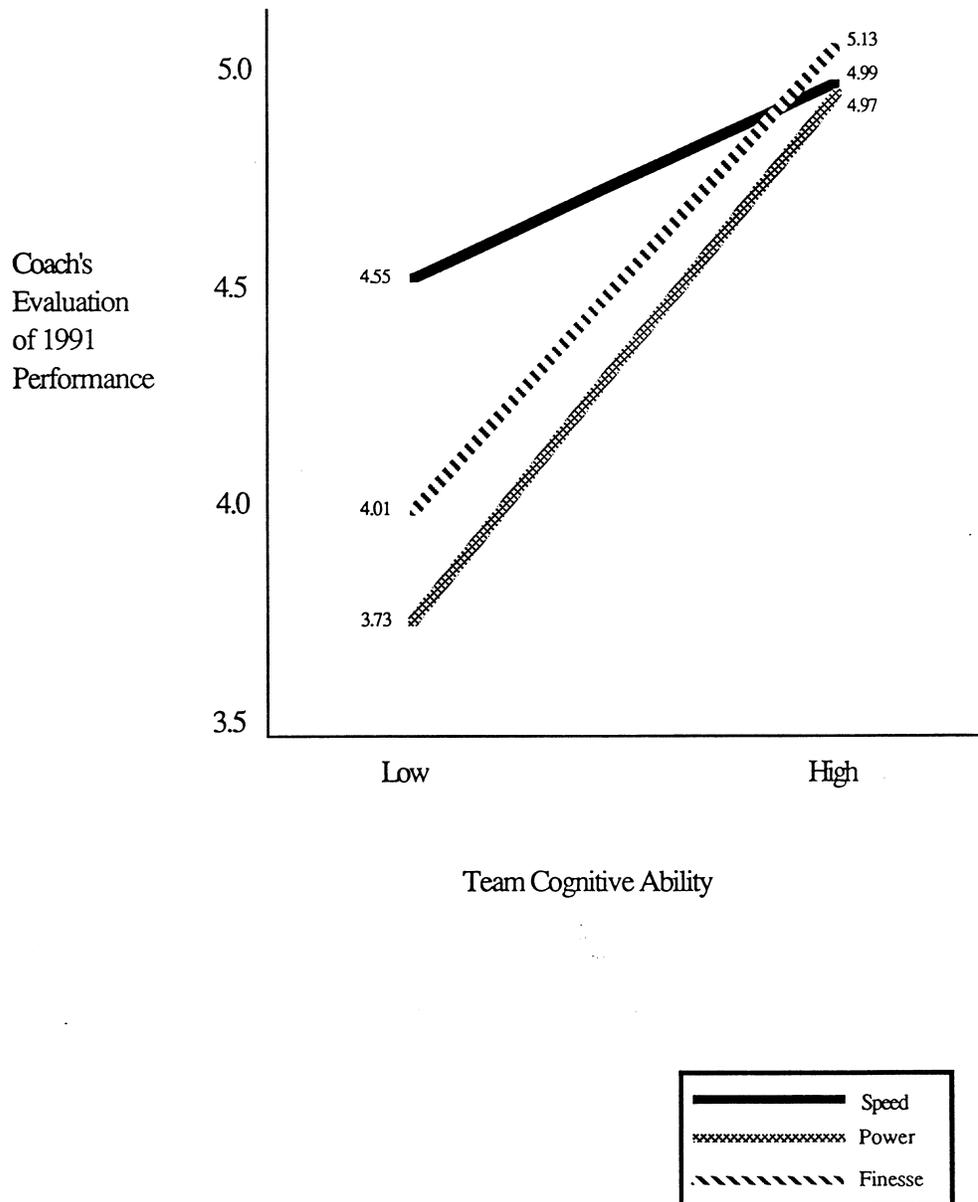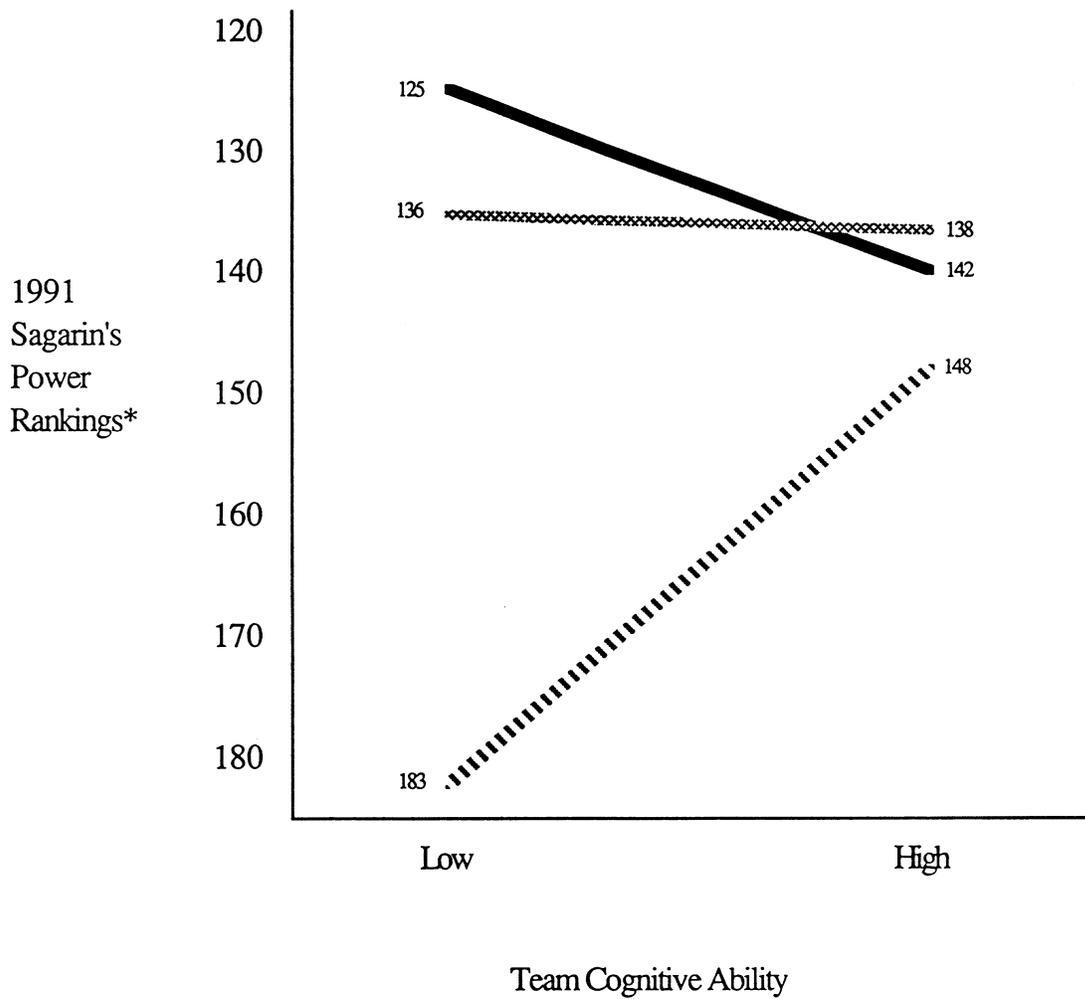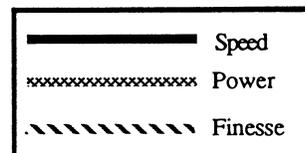Determining Coaches' Evaluation of Performance in Study 1.

