SETTING THE STAGE FOR EFFECTIVE TEAMS: A META–ANALYSIS OF TEAM DESIGN VARIABLES AND TEAM EFFECTIVENESS

A Dissertation

by

SUZANNE TAMARA BELL

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

August 2004

Major Subject: Psychology

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Approved as to style and content by:

Winfred Arthur, Jr. (Chair of Committee)	Stephanie C. Payne (Member)
Adrienne Colella (Member)	Christopher O. L. H. Porter (Member)
William S. Rholes (Head of Department)	

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ABSTRACT

Setting the Stage for Effective Teams: A Meta–Analysis of Team

Design Variables and Team Effectiveness. (August 2004)

Suzanne Tamara Bell, B.A., Olivet Nazarene University;

M.S., Texas A&M University

Chair of Advisory Committee: Dr. Winfred Arthur, Jr.

Teams are pervasive in organizations and provide an important contribution to organizational productivity. Since Hackman's (1987) seminal work, the team research focus has shifted from describing teams to outlining how researchers might use points of leverage, such as team design, to increase team effectiveness. There has been a wealth of research on team design variables that relate to team effectiveness. However, more than 15 years later, the team design literature remains fragmented and is inconsistent, and conclusions regarding optimal team design are difficult to make. The present study sought to unify the team design research by proposing a conceptual model and testing hypothesized relationships between specified design variables and team effectiveness using meta–analytic techniques. Specifically, the objectives of this study were to: (a) identify team design variables over which researchers and practitioners have some degree of control, (b) summarize the literature related to each of these variables, (c) hypothesize how each of the design variables are related to team effectiveness, (d) assess the relationship between these variables and team effectiveness using meta–analysis, (e) assess the influence of specified moderator variables (e.g., study setting, team tenure) on the team design variable/team effectiveness relationships, (f) make theoretically– and empirically–based recommendations for the design of effective teams, and (g) highlight areas in need of additional research. Results indicated that several team design variables show promise as a means of increasing team effectiveness. The strength of the team composition variable/team performance relationships was dependent on the study setting (lab or field); however, the study setting had considerable overlap with the type of team assessed (intellectual or physical). For lab studies (intellectual teams), team general mental ability (GMA) and task–relevant expertise were strong predictors of team performance, while team personality variables were unrelated to team performance. In field studies (physical teams), team agreeableness and conscientiousness had stronger relationships with team performance than team GMA and team task–relevant expertise. Team task design variables (e.g., task significance) had consistent, positive relationships with team performance, and several team structure variables (e.g., degree of self–management) were also related to team performance.

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INTRODUCTION

A recent survey indicated that more than 48% of U.S. organizations use teams of some sort (Devine, Clayton, Philips, Dunford, & Melner, 1999). Teams are important not only because of their pervasiveness, but also due to the nature of the tasks they perform such as problem solving, decision–making, and chain customer service (i.e., highly interdependent tasks that require more than one individual). There is widespread recognition that a large amount of the work accomplished in business and industry is the result of teams (Cohen & Bailey, 1997; Sundstrom, De Meuse, & Futrell, 1990). Given the use and importance of teams, and the unique contribution teams make to industry, research on variables that are related to the effectiveness of teams is warranted.

Normative models of team effectiveness (Hackman, 1987) emerged in the late 1980's and highlighted points of leverage that practitioners and researchers can use to influence the effectiveness of teams. Specifically, Hackman's normative model emphasized how teams could be designed and managed to become more effective. Since the normative theories replaced more descriptive approaches to team research, there has been a wealth of research on team design variables that are related to team effectiveness. However, despite ongoing research efforts and periodic narrative reviews, the team design literature remains fragmented and is inconsistent, and conclusions regarding optimal team design are difficult to make. The present study sought to unify the team design research by proposing a conceptual model and testing hypothesized

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relationships between specified design variables and team effectiveness using meta–analytic techniques. Specifically, the objectives of this study were to: (a) identify team design variables over which researchers and practitioners have some degree of control, (b) summarize the literature related to each of these variables, (c) hypothesize how each of the design variables are related to team effectiveness, (d) assess the relationship between these variables and team effectiveness using meta–analysis, (e) assess the influence of specified moderator variables (i.e., study setting, type of team, supportiveness of the organizational context, team tenure) on the team design variable/team effectiveness relationships, (f) make theoretically– and empirically–based recommendations for the design of effective teams, and (g) highlight areas in need of additional research based on the results of the study.

Defining Teams

The present paper focuses on teams, with a special interest in team design variables that are related to team effectiveness. Thus, the unit of interest, teams, is first defined. Teams differ from or are a special case of groups because teams have shared goals and task interdependency and therefore require a certain degree of coordination. Specifically, teams are units of two or more individuals who bring specialized knowledge, skills, or abilities, and coordinate them to achieve a common objective. Hackman (1987, 1990) defined a team as two or more people with different tasks who work adaptively together to achieve specified shared goals. Similarly, Baker and Salas (1997) defined a team as two or more individuals who have specific role assignments, perform specific tasks, and must interact and coordinate to achieve a common goal.

Other researchers have used the term "work group" (e.g., Cohen & Bailey, 1997; Guzzo & Dickson, 1996) to describe teams in organizations. Guzzo and Dickson (1996) suggested a work group is composed of individuals who are interdependent because of the tasks they perform, see themselves and are seen by others as a social entity, and are embedded in a larger social system such as an organization. Cohen and Bailey (1997) defined both work groups and teams as collections of individuals who are task and outcome interdependent, are viewed as a socially intact identity embedded in a larger social context, and manage relations across social boundaries. Likewise, Kozlowski and Bell (2003) recently offered a comprehensive definition and suggested that work groups and teams are composed of two or more individuals who exist to perform organizationally relevant tasks, share goals and task interdependencies, interact socially, maintain and manage boundaries, and exist within an organizational context.

In the present study, the term "team" is used to describe both work groups and teams if they meet the interdependency and other definitional requirements (e.g., interact socially; Kozlowski & Bell, 2003) to be considered a team. The present study is specifically interested in teams. Limiting the scope of interest to teams (i.e., not including all of the group literature) is consistent with other meta–analytic research (e.g., Webber & Donahue, 2001) and reviews (e.g., Cohen & Bailey, 1997; Guzzo & Dickson, 1996) in the management and industrial/organizational psychology literature that are concerned specifically with teams in organizations.

Broadening Definitions of Team Effectiveness

The criterion of interest in the present study—team effectiveness—has received extensive attention in the literature. Although first outlined in Hackman's (1987) model, subsequent reviews (e.g., Cohen & Bailey, 1997; Guzzo & Dickson, 1996; Kozolowski & Bell, 2003; Sundstrom et al., 1990) have highlighted the importance of considering multiple criteria in the operationalization of team effectiveness. Specifically, additional criteria beyond performance are needed to assess the effectiveness of teams in organizations. So, for example, because teams usually have a history and will continue to work together in the future, other outcome variables such as team viability (the capability for the team to continue functioning as a unit; Barrick, Stewart, Neubert, & Mount, 1998; Kozolowski & Bell, 2003) and satisfaction are important to consider as indicators of a team's effectiveness. Hackman specified three criteria to assess team effectiveness: (a) output should meet or exceed the performance standards of relevant parties (i.e., team performance), (b) social processes used in the team's work should maintain or enhance the capability of members to work together on subsequent team tasks (i.e., team viability), and (c) the team experience should satisfy, rather than frustrate, the team (i.e., team satisfaction). Similarly, Guzzo and Dickson suggested that team effectiveness encompasses team–produced outputs, the enhancement of the team's ability to perform in the future, and the consequences of a team for its members. Cohen and Bailey added behavioral outcomes (e.g., absenteeism, turnover, safety) to performance (e.g., efficiency, response times, quality, customer satisfaction, innovation) and attitudinal (e.g., satisfaction, commitment, trust of management) effectiveness criteria. And finally, Thompson (2000) added organizational gains or the extent to which the organization benefits from the team as an additional team effectiveness criterion beyond performance, attitudinal, and behavioral outcomes. In summary, there is extensive agreement in the literature that team effectiveness is multifaceted and must encompass more than just team performance. Discussions on increasing team effectiveness cannot solely focus on performance, but instead must focus on team effectiveness broadly defined. Consistent with this, the present study is interested in team design variables that are related to team effectiveness, with team effectiveness broadly defined to include measures of team performance, viability, and satisfaction.

Increasing Team Effectiveness

In response to the importance of team effectiveness, much of the recent team research has focused on variables related to the effectiveness of teams. Team research has developed from more descriptive approaches of how teams function to normative models that suggest how researchers and practitioners can increase team effectiveness. Early research attempts such as McGrath's (1964) input–process–output model sought to describe group dynamics. However, a major paradigm shift for team research occurred in the late 1980's with Hackman's (1987) introduction of his normative model of team effectiveness. Hackman's pivotal work summarized, integrated, and extended knowledge about the design and management of teams, and offered guidelines for effectively structuring, supporting, and managing teams in organizations. His approach marked a major shift away from models that sought to describe group dynamics (e.g., McGrath's

[1964] input–process–output model) and instead was prescriptive and focused on information that could be applied to make teams more effective.

Hackman's normative model was based on the premise that team effectiveness is a joint function of three "process criteria of effectiveness": (a) the amount of knowledge and skill team members can contribute to the team task, (b) the level of effort the members expend on the team task, and (c) the appropriateness of performance strategies to the task that are used by team members. He suggested that instead of trying to manipulate the team's standing on these process criteria of effectiveness, teams could be designed and managed in such a way that these processes emerge naturally. Specifically, he highlighted points of leverage (i.e., design of the team, organizational context, team synergy) through which researchers and practitioners can promote team effectiveness. Similar to Hackman, later researchers (e.g., Campion, Medsker, & Higgs, 1993; Campion, Papper, & Medsker, 1996; Guzzo & Dickson, 1996) have echoed team design, context, and process as points of leverage through which researchers and practitioners can influence team effectiveness.

Of these points of leverage, the relationship between team design variables and team effectiveness may be of particular interest to researchers and practitioners. Team design should have a strong impact on team effectiveness; in addition, it may be the easiest point of leverage through which practitioners and researchers can influence team effectiveness. Specifically, the design of the team sets the boundaries within which the team must function. Choosing who will be on the team (i.e., team composition), designing the tasks that the team will work on (i.e., team task design), and deciding how the team will be structured such as the extent to which the team is self–managing (i.e., team structure) are ways of influencing team effectiveness through team design. These design variables set the stage for later team processes and place boundaries on how effective the team can be. An additional benefit beyond its potentially strong impact on team effectiveness is that team design may be the easiest point of leverage through which researchers and practitioners can influence team effectiveness. For example, it may be easier to control team size (i.e., how many employees are on a team, an aspect of team design) than the organizational culture within which the team is embedded (i.e., an aspect of organizational context). Knowledge of effective team design should also be useful and can be easily applied when organizations are restructuring or becoming team–based. Given the potential importance of team design as a point of leverage in increasing team effectiveness, the present study focuses on the relationships between team design variables (such as team composition, team task design, and team structure variables that researchers and practitioners can potentially control when designing a team) and team effectiveness.

Since 1987, there has been a wealth of research on team design variables that are posited to be related to team effectiveness. Although numerous authors have studied the relationship between specified team design variables and the effectiveness of teams, how to design a team to be more effective is still unclear. Some direction has been given by narrative reviews on teams (e.g., Bettenhausen, 1991; Cohen & Bailey, 1997; Guzzo & Dickson, 1996; Ilgen, Major, Hollenbeck, & Sego, 1993; Kozolowski & Bell, 2003), however, despite the inclusion of team design variables in these reviews, the area has made little progress, is fragmented and inconsistent, and it is consequently difficult to draw conclusions regarding optimal team design (Cannon–Bowers, Oser, & Flanagan, 1992). Specifically, the literature reviews tend to cover different and particular spans of time (e.g., 1990–1996; Cohen & Bailey, 1997), thus information on effective team design is fragmented. In addition, these narrative reviews often highlight only recent or single empirical studies deemed to be important (e.g., Guzzo & Dickson, 1996). Further, results of empirical studies have been inconsistent regarding the importance of different team design variables and which design variables are predictive of team performance (e.g., Barrick et al., 1998; Mohammed, Mathieu, & Bartlett, 2002). These weaknesses are problematic because few, if any, empirically sound conclusions can be made regarding what researchers and practitioners should and can do at the design stage of teams to increase team effectiveness. The result is a lack of clear direction for practitioners and researchers who are designing teams. Dunphy and Bryant's (1996) case studies indicate that organizations stumble through team implementation; particularly attribute development (i.e., team design). They suggested this is because most of the literature is "how to" books based on the experience of consultants, or articles with suggestions that are often limited to general statements that do not give much direction (e.g., composition skills profoundly affect the team's ability; Dunphy & Bryant, 1996). Thus, although the current team research paradigm is to investigate variables that are related to team effectiveness, few conclusions can be made about how an individual would actually design an effective team. The present paper seeks to rectify the current state of the team design literature by hypothesizing and testing the relationships between different design variables and team effectiveness using meta–analytic techniques.

Meta–Analytic Integration

A meta–analysis of the relationships between specified team design variables and team effectiveness should be of great relevance to both researchers and practitioners because of the unique ability of meta–analysis to quantitatively summarize the literature. Meta–analysis has several advantages over narrative reviews (Arthur, Bennett, & Huffcutt, 2001). Meta–analysis quantitatively aggregates the results of individual studies to arrive at an overall conclusion or to estimate relationships between variables across multiple studies. Thus, information can be garnered on how specified design variables are related to team effectiveness across multiple primary studies. In addition, meta–analysis makes it possible to assess relationships not investigated in the original primary studies including the influence of specified moderator variables. Because of the wealth of team design and team effectiveness research, this area readily lends itself to meta–analysis. Applying meta–analytic techniques to hypothesized relationships between team design and team effectiveness should be useful to both researchers and practitioners because it can help unify the team design literature and contribute knowledge to the optimal design of teams.

In conclusion, the overall purpose of the present paper is to summarize, hypothesize, and test relationships between team design variables and team effectiveness. The following steps were used to meet this objective. First, a qualitative review of the team design literature was conducted and used to develop a conceptual framework and hypotheses for how specified team design variables are related to team effectiveness. Second, several of the hypotheses from the review were tested using meta–analytic techniques.

DESIGN VARIABLES RELATED TO TEAM EFFECTIVENESS

Hackman's (1987) call to assess the influence of team design variables on team effectiveness began a flurry of research which has resulted in the investigation of a variety of design variables hypothesized to be related to the effectiveness of teams. In the present study, design variables are organized into three major areas: (a) attributes of the team members and how they are configured (i.e., team composition), (b) manipulable characteristics of the task (i.e., team task design), and (c) features of the team—such as the distribution of authority—that structure the immediate context in which the team members behave. Although team task design and team structure are presented in the current framework as two areas of team design that are related to team effectiveness, they are not necessarily mutually exclusive categorizations. For example, the distribution of authority in a team (mentioned as a team structure variable) can influence both the distribution of tasks and relationships in the team, but also can increase feelings of autonomy which could be framed as a characteristic of team task design. Each of the identified areas (i.e., team composition, team task design, team structure) is discussed in detail in the subsequent review. Within each area, specific variables are described, the importance of each variable is discussed, and hypotheses of how the variable is related to team effectiveness are proposed. Throughout the review, variables are fit into an overall conceptual framework that is summarized at the end of the literature review.

Team Composition

The first area of team design discussed is team composition, or configurations of team member attributes of the team (Levine & Moreland, 1990). Combinations of member attributes are thought to have a powerful influence on team processes and outcomes (Kozolowski & Bell, 2003) and be an effective means of increasing team effectiveness (Foushee & Helmreich, 1988; Morgan & Lassiter, 1992). However, although team composition is considered to be a powerful and effective means of increasing team effectiveness, team composition is difficult to utilize because of a lack of understanding in the area (Foushee & Helmreich, 1988; Morgan & Lassiter, 1992). Much of the lack of understanding can be attributed to the difficulty in researching team composition variables. In addition to specifying which team composition variables should be related to effectiveness, team composition must also be operationalized at the team level.

Composition variables pose a particular problem because although team member attributes (i.e., individual difference variables) are by definition at the individual level, the interest in team composition is in the combinations of individuals (Mohammed et al., 2002), or how the individual–level variables are combined to reflect a team–level construct. This results in a discrepancy between the level of analyses and the need to specify some operationalization of the individual–level variables to the team level. Thus, not only will different composition variables share different relationships with team effectiveness, but also these relationships will be dependent on the operationalization of the team composition variables, particularly when individual–level variables are used to form a team–level construct. To best understand the relationship between team composition and team effectiveness, team composition can be understood in terms of two major components: (a) which team member attributes or constructs (i.e., individual difference variables) are related to team effectiveness and are important for team composition, and (b) how the team–level combinations of those variables (i.e., operationalization of team–level composition) are related to team effectiveness. The two components of team composition are discussed below.

Individual Difference Variables. Many individual difference variables have been hypothesized (using various statistical operationalizations) to be related to team effectiveness. These variables include general mental ability (GMA) and task–specific ability (e.g., Barrick et al., 1998; Mohammed et al., 2002; Neuman & Wright, 1999), personality (e.g., Barrick et al., 1998; Barry & Stewart, 1997; Driskell, Hogan, & Salas, 1987; Mohammed et al., 2002; Neuman & Wright, 1999), preference for working in teams (e.g., Campion et al., 1993; Campion et al., 1996), and demographic variables (e.g., Gladstein, 1984; Milliken, & Martins, 1996; Pelled, Eisenhardt, & Xin, 1999). Hackman (1987) suggested that the team's composition is the most important condition that supports the knowledge, skills, and abilities (KSAs) needed for the team task (i.e., one of his process criteria of effectiveness). Because teams are by definition composed of individuals who bring specialized KSAs and coordinate them to achieve a common objective, specific composition variables can be related to team effectiveness either by enhancing the team's KSAs needed for the task (i.e., taskwork–related variables) or by facilitating the coordination needed in executing the task (i.e., teamwork–related variables). Grouping team composition variables into those that are taskwork–related and those that are teamwork–related can be helpful in predicting how specific team composition variables are related to team effectiveness (Mohammed et al., 2002).

The teamwork–/taskwork–related composition variable grouping is an extension of the distinction made between teamwork and taskwork elements of team performance (e.g., Glickman et al., 1987; Morgan, Glickman, Woodward, Blaiwes, & Salas, 1986). The team performance literature suggests that, for any given team, team performance is based on both taskwork and teamwork elements. Taskwork is the behavior involved in the execution of the actual "task", and teamwork is the behavior needed for the cooperation and coordination requirements of the task because it is executed within the context of a team (Arthur, Edwards, Bell, Villado, & Bennett, 2004). Extending the distinction to team composition, taskwork–related composition variables allow team members to execute their "task" portion of the team's activity, and teamwork–related composition variables allow team members to execute the task within the context of a team. This distinction is important for understanding which individual difference variables will be related to team performance, because the same predictors of individual task performance should also predict how well team members execute their taskwork, and thus predict team performance. Logically, information can be borrowed from the selection and job performance literatures (e.g., the robustness of GMA as a predictor of job performance) and applied to team composition to suggest which team composition variables will be related to team effectiveness because they represent needed taskwork KSAs. Teamwork, on the other hand, is specific to teams and creates a unique situation in which additional variables (i.e., teamwork–related variables) may have increased importance because of the coordination requirements of interdependence—the requirement of teamwork. As the level of interdependence involves more coordination and teamwork, the teamwork–related composition variables become as critical as the taskwork–related composition variables for team effectiveness. For example, teamwork–related variables may be more related to performance for teams that are intended to do multiple tasks because of the increased coordination demands needed to effectively execute a variety of tasks (Cannon–Bowers, Tannenbaum, Salas, & Volpe, 1995). Teamwork–related composition variables may also be more important for reciprocally interrelated tasks (Tesluk, Zaccaro, Marks, & Mathieu, 1997). Specifically, when teams have low interdependence and require less coordination between team members, taskwork–related KSAs may be more related to team effectiveness; teamwork–related KSAs may be more important as team interdependence increases.

Although the distinction between taskwork and teamwork has been discussed in relation to team performance, the taskwork/teamwork distinction can also be applied to other team effectiveness outcomes. For example, compared to taskwork–related composition variables, teamwork–related composition variables may be more strongly related to attitudinal outcomes such as satisfaction, because of teamwork–related composition variables' contribution to improved coordination. Improved coordination may result in positive attitudes toward the team from team members including increased team satisfaction. In summary, a team is a combination of individuals who contribute task–relevant KSAs and coordinate them for the accomplishment of the team's tasks. Team composition variables should be related to team effectiveness to the extent that they represent KSAs needed for effective task execution or needed for the coordination of team members' taskwork–related KSAs. Therefore, team composition variables can be grouped into taskwork–related and teamwork–related variables.

Because the present study is concerned with the design of teams, an important and very practical distinction for the importance of specific individual difference variables is the trainability of the variable. Assessing whether or not an individual difference variable is related to team effectiveness and whether or not the variable is trainable has implications for the design of teams. For nontrainable characteristics, the implication is that team members need to already have those characteristics and, therefore, would need to be selected into the team on the basis of the characteristics. For variables that are trainable, team members do not necessarily need to be selected on these characteristics, but the organization must be willing to train individuals or teams deficient on these variables. If the organization is unwilling or does not have the resources to train, then the team members would need to be selected on the specified characteristics at the design stage of the team.

Team–Level Operationalizations of Composition Variables. A second consideration for team composition is how team–level operationalizations moderate the relationships between the individual difference variables and team effectiveness. Researchers have struggled with team–level operationalizations of individual–level composition variables and have used a variety of methods including statistical operationalizations (e.g., mean, variance, minimum, maximum). Recent multilevel research provides guidance on how to appropriately conceptualize team composition (Chan, 1998; Kozlowski & Klein, 2000). Specifically, Chan (1998) and Kozlowski and

Klein's (2000) research is relevant to team composition, because it suggests that different individual difference variables may be best represented at the team level by different operationalizations. The relationship between team member individual difference variables and team effectiveness will be moderated by how the construct is operationalized at the team–level, with more appropriate team–level operationalizations of the constructs resulting in stronger relationships between team composition and team effectiveness (Arthur, Bell, & Edwards, 2004).

To specify the most appropriate operationalization, Kozlowski and Klein (2000) suggested that researchers should indicate how a lower–level phenomenon might manifest itself at a higher level. Specifically, Kozlowski and Klein suggested that for phenomena that emerge in the same way and are functionally equivalent across levels (e.g., individual and team), appropriate operationalizations are the sum or average. The implication for the present study is that individual difference variables that are functionally equivalent at the team level should be operationalized as the sum or average. For example, manifestations of GMA may be the same across levels because the expected GMA/performance relationship at both the individual and team level is continuous and linear. Because each team member has a unique performance contribution to a team's task, a team should be more effective the higher the GMA of each member (and consequently the higher the team mean on GMA; Day et al., in press). Using the same reasoning, the sum or average may be the best operationalization of all taskwork–related individual difference variables to the team level (i.e., the team composition). This is because each team member contributes to a unique portion of the taskwork; the better contribution each team member can make, the more effectively the team should function as a unit. In contrast, variables that are hypothesized to be distinctively different in their structure as they emerge across levels (i.e., individual contributions are not shared or consistent) may require other operationalizations (Kozlowski & Klein, 2000).

Team–level operationalizations of teamwork–related composition variables may be better represented by operationalizations—such as configural models—that allow for complex patterns of interactions as the team members' individual attributes combine to a team level. Configural models of team–level variables rely on the ideas of discontinuity and complex nonlinear processes of the combinations of lower–level variables. The team–level variable of interest is not just an average of the individual–level representations of the variable because individual contributions are not shared or consistent across the team. For example, team–level agreeableness may not be best represented by the mean of the team members' individual–level agreeableness. Instead, operationalizations that can account for the interaction between different contributions of each team member's agreeableness may be related to team effectiveness. In fact, teamwork–related composition variables, in general, may be best represented at the team–level by configural operationalizations, because teamwork–related composition variables are related to team effectiveness through coordination and the interplay between the team members' individual contributions. Examples of configural operationalizations are the minimum and the maximum team values or the team variance (heterogeneity) on the variable of interest, or more complex operationalizations such as social networks. Although it is expected that more complex configural operationalizations have the ability to better capture team–level representations of teamwork–related composition variables, these have rarely been used in the team design research. Consequently, although these operationalizations were included in the meta–analytic review when reported in the primary studies, they are not included in the hypotheses.