Figure 2.

Depiction of the Interaction between Team Cognitive Ability and Strategy in

Determining Sagarin's Power Rankings in Study 1.

*Low Ranking Equals High Performance

Discussion

This study presents some evidence for the validity of examining abilities such as cognitive ability at the team level. The results indicate that a team's average SAT score is related to the coach's evaluation of performance in a bivariate sense, however, this relationship was not observed for the objective power ranking measure of performance. It is important to note that the coach's measure contained items such as "Our players were very quick learners," and "Our players had problems with their studies." These items should strongly tap the day-to-day learning activities of team performance, which are missing from the more objective measure. In many ways this performance measure could be compared to a supervisory evaluation of performance, and although subjective, taps an aspect of performance that is not measured by the more objective power ranking.

In addition, our results point to the moderating role of strategy in the relationship between cognitive ability and team performance. As can be seen in Figure 1, the relationship between SAT scores and the coach's evaluation of performance was stronger for the finesse and power strategies relative to the speed strategy. This seems to imply that cognitive ability of team members is less important to team success for teams that engage in a speed strategy, but that it is critically important to success for teams using one of the other strategies. This likely stems from the fact that the latter strategies create task requirements that have a relatively greater cognitive requirement through the memorization of plays and sequences. Coaches using a finesse strategy seem to believe that they will "outthink" (i.e., "play smarter" than) the other team, and there appears to be some evidence to support that assertion as being critical to success.

However, the nature of the interaction, while strong, was not exactly the same when using the objective rankings. In fact, as can be seen in Figure 2, these data seem to indicate that team cognitive ability is somewhat negatively related to performance for the speed and power strategy. However, the strong relationship between cognitive ability and performance for the finesse strategy is still observed, again supporting the idea that "outthinking" opponents is critical to the finesse strategy.

However, some limitations exist with this study. First, the data were collected after the season was complete. While unlikely given the coaches opinions that SAT scores do not relate to team performance, it may reflect a post hoc justification for the team's performance. Second, using only one respondent did not allow us to assess the interrater reliability of the variables measured. Finally, given the exploratory nature of the study, we sought to confirm our results

through a replication. Thus, Study 2 was conducted to attempt to address some of these issues.

STUDY 2
Method

Sample

The sample consisted of NCAA Division 1 men's basketball teams. The survey was sent to both the head coach and the assistant coach for all 300 teams during the 1993-94 season. At least one completed survey was received from 78 teams for an overall response rate of 26%. Two completed surveys were received from 33 teams for a response rate of 11%.

Measures

Team Cognitive Ability. As in Study 1, respondents were asked to indicate the number of the top eight players that fell within a series of 50-point ranges on the SAT (with corresponding ACT ranges). The average cognitive ability of team members was computed by multiplying the number of individuals in a category by the midpoint of that category, summing, and dividing by 8. The interrater reliability of this measure was computed by correlating the measures between the two respondents in the cases where this was possible. This correlation was .54 (p <.01) indicating at least moderate interrater reliability.

Team Strategy. As in Study 1, the survey attempted to assess the extent to which the team used each of the three strategies by asking respondents to indicate the percentage of their team's emphasis on each of the three strategy options. The correlations between coaches ratings on these variables were .71 for the speed strategy, .52 for the power strategy, and .54 for the finesse strategy (all p <.01) indicating adequate interater reliability. However, in order to conduct the analyses, we classified each team as either a power, finesse, or speed strategy according to which strategy was emphasized the most.

Team Performance. Team performance was again assessed in two ways. First, Sagarin's Power Rankings (USA Today, March, 1994) provided an objective assessment of the team's performance over the course of the 1993-94 season. In addition, a subjective assessment of the team's performance was obtained by asking the respondents to indicate their agreement with seven statements regarding the day-to-day workings of the team (see Appendix A). These items were summed, and exhibited a coefficient alpha internal consistency reliability estimate of .65.

Procedure

Surveys were mailed to all 300 NCAA Division 1 Men's Basketball teams during the 1993-94 season. The survey was mailed to a school along with a self-addressed postage paid return envelope in December of 1993. A cover letter explained that the purpose of the survey was to examine how an organization's people are linked to its strategy and how that link affects performance. Respondents were assured that their responses would remain confidential. A follow up letter and set of surveys was sent in January of 1994 to those schools that had not yet responded.

Results

Due to the low power associated with the small N for cases with two respondents, the data presented here was based on all cases where at least one coach responded (n = 78). The analyses were replicated using averaged responses in the cases where two coaches responded, and any differences in the directions of the effects observed are noted. The means, standard deviations, and intercorrelations among the variables are presented in Table 3. Team strategy was dummy coded as two variables with the speed, finesse, and power strategies coded 1,0; 0,1; and 0,0, respectively.

Table 3

Table of Means, Standard Deviations, and Intercorrelations Among the Study 2 Variables

Variable	Mean	SD	1	2	3	4	5
1. Team SAT	875.4	161.4	-				
2. Speed Strategy	.56	.50	-.31**	-			
3. Finesse Strategy	.28	.42	.33**	-.72**	-		
4. Performance (Coach)	4.63	.87	.37*	-.01	.08	-	
5. Performance (Ranking)	157.3	87.9	.15	-.19	.16	-.34**	-

*p <.05; **p <.01*

To test the first research question, we again examined the bivariate correlations between the average SAT of team members and each of the performance measures. As can be seen in Table 3, the cognitive ability of team members was significantly correlated (r = .37; p < .01) with the coach's assessment of performance, but not the power rankings (r = .15; n.s.). Thus, the

answer to the first research question was again a qualified yes, as the team SAT was significantly related to only one of the performance measures.