In summary, for individual–level variables that behave the same way at the team–level (i.e., taskwork–related composition variables), statistical operationalizations such as the mean or sum may be the best team–level representation or operationalization. On the other hand, for variables that emerge in different ways across levels (i.e., teamwork–related composition variables), configural operationalizations such as the minimum, maximum, and variance may best represent the team–level phenomenon.

On a related note, one particular operationalization—diversity—has received extensive research attention in the team literature (see Milliken & Martins, 1996). Diversity has not shown consistent main effects (relationships) with team performance (Jehn, Northcraft, & Neale, 1999). This is because diversity in a team merely suggests that there is variance or differences in a team, so, for team composition, diversity without reference to a particular attribute or variable is meaningless. The specific composition variable on which the team is diverse must be specified before its relationship with team effectiveness can be hypothesized. In the present study, diversity (i.e., homogeneity or heterogeneity) will be one possible configural operationalization of team composition variables. Because teamwork–related composition variables should be better captured using configural operationalizations, diversity should be a more meaningful operationalization for teamwork–related composition variables than for taskwork–related composition variables.

In conclusion, the relationship between team composition variables and team effectiveness can be best understood in terms of whether the variables are taskwork–related or teamwork–related. Second, teamwork–related composition variables should be best operationalized at the team–level using configural models while taskwork–related composition variables are likely to be best operationalized as the team mean or sum. Using these guidelines, specific team composition variables and specific hypotheses are discussed in the remainder of this section.

General Mental Ability. The strong relationship between GMA and task performance is a robust phenomenon (Schmidt, 2002) that should generalize to team contexts. Indeed, Devine and Phillips' (2001) meta–analysis suggested a positive relationship between GMA and team performance. Specifically, team GMA was more predictive of performance on unfamiliar than familiar tasks, and the strength of the team GMA/team performance relationship was also dependent on how team GMA was operationalized (i.e., team average GMA was more strongly related to team performance than when the lowest team member score was used). Given the overwhelming evidence that GMA is a predictor of general job performance (see Schmidt, 2002), the positive relationship with team performance is not surprising. In fact, it would seem that team GMA should be one of the strongest predictors of team performance because GMA should represent the team members' ability to effectively execute their portion of the team task. Because higher (more) GMA should result in increases in performance at both the individual– and team–level, the best operationalization of team GMA should be the team mean. Day et al. (in press) assessed the different statistical operationalization of team GMA across Steiner's (1972) task types—which are based on member contribution—and found that the team mean GMA was the best predictor of team performance even across task types. In addition to being a predictor of performance, teams with higher GMA may also have increased viability and satisfaction, through GMA's effect on performance. This is because if team members can view the team as competent and the team can successfully perform, the team should have a better chance of effectively working together in the future. Likewise, when team members perceive the team to be an effectively performing unit they will be more satisfied with the team (Costa, Roe, & Tallillieu, 2001). Thus,

H1: Team GMA will be positively related to team performance (H1a), team viability (H1b), and team satisfaction (H1c).

H1d: The team GMA/team effectiveness relationships will be strongest when team GMA is operationalized as the team mean or sum.

Specific Ability/Task–Relevant Expertise. Additional measures of ability exist (e.g., specific ability, task–relevant expertise), however, Schmidt (2002) argues that these are merely facets of GMA and that multiple predictors of ability are merely surrogates for GMA. However, because of the nature of teams, specific measures of ability should be particularly important. Teams are important because they can be used to execute tasks that require more than one individual. In order for teams to perform well, each team member needs the requisite specific abilities or task–relevant expertise to complete their portion of the taskwork. Because specific ability measures are related to the completion of the team members' portion of the taskwork, they serve as a task–related composition variable. Hackman (1987) proposed that well–composed teams have individuals that have a high level of task–relevant expertise (e.g., high expertise/task knowledge). Thus, the higher each team member is on the specific task–related expertise, the better the team should perform the team task. This suggests that the team mean or sum of task–related expertise should be the best predictor of team performance. Similar to predictions for GMA, when team members view the team as more competent and the team performs well, the team will have increased viability and be more satisfied with the experience. Thus,

> H2: Team task–relevant expertise will be positively related to team performance (H2a), team viability (H2b), and team satisfaction (H2c).
>
> H2d: The team task–relevant expertise/team effectiveness relationships will be strongest when team specific ability/task–relevant expertise is operationalized as the team mean or sum.

Hackman (1987) also suggested that an effective team is one that is *just* large enough to complete or perform the task, thus, each team member should bring a relatively unique set of task–relevant expertise to the team. Because team members should have a high level of task–relevant expertise in unique areas, well–composed teams should consist of team members with diverse *types* of expertise. Diverse types of task–relevant expertise will increase the breadth of the team's KSAs. Composition of task–relevant expertise *type* should be more strongly related to team effectiveness when operationalized as diversity (i.e., teams with members who are heterogeneous in types of expertise should be better performing).

However, while increasing the breadth of team KSAs, too much diversity in task–relevant expertise type may lead to coordination problems and decrease the flexibility of the team. Thus, some overlap in member KSAs may be beneficial. Dunphy and Bryant (1996) suggested that as team member skills overlap (i.e., team members "mulitskill"), team members acquire a broader understanding and appreciation of how the full range of team skills must combine to meet the team's objectives. In addition, when different members in a team can perform other team members' tasks, flexibility results (Campion et al., 1993; Stewart & Barrick, 2000). Thus, as team members' task–relevant expertise increases in uniqueness, teams will have less flexibility. The benefits of overlap in team member KSA are also the impetus underlying the importance of similar concepts in the team literature such as interpositional knowledge and cross–training (e.g., Blickensderfer, Cannon–Bowers, & Salas, 1998; Marks, Sabella, Burke, & Zaccaro, 2002; Volpe, Cannon–Bowers, Salas, & Spector, 1996). For teams that have frequent changes in membership, or teams for which effective performance requires having task knowledge related to another team member's position (e.g., high interpositional knowledge), heterogeneity in task–relevant expertise type should be negatively related to team performance. When team members view the team as more competent because of the breadth of the KSAs that can be used to meet the team's objectives, they will have increased viability and increased satisfaction. However, too much diversity in task–relevant expertise type will result in increased difficulties in coordination and thus decreases in team viability and satisfaction, suggesting a curvilinear relationship between task–relevant expertise type and team effectiveness. Thus,

> H2e–g: Task–relevant expertise type diversity will have a curvilinear relationship with team performance (H2e), team viability (H2f), and team satisfaction (H2g). Specifically, moderate diversity will be related to the highest levels of team effectiveness.

Personality Variables. The team effectiveness literature suggests that personality is an important factor in team functioning and performance (e.g., Driskell et al., 1987; Hackman, 1987). Much of the progress in personality research in organizations has been attributed to the development of the Five Factor Model (FFM) of personality (McCrae & Costa, 1987), which is a framework for assessing normal personality. However, personality represents a particularly challenging area of team composition because the team personality variables that are related to team performance are likely to vary across situations (Tett & Burnett, 2003), and because of the difficulty in aggregating team members' individual personalities to a "team personality". A wide variety of team personality/team effectiveness relationships exist in the literature and these are likely to be at least in part due the team type (i.e., situation) and the different operationalizations of team personality.

Recently, Tett and Burnett (2003) proposed a trait–based interactionist model of job performance and personality. They suggested that the variation found in the personality variable/job performance relationships is because the relationships vary across situation. Their model identified general mechanisms by which the personality variables are related to job performance. Situations should exert a force on individuals that results in the individual behaving in trait–related ways. Cues for trait expression can be through job tasks (task level), other people in the work setting (social level), and organizational features (organizational level). Team type may serve as a cue and indicate which personality variables will serve as taskwork–related composition variables. For example, agreeableness may be crucial in service teams because of the job demands of having to deal with difficult customers; openness may be crucial in project teams because of an increased need for tolerance of others' ideas (Tett & Burnett, 2003). There may also be some personality variables that are necessary for all teams or all jobs such as conscientiousness—where responsibility and dependability will always result in increased team effectiveness.

Of the FFM dimensions, conscientiousness, which has emerged as the strongest and most consistent predictor of individual job performance regardless of task (Barrick & Mount, 1991; Barrick, Mount, & Judge, 2001; Hurtz & Donovan, 2000), may also be predictive of performance in teams. In addition, the conscientiousness/performance relationship is even stronger when performance is limited to citizenship behaviors (e.g., volunteering and helping; Borman, Penner, Allen, & Motowidlo, 2001), thus conscientiousness may be predictive of both the KSAs needed to perform the task and also the coordination required for the team to be effective.

The team design literature has assessed the relationship between conscientiousness and team effectiveness. Kickul and Neuman (2000) found individual team member conscientiousness to be related to team performance, however, Mount, Barrick, and Stewart (1998) suggested that conscientiousness seems to be a better predictor for nonteam jobs and other researchers have found that it does not predict team performance (e.g., Barry & Stewart, 1997; Mohammed et al., 2002). These contradictions may vary as a result of the team type (i.e., situation) or may also be a result of the operationalizations of team conscientiousness (i.e., the phenomenon was not adequately captured). When personality variables such as conscientiousness are related to the task and are therefore taskwork–related variables, they will behave similarly to the ability variables and be best operationalized at the team–level as the team mean or sum. Team conscientiousness should also be related to team viability and satisfaction in that members who are more dependable and reliable will be less irritating to work with in a team context. In addition to conscientiousness, other team personality variables may serve as taskwork–related composition variables for specific team types (e.g., agreeableness for service jobs). When the specified personality variables are relevant to executing the taskwork, they will also best predict team performance when they are operationalized as the team mean or sum. Thus,

> H3: Team conscientiousness will be positively related to team performance (H3a), team viability (H3b), and team satisfaction (H3c).

H3d: The team conscientiousness/team effectiveness relationships will be strongest when team conscientiousness is operationalized as the team mean or sum.

In addition, as a team's tasks become more interdependent, effective teams will require not only taskwork–related composition variables but also the ability to coordinate with others (i.e., teamwork–related composition variables). Because of the coordination required for teamwork and the presence of a teamwork element requirement for all team tasks, other personality variables might potentially be predictive of team effectiveness. Higher levels of extraversion are hypothesized to be beneficial when situations require social interaction (Barrick & Mount, 1991). Likewise, Organ and Ryan (1995) found extraversion to be a predictor of job performance when jobs require interpersonal interaction. Thus, extraversion may contribute positively to teamwork. In addition, individuals who are agreeable (e.g., considerate, trusting, friendly) and individuals who are emotionally stable (e.g., secure, calm, steady), may positively contribute to teamwork, and therefore enhance team effectiveness (Hough, 1992; Mount et al., 1998). As team tasks become more interdependent and the need for coordination increases in importance, teamwork–related variables such as extraversion, agreeableness, and emotional stability should allow for easier coordination of team KSAs and be positively related to team effectiveness outcomes (Cannon–Bowers et al., 1995; Tesluk et al., 1997). Specifically, personality variables that are related to the coordination of team KSAs (i.e., are teamwork–related composition variables) should be related to team satisfaction, viability, and because teams by definition are interdependent, team performance.

The appropriate measurement or operationalization of a team personality variable acting as a teamwork–related composition variable is particularly difficult. This difficulty arises from the fact that each team member introduces a unique set of personality variables that will interact with all other team members' personalities during the coordination of team KSAs. Given this complexity, the team–level operationalization of personality variables should be better captured and thus, more related to team effectiveness through configural operationalizations. The literature has addressed the difficulty in creating a team–level personality by hypothesizing and exploring how different operationalizations moderate the team personality variable/team effectiveness relationships. Several hypotheses exist. Homogeneity on personality variables is posited to increase effectiveness because members are similar to each other and can communicate and understand each other better. On the other hand, heterogeneity is posited to increase team effectiveness because each team member contributes something unique to the process and complements the other team members' standings on the variable (e.g., high extraverts may be complemented by low extraverts so they are not fighting over the "floor"). Other operationalizations—the minimum or maximum for a team on a personality variable—are hypothesized to be important if one team member will have a profound impact on team effectiveness (e.g., one neurotic individual may negatively impact team effectiveness). And, still other operationalizations have been suggested such as creating a "team personality" based on the number of high scores on a specified dimension in a team (Barry & Stewart, 1997).

Guided by the competing hypotheses outlined above, research has specifically explored how different operationalizations of team personality affect the team personality variable/team effectiveness relationships. In a study on retail teams, Neuman, Wagner, and Christiansen (1999) compared two team personality operationalizations—diversity and mean—and found conscientiousness, agreeableness, and openness to experience best predicted team performance when operationalized as the team mean, while extraversion and emotional stability best predicted team performance when operationalized as variance (teams with larger variance performed better). Barrick et al. (1998) assessed the relationship between team personality variables (operationalized as the mean, minimum, maximum, and variance), and team performance and viability using production teams. Unlike Neuman et al. (1998), compared to other operationalizations, the mean of emotional stability was the best predictor of both team viability and performance, and the mean of extraversion best predicted team viability while the minimum predicted both team viability and performance. Consistent with Neuman et al. (1998) the mean (and the minimum) of agreeableness predicted team performance. Thus, overall, the relationships between team personality variables and team effectiveness are inconsistent across studies, even when multiple operationalizations are used. It could be that configural operationalizations used in the literature to operationalize team composition (e.g., minimum, maximum) are too simplistic to adequately capture the team–level construct. However, meta–analytic aggregation of these studies should offer some insight into the relationship between specified personality variables and team effectiveness using different operationalizations. If no consistent effects emerge, this may suggest that the team–level phenomenon is inadequately captured by simple configural operationalizations or that the specified personality variable is unrelated to team effectiveness. Based on the preceding review,

H4: Team agreeableness will be related to team performance (H4a), team viability (H4b), and team satisfaction (H4c).

H4d: The team agreeableness/team effectiveness relationships will be strongest when a configural operationalization is used to operationalize team personality.

H5: Team extraversion will be related to team performance (H5a), team viability (H5b), and team satisfaction (H5c).

H5d: The team extraversion/team effectiveness relationships will be strongest when a configural operationalization is used to operationalize team personality.

H6: Team emotional stability will be related to team performance (H6a), team viability (H6b), and team satisfaction (H6c).

H6d: The team emotional stability/team effectiveness relationships will be strongest when a configural operationalization is used to operationalize team personality.

Demographic Variables. Team member demographic variables (e.g., sex, race, age, organizational tenure, educational background) have received a great deal of attention as team composition variables. This increased attention is due to the changing nature of the workforce—an increase of working women and minorities (Muchinsky, 2003; Tsui & Gutek, 1999)—which has subsequently been reflected in team composition. Despite the research attention, the use of some demographics as composition variables is limited because it is illegal to make any employment–related decisions (such as selection and selection into teams) based on protected class status (e.g., sex, race, age). Demographic variables have limited or no applied value as design variables for practitioners when they include protected class variables. However, other demographic variables that do not represent protected classes such as educational background and tenure with the organization may be useful to practitioners in the design of teams.

Some researchers have suggested team diversity of demographic variables is related to team effectiveness (see Tsui & Gutek, 1999). For example, Millken and Martins (1996) listed several attributes that can potentially affect team process, performance, and member satisfaction through diversity: race and ethnic background, nationality, sex, age, cultural values, socio–economic background, educational background, functional background, occupational background, industry experience, organizational membership, organizational tenure, and team tenure. In fact, most of the attention to demographic variables as team composition variables has been in the context of how demographic diversity (i.e., heterogeneity and homogeneity) is related to team effectiveness. Although the term "demographic diversity" is widely used in the team literature, Tsui and Gutek (1999) distinguished between demographic diversity and demography, where demographic diversity research focuses on the experiences of minority individuals and demography research focuses on the effect of demographic differences on everyone. The present study is interested in team effectiveness, not individual outcomes within the teams. Thus, demography as differentiated from demographic diversity by Tsui and Gutek (1999) is of interest. Most of the team research, however, has not made the demographic diversity/demography distinction and has investigated demographic variables in relation to team effectiveness using the term "diversity" even when concerned with team–level effectiveness outcomes, not individual–level outcomes. Thus, the term diversity will be used in the remainder of this section to be consistent with the research cited.

General hypotheses of demographic diversity in the team literature suggest that demographic diversity can lead to more high quality solutions through differences in perspectives, but may also result in negative attitudinal outcomes such as decreased satisfaction for minority team members (Milliken & Martins, 1996). The idea that increased demographic diversity improves team performance is based on the general mental resource perspective, which suggests team composition diversity is an indicator of available knowledge and differing perspectives. Pelled (1996) suggested that diversities that are "job–related" (i.e., educational, functional, occupational, industrial background) are related to team performance whereas those that are "less job–related" (i.e., age, sex, race/ethnicity) are not. However, using Pelled's (1996) conceptualization of highly job–related and less job–related attributes, Webber and Donahue (2001) conducted a meta–analysis (of 24 studies) on the outcomes of both types of diversity on performance to see if increasing these diversities increased team performance. Results indicated no relationship between team diversities and performance, including when they looked at both job–related diversities and less job–related diversities separately or when they combined them for an overall assessment of diversity. In addition, there was still no effect when team type (i.e., top management teams and lower–level teams) was used as a moderator. Webber and Donahue (2001) suggested several explanations for their lack of significant findings including that: (a) the literature has not discussed the magnitude of these relationships that turned out to be quite small, (b) the moderating influence of time, (c) the tenure of the team, and (d) the organizational climate toward diversity. However, it is most likely that demographic diversity served as a weak representation (if one at all) of differing job or task–related perspectives, and was therefore unrelated to team performance (and will also then be unrelated to team viability). However, diversity of demographic variables may instead be more strongly related to attitudinal outcomes such as satisfaction through social processes. For example, if team members are less attracted to each other because of an increased diversity in demographic variables, increased demographic diversity may be related to lower team satisfaction.

Instead of using diversity operationalizations, the influence of demographic variables on team effectiveness may be better captured using other operationalizations when the demographic variables serve as indicators of underlying taskwork KSAs. However, it should be noted that because some demographic variables are nominal (e.g., sex, race, religion) the team–level operationalizations are limited to measures of proportions of the different categories instead of the team mean (e.g., the team "mean" on race is meaningless). Wood (1987) conducted a meta–analysis on sex differences in group performance. Her results indicated that male–only groups outperformed mixed sex and female–only groups. However, she concluded that sex–based differences in performance were due to the masculine nature of the tasks. Specifically, women performed better at tasks that required positive social activities, whereas men tended to perform better at tasks that required more task–oriented behavior (e.g., giving opinions and suggestions). Many of the primary studies in Wood's meta–analysis were conducted before the 1970's; because the nature of women's interactions, roles, and presence in the workplace has changed, different sex/team performance relationships may emerge in more recent research. In a more recent study, Lepine, Hollenbeck, Ilgen, Colquitt, and Ellis (2002) question the relationship between sex and team performance and found that all–male teams were the worst configuration for performance on a decision–making task (even though it was a masculine–type task). Male teams tended to make decisions that were overly aggressive. Thus, given the change in women's interactions, roles, and presence in the workplace, the specific effects of sex on team effectiveness (or for that matter, which demographic variables will be taskwork–related) are relatively unclear.

Overall, the relationships between different demographic variables and team effectiveness are likely to be weak. However, if demographic variables are related to how team members perform their portion of the task, they should be more accurately operationalized using strategies such as proportion (e.g., if males are better at the team tasks, the more males the team has, the more effective the team should be). Demographic variables that are related to the coordination of the team will serve as teamwork–related composition variables and should be better operationalized using configural approaches.

In addition, teamwork–related composition variables should be more strongly related to team satisfaction than viability and performance. Thus,

H7a: Taskwork–related demographic variables (e.g., educational background, organizational tenure) will be related to team performance.

H7b: The taskwork–related demographic variables/team performance relationship will be strongest when taskwork–related variables are operationalized as the team mean or proportion.

H7c: Teamwork–related demographic variables (e.g., age, race) will be related to team satisfaction.

H7d: The teamwork–related demographic variables/team satisfaction relationship will be strongest when teamwork–related demographic variables are operationalized as heterogeneity (e.g., a configural operationalization).

Preference for Teamwork. An additional team composition variable that may be related to team effectiveness is members' attitudes toward working in a team. Preference for teamwork is the degree to which individuals have strong preferences for team rather than autonomous work (Wagner, 1995; Wagner & Moch, 1986). Research has indicated that preference for teamwork is related to team member satisfaction (Campion et al., 1993; Shaw, Duffy, & Stark, 2000), but it has not been related to team performance or productivity (Campion et al., 1993). Thus, although preference for teamwork may be related to satisfaction, it may not necessarily affect actual team member behaviors and therefore it may not be related to team performance or viability. Because it is not likely to be expressed through team member behaviors, it should not affect the team KSAs or the coordination of those KSAs, and instead have a direct effect on satisfaction. Preference for teamwork should also manifest in the same way at the team level and individual level. Specifically, teams composed of team members with low preference for teamwork, should be less satisfied with the team suggesting the best team–level operationalization is the team mean or sum. Thus,

H8: Preference for teamwork will be positively related to team satisfaction.

Relative Contribution of Different Team Composition Variables to Team Effectiveness. Although many different composition variables have been hypothesized to be related to team effectiveness, it is likely that the magnitude of these relationships will differ. In addition, it is feasible that relationships may be reduced when other composition variables are considered (e.g., does conscientiousness matter when GMA is considered?). Although some studies have looked at multiple composition predictors simultaneously (e.g., Mohammed et al., 2002), the comparative contribution of the different team composition variables is relatively unknown. Thus, an additional objective of this meta–analysis is to compare the size of the relationships between team composition variables and team effectiveness. This is a distinct strength of the comprehensiveness of this meta–analysis.

Some predictions about the relative contribution of team composition variables to team effectiveness can be made based on the job performance literature. In the job performance literature, the predictive validity of personality variables is often small in comparison to GMA or task knowledge. Thus, compared to teamwork–related variables, taskwork–related variables should be more strongly related to team performance.

However, teamwork–related variables may be more predictive in the team setting than in the general job performance literature because of the increased importance of teamwork in addition to taskwork (Cannon–Bowers et al., 1995). Because teamwork–related composition variables are posited to influence effectiveness through coordination, if coordination is difficult, team members are likely to be frustrated and therefore less satisfied with the experience. Because taskwork–related composition variables are posited to be related to team effectiveness through the taskwork KSAs, the relationship between taskwork–related composition variables and team satisfaction will be indirect through performance. Thus,

H9a: Compared to teamwork–related predictors (i.e., agreeableness, extraversion, emotional stability), taskwork–related predictors (i.e., GMA, task–relevant expertise, conscientiousness) will be more strongly related to team performance.

H9b: As team interdependency increases, the strength of the teamwork–related predictors/team performance relationship will be similar to the strength of the taskwork–related predictor/team performance relationship.

H9c: Compared to teamwork–related predictors (i.e., agreeableness, extraversion, emotional stability), taskwork–related predictors (i.e., GMA, task–relevant expertise, conscientiousness) will have weaker relationships with team satisfaction.

Team Task Design

The second area of team design that researchers and practitioners can use to influence the effectiveness of teams, is the manipulable aspects of the team task. The idea that team task design is related to team effectiveness is rooted in motivation, parallels job and work design concepts, and suggests that features of the team task will be related to team effectiveness. Although there is no well–developed theory of team motivation (Kozlowski & Bell, 2003), research from job characteristics theory, work design models, and team design models suggests team task design will be related to team effectiveness by creating conditions that support effort (i.e., the motivation to use KSAs).