In order to test second research question, two hierarchical regression equations were again computed. The first equation regressed the coach's evaluation of performance on the team SAT score in the first step, the dummy-coded strategy variables in the second step, and the SAT by strategy variables in the third step. The second equation was similar, except that the power ranking was used as the dependent variable. If the relationship between SAT in performance was moderated by team strategy, then a significant amount of incremental variance would be explained in the third step of each of the equations. These results are presented in Table 4.

Table 4
Results of Regression Equations Regressing Performance on Team SAT,
Strategy, and the Interactions From Study 2

Variable	R^2 Change	Beta[a]	R^2 Change	Beta[a]
	Performance (Coach)		Performance (Rank)	
Step 1	.15*		.04	
SAT		-1.15		2.79
Speed Strategy		-4.51		8.95
Finesse Strategy		-5.24*		7.96
Step 2	.08		.17**	
SAT X Speed Strategy		4.02		-8.09
SAT X Finesse Strategy		5.37*		-8.07
Total	.23*		.21**	
	F = 4.30**; d.f. = 5, 71		F = 3.81**; d.f. = 5, 72	

* $\underline{p}$ <.05; ** $\underline{p}$ <.01
[a] Beta's for each variable are from the full regression model.

As to whether strategy moderates the relationship between team SAT and performance, as can be seen in Table 4, significant variance was explained by the SAT by Strategy interaction terms for both the coach's evaluation of performance (R^2 Change = .08, $\underline{p}$ <.05) and for the power rankings (R^2 Change= .19, $\underline{p}$ <.01). With regard to the coach's evaluation of

performance, the regression weights indicated a pattern similar to that observed in Study 1, thus, replicating the interaction. As in Study 1, the regression weight for the finesse X SAT interaction was positive and significant, indicating support for the hypothesized positive relationship between SAT scores and performance for teams using a finesse strategy. This interaction is depicted in Figure 3.

Figure 3.

Depiction of the Interaction between Team Cognitive Ability and Strategy in

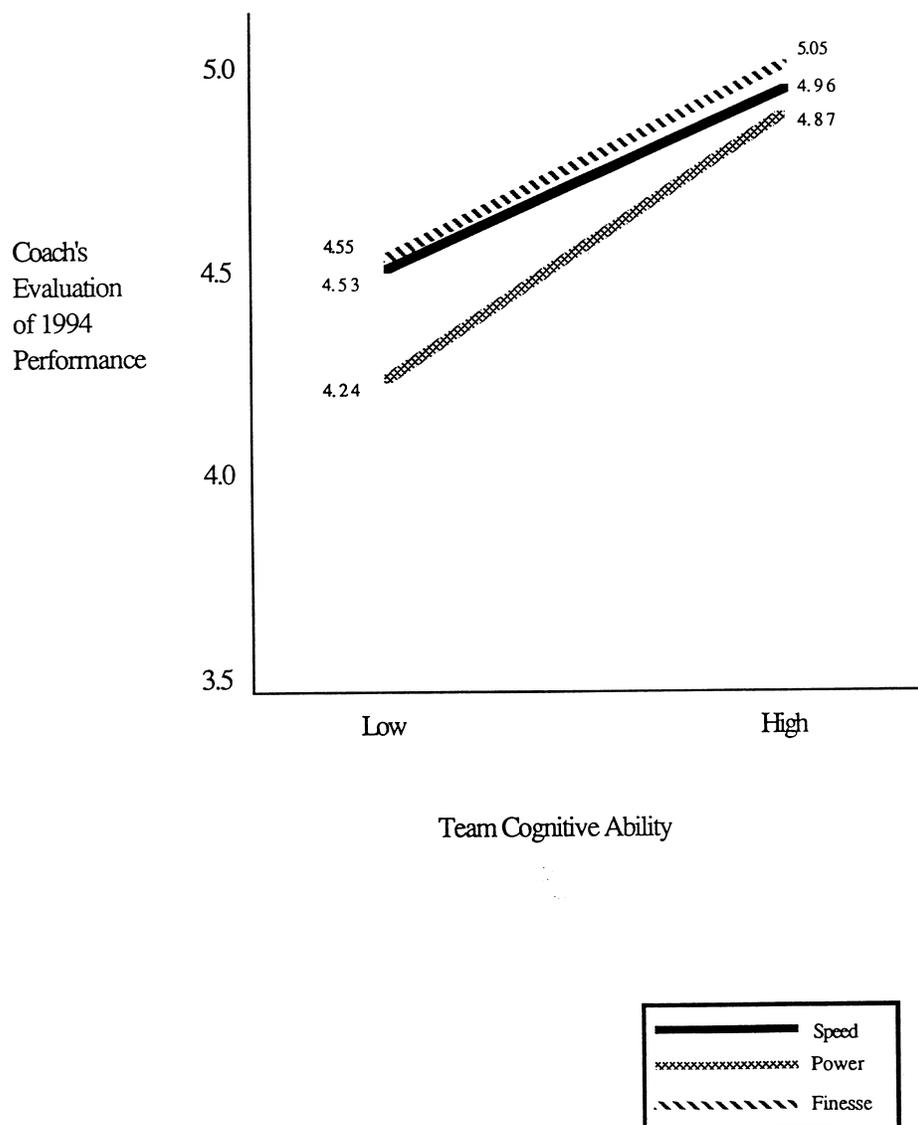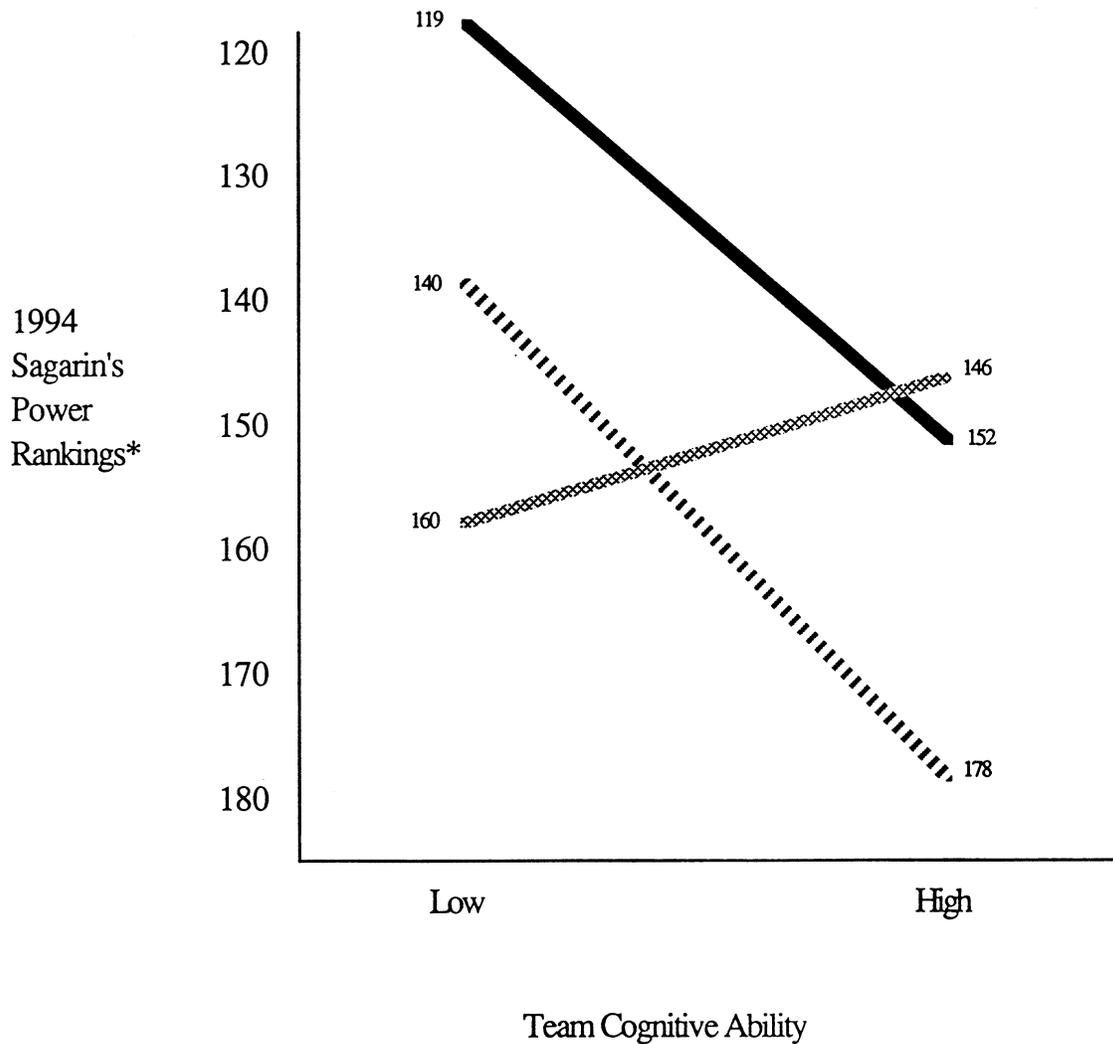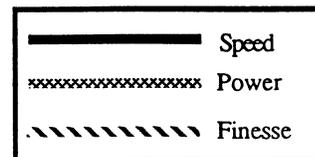Determining Coaches' Evaluation of Performance in Study 2.