Recently, Morgeson and Campion (2003) presented a framework of work design which includes three broad characteristics of work—job complexity, social environment, and physical demands. Of these, job complexity may be the most applicable to creating conditions that support effort in teams and understanding the KSAs needed for effective execution of the team task. The job complexity dimension combines Hackman and Oldham's (1980) five job design characteristics—job variety, identity, significance, autonomy, and feedback (i.e., traditional motivational job design characteristics) and other work that focuses on the dimensions which can be used for describing work (e.g., mechanistic approach [specialization and task simplicity], perceptual–motor approach [ergonomic design and cognitive simplicity]). Elements of the job complexity dimension may also have implications for effective team task design. Because team task design variables have received little attention in the team literature, specified team task design variables are discussed together in the following section. Although autonomy is likely to motivate team members and could be considered a team task design variable, it is not discussed here as a team task design variable, rather, team design variables that are related to autonomy (i.e., distribution of authority) are discussed under team structure.

Task Variety, Task Identity, Task Significance, and Task Feedback. In the team literature, attention to team task design has mostly paralleled Hackman and Oldham's (1980) five job design characteristics (i.e., traditional motivational job design characteristics). Within the job/work design literature, job variety, identity, significance, and feedback have all been related to quality of work life (i.e., satisfaction, trust in management, commitment) with task identity emerging as the most strongly related to performance (Spreitzer, Cohen, & Ledford, 1999). And, although variety of work was related to quality of work life, it was strongly and negatively related to productivity ($r = -.55$; Spreitzer et al., 1999). This is likely to be because as the motivational properties of jobs are enhanced (e.g., task identity, task significance), jobs also become increasingly complex and they have additional general mental demands (Morgeson & Campion, 2003). Hackman (1987) suggested the same task characteristics support effort in teams, namely, team members should use a variety of skills (i.e., task variety); the task should result in a meaningful and identifiable piece of work (i.e., task identity); the team's work should have significant consequences for other people (i.e., task significance); and the work should generate frequent and accurate feedback about how the team is performing (i.e., task feedback).

Together job characteristics theory and team design models suggest the design of team tasks can be altered to motivate team members to work harder, produce more output at a higher quality, and be more satisfied (Griffin & McMahan, 1994). Altering the team task is based on the idea that the task itself must motivate the team members (Griffin & McMahan, 1994; Hackman, 1987). Thus, inherent properties of the team task (i.e., task variety, task identity, task significance, task feedback) can be manipulated to increase team effectiveness. Specifically, team task identity motivates team members by encouraging a sense of collective identity for completing a whole piece of work. Team task significance motivates team members to care about the task they perform and cooperate with one another. Feedback from the task can allow members to monitor how their behaviors are related to effective execution of the task. Team task variety allows members to use different skills that can reduce boredom and monotony (Hackman, 1987) and also can lead to increased flexibility (Susman, 1976). Increased flexibility allows a team to be versatile and to continue being effective and may be positively related to team viability. Although integrating the preceding principles into the teams' task may motivate team members, the extent that the integration of these principles also increases the complexity of the task and therefore increases mental demands, may result in decreases in team performance. In summary, team task design variables are thought to impact team effectiveness by creating conditions that support effort. Thus,

> H10: Team task design that is consistent with effective job design principles (i.e., increased task variety, task significance, task identity, task feedback) will result in higher team performance (H10a), team viability (H10b), and team satisfaction (H10c).
>
> H10d: Team task design that results in increases in task complexity will result in decreases in team performance.

Team Structure

A third area of team design related to team effectiveness is team structure. Several authors have suggested that team effectiveness can be explained by differences in team structure (e.g., Cohen & Bailey, 1997; Hackman, 1987; Stewart & Barrick, 2000; Wageman, 1995; Werner & Lester, 2001). Team structure is defined as team relationships that determine the allocation of tasks, responsibilities, and authority (Stewart & Barrick, 2000). Thus, design features of a team that support an effective team structure, should be related to team effectiveness. Distribution of authority—including the degree of team self–management and the assignment of team leadership—team size, and structural interdependence were identified as elements of team structure that could be manipulated during the design of teams and related to team effectiveness. Each of these team structure variables are discussed below.

Distribution of Authority. Distribution of authority is an important area because it can be easily manipulated by the organization. Specifically, teams can be designed to have varying degrees of self–management, and have an assigned, a rotated, or no formal team leader. Self–managing teams are one of the most common team types in organizations (Lawler, Mohrman, & Ledford, 1995) and have been found to increase productivity and quality (Cohen & Ledford, 1994). Self–managing teams are assigned a relatively whole task and then are given decision–making authority on how to go about accomplishing the task. Team members are responsible for assigning tasks, setting goals, deciding on procedures, and solving team problems. The degree of team self–management should be related to team members' feelings of autonomy and control, and according to job design theory, increase the effort on the team task. The resultant increase in autonomy and control should subsequently be related to team effectiveness.

In addition to increasing feelings of autonomy, the use of self–managing teams can be beneficial to organizations because empowering teams can result in decreased decision times (because decisions are made at the team level), and reduce the need for supervisory/middle management positions (Dunphy & Bryant, 1996). Activities such as planning, coordinating, and personnel functions have traditionally been the work of supervisors or middle managers; however, self–managing teams have those administrative duties relegated to them. The implementation of self–managing teams has been used as a reorganization strategy in organizations to remove extra or unnecessary positions—specifically, to remove middle management positions (Dunphy & Bryant, 1996). Thus, assessing how structuring a team to be self–managing affects team effectiveness is important. If self–managing teams are effective, then their use in organizational design will be an even more appealing strategy.

Team self–management is not categorical (i.e., self–managing or not), but is instead best conceptualized as the degree to which teams are self–managing. Dunphy and Bryant (1996) distinguished between supervisor–centered teams and self–managing teams. In the former, the team leader or supervisor is central to the decision–making. In contrast, in self–managing teams, supervisor functions are taken over by the team as a whole. However, just because the team is self–managing does not necessarily imply that the team does not have a leader (Stewart & Barrick, 2000). In addition to the degree to which teams are self–managing, the assignment of team leaders may be a second area through which the distribution of authority affects autonomy and subsequently team effectiveness. Assigning a supervisor or leader to a team may help ensure that critical team tasks are executed, however, compared to teams that do not have a leader or that the leader emerges naturally from within the team, assigning a team leader may lead to reduced feelings of autonomy. In addition, the leadership style of the team leader may be related to feelings of autonomy. For example, Stewart and Manz (1995) suggested that leaders of self–managing teams who are autocratic might decrease team members' feelings of autonomy. Erez, Lepine, and Elms (2002) suggested rotated leadership as an alternative to the emergent leader or assigned leader in self–managing teams. Rotated leadership has team members take turns (i.e., rotate) being the leader of the team. Rotated leadership should ensure that the leader maintains a level of responsibility and that the members engage in their fair share of work. It should also improve role clarification. In Erez et al.'s (2002) study, rotated leadership was expected to increase workload sharing, voice, cooperation, and subsequently increase team performance and satisfaction; however, it only increased cooperation and performance. This could be because, although it ensures that roles and responsibilities are clear to team members, having the "assignment" of using a rotated leader could decrease feelings of autonomy and subsequently decrease satisfaction.

In summary, elements of team structure that can be manipulated to affect the distribution of authority in a team are the degree of team self–management, and the assignment of a leader or lack thereof, or leader rotation. Additional predictions for the relationship between the distribution of authority and team effectiveness can be made for team viability through performance. If teams are unable to perform with the structured distribution of authority then it is unlikely that they would be effective in the future and they could actually enter into a downward spiral. Specific predictions for the relationship between the distribution of authority and team effectiveness are:

H11: Conditions of the distribution of authority that support higher autonomy (e.g., no assigned leader, self–managing) will result in higher team performance (H11a), team viability (H11b), and team satisfaction (H11c).

Team Size. In addition to the individuals who compose the team, other team staffing variables such as team size, should be related to team performance. Much of the team literature focuses on the actual number of individuals in a team, which results in suggestions of specific numbers for effective teams. For example, Katzenbach and Smith (1993) suggested teams should have approximately 12 members. In a survey of executives, Thompson (2000) found team size varied from 3 to 25 with an average of 8.4. She recommended no more then 10 members per team—with more like 5 or 6. In addition, studies that have assessed team size have found a variety of relationships between team size and team performance including curvilinear, unrelated, or linear relationships (e.g., Baugh & Graen, 1997; Martz, Vogel, & Nunamaker, 1992; Pearce & Giacalone, 2003). However, specific team size recommendations may not be particularly meaningful because effective size is likely to be a function of the task.

A better way to assess the team size/team performance relationship may be using *relative* team size (e.g., Campion et al., 1993; Campion et al., 1996), which attempts to capture the notion that the size of the team should be just large enough to execute the tasks (Hackman, 1987). Specifically, it is likely that optimal size is dependent on team type or task properties of the team (Kozlowski & Bell, 2003). Measures of relative size attempt to capture the appropriateness of the team size by asking team members (or others) to rate the relative size of the team to the task (e.g., Was the number of people too large for the task at hand? [Campion et al., 1993]). Team researchers have assessed team size in two ways—relative size and absolute size. Compared to measures of actual size, relative size may be more strongly related to team performance. Thus,

> H12a: Compared to actual team size, relative team size will be more strongly related to team performance.
>
> H12b: Using the relative team size operationalization, team sizes that are rated as appropriate relative to the task will be related to increased team performance.

Despite the benefit of using relative team size, there is extensive research that indicates larger teams have a spectrum of negative outcomes including less participation by team members, decreased satisfaction and coordination, social–loafing, and free–riding problems (e.g., Albanese & Van Fleet, 1985; Karau & Williams, 1993; Sheppard, 1993). Thus, there still might be general guidelines that can be developed from absolute team size. For any type of team, there may be a point at which there are just too many team members for effective coordination (i.e., teamwork) which could have detrimental effects on team performance, viability, and satisfaction. Thus,

> H12c–e: There will be a point at which the actual team size is too large and team size will be negatively related to team performance (H12c), team viability (H12d), and team satisfaction (H12e).

Structural Interdependence. A third aspect of team structure that is related to team effectiveness is the interdependence of the team. Interdependence is defined as the extent to which team members cooperate and work interactively to complete tasks. Because the present study is concerned with team design features that are related to team effectiveness, structural interdependence—the context that defines the relationship between team members—is of primary interest (Wageman, 2001). Structural interdependence is composed of task interdependence (i.e., features of the work itself that require multiple individuals to complete it) and outcome interdependence (i.e., the extent to which goals and rewards are shared). Wageman (2001) noted that task interdependence is typically manipulated in the extant literature using four structures: (a) how the task is defined to the team (who is responsible for what), (b) rules about sharing or working alone, (c) technology used for the task and how this affects interdependency, and (d) the degree to which resources are divided among the team members. Outcome interdependency focuses on the degree to which consequences (outcomes) are shared, significant, and contingent upon the collective performance of the task. Two main outcome interdependencies are reward and goal interdependency, or how strongly rewards and goals are based on the collective effort of the team. Both task interdependency and outcome interdependency can be manipulated to increase team effectiveness.

Wageman (2001) suggested that tasks and outcome interdependencies that are congruent (e.g., high task interdependency is paired with high outcome interdependency), as opposed to incongruent, are related to increases in team performance. For example, a chain customer service team that relies heavily on each team member to contribute to a part of the task (i.e., high task interdependence) should be paired with team–based rewards (i.e., high reward interdependency) to be most effective. However, Wageman suggested the relationship between interdependence congruency and effectiveness would only be true for high and low interdependencies, because medium interdependence fails to optimize the work structure from either an individual or a team perspective. Wageman found this to be the case for conceptual tasks, but for behavioral tasks the opposite was true; the highest levels of performance were for moderately interdependent tasks. From her results, Wageman suggested that the clear implication from the interdependence literature is that when teams perform highly interdependent tasks, highly interdependent outcomes are essential. Thus,

> H13: Teams that have levels of outcome interdependence consistent with levels of task interdependence will have better performance than those with inconsistent levels.

Moderators of the Team Design and Team Effectiveness Relationships

Kozolowski and Bell (2003) suggested four conceptual issues that are critical for investigating and understanding teams, namely, task or workflow interdependence, context, multilevel influences, and temporal dynamics. Accordingly, in addition to the aforementioned operationalization and workflow interdependence moderators on specified hypotheses, study setting (i.e., lab or field), supportiveness of the organizational context, and time and team tenure were assessed as moderators of the team design and team effectiveness relationships. The type of team was also assessed as a moderator of the team design/team effectiveness relationships. Different levels of analyses were controlled for in that only team–level operationalizations of team design variables and team effectiveness outcomes were included in the meta–analysis. The investigated moderators are outlined below.

Study Setting. The first potential moderator of the team design/team effectiveness relationships is the study setting (i.e., whether the study was conducted in a lab or field setting). As previously noted, Hackman's (1987) original model of how to effectively design and manage teams was based on and conceptualized for teams that exist within the context of an organization. This criterion of organizational context has been reiterated by many of the definitions of teams (Cohen & Bailey, 1997; Kozlowski & Bell, 2003). However, the control available in lab settings can be important for theory building, and lab settings have been used in the investigation of team design/team effectiveness relationships. Features of the setting (e.g., fidelity) could potentially affect the observed relationships between team design and team effectiveness. For example, are relationships between team personality variables and team performance able to emerge in artificial lab settings, or do they require the investment and concern for the outcome more readily experienced by team members in the organizational (i.e., field) settings? Given its potential impact on the team design variable/team performance relationships, study setting was investigated as a potential moderator.

Type of Team. The second hypothesized moderator of the team design variable/team effectiveness relationships is the team type. There are several typologies for classifying teams, with most focusing on the tasks performed by the team (e.g., McGrath, 1984; Steiner, 1972). Using these typologies, team category designations are based on what the team does or the particular type of task it is charged with executing. For example, McGrath (1984) presented a typology based on a "circumplex" that includes four task categories: generating ideas and plans, choosing between alternatives, negotiating conflicts of interest, and executing work. Along one dimension of the circumplex, tasks differ in the extent to which they are behavioral or conceptual. Steiner's (1972) group task types vary according to the influence of individual member performance on group effectiveness. Of the two, Steiner's (1972) task typology has been consistently used as a means of categorizing teams when seeking to understand or investigate which particular operationalizations of team composition variables would be most related to team performance. Because Steiner's task types specifically vary according to the proposed influence of individual members' contribution to performance on the task, this typology may have particular relevance when unraveling how the operationalization of individual–level variables represents a team–level construct. In Steiner's task typology, additive tasks are tasks where every member performs the same function. For additive tasks, because performance is thought to be equal to the sum of the team's parts, the team mean or sum on the variable of interest is thought to be the best operationalization of individual–level variables at the team level. Disjunctive tasks are those for which an individual team member's contribution can solve the problem or complete the task. For disjunctive tasks, the team maximum (or the best individual within the team on a specified variable) should be the best operationalization of the individual–level phenomenon at the team level. Conjunctive tasks require all members of the team to succeed in order for the team to be effective. For conjunctive tasks, the best team–level representation of contributions of the individual team members should be the team minimum, because the "weakest link" of the team can have a detrimental effect on the performance of such tasks. Compensatory teams are team tasks in which team members can compensate for one another. Team heterogeneity (homogeneity) is thought to be the best operationalization of team–level composition variables of teams performing compensatory tasks. In summary, Steiner's task typology may be relevant to understanding how individual–level constructs are best represented at the team level. Specifically, when an operationalization is appropriate for the task type stronger effects for the relationship between team design and team performance should be observed. However, although lab teams—with their well–defined tasks—may be neatly organized into Steiner's task typology, this typology may be less relevant and more difficult to apply when categorizing teams that exist within the context of an organization (and subsequently field studies).

In fact, a problem with McGrath's task circumplex and other task–based typologies such as Steiner's task typology is that they are less relevant to real teams in organizations, because teams rarely perform only one type of task (Argote & McGrath, 1993). In response to this, two solutions have emerged in the literature. One solution is to categorize teams by the relative amount of time they spend on the different types of tasks, such as ratings teams along a continuum of the behavioral and conceptual dimensions of McGrath's task circumplex (Stewart & Barrick, 2000). The second solution is to begin categorizing team types not only according to their tasks, but also according to their functional role in the organization. These categorizations were consistent with the expectation that teams must be understood in terms of their context. For example, Cohen and Bailey (1997) and Sundstrom et al. (1990) divided teams into advice/involvement, production/service, product/development, and action/negotiation, taking both internal homogeneity and the linkage to organizational activities into account. Dunphy and Bryant (1996) suggested the degree of self–management, the nature of the team membership (e.g., virtual, project), or the purpose and functioning in the organization (e.g., service, quality, operational) serve as criteria for the classification of teams. Numerous additional taxonomies have been presented for practitioners. For example, a fairly long list that includes 21 team types in industry was provided by Cannon–Bowers et al. (1992).

More recently, Devine (2002) presented a taxonomy of team types that differentiates teams based on the critical determinants of effectiveness, which vary according to the team context. He started with a broad distinction between teams engaged in knowledge or intellectual work and teams engaged in physical work (i.e., two major categorizations of intellectual teams and physical teams). He then identified the four primary functions that characterize the teams that engage in tasks that are intellectual in nature, and assigned each of those functions a name. This resulted in the following four team types: (1) advisory teams that address workflow problems and organizational improvement, (2) design teams that design new products, goods, or services, (3) commission teams that handle special and nonroutine decision–making that require extensive acquisition and integration of information, and (4) executive teams (or top management teams) that coordinate the work of functions, departments, or the organization as a whole. Two other intellectual teams not included in the last four were also added, specifically, (5) command teams which make organization–level decisions in real time (Klimoski & Jones, 1995), and (6) negotiation teams which represent larger entities and attempt to maximize the outcomes for their constituents (Sundstrom, 1999). Thus, a total of six types of teams that engage in intellectual types of work were identified. Devine's (2002) second team domain was the physical work domain. This domain included (7) production teams, which build, assemble, or harvest, (8) service teams which process orders or requests from customers as quickly as possible, and an action/performance/work category that is divided into (9) performance, (10) medical, response, (11) sports, (12) transportation, and (13) military teams.

Devine's (2002) typology is based on key contingencies for the effectiveness of different types of teams and thus, is consistent with Kozolowski and Bell's (2003) call for such a classification of teams. Assessing the team types of this taxonomy as a moderator in the team design/team effectiveness relationships will also serve as an empirical test of the model. Specifically, either the team design variables will have different relationships with team effectiveness across the team types, or there will be no differences across team types (i.e., team type will not moderate). Devine's (2002) typology may also be particularly useful for organizing teams that exist within the context of the organization because it can allow for teams performing several types of tasks.

In summary, Devine (2002) suggests a classification system of teams based on the contributions required for team effectiveness. These types of teams may be understood within the broader groupings of intellectual or physical teams, or may even be meaningful at the level of the specific team (e.g., advisory, design, service) with each requiring different contributions in order to be effective. This classification system can be easily adapted when classifying organizational teams and is less restrictive concerning the degree to which teams engage in multiple and different types of tasks.

Two classification systems were assessed as moderators in the present study. First, Steiner's task typology was used because of its potential to serve as a meaningful classification system for lab teams, and its direct relationship to conceptualizing how different operationalizations of individual–level variables to the team level would be related to team effectiveness. Second, Devine's (2002) classification system was also chosen because classification systems such as Steiner's may be less meaningful in complex, real, organizational teams. Devine's (2002) classification system is based on the premise that critical determinants of effectiveness vary across these team types, and characteristics of the team context are responsible for the variation. This is particularly important for the present study because of its focus on the relationship between team design variables and team effectiveness. Because the team composition variable/team effectiveness relationships are expected to vary across the team types, team type will be used as a moderator of this relationship in the present study.

Supportiveness of the Organizational Context. The next hypothesized moderator of the team design/team effectiveness relationships is specific to field studies and is the organizational context of the team, such as the reward, training, information systems, and material resources at the team's disposal. Although Hackman (1987) suggested this influence, it has often been ignored in research. Organizational context has again been highlighted (Cohen & Bailey, 1997; Hackman, 1999; Webber & Donahue, 2001) as a possible influence on team effectiveness. For example, organizational reward systems can promote effort exerted by the team and promote the application of team KSAs. More recent research has begun to assess the perceptions of the supportiveness of the organizational context and how it is related to team effectiveness (e.g., Pearce & Giacalone, 2003; Wageman, 2001). An unsupportive organizational context may make it difficult or impossible for a team to function effectively. Thus, the supportiveness of the organizational context of the team may affect whether team design variables are related to team effectiveness (i.e., it may moderate the team design/team effectiveness relationships).

Time and Team Tenure. The final proposed moderator of the team design/team effectiveness relationships is the temporal dynamics of the team. Teams usually have a history and a future (Brannick & Prince, 1997) both of which influence current behavior (Hackman, 1992; McGrath, 1990, 1991). This highlights the need to assess teams longitudinally—particularly when history and intra–team relationships have a logical connection to the variable of interest. Baker and Salas (1997) indicate that teamwork is very dynamic and measurement/research approaches must account for this. Team tenure is an important factor because the length of time teams have worked together can have a significant effect on team processes and thus may affect the team design/team effectiveness relationships. It could be that different team design variables (e.g., demographic diversity) have stronger relationships with team effectiveness when a team is relatively new, however, the same relationships may not be observed in mature teams. Thus, the influence of temporal dynamics on the team design/team effectiveness relationships was tested using both the team tenure (the amount of time the team has been intact), and the length of time between the collection of the team design variable and the team effectiveness variable within a study.

Summary of Team Design Variables Related to Team Effectiveness

The purpose of the proceeding review was to identify team design variables that are related to team effectiveness and discuss why they may be related to team effectiveness. Specifically, the identified design variables were: (a) team composition which includes teamwork–related and taskwork–related composition variables and their operationalization to the team–level, (b) team task design which includes increasing task identity, task significance, task variety, and task feedback, and (c) team structure which includes distribution of authority, team size, and structural interdependence. In addition, the effects of four potential moderators—study setting, type of team, supportiveness of the organizational context, and time and team tenure—on the team design variable/team effectiveness relationships were outlined.

THE PRESENT STUDY

Based on the preceding review of the team design literature and hypothesized relationships between specified design variables and team effectiveness, a conceptual framework was developed and is depicted in Figure 1. This framework outlines the major distinctions made in the review and the relationships of the team design variables with team effectiveness. Specifically, team design variables were grouped into three major areas: (a) team composition, (b) team task design, and (c) team structure. These groupings contain variables that were identified as those over which researchers and practitioners could have a reasonable degree of control when designing a team. Team composition variables were further divided into taskwork–related or teamwork–related based on whether they are related to team effectiveness because they represent KSAs need for successful execution of the team's taskwork or because they represent KSAs used in the coordination needed to execute the taskwork within the context of a team respectively. The attitudinal variable of preference for teamwork is included under team composition and its hypothesized direct effect on team satisfaction is indicated. The multidimensional nature of team effectiveness is reflected by the inclusion of performance, viability, and satisfaction. Throughout the literature review, specific hypotheses were generated that were tested using meta–analytic techniques and are summarized in the next section.

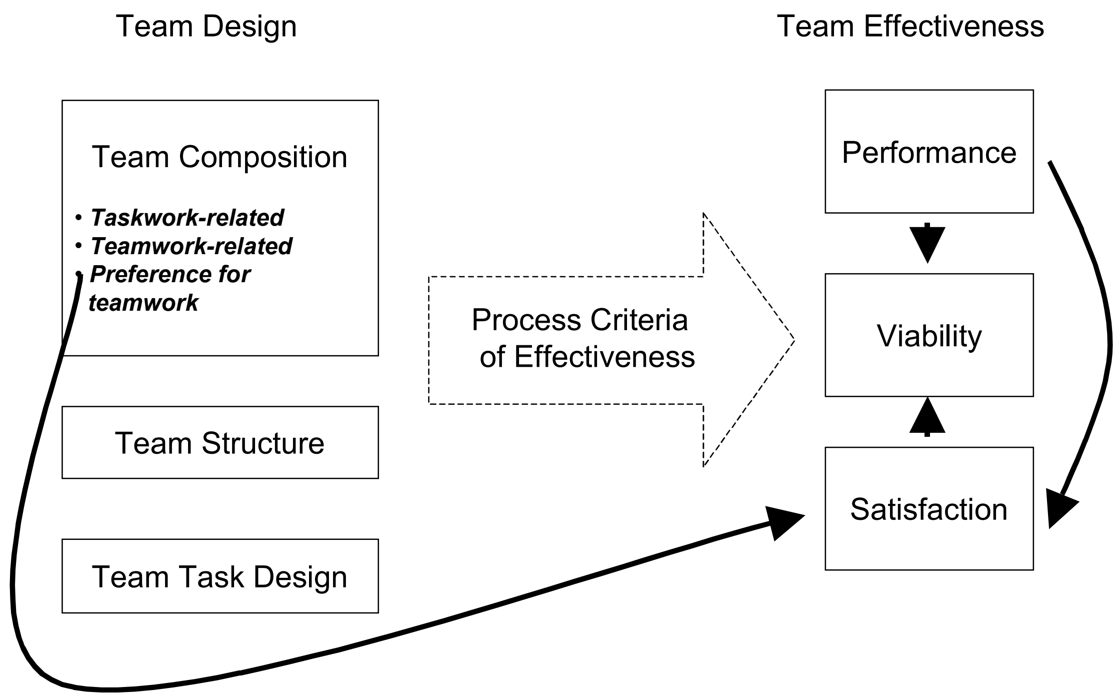

Figure 1. Conceptual framework for the relationship between team design and team effectiveness.

Summary of Research Hypotheses

Specific study hypotheses are summarized below.

H1: Team GMA will be positively related to team performance (H1a), team viability (H1b), and team satisfaction (H1c).

H1d: The team GMA/team effectiveness relationships will be strongest when team GMA is operationalized as the team mean or sum.

H2: Team task–relevant expertise will be positively related to team performance (H2a), team viability (H2b), and team satisfaction (H2c).

H2d: The team task–relevant expertise/team effectiveness relationships will be strongest when team task–relevant expertise is operationalized as the team mean or sum.

H2e–g: Task–relevant expertise type diversity will have a curvilinear relationship with team performance (H2e), team viability (H2f), and team satisfaction (H2g). Specifically, moderate diversity will be related to the highest levels of team effectiveness.

H3: Team conscientiousness will be positively related to team performance (H3a), team viability (H3b), and team satisfaction (H3c).

H3d: The team conscientiousness/team effectiveness relationships will be strongest when team conscientiousness is operationalized as the team mean or sum.

H4: Team agreeableness will be related to team performance (H4a), team viability, (H4b), and team satisfaction (H4c).

H4d: The team agreeableness/team effectiveness relationships will be strongest when a configural operationalization is used to operationalize team personality.

H5: Team extraversion will be related to team performance (H5a), team viability (H5b), and team satisfaction (H5c).

H5d: The team extraversion/team effectiveness relationships will be strongest when a configural operationalization is used to operationalize team personality.

H6: Team emotional stability will be related to team performance (H6a), team viability, (H6b), and team satisfaction (H6c).

H6d: The team emotional stability/team effectiveness relationships will be strongest when a configural operationalization is used to operationalize team personality.

H7a: Taskwork–related demographic variables (e.g., educational background, organizational tenure) will be related to team performance.

H7b: The taskwork–related demographic variables/team performance relationship will be strongest when taskwork–related variables are operationalized as the team mean or proportion.

H7c: Teamwork–related demographic variables (e.g., age, race) will be related to team satisfaction.

H7d: The teamwork–related demographic variables/team satisfaction relationship will be strongest when teamwork–related demographic variables are operationalized as heterogeneity (e.g., a configural operationalization).

H8: Preference for teamwork will be positively related to team satisfaction.

H9a: Compared to teamwork–related predictors (i.e., agreeableness, extraversion, emotional stability), taskwork–related predictors (i.e., GMA, task–relevant expertise, conscientiousness) will be more strongly related to team performance.

H9b: As team interdependency increases, the strength of the teamwork–related predictors/team performance relationship will be similar to the strength of the taskwork–related predictor/team performance relationship.

H9c: Compared to teamwork–related predictors (i.e., agreeableness, extraversion, emotional stability), taskwork–related predictors (i.e., GMA, task–relevant expertise, conscientiousness) will have weaker relationships with team satisfaction.

H10: Team task design that is consistent with effective job design principles (i.e., increased task variety, task significance, task identity, task feedback) will result in higher team performance (H10a), team viability (H10b), and team satisfaction (H10c).

H10d: Team task design that results in increases in task complexity will result in decreases in team performance.

H11: Conditions of the distribution of authority that support higher autonomy (e.g., no assigned leader, self–managing) will result in higher team performance (H11a), team viability (H11b), and team satisfaction (H11c).

H12a: Compared to actual team size, relative team size will be more strongly related to team performance.

H12b: Using the relative team size operationalization, team sizes that are rated as appropriate relative to the task will be related to increased team performance.

H12c–e: There will be a point at which the actual team size is too large and team size will be negatively related to team performance (H12c), team viability (H12d), and team satisfaction (H12e).

H13: Teams that have levels of outcome interdependence consistent with levels of task interdependence will have better performance than those with inconsistent levels.

In addition, the following four variables were hypothesized to moderate the team design/team effectiveness relationships specified above: (a) study setting, (b) team type, (c) supportiveness of the organizational context, and (d) time and team tenure.

METHOD

Literature Search

The present meta–analysis included the published team effectiveness literature from 1987 to October 2003. The literature search encompassed studies published in journals, books or book chapters, dissertations or theses, and published conference proceedings or technical reports which investigated a measure of team design and team effectiveness, and met the inclusion criteria as outlined below.

An extensive literature search was conducted to identify empirical studies that measured some aspect of team design and team effectiveness, with team effectiveness broadly defined to include performance, satisfaction, and viability. The process began with computer searches of ABI/Inform, Econlit, Educational Research Information Center (ERIC), PsycINFO, and Sociological Abstracts databases using the key words *team/work group effectiveness, team/work group outcomes, team/work group performance, team/work group satisfaction, team/work group viability, team/work group design*, and *team/work group composition*. The electronic search was supplemented with a manual search of the reference lists from past reviews of teams in organizations (e.g., Cohen & Bailey, 1997; Guzzo & Dickson, 1996; Kozolowski & Bell, 2003) and other smaller meta–analyses that assessed team design variables (e.g., Bowers, Pharmer, & Salas, 2000; Devine & Phillips, 2001; Webber & Donahue, 2001). Abstracts were reviewed for appropriate content (i.e., did they investigate some aspect of team design and its relationship with team effectiveness?) and possible inclusion in the meta–analysis. The reference lists of obtained articles were also reviewed to identify additional sources. Abstracts of newly identified sources were then reviewed and considered for inclusion in the meta–analysis. These efforts along with the decision to include only English language articles resulted in an initial list of 548 sources. The search was intended to be very liberal at this point, such that if the review of the abstract indicated the possibility of a team design variable without explicitly stating so, the manuscript was obtained for closer inspection. Each obtained source was then reviewed in more detail for possible inclusion in the meta–analysis using the inclusion criteria outlined below. The number of articles was substantially reduced after a detailed inspection of the manuscripts and the application of the inclusion criteria.

Inclusion Criteria

To be included in the meta–analysis, a study needed to meet the following inclusion criteria. First, a study had to investigate the effectiveness of teams. Sports teams were not included because they are not likely to be of interest to researchers and practitioners who seek to improve team design in business–related organizational settings and because there is some evidence that they behave differently from other teams (see Mullen & Cooper, 1994). Second, to be included, studies had to report sample sizes and information that allowed for the computation of a correlation that represented the relationship between a team design variable and team effectiveness at the team level. Because of the inappropriateness of mixing levels of analyses when calculating sample–weighted effects (Beal, Cohen, Burke, & McLendon, 2003; Gully, Devine, & Whitney, 1995), articles that reported only individual–level data were excluded, even if the individual performed in the context of the team. When correlations were not reported, the appropriate conversion formulas (see Arthur et al. [2001], Appendix C.2) were used to convert the reported statistics to correlations. In addition, statistical artifact information (i.e., predictor and criterion reliability) was collected from studies when reported. Although the initial intention was to correct for range restriction, no included studies reported enough information for the calculation of range restriction. Of the original 548 sources, 426 were excluded. The majority of the excluded sources were eliminated because they did not present original or codeable data (42.59%), did not assess a design variable (16.20%), or reported individual–level data only (15.74%). Other articles were excluded because of reasons such as the groups or "teams" studied were not task interdependent, the teams were composed of an irrelevant population (e.g., children), or there were no relevant outcome variables reported (i.e., there was no measure of team effectiveness).

Data Set

Independence. As a result of the above inclusion criteria, an initial set of 1,320 correlations (*r*s) from 122 sources was obtained. However, some of the correlations were non–independent or computed from data collected from the same sample of participants. Consistent with recommendations made by Arthur et al. (2001) correlations were considered non–independent only if the correlation in the study represented the same variable or construct. So, for example, because team–level statistical operationalizations of individual difference variables are a variable of interest in the present study, if a study reported correlation coefficients for multiple operationalizations, these correlations were considered independent even though they were based on the same sample. They were then retained as separate correlations. Consistent with this, correlations based on multiple measures of the same criterion (e.g., team performance) for the same sample were considered non–independent and were represented in the data set by a linear composite. Similarly, correlations based on repeated measures of the same criterion over time for the same sample were considered non–independent and were represented in the data set by a linear composite. The associated time intervals between the collections of the variables of interest were also averaged. Implementing these non–independence rules resulted in a data set of 786 independent correlations from 122 sources.

Outliers. Huffcutt and Arthur's (1995; Arthur et al., 2001; cf. Beal, Corey, & Dunlap, 2002) sample–adjusted meta–analytic deviancy (SAMD) statistic was computed to detect outliers. Based on these analyses, 8 outliers were identified for review and possible removal from the data set. (A scree plot of the SAMD values and rank order of the first 60 values is presented in Appendix A.) A detailed review of these correlations indicated that they were detected due to large effect sizes or fairly large effect sizes combined with large sample sizes. However, with 7 of the 8 identified studies, the reported relationships seemed reasonable (e.g., a large effect size between organizational support and team satisfaction). One study, however, was removed from the data set after inspection. This study's effect size was calculated from collapsed study means and standard deviations converted to a d, which was then converted to a correlation (r). The resulting effect size appeared to be inflated as it suggested a –0.87 for the sex/team performance relationship. Because this data point was viewed as suspect, it was dropped from subsequent analyses. Thus, the final data set consisted of 785 independent correlations from 121 sources. Five hundred and ninety–two of the correlations were from journal articles, 180 were from dissertations, 7 were from book chapters, and 6 were from published conference papers or technical reports. Articles included in the meta–analysis are presented in Appendix B.

Description of Variables

This section presents a description of the variables that were coded in the meta–analysis. If information for a variable was not available in a study, it was coded as missing. For variables that required coder judgment, studies that did not report enough information to make a reasonable judgment were coded as "cannot be determined".

Team Design Variables. The type of team design variable assessed in the study was coded. For team composition variables, the type of composition variable was coded (i.e., GMA, specific ability/task–relevant expertise, personality variables, preference for working in teams, demographic variables [e.g., educational background, functional background, organizational tenure, age, sex, race]) along with how the composition variable was operationalized at the team level. The operationalization of the composition variable was coded as minimum, maximum, mean, proportion, heterogeneity, or consensus (i.e., a team–level estimate). When relevant and presented, agreement index statistics (e.g., $r_{wg,}$ WABA) were coded. For team task design, the type of task design that was tested in the study was coded (i.e., task variety, task significance, task identity, task feedback, task complexity). For team structure variables, the degree of team self–management and the team's degree of control over leadership assignment were coded. Team size was coded as either relative or actual. Relative size was measured by scale items, which address the appropriateness of the team size to the task (e.g., Campion et al., 1993; Campion et al., 1996). Because relative size is measured by scale items, the reliabilities associated with the relative team size measures were coded. The rated level of team interdependence by type (i.e., task, reward, goal interdependence) was also coded.

Study Setting. Study setting was coded as either lab setting or field setting.

Type of Team and Team Interdependence. Several methodologies were used to code the type of team and team interdependence. Type of team was coded using Devine's (2002) typology (e.g., advisory, design, commission, executive, production [which fall under two broader dimensions of intellectual and physical teams]). Team task type was also coded using Steiner's task type typology (i.e., additive, disjunctive, conjunctive, compensatory) and the degree of team task interdependence was coded using Tesluk et al.'s (1997) workflow typology (i.e., pooled/additive, sequential, reciprocal, intensive). The type of team and degree of team interdependence were coded if the type of team or degree of team interdependence was explicitly stated using these methodologies or described in enough detail to make a reasonable judgment.

Supportiveness of the Organizational Context. Originally, the supportiveness of the organizational context (e.g., reward, training, technology, availability of resources) was to be coded in two ways. First, supportiveness of the organizational context was to be coded if it was reported in the article, and second, articles that did not explicitly state the supportiveness of the organizational context were to be coded if enough information was given for it to be rated by the coders (i.e., rater judgment). Early in the coding process, however, it was apparent that no articles reported enough information for the supportiveness of the organizational context coding scheme. Thus, because organizational context could not be coded in this manner, organizational context was added to the team design variable list and the effect size between the perceived supportiveness of the organizational context (i.e., perceived organizational support) and team effectiveness was coded when reported in the study.

Time and Team Tenure. Two temporal relationships were coded. First, team tenure (i.e., how long the team had worked together) at the time the predictor was collected was coded. Second, the time (i.e., number of days) between the collection of the predictor variable (i.e., team design variable) and the collection of the team effectiveness measure was coded. To assess if team tenure moderated the team design variable/team effectiveness relationship, the number of days the team had been together at the time of the collection of the predictor variable was added to the number of days between predictor and criterion collection. To assess whether the amount of time between the predictor and criterion collection moderated the team design variable/team effectiveness relationship, the number of days between predictor and criterion collection was used.

Team Effectiveness. Team effectiveness was coded for both the specific criterion assessed (i.e., team performance, team viability, team satisfaction, overall team effectiveness) and also the criterion method used such as objective, self–ratings, peer ratings, and supervisory ratings.

Coding Accuracy and Interrater Agreement

The author and a post–master's doctoral graduate student served as the coders for the meta–analysis. The author trained the post–master's doctoral graduate student on the coding scheme. First, he was given a coding sheet along with a sheet that outlined additional information regarding the different variable categorizations. Each coder then independently coded one article. Next, the coders attended a follow–up session to discuss problems encountered in using the coding sheet and information sheet, and to make changes to either sheet as deemed necessary. The two coders then coded the same five articles. After coding these five articles, the coders again met and the degree of interrater agreement between them was assessed. Discrepancies and disagreements related to the coding of the five articles were resolved using a consensus discussion and agreement between the coders. After the second session, the author coded all remaining articles in the meta–analysis. As a part of this process, the second coder coded a common set of 20 articles that were used to assess the efficacy of the coding process and decision rules. Interrater agreement was high with a mean agreement of 97.20% (*SD* = 7.55%) on the coded variables.

Meta–Analysis of Correlations

Primary Analyses. Correlations (*r*s) were used as the common effect size metric for the meta–analysis. Seven hundred and seventy–six of the effects (98.85%) were represented by a correlation while the remaining 9 (1.15%) effects were represented by a biserial correlation (2 effects; converted to Pearson's correlation coefficient), means and standard deviations (3 effects), an ANOVA (*F*; 2 effects), or a *t* (2 effects). If a correlation was not reported for a given effect, the statistic was converted to a correlation using the appropriate conversion formula (Arthur et al., 2001). The data analyses were then performed using Arthur et al.'s (2001) SAS PROC MEANS meta–analysis program. Sample–weighted mean correlations were calculated using the Hunter and Schmidt (1990) meta–analytic approach. Sample weighting the mean correlations assigns more weight to studies with larger sample sizes because sampling error decreases as sample size increases. Ninety–five percent confidence intervals were calculated around the sample–weighted mean correlation as a measure of accuracy of the effect size (Whitener, 1990). In addition, the sample–weighted mean correlations were then corrected for predictor and criterion unreliability. Sample–weighted mean correlations were corrected using the artifact distributions for the specified predictor (team design variable) and criterion (team effectiveness variable) because the distributions were expected to differ (e.g., agreeableness [personality] scores typically have better reliabilities than ratings of relative team size). For team design variables that were measured without error (e.g., race, sex, age, functional background, actual size) the sample–weighted mean correlations were corrected for criterion unreliability only. To interpret the effect sizes, Cohen's (1992) suggested guidelines of 0.10, 0.30 and 0.50 for small, medium, and large effect sizes, respectively, were used. In addition, the variance accounted for by statistical artifacts, the lower 95% credibility value (95% CV_L), and the standard deviation of the corrected population correlation ($SD\rho$) were used as indicators of the presence of moderators or that a given effect is dependent on the situation (i.e., there are subpopulations present; Hunter & Schmidt, 1990; Whitener, 1990).

Moderator Analyses. Theoretical moderators (e.g., operationalization, interdependence) of the team design variable/team effectiveness relationships were hypothesized in the present study. Thus, the relationships between team design variables and team effectiveness were tested across the specific moderators of interest for a given hypothesis and also across the general moderators proposed in the study. Categorical moderators were assessed using Hunter and Schmidt's (1990) subgroup analysis. In subgroup analysis, a meta–analysis is conducted on specified subgroups or moderator levels of the relationship of interest. Moderators are inferred to be present if the mean effect sizes estimated in the subgroups differ from the mean across all groups, and if the average of the standard deviation of the corrected population correlation of the subgroups is reduced compared to when the groups are collapsed (Hunter & Schmidt, 1990; Whitener, 1990).

Fully hierarchical moderator analyses are notably rare in meta–analytic research and are often not feasible due to the limited number of correlations available (Arthur et al., 2001). However, interpretation errors may result when the influence of combinations of moderators is not tested on a reported relationship (Hunter & Schmidt, 1990). In order to best understand the data, some analyses tested relationships at subgroup levels that included nested moderators. For some of these analyses there were less than five correlations for the specified relationship. For relationships with less than five correlations, corrected mean correlations (ρ) are reported as a descriptive statement of the few correlations in the literature; the relationships should be interpreted cautiously and should not be interpreted as a population estimate.

For the continuous moderators (e.g., time and team tenure), weighted least squares (WLS) regression was used as suggested by Steel and Kammeyer–Muller (2002). Using such an approach avoids the artificial categorization required by subgroup analysis of moderators that are truly continuous. WLS regression is the recommended approach for continuous moderators because of its robustness to conditions such as multicollinearity and skewed distributions often observed in meta–analysis (Steel & Kammeyer–Muller, 2002). In WLS regression, analyses of the correlations are based on inverse sample–error weighting. Specifically, in the WLS regressions used for the continuous moderator analyses, the weighting factor was the inverse square root of the sampling error for each study.

Hierarchical Regressions. Hierarchical regressions were used in the study for two primary investigations. First, the different statistical operationalizations of each team composition variable were expected to have high intercorrelations. Hierarchical regression techniques were employed to better understand the extent to which one operationalization explained variance in team performance beyond others. Second, one of the major strengths of the present study is its comprehensiveness regarding the number of team design variables included. In order to determine the degree to which certain composition variables accounted for variance beyond other composition variables and better understand the team design variable/team effectiveness relationships, hierarchical regressions were conducted. Specifically, Hypothesis 9 was expanded to assess the relative contribution of teamwork–related predictors (i.e., agreeableness, extraversion, emotional stability) and taskwork–related predictors (i.e., cognitive ability, task–relevant expertise, conscientiousness) to team performance.

Similar to the procedures outlined (Viswesvaran & Ones, 1995) and employed by other meta–analytic researchers (e.g., Arthur, Day, McNelly & Edens, 2003; Colquitt, Conlon, Wesson, Porter, & Ng, 2001), the following steps were used for each of the hierarchical regressions conducted. First, a matrix of the intercorrelations between the team design variables or variable operationalizations of interest was created. For the hierarchical regressions testing the operationalizations of a specified predictor, to be included in the matrix (and the regressions) the operationalization had to: (a) have the strongest relationship with team performance or not be meaningfully different from the strongest operationalization after an inspection of the confidence intervals around the sample–weighted mean correlations, and (b) have at least a small relationship (i.e., ρ greater than .10) with team performance. For the hierarchical regressions testing the relative contribution of the different team design variables on team performance, only the intercorrelations between the best operationalization of each of the teamwork–related and taskwork–related variables of interest were coded. Implementing these decision rules resulted in manageable subsets of intercorrelations. In addition, because study setting was found to consistently moderate the team composition variable/team performance relationships, intercorrelations of the design variables and operationalizations were coded only for the study setting relevant to the specified analysis.

Overall, few studies reported correlation matrices that included multiple predictor variables or multiple operationalizations of a predictor at the team level. Thus, intercorrelations were based on a small number of studies (including a few cells with only one estimate). Because of this, the sample–weighted mean correlations, rather than the corrected population correlations, were used as estimates in the correlation matrix. This decision was made to avoid inappropriately correcting single relationships by artifact distributions. Also, because the estimates are based on a few number of studies, the regressions should be considered exploratory. For each matrix, the harmonic mean was used as an estimate of the sample size. Hierarchical regressions were then conducted on the correlation matrices of sample–weighted mean correlations using the resultant sample sizes. The correlation matrices upon which the hierarchical regressions are based are presented in Appendix C.

RESULTS

Summary statements of the data set are presented first, followed by tests of the hypotheses and specified moderators. A large majority of correlations were obtained from studies conducted in field settings (*k* = 526; 67.01%) as opposed to lab settings (*k* = 259; 32.99%). Of the studies that reported an average team size (*k* = 540; 68.79%), the mean average team size was 6.17 (*SD* = 3.15) with the average team size ranging from 2–14. This range suggests that teams with a variety of sizes are studied in the team design literature. Further, team composition variables (*k* = 561; 71.46%) were the most commonly studied team design variables, followed by team structure (*k* = 175; 22.29%) and then team task design (*k* = 49; 6.24%). The majority of studies (*k* = 617; 78.60%) assessed the team design variable/team performance relationship, with a much smaller percentage of studies testing the relationship between team design variables and team satisfaction (*k* = 55; 7.01%), team viability (*k* = 47; 5.99%), or an overall effectiveness measure (*k* = 66; 8.41%).

Because a large majority of the correlations reflected the relationship between a team design variable and team performance, but relatively few correlations represented the relationship between a team design variable and team viability or team satisfaction, the narrative of the results is limited to team performance for several of the design variables. At the level of specific design variables, the number of correlations representing the relationship between the team design variable and team viability ranged from 0 to 9; the same range was obtained for correlations representing the relationship between the design variable and team satisfaction. Consequently, team satisfaction results are presented in the narrative when team satisfaction was the only hypothesized effectiveness outcome for the design variable of interest (e.g., preference for teamwork). However, for the sake of completeness, all other results for the team design variables and team satisfaction, and team design variables and team viability are presented in Appendix D.

General Mental Ability

The first hypothesis was that team GMA would be positively related to team performance (H1a). Results are presented in Table 1. As indicated in Table 1, the corrected population correlation for the team GMA and team performance relationship was 0.25 (95% CV_L = –0.09) representing a small to medium positive relationship between team GMA and team performance; however the 95% CV_L was less than zero.

The next hypothesis posited that the team GMA and team performance relationship would be strongest when team GMA was operationalized as the team mean or sum (H1d). The team mean was the best operationalization of team GMA for the team GMA/team performance relationship (ρ = 0.33; 95% CV_L = 0.01) followed by the minimum (ρ = 0.29; 95% CV_L = –0.01) and the maximum (ρ = 0.27; 95% CV_L = –0.01). Team heterogeneity of GMA was unrelated to team performance (ρ = 0.00; 95% CV_L = 0.00).