Figure 4.

Depiction of the Interaction between Team Cognitive Ability and Strategy in

Determining Sagarin's Power Rankings in Study 2.

*Low Ranking Equals High Performance

On the other hand, the significant interaction with regard to the power ranking measure of performance differed from that observed in Study 1. This interaction is depicted in Figure 4. As can be seen in this figure, the major differences were due to the changing nature of the relationship between SAT and the power ranking within the finesse strategy. This relationship reversed direction. Additionally, the SAT was strongly related to both measures of performance for teams using a power strategy, whereas in Study 1 it was only related for the coach's performance measure. Thus, the interpretation of support for the moderating role of strategy in the SAT - power ranking relationship should be tempered.

Discussion

The results with regard to the correlation between SAT and the coaches' evaluation of performance replicate those observed in Study 1. In fact the correlation observed was somewhat (albeit not significantly) higher in Study 2. However, also similar to Study 1, the SAT was not significantly correlated with the power ranking measure of performance, thus providing only qualified support for the hypothesis that a team's average SAT is correlated with team performance.

Similarly, these results seem to provide support for the moderating role of the team's strategy in the relationship between the average SAT score of team members and team performance. This moderating role was similar to that observed in Study 1 for the coach's evaluation of performance with the incremental R-squared both stronger and significant. The analyses with regard to the power ranking measure of performance indicated a strong moderating role, but the nature of the moderation differed somewhat from Study 1.

In order to investigate why the relationship between SAT and power rankings changed in Study 2, we examined the data for teams classified as using a finesse strategy. We believe that this change was due to a combination of a small sample and one or two outliers. Study 1 had 35 teams categorized as Finesse teams, whereas Study 2 had only 13. Because of the low number of teams in Study 2, one or two outliers might change the nature of the interaction quite significantly. Evidence of outliers was indicated by two characteristics of the data. First, the mean SAT for finesse teams in Study 1 was 870 (SD = 119), whereas it was 993 (SD = 232) in Study 2. Second, two of the 13 teams fell greater than 2 standard deviations from the overall mean (SAT's = 1212 and 1206), with one indicating 6 players scoring above 1150 and one indicating 6 players scoring above 1200. Both of these teams also exhibited low power rankings (below 240).

OVERALL DISCUSSION

The results of these two studies provide some support for the notion that the average cognitive ability of team members influences team performance (Bass, 1980). The significant correlation between average SAT scores and the coaches' evaluation of the team's performance was observed across both studies. One might note that the coaches' evaluation of performance resembles that of subjective performance measures used in much of the validation research on cognitive ability testing. Thus, this research seems to indicate that the relationships between cognitive ability and supervisory evaluations of performance that have been well documented at the individual level (Hunter & Hunter, 1984), might also hold at the team level.

It is important to note again, that the performance measure was developed to assess aspects of performance (i.e., interpersonal relationships, conflict, acquisition of job knowledge, etc.) that are not assessed by the power ranking measure. Thus, it is not surprising that the average SAT score of team members was more strongly related to this measure than to the power ranking measure, with which no relationship was observed. However, the results might have been more convincing had the SAT measure also exhibited a significant relationship with the more objective measure of performance. In any case, the results provide support for the hypothesis that the average cognitive ability of a team does, in fact, affect team performance. Certainly additional research needs to be conducted to assess the validity of this assertion.

Additionally, the results indicated limited support for the notion that the nature of the team's task might well moderate the relationship between the average cognitive ability of team members and team performance. Across the two studies, four tests of the interactive hypothesis were performed (using both performance measures in each of the studies), and the relationships hypothesized were somewhat supported in 3 of those four analyses. On the other hand, the differences in the nature of the interactions across the two studies were large enough to encourage great caution in interpreting the validity of the relationships. This is certainly an area for future research.