For each of the team GMA operationalizations, a large amount of variance remained unexplained after correcting for artifacts, and in the case of the minimum and maximum operationalizations, the 95% CV_L was less than zero. So, the influence of additional moderators was tested for the team GMA and team performance relationship.

Table 1

Meta–Analytic Results for the Relationship Between Team GMA and Team Performance Moderated by Operationalization and Study Setting

Variable	*k*	*N*	*SWM r*	*SW SD*	*% Var. due to Sampling Error*	*95% Conf. Int.*		*ρ*	*SDρ*	*% Var. Acc. for*	*95% CV $_L$*
						L	*U*				
Overall	56	5,274	0.21	0.20	24.22	0.19	0.24	0.25	0.21	24.55	-0.09
Mean and Sum	26	2,202	0.28	0.19	27.31	0.24	0.32	0.33	0.19	27.95	0.01
Mean	25	2,152	0.28	0.19	26.58	0.24	0.32	0.33	0.20	27.20	0.01
Sum	1	50	0.40	—	—	—	—	—	—	—	—
Configural	30	3,072	0.16	0.19	25.29	0.13	0.20	0.19	0.20	25.51	-0.13
Maximum	10	991	0.23	0.17	30.42	0.17	0.29	0.27	0.17	30.95	-0.01
Minimum	11	1,079	0.25	0.18	26.83	0.19	0.30	0.29	0.18	27.38	-0.01
Heterogeneity	9	1,002	0.00	0.10	100.00	-0.06	0.06	0.00	0.00	100.00	0.00
Lab	41	4,287	0.24	0.19	23.48	0.21	0.27	0.30	0.21	23.63	-0.04
Intellectual	38	4,139	0.24	0.19	22.90	0.21	0.27	0.30	0.21	23.03	-0.04
Physical	2	88	0.16	0.17	76.40	-0.05	0.37	0.20	0.10	76.49	0.03
Field	15	987	0.09	0.20	39.02	0.03	0.15	0.10	0.18	39.08	-0.19
Intellectual	1	79	0.35	—	—	—	—	—	—	—	—
Physical	14	908	0.07	0.19	43.29	0.00	0.13	0.08	0.17	43.30	-0.20

Note. Overall *k* and *N* may not be equal the sum of the nested moderators listed because values for some operationalizations are not presented at the moderator level if there was only one correlation and there was no *a priori* hypothesis. Results are corrected for predictor and criterion unreliability. Artifact distributions of the design variable and criterion of interest were used for corrections. *k* = number of correlations; *N* = number of teams; *SWMr* = sample–weighted mean correlation; *SWSD* = sample–weighted standard deviation; *% Var. due to Sampling Error* = percentage of variance due to sampling error; *95% Conf. Int. L* = lower 95% confidence interval; *95% Conf. Int. U* = upper 95% confidence interval; *ρ* = corrected population correlation; *SDρ* = standard deviation of the corrected population correlation; *% Var. Acc. for* = percentage of variance accounted for by sampling error and artifact corrections; *95% CV_L* = lower 95% credibility value.

Specifically, the influence of the study setting (i.e., lab or field) and team type was assessed. Results are presented in Table 1. The data suggest that the study setting moderated the team GMA and team performance relationship with a stronger relationship between team GMA and team performance for studies conducted in lab settings (ρ = 0.30; 95% CV_L = –0.04) than for studies conducted in field settings (ρ = 0.10; 95% CV_L = –0.19). However, in both cases a large amount of variance remained unexplained after artifact corrections.

To gain additional insight into the different relationships observed across the two settings, team type using Devine's (2002) typology was investigated as an additional moderator. Results are presented in Table 1. Out of the 15 field studies that assessed the team GMA/team performance relationship, 14 studies tested the relationship using physical teams and only one assessed the relationship in an intellectual team. In contrast, the lab studies included 38 intellectual teams and only 2 physical teams. Thus, although at first glance, team GMA appeared to be a much better predictor of team performance in lab as opposed to field settings, this could possibly be a function of the extent to which physical or intellectual teams were studied in each setting.

The team GMA/team performance relationship was also tested while simultaneously considering both study setting and team GMA operationalization as moderators (see Table 2). Although each crossed moderator level was generally based on a limited number of correlations, the data indicate that only the mean operationalization of team GMA had a small to medium positive relationship with team performance in field settings and the 95% CV_L was less than zero (ρ = 0.24; 95% CV_L = –0.13). In field

Table 2

Meta–Analytic Results for the Relationship Between Team GMA and Team Performance Moderated by Study Setting Nested Within Operationalization

Variable	*k*	*N*	*SWM r*	*SW SD*	*% Var. due to Sampling Error*	*95% Conf. Int.* *L*	*95% Conf. Int.* *U*	*ρ*	*SDρ*	*% Var. Acc. for*	*95% CV$_L$*
Mean											
Lab	21	1,866	0.29	0.19	27.55	0.25	0.33	0.36	0.20	27.79	0.04
Additive	5	411	0.22	0.14	58.19	0.13	0.31	0.28	0.11	58.44	0.09
Field	4	286	0.20	0.23	25.62	0.09	0.32	0.24	0.23	25.87	-0.13
Additive	0	—	—	—	—	—	—	—	—	—	—
Maximum											
Lab	7	823	0.28	0.14	35.47	0.22	0.34	0.35	0.14	35.84	0.12
Disjunctive	1	157	0.44	—	—	—	—	—	—	—	—
Field	3	168	-0.02	0.05	100.00	-0.17	0.13	-0.02	0.00	100.00	-0.02
Disjunctive	0	—	—	—	—	—	—	—	—	—	—
Minimum											
Lab	7	832	0.30	0.12	44.79	0.25	0.37	0.38	0.12	45.37	0.19
Conjunctive	3	329	0.36	0.02	100.00	0.27	0.46	0.46	0.00	100.00	0.46
Field	4	247	0.06	0.22	33.92	-0.06	0.18	0.07	0.21	33.94	-0.27
Conjunctive	3	196	0.07	0.25	25.55	-0.07	0.21	0.08	0.25	25.58	-0.32
Heterogeneity											
Lab	5	716	-0.03	0.06	100.00	-0.09	0.05	-0.03	0.00	100.00	-0.03
Compensatory	1	157	0.07	—	—	—	—	—	—	—	—
Field	4	286	0.06	0.14	75.22	-0.05	0.18	0.07	0.08	75.28	-0.06
Compensatory	0	—	—	—	—	—	—	—	—	—	—

Note. Overall *k* and *N* may not be equal the sum of the nested moderators listed because values for some operationalizations are not presented at the moderator level if there was only one correlation and there was no *a priori* hypothesis. Results are corrected for predictor and criterion unreliability. Artifact distributions of the design variable and criterion of interest were used for corrections. *k* = number of correlations; *N* = number of teams; *SWMr* = sample–weighted mean correlation; *SWSD* = sample–weighted standard deviation; *% Var. due to Sampling Error* = percentage of variance due to sampling error; *95% Conf. Int. L* = lower 95% confidence interval; *95% Conf. Int. U* = upper 95% confidence interval; *ρ* = corrected population correlation; *SDρ* = standard deviation of the corrected population correlation; *% Var. Acc. for* = percentage of variance accounted for by sampling error and artifact corrections; *95% CV$_L$* = lower 95% credibility value.

settings, the other operationalizations of team GMA were unrelated to team performance (ρs ranging from –0.02–0.07). In contrast, in lab settings, the team mean, minimum, and maximum operationalizations all had medium to large relationships with team performance (ρs ranging from 0.35–0.38) and all 95% CV_L were above zero suggesting that the effects generalized across situations.

To better understand the varying relationships between team GMA and team performance across the different operationalizations and study settings, the impact of task type using Steiner's (1992) task typology was tested. The goal of this exploration was to test whether some operationalizations were having stronger effects because the "correct" operationalization was used for the task type (i.e., a correct theoretical match between the team GMA operationalization and the Steiner's task type examined). For example, if all studies that assessed the team maximum GMA/team performance relationship used a disjunctive task whereas no studies that assessed the team heterogeneity GMA/team performance relationship used a compensatory task, the larger effect for team maximum could be a reflection of an appropriate match between the operationalization and the task type. Results are presented in Table 2 and suggest that the correlations for each operationalization were not biased by the extent to which the operationalization was matched to the correct task type.

Because the minimum, mean, and maximum operationalizations had similar relationships with team performance in lab settings and the 95% confidence intervals of each operationalization included the sample–weighted mean correlations of the other two operationalizations, a series of exploratory hierarchical regressions were conducted to test the unique contribution of each of the team GMA operationalizations to team performance. As expected, the three operationalizations of team GMA were strongly intercorrelated with a sample–weighted mean correlation of 0.62 (min = 0.33, max = 0.77). The order of entry of the operationalizations into the regressions was based on the rank order of the strength of the team GMA/team performance relationships. The hierarchical regressions revealed that regardless of the order of entry (ascending or descending), the mean, minimum, and maximum accounted for unique variance in team performance (see Table 3), however, the minimum contributed more unique variance than the other operationalizations even when entered as the last step ($\Delta R^2 = 0.05$, $p < 0.01$). Thus, there is some indication that of the three operationalizations, the team minimum may be the single best operationalization of team GMA as it relates to team performance, however, the team mean and maximum explained unique variance in performance beyond the minimum.

In summary, the data indicate that team GMA is related to team performance, however the presence and magnitude of the relationship is dependent on the study setting or team type and operationalization (partial support for H1a). Results indicate a stronger relationship for team GMA and team performance in lab settings compared to field settings. The data also suggest, however, that this effect could be a function of the type of teams that were studied in each setting. There was considerable overlap between the type of team studied (intellectual or physical) and the setting of the study (lab or field). Specifically, the large majority of lab studies assessed intellectual teams, whereas the field studies generally investigated physical teams. In field studies, team GMA was positively related to team performance when operationalized as the team mean (partial support for H1d). For lab studies (intellectual teams), the team mean, maximum, and minimum were all predictors of team performance, had considerable overlap, and explained unique variance in team performance. However, there is some indication that the team minimum is the single best operationalization in field settings (intellectual teams). Heterogeneity of team GMA was not a good predictor of team performance regardless of setting or task type studied.

Table 3

Hierarchical Regressions of Team Minimum, Mean, and Maximum Operationalizations of Team GMA on Team Performance

Step	Operationalization Added	β	R	R^2	ΔR^2
Descending order of entry based on *SWMr* (largest to smallest *SWMr*)					
1	Minimum	0.45*	0.30	0.09*	
2	Mean	–0.37*	0.36	0.13*	0.04*
3	Maximum	0.41*	0.38	0.14*	0.01*
Ascending order of entry based on *SWMr* (smallest to largest *SWMr*)					
1	Maximum	0.41*	0.28	0.08*	
2	Mean	–0.37*	0.30	0.09*	0.01*
3	Minimum	0.45*	0.38	0.14*	0.05*

Note. $N = 462$. βs are based on the final step in the model. * $p < 0.01$.

Task–Relevant Expertise

Hypothesis 2a suggested that team task–relevant expertise would be positively related to team performance and Hypothesis H2d stated that this relationship would be the strongest when task–relevant expertise was operationalized as the team mean or sum. Results for the team task–relevant expertise and team performance relationship are presented in Table 4. The corrected population correlations for the team task–relevant expertise/team performance relationship was 0.32 (95% CV_L = 0.04) indicating a medium effect and the 95% CV_L did not include zero. Most of the relationships were operationalized using the mean (k = 8) and a few were operationalized by the different configural operationalizations (k = 4). Moderating by operationalization did not account for substantially more variance and the corrected population correlation remained similar suggesting that operationalization did not moderate the team task relevant expertise/team performance relationship (although each configural operationalizations had a low number of correlations [1 heterogeneity, 2 minimum, and 1 maximum]). To test H2e—that task–relevant expertise type diversity should have a curvilinear relationship with team performance with a moderate level of diversity having the strongest relationships with team performance—more diversity (heterogeneity) correlations would have been needed, thus, H2e could not be tested.

Study setting was also assessed as a moderator of the team task–relevant expertise/team performance relationship. Results are presented in Table 4 and suggest a similar effect in lab (ρ = 0.35; 95% CV_L = 0.09) and field settings (ρ = 0.28; 95% CV_L = 0.01). In both settings, a medium effect (size) was obtained for the task–

Table 4

Meta–Analytic Results for the Relationship Between Team Task–Relevant Expertise and Team Performance Moderated by Operationalization and Study Setting

Variable	*k*	*N*	*SWM r*	*SW SD*	*% Var. due to Sampling Error*	*95% Conf. Int.*		*ρ*	*SDρ*	*% Var. Acc. for*	*95% CV $_L$*
						L	*U*				
Overall	13	656	0.26	0.20	47.26	0.19	0.33	0.32	0.17	47.70	0.04
Mean and Sum	9	517	0.27	0.18	49.17	0.19	0.35	0.33	0.15	49.76	0.08
Mean	8	467	0.26	0.18	45.39	0.18	0.35	0.32	0.16	45.90	0.05
Configural	4	139	0.21	0.24	46.68	0.05	0.38	0.26	0.21	46.69	-0.09
Setting											
Lab	6	285	0.30	0.19	48.45	0.20	0.41	0.35	0.16	48.65	0.09
Field	7	308	0.23	0.19	49.23	0.13	0.32	0.28	0.16	49.63	0.01
Team Type											
Physical	8	293	0.24	0.22	51.67	0.13	0.35	0.29	0.19	51.95	-0.01
Intellectual	4	247	0.23	0.18	44.48	0.11	0.35	0.28	0.17	44.87	0.01
Mixed/other	1	116	0.38	—	—	—	—	—	—	—	—

Note. Overall *k* and *N* may not be equal the sum of the nested moderators listed because values for some operationalizations are not presented at the moderator level if there was only one correlation and there was no *a priori* hypothesis. Results are corrected for predictor and criterion unreliability. Artifact distributions of the design variable and criterion of interest were used for corrections. *k* = number of correlations; *N* = number of teams; *SWMr* = sample–weighted mean correlation; *SWSD* = sample–weighted standard deviation; *% Var. due to Sampling Error* = percentage of variance due to sampling error; *95% Conf. Int. L* = lower 95% confidence interval; *95% Conf. Int. U* = upper 95% confidence interval; *ρ* = corrected population correlation; *SDρ* = standard deviation of the corrected population correlation; *% Var. Acc. for* = percentage of variance accounted for by sampling error and artifact corrections; *95% CV $_L$* = lower 95% credibility value.

relevant expertise/team performance relationship and the 95% CV_L did not include zero. Next, the moderating effect of Devine's team types (intellectual and physical) was tested. Results indicate a similar effect for team task–relevant expertise and team performance for intellectual ($\rho = 0.28$; 95% $CV_L = 0.01$) and physical teams ($\rho = 0.29$; 95% $CV_L = -0.01$).

In summary, team task–relevant expertise was positively related to team performance regardless of operationalization, study setting, or team type (full support for Hypothesis 2a; no support for Hypothesis 2d).

Team Conscientiousness

The next series of hypotheses were concerned with the relationship between team personality variables and team performance. Hypothesis 3a posited that team conscientiousness would be positively related to team performance. Corrected population correlations presented in Table 5 suggest a negligible relationship between team conscientiousness and team performance ($\rho = 0.05$; 95% $CV_L = -0.20$).

Next, the theoretical moderators of the team conscientiousness/team performance relationship were investigated. Hypothesis H3d suggested that the team conscientiousness/team performance relationship would be strongest when team conscientiousness was operationalized as the team mean or sum. Results indicate that the magnitudes of the corrected population correlations between team conscientiousness and team performance across the different operationalizations ranged from 0.01 to 0.22 with the team minimum conscientiousness score as the strongest predictor, and a large amount of the variance accounted for by statistical artifacts for each of the configural

Table 5

Meta–Analytic Results for the Relationship Between Team Conscientiousness and Team Performance Moderated by Operationalization and Study Setting

Variable	*k*	*N*	*SWM r*	*SW SD*	*% Var. due to Sampling Error*	*95% Conf. Int.* *L*	*95% Conf. Int.* *U*	*ρ*	*SDρ*	*% Var. Acc. for*	*95% CV$_L$*
Overall	50	2,899	0.04	0.18	52.14	0.01	0.08	0.05	0.15	52.16	-0.20
Mean	19	1,135	0.08	0.15	71.27	0.02	0.14	0.09	0.10	71.35	-0.07
Configural	31	1,764	0.02	0.20	46.22	-0.02	0.07	0.03	0.17	46.22	-0.26
Maximum	8	410	-0.01	0.16	76.88	-0.09	0.11	0.01	0.09	76.88	-0.14
Minimum	9	500	0.18	0.13	100.00	0.09	0.27	0.22	0.00	100.00	0.22
Heterogeneity	11	671	-0.12	0.10	100.00	-0.19	-0.04	-0.14	0.00	100.00	-0.14
Lab	27	1,830	0.00	0.13	88.18	-0.05	0.04	0.00	0.05	88.18	-0.09
Intellectual	26	1,818	-0.01	0.13	90.03	-0.05	0.04	-0.01	0.05	90.03	-0.09
Physical	1	12	0.38	—	—	—	—	—	—	—	—
Field	23	1,069	0.13	0.23	41.88	0.07	0.19	0.15	0.20	41.98	-0.18
Intellectual	1	79	0.20	—	—	—	—	—	—	—	—
Physical	22	990	0.12	0.23	40.53	0.06	0.18	0.15	0.22	40.57	-0.21

Note. Overall *k* and *N* may not be equal the sum of the nested moderators listed because values for some operationalizations are not presented at the moderator level if there was only one correlation and there was no *a priori* hypothesis. Results are corrected for predictor and criterion unreliability. Artifact distributions of the design variable and criterion of interest were used for corrections. *k* = number of correlations; *N* = number of teams; *SWMr* = sample–weighted mean correlation; *SWSD* = sample–weighted standard deviation; *% Var. due to Sampling Error* = percentage of variance due to sampling error; *95% Conf. Int. L* = lower 95% confidence interval; *95% Conf. Int. U* = upper 95% confidence interval; *ρ* = corrected population correlation; *SDρ* = standard deviation of the corrected population correlation; *% Var. Acc. for* = percentage of variance accounted for by sampling error and artifact corrections; *95% CV$_L$* = lower 95% credibility value.

operationalizations (76.88%–100.00%). An inspection of the confidence intervals indicates that the relationship between team conscientiousness operationalized as the team minimum and heterogeneity (reversed to be homogeneity) and team performance were similar.

To further examine these relationships, the impact of the study setting was tested as a moderator. Results are presented in Table 5 and indicate no relationship between team conscientiousness and team performance for studies in lab settings ($\rho = 0.00$; 95% $CV_L = -0.09$) and a small effect in field settings ($\rho = 0.15$; 95% $CV_L = -0.18$). Again, however, study setting had considerable overlap with team type and so it is unclear whether study setting or team type was moderating the effect. All but one of the field studies tested physical teams; in contrast, all but one of the lab studies assessed intellectual teams.

The team conscientiousness/team performance relationship was also tested while simultaneously considering both study setting and operationalization as moderators. Results are presented in Table 6 and show that the mean operationalization of team conscientiousness emerged as the strongest predictor of team performance in field settings with a corrected population correlation of 0.29 (95% $CV_L = 0.29$), suggesting a medium effect. Team conscientiousness heterogeneity (reversed to be homogeneity) and the team conscientiousness minimum were also strong predictors of team performance; an inspection of the confidence intervals suggests they were not meaningfully different from the team mean operationalization. The results indicate that both study setting (or team type) and operationalization moderated the team conscientiousness and team

Table 6

Meta–Analytic Results for the Relationship Between Team Conscientiousness and Team Performance Moderated by Study Setting Nested Within Operationalization

Variable	*k*	*N*	*SWM r*	*SW SD*	*% Var. due to Sampling Error*	*95% Conf. Int.*		*ρ*	*SDρ*	*% Var. Acc. for*	*95% CV $_L$*
						L	*U*				
Mean											
Lab	14	918	0.04	0.13	92.80	-0.02	0.11	0.05	0.04	92.82	-0.02
Additive	4	224	-0.04	0.15	81.96	-0.17	0.09	-0.05	0.08	81.96	-0.17
Field	5	217	0.24	0.14	100.00	0.11	0.37	0.29	0.00	100.00	0.29
Additive	0	—	—	—	—	—	—	—	—	—	—
Maximum											
Lab	3	193	-0.09	0.02	100.00	-0.23	0.05	-0.11	0.00	100.00	-0.11
Disjunctive	0	—	—	—	—	—	—	—	—	—	—
Field	5	217	0.10	0.18	70.73	-0.04	0.23	0.11	0.12	70.82	-0.08
Disjunctive	0	—	—	—	—	—	—	—	—	—	—
Minimum											
Lab	3	204	0.11	0.10	100.00	-0.03	0.25	0.13	0.00	100.00	0.13
Conjunctive	3	204	0.11	0.10	100.00	-0.03	0.25	0.13	0.00	100.00	0.13
Field	6	296	0.23	0.13	100.00	0.12	0.34	0.27	0.00	100.00	0.27
Conjunctive	3	123	0.18	0.11	100.00	0.00	0.35	0.21	0.00	100.00	0.21
Heterogeneity											
Lab	6	454	-0.10	0.09	100.00	-0.19	-0.01	-0.12	0.00	100.00	-0.12
Compensatory	0	—	—	—	—	—	—	—	—	—	—
Field	5	217	-0.16	0.11	100.00	-0.29	-0.03	-0.19	0.00	100.00	-0.19
Compensatory	2	122	-0.15	0.02	100.00	-0.33	0.02	-0.18	0.00	100.00	-0.18

Note. Overall *k* and *N* may not be equal the sum of the nested moderators listed because values for some operationalizations are not presented at the moderator level if there was only one correlation and there was no *a priori* hypothesis. Results are corrected for predictor and criterion unreliability. Artifact distributions of the design variable and criterion of interest were used for corrections. *k* = number of correlations; *N* = number of teams; *SWMr* = sample–weighted mean correlation; *SWSD* = sample–weighted standard deviation; *% Var. due to Sampling Error* = percentage of variance due to sampling error; *95% Conf. Int. L* = lower 95% confidence interval; *95% Conf. Int. U* = upper 95% confidence interval; *ρ* = corrected population correlation; *SDρ* = standard deviation of the corrected population correlation; *% Var. Acc. for* = percentage of variance accounted for by sampling error and artifact corrections; *95% CV_L* = lower 95% credibility value.

performance relationship. Specifically, medium–sized relationships were observed between team conscientiousness and team performance in field settings (physical teams) when team conscientiousness was operationalized as the team mean, minimum, or heterogeneity. In contrast, much smaller effects were observed for team conscientiousness on team performance in studies conducted in lab settings (intellectual teams).

The team conscientiousness operationalization/team performance relationships were also assessed across Steiner's task types to see if the strength of the relationships could be explained by the appropriateness of the operationalization to the task type. Results are presented in Table 6 and indicate the strength of the relationships was not biased by the appropriateness of the operationalization to the task type.

A series of exploratory hierarchical regressions were conducted to further evaluate the contribution of team conscientiousness when operationalized as the team mean, minimum, and heterogeneity to team performance in field settings. As expected, the three operationalizations of team conscientiousness were strongly intercorrelated with a sample–weighted mean correlation of 0.62 (min = 0.36, max = 0.73). Order of entry was based on the rank order of the relationships between team conscientiousness with the specified operationalization and team performance. A hierarchical regression based on descending entry revealed that team minimum and team heterogeneity conscientiousness did not explain variance beyond the team mean (Table 7), however, when the order of entry was reversed, team heterogeneity explained variance beyond the team minimum and the team mean was able to explain a small amount of variance beyond the other two (see Table 7). Thus, there is some indication that of the three operationalizations, the team mean may be the best operationalization of team conscientiousness as it relates to performance.

Table 7

Hierarchical Regression of Team Mean, Minimum, and Heterogeneity Operationalizations of Team Conscientiousness on Team Performance

Step	Operationalization Added	β	R	R^2	ΔR^2
Descending order of entry based on *SWMr* (largest to smallest *SWMr*)					
1	Mean	0.16*	0.24	0.06***	
2	Minimum	0.10	0.26	0.07***	0.01
3	Heterogeneity	–0.03	0.26	0.07***	0.00
Ascending order of entry based on *SWMr* (smallest to largest *SWMr*)					
1	Heterogeneity	–0.03	0.16	0.03**	
2	Minimum	0.10	0.23	0.05***	0.03**
3	Mean	0.16*	0.26	0.07***	0.01*

Note. $N = 200$. βs are based on the final step in the model. * $p < .10$, ** $p < .05$ ***$p < .01$.

In summary, team conscientiousness was related to team performance in field settings (physical teams) but not in lab settings (intellectual teams; partial support for

Hypothesis 3a). In field settings (physical teams), team conscientiousness was best operationalized as the team mean (partial support for Hypothesis 3d).

Team Agreeableness

Hypothesis 4a stated that team agreeableness would be related to team performance. The results for the team agreeableness/team performance relationship are presented in Table 8. The corrected population correlation for team agreeableness/team performance relationship was small and (ρ = 0.13; 95% CV_L = –0.15) and a fair amount of variance was accounted for by artifact corrections (51.82%). The second aspect of the hypothesis (H4d) suggested that team agreeableness would be best operationalized as a configural operationalization. An inspection of the different operationalizations revealed that the team minimum agreeableness was the best predictor of team performance (ρ = 0.37; 95% CV_L = 0.37) and all variance was accounted for by artifact corrections.

To further investigate the relationship between the team agreeableness and team performance, the influence of additional moderators (e.g., setting, team type) was tested. Results are presented in Table 8 and suggest that there was a strong team agreeableness/team performance relationship in studies conducted in field settings (ρ = 0.25; 95% CV_L = –0.02) and no relationship in studies conducted in lab settings (ρ = 0.00; 95% CV_L = 0.00). The study setting (lab or field) and team type (intellectual or physical) moderators again had considerable overlap.

Next, the impact of study setting and operationalization as moderators of the team agreeableness/team performance relationship were tested simultaneously. Results are presented in Table 9. Results indicate that when only correlations from field settings

Table 8

Meta–Analytic Results for the Relationship Between Team Agreeableness and Team Performance Moderated by Operationalization and Study Setting

Variable	*k*	*N*	*SWM r*	*SW SD*	*% Var. due to Sampling Error*	*95% Conf. Int.*		*ρ*	*SDρ*	*% Var. Acc. for*	*95% CV$_L$*
						L	*U*				
Overall	41	1,991	0.11	0.20	51.73	0.06	0.15	0.13	0.17	51.82	-0.15
Mean	15	718	0.13	0.19	57.83	0.05	0.20	0.16	0.15	57.98	-0.09
Configural	26	1,273	0.10	0.20	49.12	0.04	0.15	0.12	0.18	49.20	-0.17
Maximum	6	242	0.12	0.15	100.00	0.00	0.25	0.15	0.00	100.00	0.15
Minimum	7	321	0.30	0.13	100.00	0.20	0.40	0.37	0.00	100.00	0.37
Heterogeneity	10	527	-0.08	0.08	100.00	-0.16	0.01	-0.09	0.00	100.00	-0.09
Lab (Intellectual Only)	18	922	0.00	0.14	100.00	-0.07	0.07	0.00	0.00	100.00	0.00
Field	23	1,069	0.20	0.20	52.74	0.14	0.26	0.25	0.17	53.50	-0.02
Intellectual	1	79	0.46	—	—	—	—	—	—	—	—
Physical	22	990	0.18	0.19	59.64	0.12	0.25	0.22	0.15	59.75	-0.02

Note. Overall *k* and *N* may not be equal the sum of the nested moderators listed because values for some operationalizations are not presented at the moderator level if there was only one correlation and there was no *a priori* hypothesis. Results are corrected for predictor and criterion unreliability. Artifact distributions of the design variable and criterion of interest were used for corrections. *k* = number of correlations; *N* = number of teams; *SWMr* = sample–weighted mean correlation; *SWSD* = sample–weighted standard deviation; *% Var. due to Sampling Error* = percentage of variance due to sampling error; *95% Conf. Int. L* = lower 95% confidence interval; *95% Conf. Int. U* = upper 95% confidence interval; *ρ* = corrected population correlation; *SDρ* = standard deviation of the corrected population correlation; *% Var. Acc. for* = percentage of variance accounted for by sampling error and artifact corrections; *95% CV$_L$* = lower 95% credibility value.

Table 9

Meta–Analytic Results for the Relationship Between Team Agreeableness and Team Performance Moderated by Study Setting Nested Within Operationalization

Variable	*k*	*N*	*SWM r*	*SW SD*	*% Var. due to Sampling Error*	*95% Conf. Int.* *L*	*95% Conf. Int.* *U*	*ρ*	*SDρ*	*% Var. Acc. for*	*95% CV_L*
Mean											
Lab	10	501	0.05	0.15	88.38	-0.04	0.13	0.06	0.07	88.39	-0.05
Additive	4	306	0.00	0.09	100.00	-0.11	0.12	0.00	0.00	100.00	0.00
Field	5	217	0.31	0.12	100.00	0.19	0.43	0.38	0.00	100.00	0.38
Additive	0	—	—	—	—	—	—	—	—	—	—
Maximum											
Lab	1	25	-0.04	—	—	—	—	—	—	—	—
Disjunctive	0	—	—	—	—	—	—	—	—	—	—
Field	5	217	0.14	0.15	100.00	0.01	0.27	0.17	0.00	100.00	0.17
Disjunctive	0	—	—	—	—	—	—	—	—	—	—
Minimum											
Lab	1	25	0.22	—	—	—	—	—	—	—	—
Conjunctive	1	25	0.22	—	—	—	—	—	—	—	—
Field	6	296	0.31	0.14	89.83	0.20	0.41	0.37	0.05	91.54	0.29
Conjunctive	3	123	0.31	0.20	50.44	0.15	0.48	0.38	0.17	51.29	0.10
Heterogeneity											
Lab	5	310	-0.08	0.08	100.00	-0.19	0.03	-0.10	0.00	100.00	-0.10
Compensatory	0	—	—	—	—	—	—	—	—	—	—
Field	5	217	-0.08	0.06	100.00	-0.21	0.06	-0.09	0.00	100.00	-0.09
Compensatory	2	122	-0.08	0.08	100.00	-0.26	0.09	-0.10	0.00	100.00	-0.10

Note. Overall *k* and *N* may not be equal the sum of the nested moderators listed because values for some operationalizations are not presented at the moderator level if there was only one correlation and there was no *a priori* hypothesis. Results are corrected for predictor and criterion unreliability. Artifact distributions of the design variable and criterion of interest were used for corrections. *k* = number of correlations; *N* = number of teams; *SWMr* = sample–weighted mean correlation; *SWSD* = sample–weighted standard deviation; *% Var. due to Sampling Error* = percentage of variance due to sampling error; *95% Conf. Int. L* = lower 95% confidence interval; *95% Conf. Int. U* = upper 95% confidence interval; *ρ* = corrected population correlation; *SDρ* = standard deviation of the corrected population correlation; *% Var. Acc. for* = percentage of variance accounted for by sampling error and artifact corrections; *95% CV_L* = lower 95% credibility value.

were considered, the team mean agreeableness operationalization became a much stronger predictor of team performance ($\rho = 0.38$; 95% $CV_L = 0.38$), similar in strength to the team minimum ($\rho = 0.37$; 95% $CV_L = 0.29$). For lab settings, each operationalization had very few correlations. Except for one correlation that represented the team minimum operationalization and indicated a small to medium effect, team agreeableness was unrelated to team performance in lab settings.

The team agreeableness/team performance relationships were next assessed across Steiner's task types to see if the strength of the relationships could be explained by the appropriateness of the operationalization to the task type. The results presented in Table 9 suggest that the varying team agreeableness operationalization/team performance effects were not due to the appropriateness of the operationalization to the task type.

Exploratory hierarchical regressions were conducted to test the relative contribution of team agreeableness when operationalized as the mean and minimum on team performance in field settings. The minimum and mean operationalizations of team agreeableness were strongly correlated with a sample–weighted mean correlation of 0.78. The regressions revealed that team minimum and mean agreeableness did not explain a meaningful amount of variance beyond one another in either order of entry ($\Delta R^2 = .01$, $p = 0.10$ for both operationalizations beyond the other). This suggests that the operationalizations were largely redundant of one another. In summary, team agreeableness, when operationalized as the team mean or minimum, shared a medium, positive relationship with team performance in field settings (partial support for Hypotheses 4a and 4d).

Team Extraversion

Hypothesis 5a proposed that team extraversion would be related to team performance. Results are presented in Table 10. Overall, team extraversion had no relationship with team performance (ρ = 0.05; 95% CV_L = –0.07) and most of the variance was explained by artifact corrections (84.81%). An inspection of the hypothesized moderator of operationalization suggested similar negligible corrected population correlations for the team extraversion/team performance relationships except when team extraversion was operationalized as the maximum; team extraversion had a small relationship with team performance when operationalized as the team maximum. These effects were further clarified when the study setting was assessed as a moderator. Specifically, the team extraversion/team performance relationship was stronger in field settings (ρ = 0.12; 95% CV_L = 0.12) compared to lab settings (ρ = –0.05; 95% CV_L = –0.05). Again, lab and field settings had almost complete overlap with intellectual and physical teams respectively.

When both operationalization and study setting were assessed simultaneously (see Table 11), there were similar effects for team extraversion on team performance across the different operationalizations of team mean, maximum, and heterogeneity in field settings. There were a limited number of correlations in lab settings (intellectual teams). In lab settings (intellectual teams), team extraversion was mostly operationalized as the team mean or heterogeneity and team extraversion had a negligible relationship

Table 10

Meta–Analytic Results for the Relationship Between Team Extraversion and Team Performance Moderated by Operationalization and Study Setting

Variable	*k*	*N*	*SWM r*	*SW SD*	*% Var. due to Sampling Error*	*95% Conf. Int.*		*ρ*	*SDρ*	*% Var. Acc. for*	*95% CV $_L$*
						L	*U*				
Overall	36	1,800	0.04	0.15	84.79	-0.01	0.09	0.05	0.07	84.81	-0.07
Mean	14	687	0.04	0.16	75.97	-0.04	0.11	0.04	0.10	75.99	-0.12
Configural	22	1,113	0.04	0.15	91.60	-0.02	0.10	0.05	0.05	91.63	-0.04
Maximum	5	202	0.13	0.17	87.38	-0.01	0.27	0.16	0.07	87.58	0.04
Minimum	6	281	0.01	0.16	82.82	-0.10	0.13	0.02	0.08	82.83	-0.11
Heterogeneity	9	487	0.03	0.13	100.00	-0.06	0.12	0.03	0.00	100.00	0.03
Lab	17	813	-0.04	0.14	100.00	-0.11	0.03	-0.05	0.00	100.00	-0.05
Intellectual	16	801	-0.04	0.13	100.00	-0.11	0.02	-0.06	0.00	100.00	-0.06
Physical	1	12	0.46	—	—	—	—	—	—	—	—
Field	19	987	0.10	0.14	100.00	0.04	0.16	0.12	0.00	100.00	0.12
Intellectual	1	79	-0.04	—	—	—	—	—	—	—	—
Physical	18	908	0.11	0.13	100.00	0.05	0.18	0.14	0.00	100.00	0.14

Note. Overall *k* and *N* may not be equal the sum of the nested moderators listed because values for some operationalizations are not presented at the moderator level if there was only one correlation and there was no *a priori* hypothesis. Results are corrected for predictor and criterion unreliability. Artifact distributions of the design variable and criterion of interest were used for corrections. *k* = number of correlations; *N* = number of teams; *SWMr* = sample–weighted mean correlation; *SWSD* = sample–weighted standard deviation; *% Var. due to Sampling Error* = percentage of variance due to sampling error; *95% Conf. Int. L* = lower 95% confidence interval; *95% Conf. Int. U* = upper 95% confidence interval; *ρ* = corrected population correlation; *SDρ* = standard deviation of the corrected population correlation; *% Var. Acc. for* = percentage of variance accounted for by sampling error and artifact corrections; 95% CV_L = lower 95% credibility value.

Table 11

Meta–Analytic Results for the Relationship Between Team Extraversion and Team Performance Moderated by Study Setting Nested Within Operationalization

Variable	*k*	*N*	*SWM r*	*SW SD*	*% Var. due to Sampling Error*	*95% Conf. Int.*		*ρ*	*SDρ*	*% Var. Acc. for*	*95% CV $_L$*
						L	*U*				
Mean											
Lab	9	392	-0.03	0.18	74.10	-0.13	0.07	-0.03	0.11	74.10	-0.22
Additive	3	197	-0.14	0.04	100.00	-0.28	-0.01	-0.18	0.00	100.00	0.18
Field	5	295	0.10	0.10	100.00	-0.01	0.21	0.12	0.00	100.00	0.12
Additive	0	—	—	—	—	—	—	—	—	—	—
Maximum											
Lab	1	25	0.09	—	—	—	—	—	—	—	—
Disjunctive	0	—	—	—	—	—	—	—	—	—	—
Field	4	177	0.14	0.18	70.14	-0.01	0.28	0.16	0.12	70.30	-0.03
Disjunctive	0	—	—	—	—	—	—	—	—	—	—
Minimum											
Lab	1	25	-0.22	—	—	—	—	—	—	—	—
Conjunctive	1	25	-0.22	—	—	—	—	—	—	—	—
Field	5	256	0.04	0.15	86.11	-0.09	0.16	0.04	0.07	86.12	-0.07
Conjunctive	3	123	-0.02	0.15	100.00	-0.20	0.16	-0.02	0.00	100.00	-0.02
Heterogeneity											
Lab	5	310	-0.03	0.08	100.00	-0.14	0.08	-0.04	0.00	100.00	-0.04
Compensatory	0	—	—	—	—	—	—	—	—	—	—
Field	4	177	0.13	0.13	100.00	-0.01	0.28	0.16	0.00	100.00	0.16
Compensatory	1	82	0.19	—	—	—	—	—	—	—	—

Note. Overall *k* and *N* may not be equal the sum of the nested moderators listed because values for some operationalizations are not presented at the moderator level if there was only one correlation and there was no *a priori* hypothesis. Results are corrected for predictor and criterion unreliability. Artifact distributions of the design variable and criterion of interest were used for corrections. *k* = number of correlations; *N* = number of teams; *SWMr* = sample–weighted mean correlation; *SWSD* = sample–weighted standard deviation; *% Var. due to Sampling Error* = percentage of variance due to sampling error; *95% Conf. Int. L* = lower 95% confidence interval; *95% Conf. Int. U* = upper 95% confidence interval; *ρ* = corrected population correlation; *SDρ* = standard deviation of the corrected population correlation; *% Var. Acc. for* = percentage of variance accounted for by sampling error and artifact corrections; 95% CV_L = lower 95% credibility value.

with team performance using both operationalizations.

To further explore the team extraversion and team performance relationship, hierarchical regressions were conducted to test the relative contribution of team extraversion when operationalized as the team mean, maximum, and heterogeneity on team performance in field settings. The three operationalizations of team extraversion were moderately intercorrelated with a sample–weighted mean correlation of 0.42 (min = 0.13, max = 0.68). The regressions revealed that team extraversion operationalized as team heterogeneity or mean did not account for variance beyond the maximum when entered into the regression in descending order (Table 12; order of entry was based on the strength of the relationship with team performance.) When the order of entry was reversed, team heterogeneity accounted for a small amount of variance in team performance beyond the mean ($\Delta R^2 = 0.02$, $p = 0.04$), but the maximum did not account for variance in performance beyond the two. In all models, only a small amount of variance in team performance was explained by team extraversion.

In summary, team extraversion had a small relationship with team performance in field settings (physical teams) when operationalized as the team mean, maximum, or heterogeneity (partial support for Hypothesis 5a and 5d).

Team Emotional Stability

Hypothesis 6a posited that team emotional stability would be related to team performance. Results for emotional stability are presented in Table 13 and indicate a small corrected population correlation ($\rho = 0.08$; 95% $CV_L = -0.05$) for the team emotional stability and team performance relationship with a large amount of variance

Table 12
Hierarchical Regressions of Team Mean, Heterogeneity, and Maximum Operationalizations of Team Extraversion on Team Performance

Step	Operationalization Added	β	R	R^2	ΔR^2
Descending order of entry based on *SWMr* (largest to smallest *SWMr*)					
1	Maximum	–0.02	0.14	0.02**	
2	Heterogeneity	0.16	0.16	0.03*	0.01
3	Mean	0.13	0.18	0.03*	0.01
Ascending order of entry based on *SWMr* (smallest to largest *SWMr*)					
1	Mean	0.13	0.10	0.01	
2	Heterogeneity	0.16	0.18	0.03**	0.02**
3	Maximum	–0.02	0.18	0.03*	0.00

Note. N = 200. βs are based on the final step in the model. * $p < .10$, ** $p < .05$.

accounted for by artifact corrections. When operationalization was tested as a moderator results suggested a small to medium effect for the team maximum operationalization on team performance (ρ = 0.21; 95% CV_L = –0.04). However, when study setting wasassessed as a moderator, different effects again began to emerge. Specifically, the team emotional stability/team performance relationship was stronger in field settings (ρ = 0.16; 95% CV_L = –0.03) compared to lab settings (ρ = –0.01; 95% CV_L = –0.01), although both 95% CV_L were below zero. And, again the field and lab study settings had

Table 13

Meta–Analytic Results for the Relationship Between Team Emotional Stability and Team Performance Moderated by Operationalization and Study Setting

Variable	*k*	*N*	*SWM r*	*SW SD*	*% Var. due to Sampling Error*	*95% Conf. Int.*		*ρ*	*SDρ*	*% Var. Acc. for*	*95% CV $_L$*
						L	*U*				
Overall	29	1,577	0.06	0.15	81.42	0.01	0.11	0.08	0.08	81.46	-0.05
Mean	10	524	0.06	0.11	100.00	-0.03	0.14	0.07	0.00	100.00	0.07
Configural	19	1,053	0.07	0.17	63.98	0.01	0.13	0.08	0.12	64.02	-0.12
Maximum	4	182	0.17	0.19	57.79	0.03	0.32	0.21	0.15	58.02	-0.04
Minimum	5	261	0.00	0.12	100.00	-0.12	0.12	-0.01	0.00	100.00	-0.01
Heterogeneity	8	467	0.04	0.15	78.25	-0.05	0.14	0.05	0.08	79.28	-0.08
Lab (Intellectual Only)	15	788	-0.01	0.10	100.00	-0.08	0.06	-0.01	0.00	100.00	-0.01
Field	14	789	0.13	0.16	65.40	0.06	0.20	0.16	0.11	65.58	-0.03
Intellectual	1	79	-0.13	—	—	—	—	—	—	—	—
Physical	13	710	0.16	0.15	83.73	0.09	0.23	0.19	0.07	83.88	0.08

Note. Overall *k* and *N* may not be equal the sum of the nested moderators listed because values for some operationalizations are not presented at the moderator level if there was only one correlation and there was no *a priori* hypothesis. Results are corrected for predictor and criterion unreliability. Artifact distributions of the design variable and criterion of interest were used for corrections. *k* = number of correlations; *N* = number of teams; *SWMr* = sample–weighted mean correlation; *SWSD* = sample–weighted standard deviation; *% Var. due to Sampling Error* = percentage of variance due to sampling error; *95% Conf. Int. L* = lower 95% confidence interval; *95% Conf. Int. U* = upper 95% confidence interval; *ρ* = corrected population correlation; *SDρ* = standard deviation of the corrected population correlation; *% Var. Acc. for* = percentage of variance accounted for by sampling error and artifact corrections; *95% CV$_L$* = lower 95% credibility value.

almost complete overlap with the intellectual and physical team types.

As a further exploration of the team emotional stability/team performance relationship, results for the team emotional stability/team performance relationship are presented across operationalization, study setting, and the appropriate matching of Steiner's tasks to the operationalization in Table 14. Although based on a limited number of correlations, the data suggest that team emotional stability was unrelated to team performance regardless of operationalization in lab settings (intellectual teams) and that the team mean, maximum, and heterogeneity were better operationalizations of team emotional stability than the minimum in field settings (physical teams). The differences in these relationships were not due to a bias in the appropriateness of the operationalization to Steiner's task type.

Exploratory hierarchical regressions were conducted to further test the relative contribution of team emotional stability when operationalized as the team mean, maximum, and heterogeneity to team performance in field settings. The three operationalizations of team emotional stability were only moderately correlated with a sample–weighted mean correlation of 0.20 (min = 0.02, max = 0.40). A hierarchical regression with the operationalizations entered in descending order based on the strength of the team emotional stability operationalization and team performance relationships revealed that team heterogeneity and maximum did not account for variance in team performance beyond the team mean and when the order of entry was reversed, the team mean accounted for a small amount of variance beyond the team maximum and heterogeneity operationalizations (Table 15).

Table 14

Meta–Analytic Results for the Relationship Between Team Emotional Stability and Team Performance Moderated by Study Setting Nested Within Operationalization

Variable	*k*	*N*	*SWM r*	*SW SD*	*% Var. due to Sampling Error*	*95% Conf. Int.* *L*	*95% Conf. Int.* *U*	*ρ*	*SDρ*	*% Var. Acc. for*	*95% CV$_L$*
Mean											
Lab	7	367	0.00	0.06	100.00	-0.11	0.10	-0.01	0.00	100.00	-0.01
Additive	3	197	-0.03	0.04	100.00	-0.17	0.11	-0.04	0.00	100.00	-0.04
Field	3	157	0.20	0.04	100.00	0.04	0.35	0.24	0.00	100.00	0.24
Additive	0	—	—	—	—	—	—	—	—	—	—
Maximum											
Lab	1	25	0.11	—	—	—	—	—	—	—	—
Disjunctive	0	—	—	—	—	—	—	—	—	—	—
Field	3	157	0.18	0.20	43.67	0.03	0.34	0.22	0.18	43.90	-0.08
Disjunctive	0	—	—	—	—	—	—	—	—	—	—
Minimum											
Lab	1	25	-0.06	—	—	—	—	—	—	—	—
Conjunctive	1	25	-0.06	—	—	—	—	—	—	—	—
Field	4	236	0.00	0.13	100.00	-0.13	0.13	0.00	0.00	100.00	0.00
Conjunctive	2	103	-0.03	0.19	57.15	-0.22	0.17	-0.03	0.15	57.15	-0.27
Heterogeneity											
Lab	5	310	0.00	0.13	94.92	-0.11	0.11	0.00	0.04	94.92	-0.06
Compensatory	0	—	—	—	—	—	—	—	—	—	—
Field	3	157	0.13	0.14	90.04	-0.03	0.29	0.16	0.05	90.30	0.07
Compensatory	1	82	0.22	—	—	—	—	—	—	—	—

Note. Overall *k* and *N* may not be equal the sum of the nested moderators listed because values for some operationalizations are not presented at the moderator level if there was only one correlation and there was no *a priori* hypothesis. Results are corrected for predictor and criterion unreliability. Artifact distributions of the design variable and criterion of interest were used for corrections. *k* = number of correlations; *N* = number of teams; *SWMr* = sample–weighted mean correlation; *SWSD* = sample–weighted standard deviation; *% Var. due to Sampling Error* = percentage of variance due to sampling error; *95% Conf. Int. L* = lower 95% confidence interval; *95% Conf. Int. U* = upper 95% confidence interval; *ρ* = corrected population correlation; *SDρ* = standard deviation of the corrected population correlation; *% Var. Acc. for* = percentage of variance accounted for by sampling error and artifact corrections; *95% CV$_L$* = lower 95% credibility value.

Thus, Hypothesis 6a—that team emotional stability would be related to team performance—was supported in field settings (physical teams). Hypothesis 6d—that team emotional stability would be best operationalized using a configural operationalization was not supported—team mean, maximum, and heterogeneity operationalizations of team emotional stability were all related to team performance, with some indication that the team mean was the single best operationalization.