On the other hand, the fact that 3 of the 4 interactions were somewhat consistent with the theory, the moderating role of the task deserves discussion. While the different basketball team strategies indicate a team task that shares a number of common elements (e.g., passing, dribbling, shooting, rebounding, etc.), they differ in both the emphasis on some of these elements, and coordination required by team members. This results in differences in team task complexity that is associated with the attempt to use different basketball strategies.

This might have implications for the interactive relationship between the cognitive ability of team members and the complexity of the team's task in determining performance. A variety

of approaches have been suggested for forming teams in organizations, but in many cases, these approaches fall into the traditional categorization of types of interdependence suggested by Thompson (1967): pooled, sequential, and reciprocal. For example, teams that are formed in organizations around a pooled interdependence require little coordination among team members, thus implying that cognitive ability might be less important in influencing team performance. When teams are formed around sequential interdependence, the coordination requirements increase, thus, implying a greater need for cognitive ability of team members. Finally, reciprocally interdependent members of a team must engage in extensive coordinating activities, thus implying that cognitive ability might be extremely important in determining team performance.

While all of this is conjecture, it seems to be supported by the notion that team oriented interventions such as Total Quality Management or self managing work teams seem to require individuals with higher level skills than have existed in traditional jobs (Lawler, Mohrman, & Ledford, 1992; Majchrzak, 1988; Snell & Dean, 1992). Again, this certainly points to the need for additional research on the moderating role of the team's task in the relationship between skills of team members and team performance.

Limitations

One limitation of this study was the inability to obtain exact SAT scores for each individual by position. Our hope in designing the survey was to have coaches provide individual SAT scores and performance statistics for individuals so that we could examine the relationship between SAT and individual performance as moderated by position (e.g., guards, vs. forwards, vs. centers). However, our conversations with coaches made it clear that they would be unwilling to provide individual SAT scores in a way that could identify the players involved. In addition, to do so would have been a breach of APA ethical guidelines because the individual players would not have provided an informed consent to supply us with such information. Thus, we could only obtain a rough estimate of Team SAT scores.

One potential criticism of the present study is its counter-intuitiveness. Many believe that on a task with extremely difficult physical ability requirements such as playing basketball, cognitive abilities would be irrelevant. In fact, anecdotal data from our discussions with coaches indicated that they believed that cognitive ability (at least as measured by the SAT or ACT) was unrelated to performance. These coaches consistently argued that physical skills were of most importance. While performance on the task is in large part determined by physical abilities, at the level of collegiate basketball, these abilities become restricted relative to the general population. Thus, in the situation where restriction exists in one determinant of performance, it

is not at all unusual to find that other variables exhibit relationships with performance. This is similar to the fact that when cognitive ability is restricted in range in a given sample, other predictors, such as Need for Achievement, tend to relate more strongly to performance (Ree & Earles, 1993). Thus, we do not take issue that within the larger population, physical skills/abilities are more strongly related to basketball performance than are cognitive abilities. However, that does not negate the fact that cognitive abilities still might predict performance within our sample as was observed in this study.

A second potential criticism is that the effect sizes observed for cognitive ability are not particularly large. However, although the bivariate correlations of .24 (Study 1) and .37 (Study 2) between the teams average SAT and coach's evaluation of performance is not unusually large, it is important to note that this value is uncorrected for any artifacts. Thus, it is safe to assume that the true effect sizes are larger. In addition, these correlations are quite similar to those observed in studies on the relationship between cognitive ability and performance at the individual level of analysis. Finally, when cognitive ability is used in conjunction with strategy, it exhibits multiple R's of .38 and .48 in predicting the coach's and power ranking measures respectively in Study 1 and .48 and .46 respectively in Study 2. Considering the artifacts at work as well as the context, these effect sizes are quite respectable.

In addition, one could criticize the relationships observed between SAT and the coaches evaluation of performance as suffering from common method variance since both measures were obtained on the same survey. However, five facts argue against the validity of this criticism. First, the SAT scores were not perceptual measures, but were rather reports of objective information. Had we asked coaches to evaluate their perceptions of the cognitive ability of team members, the criticism of common method variance might be more legitimate. Furthermore, in cases where we had two respondents, Study 2 indicated somewhat significant support for the reliability of this measure. In fact, in Study 2, the observed correlations for respondent 1's reported team SAT with respondent 2's performance and respondent 2's reported SAT with respondent 1's reported performance were .34 and .28, respectively, indicating similar relationships when no common method variance exists.