Table 15
Hierarchical Regressions of Team Mean, Heterogeneity, and Maximum Operationalizations of Team Emotional Stability on Team Performance

Step	Operationalization Added	β	R	R^2	ΔR^2
Descending order of entry based on *SWMr* (largest to smallest *SWMr*)					
1	Mean	0.16	0.20	0.04**	
2	Maximum	0.10	0.23	0.05**	0.01
3	Heterogeneity	0.11	0.25	0.06**	0.01
Ascending order of entry based on *SWMr* (smallest to largest *SWMr*)					
1	Heterogeneity	0.11	0.13	0.02	
2	Maximum	0.10	0.21	0.04*	0.02*
3	Mean	0.16	0.25	0.06**	0.02*

Note. $N = 120$. βs are based on the final step in the model. * $p < .10$, ** $p < .05$.

Team Openness to Experience

Although no specific hypotheses were presented, for the sake of completeness, results for openness to experience are presented in Table 16 and indicate a small positive relationship between team openness to experience and team performance (ρ = 0.09; 95% CV_L = –0.12), although the 95% CV_L was below zero. When the relationship was tested across the different operationalizations, team openness to experience had the strongest relationship with team performance when operationalized as the team mean (ρ = 0.12; 95% CV_L = –0.13), although an inspection of the confidence intervals suggests that the relationship was not substantially stronger than when team openness to experience was represented by one of the other operationalizations. Study setting was also tested as a moderator. Results are presented in Table 16 and suggest a stronger relationship between team openness to experience and team performance in field settings (ρ = 0.15; 95% CV_L = –0.03) than in lab settings (ρ = 0.05; 95% CV_L = –0.15). However, both 95% CV_L were below zero and again, studies in lab settings only investigated intellectual teams and all but one of the studies conducted in field settings investigated physical teams.

Although based on a limited number of correlations, when the effects of study setting and operationalization were tested simultaneously, results (see Table 17) indicate that in field settings team openness to experience was best operationalized as the team mean (ρ = 0.22; 95% CV_L = 0.07) followed by the maximum (ρ = 0.16; 95% CV_L = 0.16), minimum (ρ = 0.09; 95% CV_L = 0.09), and heterogeneity (ρ = –0.07; 95% CV_L = –0.07). Exploratory hierarchical regressions were conducted to further assess the relative contribution of team openness to experience when operationalized as the team mean and

Table 16

Meta–Analytic Results for the Relationship Between Team Openness to Experience and Team Performance Moderated by Operationalization and Study Setting

Variable	*k*	*N*	*SWM r*	*SW SD*	*% Var. due to Sampling Error*	*95% Conf. Int.*		*ρ*	*SDρ*	*% Var. Acc. for*	*95% CV$_L$*
						L	*U*				
Overall	31	1,874	0.07	0.16	61.21	0.03	0.12	0.09	0.13	61.28	-0.12
Mean	10	592	0.10	0.18	51.06	0.02	0.18	0.12	0.16	51.17	-0.13
Configural	21	1,282	0.06	0.16	68.82	0.00	0.11	0.07	0.11	68.87	-0.10
Maximum	6	371	0.08	0.10	100.00	-0.03	0.18	0.09	0.00	100.00	0.09
Minimum	7	450	0.03	0.18	47.59	-0.06	0.13	0.04	0.16	47.60	-0.22
Heterogeneity	6	318	0.03	0.12	100.00	-0.08	0.14	0.05	0.00	100.00	0.04
Lab (Intellectual Only)	17	1,209	0.04	0.15	60.04	-0.01	0.10	0.05	0.12	60.05	-0.15
Field	14	665	0.13	0.17	71.45	0.05	0.20	0.15	0.11	71.60	-0.03
Intellectual	1	79	-0.02	—	—	—	—	—	—	—	—
Physical	13	586	0.15	0.17	72.87	0.07	0.23	0.17	0.10	73.06	-0.02

Note. Overall *k* and *N* may not be equal the sum of the nested moderators listed because values for some operationalizations are not presented at the moderator level if there was only one correlation and there was no *a priori* hypothesis. Results are corrected for predictor and criterion unreliability. Artifact distributions of the design variable and criterion of interest were used for corrections. *k* = number of correlations; *N* = number of teams; *SWMr* = sample–weighted mean correlation; *SWSD* = sample–weighted standard deviation; *% Var. due to Sampling Error* = percentage of variance due to sampling error; *95% Conf. Int. L* = lower 95% confidence interval; *95% Conf. Int. U* = upper 95% confidence interval; *ρ* = corrected population correlation; *SDρ* = standard deviation– of the corrected population correlation; *% Var. Acc. for* = percentage of variance accounted for by sampling error and artifact corrections; *95% CV$_L$* = lower 95% credibility value.

Table 17

Meta–Analytic Results for the Relationship Between Team Openness to Experience and Team Performance Moderated by Study Setting Nested Within Operationalization

Variable	*k*	*N*	*SWM r*	*SW SD*	*% Var. due to Sampling Error*	*95% Conf. Int.*		*ρ*	*SDρ*	*% Var. Acc. for*	*95% CV $_L$*
						L	*U*				
Mean											
Lab	7	466	0.06	0.16	58.41	-0.03	0.16	0.08	0.13	58.44	-0.13
Additive	2	188	0.13	0.12	68.42	-0.02	0.27	0.16	0.09	68.64	0.01
Field	3	126	0.19	0.17	79.73	0.02	0.36	0.22	0.09	80.10	0.07
Additive	0	—	—	—	—	—	—	—	—	—	—
Maximum											
Lab	3	245	0.04	0.05	100.00	-0.08	0.17	0.06	0.00	100.00	0.06
Disjunctive	0	—	—	—	—	—	—	—	—	—	—
Field	3	123	0.14	0.13	100.00	-0.03	0.31	0.16	0.00	100.00	0.16
Disjunctive	0	—	—	—	—	—	—	—	—	—	—
Minimum											
Lab	3	245	0.00	0.22	26.79	-0.13	0.12	0.00	0.23	26.79	-0.38
Conjunctive	3	245	0.00	0.22	26.79	-0.13	0.12	0.00	0.23	26.79	-0.38
Field	4	205	0.07	0.12	100.00	-0.06	0.21	0.09	0.00	100.00	0.09
Conjunctive	2	44	-0.03	0.05	100.00	-0.33	0.27	-0.03	0.00	100.00	-0.03
Heterogeneity											
Lab	3	192	0.09	0.10	100.00	-0.05	0.23	0.11	0.00	100.00	0.11
Compensatory	0	—	—	—	—	—	—	—	—	—	—
Field	3	126	-0.06	0.06	100.00	-0.24	0.11	-0.07	0.00	100.00	-0.07
Compensatory	1	82	-0.07	—	—	—	—	—	—	—	—

Note. Overall *k* and *N* may not be equal the sum of the nested moderators listed because values for some operationalizations are not presented at the moderator level if there was only one correlation and there was no *a priori* hypothesis. Results are corrected for predictor and criterion unreliability. Artifact distributions of the design variable and criterion of interest were used for corrections. *k* = number of correlations; *N* = number of teams; *SWMr* = sample–weighted mean correlation; *SWSD* = sample–weighted standard deviation; *% Var. due to Sampling Error* = percentage of variance due to sampling error; *95% Conf. Int. L* = lower 95% confidence interval; *95% Conf. Int. U* = upper 95% confidence interval; *ρ* = corrected population correlation; *SDρ* = standard deviation of the corrected population correlation; *% Var. Acc. for* = percentage of variance accounted for by sampling error and artifact corrections; *95% CV$_L$* = lower 95% credibility value.

maximum to team performance in field settings. The team mean and maximum operationalizations of team openness to experience were moderately intercorrelated with a sample–weighted mean correlation of 0.60. The hierarchical regressions revealed that maximum did not account for variance beyond the mean ($\Delta R^2 = 0.00$, $p = 0.72$) and the mean accounted for only a small amount of variance in performance beyond maximum ($\Delta R^2 = 0.02$, $p = 0.15$; see Table 18). These results suggest that the two operationalization had considerable overlap in predicting team performance, but that the mean may subsume the predictive power of the maximum and be the single best operationalization.

Table 18
Hierarchical Regressions of Team Mean and Maximum Operationalizations of Team Openness to Experience on Team Performance

Step	Operationalization Added	β	R	R^2	ΔR^2
Descending order of entry based on *SWMr* (largest to smallest *SWMr*)					
1	Mean	0.17	0.19	0.04*	
2	Maximum	0.04	0.19	0.04	0.00
Ascending order of entry based on *SWMr* (smallest to largest *SWMr*)					
1	Maximum	0.04	0.14	0.02	
2	Mean	0.17	0.19	0.04	0.02

Note. $N = 118$. βs are based on the final step in the model. *$p < 0.05$.

In summary, team openness to experience had a small relationship with team performance in field settings and a negligible relationship with team performance in lab studies. However, study setting (lab or field) had considerable overlap with the type of team moderator. In field settings, openness to experience appears to be best operationalized as the team mean.

Demographic Variables

The Hypothesis 7a posited that taskwork–related demographic variables (e.g., educational background, organizational tenure) would be related to team performance and Hypothesis 7b stated that the taskwork–related demographic variables/team performance relationships would be strongest when taskwork–related variables were operationalized as the team mean or proportion. Results are presented in Table 19. In support of the hypotheses, educational background and tenure with the organization were positively related to team performance; the strongest relationships where when these variables were operationalized as the team mean. The data indicate that the higher the team's average years of education the better team performance (ρ = 0.10; 95% CV_L = 0.03), and the greater average team organizational tenure, the better the team performance (ρ = 0.18; 95% CV_L = 0.00). Functional background was not related to team performance; however, in the majority of the correlations team functional background was operationalized using the heterogeneity operationalization.

The second demographic variable hypothesis stated that the teamwork–related demographic variables (e.g., age, race) would be related to team satisfaction (H7c) and that these variables would be best operationalized as heterogeneity (a configural

Table 19

Meta–Analytic Results for the Relationship Between Taskwork–Related Demographic Variables and Team Performance Moderated by Operationalization

Variable	*k*	*N*	*SWM r*	*SW SD*	*% Var.due to Sampling Error*	*95% Conf. Int.*		*ρ*	*SDρ*	*% Var. Acc. for*	*95% CV $_L$*
						L	*U*				
Educational Background	15	1,321	0.08	0.12	85.23	0.03	0.13	0.09	0.04	85.34	0.01
Mean	9	1,032	0.09	0.12	64.64	0.03	0.15	0.10	0.08	64.79	0.03
Heterogeneity	6	289	0.05	0.11	100.00	-0.07	0.16	0.05	0.00	100.00	0.05
Tenure with Organization	21	2,183	0.12	0.15	43.08	0.08	0.16	0.14	0.12	43.26	-0.07
Mean	11	1,437	0.16	0.13	44.42	0.11	0.21	0.18	0.11	44.82	0.00
Heterogeneity	10	746	0.05	0.16	55.88	-0.02	0.12	0.06	0.12	55.90	-0.13
Functional Background	18	1,151	-0.02	0.17	54.41	-0.08	0.04	-0.02	0.13	51.41	-0.23
Mean	1	44	0.28	—	—	—	—	—	—	—	—
Heterogeneity	16	1,028	-0.02	0.17	56.31	-0.08	0.04	-0.03	0.12	56.32	-0.23

Note. Overall *k* and *N* may not be equal the sum of the nested moderators listed because values for some operationalizations are not presented at the moderator level if there was only one correlation and there was no *a priori* hypothesis. Results are corrected for criterion unreliability. Artifact distributions of the design variable and criterion of interest were used for corrections. *k* = number of correlations; *N* = number of teams; *SWMr* = sample–weighted mean correlation; *SWSD* = sample–weighted standard deviation; *% Var. due to Sampling Error* = percentage of variance due to sampling error; *95% Conf. Int. L* = lower 95% confidence interval; *95% Conf. Int. U* = upper 95% confidence interval; *ρ* = corrected population correlation; *SDρ* = standard deviation of the corrected population correlation; *% Var. Acc. for* = percentage of variance accounted for by sampling error and artifact corrections; *95% CV_L* = lower 95% credibility value.

operationalization; H7d). In support of hypothesis H7c, results based on limited data and presented in Table 20 suggest that the race and sex heterogeneity were related to team satisfaction (and more strongly related to satisfaction than team performance). The effects for teamwork–related demographic variables on team performance were generally negligible with the largest effect for race such that as the team heterogeneity of race increased, team performance decreased (ρ = –0.09; 95% CV_L = –0.20), however, the 95% CV_L was below zero. Further, the trend over two correlations suggests that as team heterogeneity of race increased, team satisfaction increased (ρ = 0.18; 95% CV_L = 0.18).

The majority of correlations that reflected the relationship between team demographic variables and team performance were from field settings, thus setting was not assessed as a moderator. Instead Tables 21 and 22 present the demographic/team effectiveness relationships with the lab studies removed. The results remained relatively unchanged due to the limited number of lab correlations in the data presented in Tables 19 and 20.

Preference for Teamwork

Hypothesis 8 posited that preference for teamwork would be positively related to team satisfaction. Results are presented in Table 23. Only two studies reported a relationship between preference for teamwork and team satisfaction. The effect was in the hypothesized direction with a large effect size (ρ = 0.66; 95% CV_L = 0.25) suggesting that as the team members' preference for teamwork increased, team satisfaction increased. There were several additional correlations that represented the

Table 20

Meta–Analytic Results for the Relationship Between Teamwork–Related Demographic Variables and Team Performance and Team Satisfaction Moderated by Operationalization

Variable	*k*	*N*	*SWM r*	*SW SD*	*% Var.due to Sampling Error*	*95% Conf. Int.* *L*	*95% Conf. Int.* *U*	*ρ*	*SDρ*	*% Var. Acc. for*	*95% CV $_L$*
Performance											
Race	10	709	-0.14	0.17	49.16	-0.21	-0.07	-0.16	0.13	49.35	-0.37
Mean	1	126	-0.38	—	—	—	—	—	—	—	—
Heterogeneity	9	583	-0.09	0.14	81.96	-0.17	-0.01	-0.09	0.06	82.07	-0.20
Sex	19	1,207	0.03	0.15	67.91	-0.03	0.08	0.03	0.10	67.92	-0.13
Mean %	10	598	0.06	0.15	73.42	-0.02	0.14	0.07	0.10	73.50	-0.09
Heterogeneity	9	609	-0.01	0.15	68.83	-0.09	0.07	-0.01	0.09	68.83	-0.16
Age	21	1,849	0.01	0.10	100.00	-0.04	0.06	0.01	0.00	100.00	0.01
Mean	6	917	0.04	0.04	100.00	-0.03	0.10	0.04	0.00	100.00	0.04
Heterogeneity	15	932	-0.02	0.13	96.84	-0.08	0.05	-0.02	0.03	96.85	-0.06
Satisfaction											
Educational Background	2	147	0.01	0.06	100.00	-0.16	0.17	0.01	0.00	100.00	0.01
Race (Heterogeneity only)	2	155	0.17	0.05	100.00	0.01	0.32	0.18	0.00	100.00	0.18
Sex	4	302	-0.07	0.10	100.00	-0.18	0.05	-0.07	0.00	100.00	-0.07
Heterogeneity	3	209	-0.07	0.11	100.00	-0.21	0.06	-0.08	0.00	100.00	-0.08
Age	4	302	0.08	0.13	78.63	-0.03	0.19	0.09	0.06	78.84	-0.02
Heterogeneity	3	209	0.01	0.08	100.00	-0.13	0.14	0.01	0.00	100.00	0.01

Note. Overall *k* and *N* may not be equal the sum of the nested moderators listed because values for some operationalizations are not presented at the moderator level if there was only one correlation and there was no *a priori* hypothesis. Results are corrected for criterion unreliability. Artifact distributions of the design variable and criterion of interest were used for corrections. *k* = number of correlations; *N* = number of teams; *SWMr* = sample–weighted mean correlation; *SWSD* = sample–weighted standard deviation; *% Var. due to Sampling Error* = percentage of variance due to sampling error; *95% Conf. Int. L* = lower 95% confidence interval; *95% Conf. Int. U* = upper 95% confidence interval; *ρ* = corrected population correlation; *SDρ* = standard deviation of the corrected population correlation; *% Var. Acc. for* = percentage of variance accounted for by sampling error and artifact corrections; *95%* CV_L = lower 95% credibility value.

Table 21

Meta–Analytic Results for the Relationship Between Taskwork–Related Demographic Variables and Team Performance Moderated by Operationalization (Field Studies Only)

Variable	*k*	*N*	*SWM r*	*SW SD*	*% Var. due to Sampling Error*	*95% Conf. Int.*		*ρ*	*SDρ*	*% Var. Acc. for*	*95% CV_L*
						L	*U*				
Educational Background	13	1203	0.08	0.11	80.44	0.02	0.13	0.08	0.05	80.57	-0.02
Mean	7	914	0.09	0.11	57.63	0.02	0.15	0.09	0.08	57.79	-0.04
Heterogeneity	6	289	0.04	0.11	100.00	-0.06	0.16	0.05	0.00	100	0.05
Tenure with Organization	21	2,183	0.12	0.15	43.08	0.08	0.16	0.14	0.12	43.29	-0.07
Mean	11	1,437	0.16	0.13	44.41	0.11	0.21	0.18	0.11	44.89	0.00
Heterogeneity	10	746	0.05	0.16	55.88	-0.02	0.12	0.06	0.12	55.91	-0.13
Functional Background	14	871	-0.01	0.17	58.12	-0.07	0.06	-0.01	0.12	58.12	-0.20
Mean	1	44	0.28	—	—	—	—	—	—	—	—
Heterogeneity	13	827	-0.02	0.16	63.81	-0.09	0.04	-0.02	0.11	63.82	-0.20

Note. Overall *k* and *N* may not be equal the sum of the nested moderators listed because values for some operationalizations are not presented at the moderator level if there was only one correlation and there was no *a priori* hypothesis. Results are corrected for criterion unreliability. Artifact distributions of the design variable and criterion of interest were used for corrections. *k* = number of correlations; *N* = number of teams; *SWMr* = sample–weighted mean correlation; *SWSD* = sample–weighted standard deviation; *% Var. due to Sampling Error* = percentage of variance due to sampling error; *95% Conf. Int. L* = lower 95% confidence interval; *95% Conf. Int. U* = upper 95% confidence interval; *ρ* = corrected population correlation; *SDρ* = standard deviation of the corrected population correlation; *% Var. Acc. for* = percentage of variance accounted for by sampling error and artifact corrections; *95% CV_L* = lower 95% credibility value.

Table 22

Meta–Analytic Results for the Relationship Between Teamwork–Related Demographic Variables and Team Performance and Team Satisfaction Moderated by Operationalization (Field Studies Only)

Variable	*k*	*N*	*SWM r*	*SW SD*	*% Var. due to Sampling Error*	*95% Conf. Int.*		*ρ*	*SDρ*	*% Var. Acc. for*	*95% CV*
						L	*U*				
Peformance											
Race	7	450	-0.15	0.19	40.44	-0.24	-0.06	-0.17	0.16	40.62	-0.55
Mean	1	126	-0.38	—	—	—	—	—	—	—	—
Heterogeneity	6	324	-0.05	0.15	81.77	-0.17	0.05	-0.06	0.07	81.81	-0.18
Sex	10	557	-0.03	0.16	72.13	-0.11	0.06	-0.03	0.09	72.14	-0.18
Mean	3	178	-0.01	0.10	100.00	-0.16	0.14	-0.01	0.00	100.00	-0.01
Heterogeneity	7	378	-0.04	0.18	58.54	-0.14	0.07	-0.04	0.13	58.55	-0.25
Age	15	1,346	0.01	0.11	100.00	-0.05	0.06	0.01	0.00	100.00	0.01
Mean	3	672	0.05	0.02	100.00	-0.03	0.12	0.05	0.00	100.00	0.05
Heterogeneity	12	674	-0.03	0.14	94.29	-0.11	0.05	-0.03	0.04	94.31	-0.09
Satisfaction											
Race (Heterogeneity Only)	2	155	0.17	0.05	100.00	0.01	0.32	0.18	0.00	100.00	0.18
Sex	4	302	-0.07	0.10	100.00	-0.18	0.05	-0.07	0.00	100.00	-0.07
Heterogeneity	3	209	-0.07	0.11	100.00	-0.21	0.06	-0.08	0.00	100.00	-0.08
Age	4	302	0.08	0.13	78.63	-0.03	0.19	0.09	0.06	78.84	-0.02
Heterogeneity	3	209	0.01	0.08	100.00	-0.13	0.14	0.01	0.00	100.00	0.01

Note. Overall *k* and *N* may not be equal the sum of the nested moderators listed because values for some operationalizations are not presented at the moderator level if there was only one correlation and there was no *a priori* hypothesis. Results are corrected for criterion unreliability. Artifact distributions of the design variable and criterion of interest were used for corrections. *k* = number of correlations; *N* = number of teams; *SWMr* = sample–weighted mean correlation; *SWSD* = sample–weighted standard deviation; *% Var. due to Sampling Error* = percentage of variance due to sampling error; *95% Conf. Int. L* = lower 95% confidence interval; *95% Conf. Int. U* = upper 95% confidence interval; *ρ* = corrected population correlation; *SDρ* = standard deviation of the corrected population correlation; *% Var. Acc. for* = percentage of variance accounted for by sampling error and artifact corrections; *95%* CV_L = lower 95% credibility value.

Table 23

Meta–Analytic Results for the Relationship Between Preference for Teamwork and Team Performance and Team Satisfaction

Variable	*k*	*N*	*SWM r*	*SW SD*	*% Var. due to Sampling Error*	*95% Conf. Int.*		*ρ*	*SDρ*	*% Var. Acc.for*	*95% CV$_L$*
						L	*U*				
Peformance	15	804	0.09	0.18	54.65	0.02	0.16	0.11	0.15	54.78	-0.14
Mean	10	459	0.15	0.19	59.96	0.06	0.25	0.19	0.14	60.32	-0.05
Lab	5	218	0.12	0.23	43.70	-0.01	0.25	0.15	0.21	43.72	-0.19
Field	5	241	0.19	0.14	100.00	0.06	0.31	0.22	0.00	100.00	0.22
Heterogeneity (Lab only)	4	270	0.01	0.16	58.56	-0.11	0.13	0.01	0.12	58.56	-0.19
Setting											
Lab (Intellectual only)	9	488	0.06	0.20	45.73	-0.03	0.15	0.07	0.18	45.74	-0.22
Field	6	316	0.14	0.14	95.22	0.03	0.25	0.17	0.03	95.84	0.12
Intellectual	2	83	0.29	0.06	100.00	0.09	0.49	0.34	0.00	100.00	0.34
Physical	3	206	0.12	0.11	100.00	-0.02	0.25	0.14	0.00	100.00	0.14
Other/Mixed	1	27	-0.09	—	—	—	—	—	—	—	—
Satisfaction											
Mean (Field only)	2	80	0.56	0.25	19.69	0.41	0.72	0.66	0.25	23.89	0.25

Note. Overall *k* and *N* may not be equal the sum of the nested moderators listed because values for some operationalizations are not presented at the moderator level if there was only one correlation and there was no *a priori* hypothesis. Results are corrected for predictor and criterion unreliability. Artifact distributions of the design variable and criterion of interest were used for corrections. *k* = number of correlations; *N* = number of teams; *SWMr* = sample–weighted mean correlation; *SWSD* = sample–weighted standard deviation; *% Var. due to Sampling Error* = percentage of variance due to sampling error; *95% Conf. Int. L* = lower 95% confidence interval; *95% Conf. Int. U* = upper 95% confidence interval; *ρ* = corrected population correlation; *SDρ* = standard deviation of the corrected population correlation; *% Var. Acc. for* = percentage of variance accounted for by sampling error and artifact corrections; *95% CV$_L$* = lower 95% credibility value.

preference for teamwork and team performance relationship (*k* = 15). Overall, there was a small effect between preference for teamwork and team performance although the 95% CV_L was less than zero (ρ = 0.11; 95% CV_L = –0.14). Further, with only a fair amount (54.78%) of the variance accounted for by artifact corrections, it seemed plausible that additional moderators may be present. Consequently, when operationalization (mean or heterogeneity) and study setting were assessed as moderators, a stronger relationship emerged in field settings between the mean operationalization of preference for teamwork and team performance (ρ = 0.22; 95% CV_L = 0.22).