Second, common method variance usually stems from respondents' perceived model that certain relationships must exist. All of our discussions with coaches both before the study and in discussing the observed results as well as the frequent criticisms coaches have for NCAA attempts to raise the minimum SAT scores indicate that coaches do not see any kind of a relationship between SAT scores and performance. (We might note that some coaches believe that a player's intelligence might contribute to performance as in the case of the finesse

strategy, but they do not believe that the SAT measures intelligence.) Thus, our findings that SAT scores predict team performance run completely contrary to what appears to be the current consensus among coaches. Third, recent explorations into the prevalence of percept-percept correlations reveals that it is not at all as widespread as was believed. Crampton and Wagner (1994) suggest that some relationship are not very susceptible to percept-percept inflation, and given the previous discussion, we believe that these relationships fall in that category.

Fourth, while common method variance is especially a problem in examining bivariate relationships, it is difficult to envision it playing a role in interactive relationships. Given the fact that team SAT interacted with strategy to predict performance in Study 1, it is unlikely that common method variance was the cause. Finally, the fact that somewhat similar results were also observed for the more objective power ranking measure of performance speaks against the validity of the common method variance criticism.

A final criticism might be leveled against the external validity of this study. One could question the generalizability of the results from our sample to individual performance and the formulation and implementation of strategy within organizations over long periods of time. We do not believe this to be a problem for two reasons. First, an NCAA Division I basketball team is a year round organization. Players have assignments over the summer for things to be working on, and in many cases are involved in informal practices (e.g., weight training and pick-up basketball games informally supervised by the coaching staff). Formal practices begin in October and end in April, during which time, team members will spend a significant amount of time devoted to their "organization" (practices, team meetings, study halls, meals, travel, community support activities such as speaking at local schools, etc.) A player is part of that organization for 4 years, probably as long or longer than the average tenure of members of most business organizations. During that time they are compensated with free tuition, room board, and a small monthly living expense stipend.

In addition, at the Division I level, basketball teams are in essence a profit making enterprise. If coaches are not successful (i.e., winning), revenues from tickets and TV fall, and they get fired. In fact, these because of the length of time they work together and the importance of the task to them, these teams are much more generalizable than the samples used in much recent research on groups (e.g., Gersick, 1989).

Second, drawing analogies from sports teams to business organizations is hardly unheard of from either an applied or a research perspective. Pat Riley's (1993) book The Winner Within presented managerial rules for building teams and organizations based on his coaching experiences with the Los Angeles Lakers and New York Knicks and was a business

best seller last year. In addition, Noble (1994) reports the results of a recent survey of Fortune 1000 CEO's. When asked who were the people that most strongly influenced business decisions in 1993, Jimmy Johnson, coach of the Dallas Cowboys and Pat Riley ranked 1 and 4, respectively. In fact, Eric Yaverman, President of Jericho Productions, a Manhattan public relations firm stated in response to these results "Executives get a lot of managerial ideas from coaches of teams."

Similarly, research on a number of organizational issues has utilized sports teams. For example, studies of managerial succession have often examined major league baseball coaches (e.g., Allen, Panian, & Lotz, 1979; Cannell & Rowe, in press) and NBA coaches (Pfeffer & Davis-Blake, 1986). Studies of equity theory have used professional baseball players (e.g., Howard & Miller, 1993). Given the facts that many business organizations seem to draw implications for managing from athletic settings and that past research has utilized such settings, we do not believe that the generalizability of our sample poses any serious problems. In fact, considering the recent trend towards work teams in organizations, it seems quite appropriate to examine sports teams as a means of shedding light on the determinants of team performance.

In conclusion, we found substantial evidence for the idea that team cognitive ability is related to team performance, and that this relationship is moderated by team strategy. This points to the need for future research to address the issue of how other characteristics of teams might be related to team performance. In addition, we only viewed ability as a mean level. It is entirely possible that the variance in ability also influences the team's performance, although it is unclear as whether higher variance might be associated with higher (i.e., diversity increases performance) or lower (i.e., the chain is only as strong as the weakest link) performance (Bass, 1980). Obviously, this is a question to be addressed in future research. In any case, this study provides support for the notion that the relationship between cognitive ability and performance may hold at the team, as well as the individual level of analysis.

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Authors Notes

Appendix A

Items used in Coach's Performance Measure

1. Our team had an outstanding season.

2. Our players were very quick learners.

3. Our players got along well with each other.

4. Our players had outstanding attitudes.

5. Our players had no conflicts with coaches.

6. Our players never needed to be disciplined.

7. Our players had problems in their studies. (R)

List of Figures