Teamwork–Related and Taskwork–Related Predictors and Interdependence

Hypothesis 9a stated that compared to teamwork–related predictors (i.e., agreeableness, extraversion, emotional stability), taskwork–related predictors (i.e., GMA, task–relevant expertise, conscientiousness) would be more strongly related to team performance. In support of Hypothesis 9a, results presented in Table 24 suggest a larger effect for taskwork–related predictors and team performance (ρ = 0.19; 95% CV_L = –0.16) than for teamwork–related predictors and team performance (ρ = 0.09; 95% CV_L = –0.12) although both 95% CV_L were less than zero. Hypothesis 9b posited that as team interdependency increased, the strength of the teamwork–related predictors/team performance relationship would approach the strength of the taskwork–related predictor/team performance relationship. Results are presented in Table 24. Using the workflow typology presented by Tesluk et al. (1997) as an indicator of the level of team interdependency, a clear pattern did not emerge. Except for pooled levels, the relationship between taskwork–related variables and team performance was smaller for teams that were more interdependent. For the teamwork–related variable/team performance relationships, except for the intensive level of interdependency, the relationships was stronger for teams that were more interdependent.

Table 24
Meta–Analytic Results for the Relationship Between Teamwork–Related and Taskwork–Related Predictors and Team Performance Across Tesluk et al.'s (1997) Workflow Interdependency Levels

	Taskwork-Related				Teamwork-Related			
	k	*N*	*ρ*	*95% CV$_L$*	*k*	*N*	*ρ*	*95% CV$_L$*
Overall	119	8,819	0.19	-0.16	106	5,368	0.09	-0.12
Pooled	8	818	0.20	-0.01	1	109	-0.08	—
Sequential	23	1,791	0.27	-0.08	16	967	0.11	-0.12
Reciprocal	49	3,410	0.16	-0.15	63	2,962	0.14	-0.08
Intensive	14	335	0.12	0.02	11	265	0.02	0.02

Note. Overall does not equal the sum of the four interdependency types because some articles did not report enough information for the correlation to be meaningfully classified according to Tesluk et al.'s interdependency types. Results are corrected for predictor and criterion unreliability. Artifact distributions of the design variable and criterion of interest were used for corrections. *k* = number of correlations; *N* = number of teams; *ρ* = corrected population correlation; *95% CV$_L$* = lower 95% credibility value.

The next hypothesis stated that compared to teamwork–related predictors (i.e., agreeableness, extraversion, emotional stability), taskwork–related predictors (i.e., GMA, task–relevant expertise, conscientiousness) would have weaker relationships with team satisfaction (H9c). Although there were five correlations that assessed the taskwork–related predictor/satisfaction relationship, there were no correlations that represented the relationship between teamwork–related predictors and team satisfaction. Thus, hypothesis H9c could not be tested.

Relative Contributions of the Team Composition Variables

As previously mentioned, one of the strengths of the comprehensiveness of this meta–analysis is that it lends itself to a comparison of the relative contribution of the team composition variables. To further explore the relative contribution of the different operationalizations, exploratory hierarchical regressions were run on the different taskwork–related and teamwork–related predictors. Because study setting (or team type) consistently moderated the team composition variable/team performance relationships, such that personality variables only were related to team performance in field settings, the relative contributions of the team composition variables were tested only for the predictors in field settings. Because of the large number of predictors included in the study, and the redundancy of the operationalizations for each predictor, only the operationalization with the strongest relationship with team performance for each predictor was entered into the regression. Predictor variables were entered in descending order (largest to smallest) and also ascending order (smallest to largest) based on sample–weighted mean correlations between the predictor using the best operationalization and team performance. Results are presented in Table 25.

Intercorrelations between the predictors (e.g., team mean GMA and team mean extraversion) were typically much smaller than the intercorrelations of the different operationalizations of the same predictor. The small intercorrelations between the predictors is reflected in the hierarchical regression in that with the exception of team

Table 25

Hierarchical Regressions of Team Composition Variables on Team Performance

Step	Predictor Added	β	R	R^2	ΔR^2
Descending order of entry based on *SWMr* (largest to smallest *SWMr*)					
1	Minimum Agreeableness	0.24***	0.31	0.10***	
2	Mean Conscientiousness	0.17*	0.39	0.15***	0.06***
3	Task Relevant Expertise	0.19**	0.43	0.19***	0.03**
4	Mean Emotional Stability	0.14	0.45	0.20***	0.02
5	Mean GMA	0.13	0.47	0.22***	0.02
6	Mean Openness to Experience	0.13	0.48	0.23***	0.02
7	Maximum Extraversion	–0.01	0.48	0.23***	0.00
Ascending order of entry based on *SWMr* (smallest to largest *SWMr*)					
1	Maximum Extraversion	–0.01	0.14	0.02	
2	Mean Openness to Experience	0.13	0.23	0.05*	0.02
3	Mean GMA	0.13	0.28	0.08**	0.03*
4	Mean Emotional Stability	0.14	0.33	0.11**	0.03*
5	Task Relevant Expertise	0.19**	0.40	0.16***	0.05***
6	Mean Conscientiousness	0.17*	0.43	0.18***	0.02*
7	Minimum Agreeableness	0.24***	0.48	0.23***	0.05***

Note. $N = 108$. βs are based on the final step in the model. * $p < .10$, ** $p < .05$, *** $p < .01$.

extraversion, all predictors accounted for at least a small amount of unique variance in team performance in both ascending and descending regressions. When predictors were entered in descending order, team maximum extraversion did not account for a unique amount of variance beyond the other predictors when entered last. When variables were entered in ascending order, all variables contributed at least a small amount of unique variance beyond maximum extraversion and the other predictor variables. As the results presented in Table 25 indicate, in total, the included team composition variables accounted for 23% of the variance in team performance. This percentage of variance explained in team performance by the team composition variables is slightly underestimated. Because the regression is based on the sample–weighted mean correlations rather than the corrected population correlation, the relationship is not corrected for unreliability of the predictor and criterion.

Task Design

The hypothesis that team task design that is consistent with effective job design principles (i.e., increased task variety, task significance, task identity, task feedback) would result in higher team performance was confirmed (H10a). The results are presented in Table 26. Twenty–nine correlations reflected the relationship between team task design variables and team performance. Results indicate a small to medium effect (ρ = 0.21; 95% CV_L = –0.01) for the relationship although the 95% CV_L was less than zero. All except for two of the correlations were from field settings. When the two lab correlations were removed from the analyses, the relationship between team task design variables and team performance was slightly larger and the 95% CV_L was no longer less

Table 26

Meta–Analytic Results Between Team Task Design and Team Performance

Variable	*k*	*N*	*SWM r*	*SW SD*	*% Var. due to Sampling Error*	*95% Conf. Int.*		*ρ*	*SDρ*	*% Var. Acc. for*	*95% CV_L*
						L	*U*				
Overall (Lab and Field)	29	2,764	0.17	0.15	46.66	0.13	0.20	0.21	0.13	47.58	-0.01
Overall (Field Only)	27	2,476	0.19	0.14	50.34	0.15	0.22	0.23	0.12	51.64	0.03
Task Variety	10	1,087	0.16	0.09	100.00	0.10	0.22	0.20	0.00	100.00	0.20
Task Identity	5	398	0.14	0.14	63.70	0.05	0.24	0.18	0.11	64.28	0.01
Task Significance	12	1,048	0.17	0.19	29.04	0.11	0.23	0.21	0.20	29.52	-0.12
Task Significance (Field Only)	10	760	0.23	0.19	32.43	0.17	0.30	0.29	0.20	33.45	-0.03
Task Feedback	2	231	0.21	0.11	72.70	0.08	0.33	0.24	0.06	73.69	0.14
Task Complexity	4	204	-0.01	0.11	100.00	-0.14	0.13	-0.01	0.00	100.00	-0.01

Note. Results are corrected for predictor and criterion unreliability. Artifact distributions of the design variable and criterion of interest were used for corrections. *k* = number of correlations; *N* = number of teams; *SWMr* = sample–weighted mean correlation; *SWSD* = sample–weighted standard deviation; *% Var. due to Sampling Error* = percentage of variance due to sampling error; *95% Conf. Int. L* = lower 95% confidence interval; *95% Conf. Int. U* = upper 95% confidence interval; *ρ* = corrected population correlation; *SDρ* = standard deviation of the corrected population correlation; *% Var. Acc. for* = percentage of variance accounted for by sampling error and artifact corrections; *95% CV_L* = lower 95% credibility value.

than zero (ρ = 0.23; 95% CV_L = 0.03). Further, both of these lab correlations represented the task significance/team performance relationship. Thus, when the lab studies were removed there was a small increase in the task significance/team performance relationship (from ρ = 0.21 to ρ = 0.29). The specific task design variables (e.g., task identify, task significance) had similar relationships with team performance. The corrected population correlations ranged from 0.18 to 0.29 suggesting consistent small to medium effects across the specified task design variables. In addition to the task design variables mentioned thus far, there were four correlations that represented the task complexity and team performance relationship. H10d stated that increases in task complexity would result in decreases in team performance. Results are presented in Table 27 and indicate no effect (ρ = –0.01; 95% CV_L = –0.01); team task complexity was not related to team performance.

Team Structure

Team structure is concerned with team relationships that determine the allocation of tasks, responsibilities, and authority. The first team structure hypothesis posited that distribution of authority that supports higher autonomy (e.g., no assigned leader, self–managing) would result in higher team performance (H11a). Results for team structure variables are presented in Table 27. The relationship between the degree of self–management and team performance was assessed by several correlations (k = 20) and resulted in a corrected population correlation of 0.22 (95% CV_L = –0.02), although the 95% CV_L was less than zero. All of these correlations were obtained from studies conducted in field settings. The results suggest that team performance increased as the

Table 27

Meta–Analytic Results for Team Structure Variables and Team Performance

Variable	*k*	*N*	*SWM r*	*SW SD*	*% Var. due to Sampling Error*	*95% Conf. Int.* *L*	*95% Conf. Int.* *U*	*ρ*	*SDρ*	*% Var. Acc. for*	*95% CV_L*
Self-Managing (Field only)	20	1,654	0.18	0.16	43.28	0.14	0.23	0.22	0.15	43.77	-0.02
Relative Size (Field only)	5	306	0.12	0.17	57.44	0.01	0.23	0.13	0.12	57.58	-0.06
Actual Size (Lab and Field)	40	2,586	0.03	0.17	56.26	-0.01	0.07	0.03	0.12	56.27	-0.17
Lab	11	806	0.00	0.11	100.00	-0.07	0.07	-0.01	0.00	100.00	-0.01
Field	29	1,780	0.05	0.18	48.58	0.00	0.09	0.05	0.15	48.60	-0.19

Note. Overall *k* and *N* may not be equal the sum of the nested moderators listed because values for some operationalizations are not presented at the moderator level if there was only one correlation and there was no *a priori* hypothesis. Results are corrected for predictor and criterion unreliability except for actual team size which are corrected for criterion unreliability only. Artifact distributions of the design variable and criterion of interest were used for corrections. *k* = number of correlations; *N* = number of teams; *SWMr* = sample–weighted mean correlation; *SWSD* = sample–weighted standard deviation; *% Var. due to Sampling Error* = percentage of variance due to sampling error; *95% Conf. Int. L* = lower 95% confidence interval; *95% Conf. Int. U* = upper 95% confidence interval; *ρ* = corrected population correlation; *SDρ* = standard deviation of the corrected population correlation; *% Var. Acc. for* = percentage of variance accounted for by sampling error and artifact corrections; *95%* CV_L = lower 95% credibility value.

degree of team self–management increased. However, there was a large amount of variability around the effect suggesting that there may be additional moderators present.

Hypothesis 12a stated that compared to actual team size, relative team size would be more strongly related to team performance. In support of the hypothesis, results presented in Table 27 indicate a larger effect for relative team size (ρ = 0.13; 95% CV_L = –0.06) than for actual team size (ρ = 0.05; 95% CV_L = –0.19). Hypothesis 12b suggested that using the relative team size operationalization, team sizes that are rated as appropriate relative to the task would be related to increases in team performance. As hypothesized, the results indicate a corrected population correlation between relative team size and team performance of 0.13 (95% CV_L = –0.06) although the 95% CV_L was less than zero.

A final hypothesis for team size proposed that there would be a point at which the actual team size was too large and team size would be negatively related to team performance (H12c), viability (H12d), and satisfaction (H12e). To inspect this relationship, the average team size was plotted against the average team effectiveness. To compare across studies, means of the team effectiveness measures were standardized to a 7–point scale. A limited number of studies reported enough information to be included in this graph. Many studies did not report both an average team size and enough information to standardize the effectiveness measure to a 7–point scale (e.g., many did not report the range for the response formats or used objective data that did not have a theoretical range of values for the team effectiveness variable). The results are presented in Figure 2.

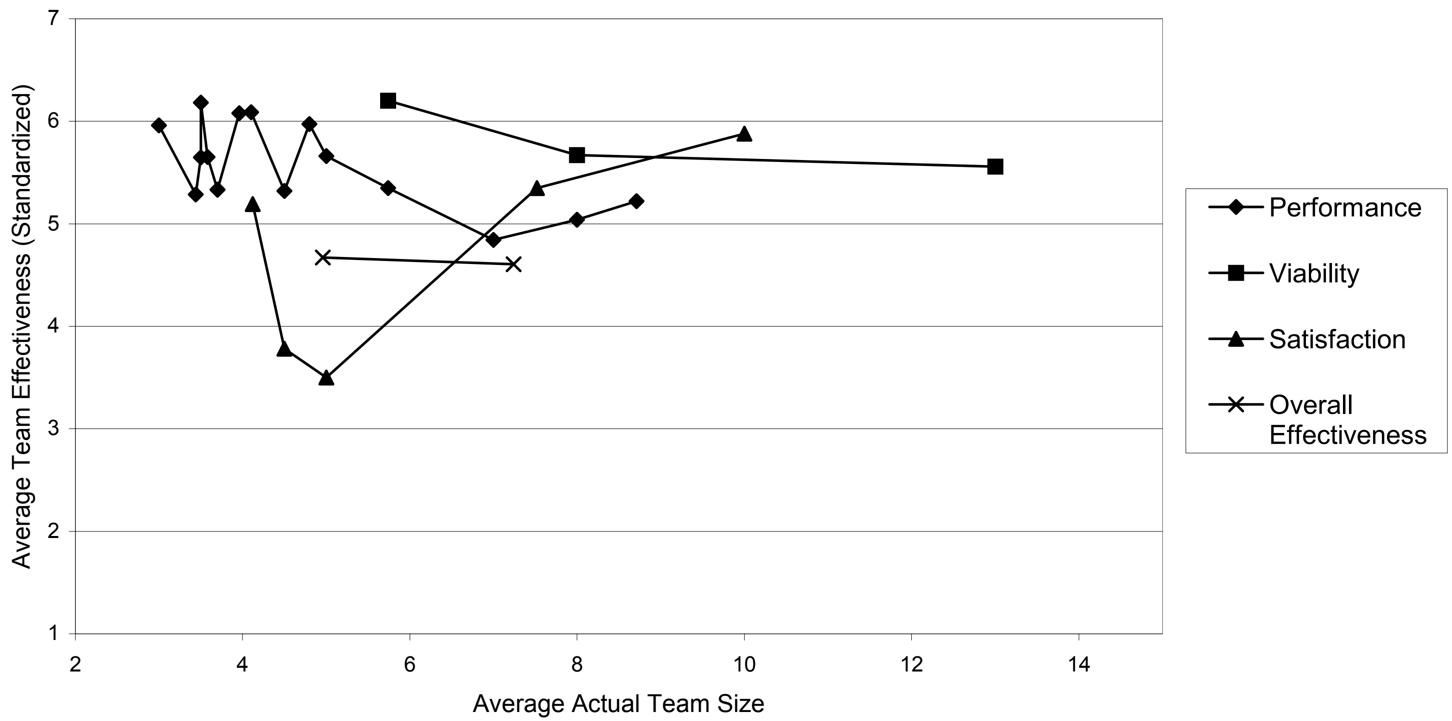

Figure 2. The relationship between average actual team size and average team effectiveness.

and do not appear to reflect any particular pattern. Thus, Hypotheses 12c, H12d, and H12e were not supported.

The last hypothesis suggested that teams that have levels of outcome interdependence consistent with levels of task interdependence would have better performance (H13). Because only two articles assessed the relationship between outcome interdependence and team effectiveness at varying levels of task interdependence (i.e., Saavedra, Early, & VanDyne, 1993; Wageman & Baker, 1997), this hypothesis was not assessed meta–analytically. However, as a descriptive statement, consistent with the hypothesis, both of these articles indicated that for high levels of task independence, teams with team–level goals (Wageman & Baker, 1997) or team–level goals and feedback (Saavedra et al., 1993) performed better than those with individual–level goals.

There were a large number of studies that assessed either the relationship between task interdependency and team performance or the relationship between outcome interdependency and team performance. The results, which are presented in Table 28, indicate a small positive relationship (ρ = 0.16; 95% CV_L = 0.01) between degree of task interdependency and team performance, suggesting that as ratings of task interdependency increase, team performance increases. In addition, team outcome interdependency demonstrated a positive medium effect with team performance although the 95% CV_L was less than zero (ρ = 0.28; 95% CV_L = –0.10). This relationship appeared to be moderated by the type of outcome interdependence with mean population correlations ranging from 0.19 to 0.58 for reward interdependence and mixed (reward

Table 28

Meta–Analytic Results for Task and Outcome Interdependency and Team Performance

Variable	*k*	*N*	*SWM r*	*SW SD*	*% Var. due to Sampling Error*	*95% Conf. Int.*		*ρ*	*SDρ*	*% Var. Acc. for*	*95% CV_L*
						L	*U*				
Task interdep.	14	954	0.12	0.14	74.94	0.06	0.18	0.16	0.09	75.37	0.01
Outcome interdep.	18	1,348	0.21	0.21	39.17	0.16	0.26	0.28	0.23	29.75	-0.10
Mixed outcome interdep.	3	216	0.47	0.18	26.76	0.37	0.57	0.58	0.18	28.55	0.27
Goal interdep.	11	801	0.17	0.18	39.77	0.10	0.24	0.22	0.19	40.10	-0.08
Reward interdep.	4	331	0.13	0.13	66.51	0.03	0.24	0.19	0.11	66.78	0.01

Note. Results are corrected for predictor and criterion unreliability. Artifact distributions of the design variable and criterion of interest were used for corrections. Interdep. = interdependence; *k* = number of correlations; *N* = number of teams; *SWMr* = sample–weighted mean correlation; *SWSD* = sample–weighted standard deviation; *% Var. due to Sampling Error* = percentage of variance due to sampling error; *95% Conf. Int. L* = lower 95% confidence interval; *95% Conf. Int. U* = upper 95% confidence interval; *ρ* = corrected population correlation; *SDρ* = standard deviation of the corrected population correlation; *% Var. Acc. for* = percentage of variance accounted for by sampling error and artifact corrections; *95% CV_L* = lower 95% credibility value.

and goal interdependence) respectively. The majority of the studies were from field settings. Results are presented in Table 29 for the relationships between team interdependence and team performance with the lab studies removed. Results are generally the same with small increases on each of the mean population correlations that originally included some lab studies.

Additional Moderators of the Team Task Design and Team Effectiveness Relationships

Additional moderators were hypothesized to influence the team design variable/team effectiveness relationships. First, the importance of the supportiveness of the organizational context was highlighted as a potential moderator of the team design/team performance relationship. As mentioned in the *Method* section, the articles did not report supportiveness of the organizational context in a way that allowed for the testing of this variable as a moderator of the team design/team effectiveness relationship. However, a few correlations ($k = 6$) represented the relationship between perceived organizational support and team performance. Results are presented in Table 29 and suggest a large effect ($\rho = 0.54$; 95% $CV_L = 0.39$) for perceived organizational support and team performance. Thus, although it was not possible to investigate the supportiveness of the organizational context as a moderator, the large effect for perceived organizational support and team performance serves as an indicator of the construct's importance to the effectiveness of teams.

The next moderator was team tenure. To test the effect of this continuous moderator, WLS regression was employed to see how well team tenure predicted the uncorrected correlations between team design and team performance. Results from the

Table 29

Meta–Analytic Results for Task and Outcome Interdependency and Team Performance (Field Studies Only)

Variable	*k*	*N*	*SWM r*	*SW SD*	*% Var. due to Sampling Error*	*95% Conf. Int.* *L*	*95% Conf. Int.* *U*	*ρ*	*SDρ*	*% Var. Acc. for*	*95% CV $_L$*
Task interdep.	13	681	0.14	0.16	77.09	0.07	0.22	0.19	0.10	77.54	0.03
Outcome interdep.	16	1086	0.22	0.22	27.29	0.16	0.28	0.29	0.25	27.88	-0.12
Mixed outcome interdep.	3	216	0.47	0.18	26.76	0.37	0.57	0.58	0.18	28.55	0.27
Goal interdep.	10	683	0.15	0.19	38.72	0.08	0.22	0.20	0.20	38.98	-0.13
Reward interdep.	3	187	0.18	0.16	58.51	0.04	0.32	0.26	0.15	58.89	0.02
Percieved org. support	6	198	0.41	0.17	78.83	0.29	0.53	0.54	0.09	81.69	0.39

Note. Results are corrected for predictor and criterion unreliability. Artifact distributions of the design variable and criterion of interest were used for corrections. Interdep. = interdependence; org. = organizational; *k* = number of correlations; *N* = number of teams; *SWMr* = sample–weighted mean correlation; *SWSD* = sample–weighted standard deviation; *% Var. due to Sampling Error* = percentage of variance due to sampling error; *95% Conf. Int. L* = lower 95% confidence interval; *95% Conf. Int. U* = upper 95% confidence interval; *ρ* = corrected population correlation; *SDρ* = standard deviation of the corrected population correlation; *% Var. Acc. for* = percentage of variance accounted for by sampling error and artifact corrections; *95% CV$_L$* = lower 95% credibility value.

WLS regression suggested that the amount of time the team had been together did not account for a significant amount of variance in the uncorrected correlations representing the team design variable/team performance effect ($R^2 = 0.00$, $F[1,278] = 0.00$, $p = 0.99$) or the team design variable/team satisfaction effect ($R^2 = 0.00$, $F[1,32] = 0.16$, $p = 0.69$). This suggests that as teams are together longer, the team design variable/team performance relationship and the team design variable/team satisfaction relationship did not change. For the team design variable/team viability relationship, team tenure accounted for a large amount of variance, ($R^2 = 0.30$, $F\ [1, 23] = 10.06$, $p < 0.01$) suggesting that as the team tenure increased the relationship between the team design variables and team viability increased ($\beta = 0.0002$).

In addition, the same WLS regression procedures were employed to test the effect of the time between predictor and criterion collection on the team design variable/team effectiveness relationships. Results indicated that the time between predictor and criterion collection did not account for variance in the uncorrected correlations representing the team design variable/team performance effect ($R^2 = 0.00$, $F[1,454] = 0.51$, $p = 0.47$). The time between predictor and criterion collection was related, however, to the strength of the team design variable/team satisfaction effect ($R^2 = 0.18$, $F[1,43] = 9.61$, $p < 0.01$). Results suggest that as the time between the predictor and criterion collection increased, the relationship between the team design and team satisfaction decreased ($\beta = –0.002$). The time between predictor and criterion collection also moderated the team design variable/team viability effect ($R^2 = 0.14$, $F[1,42] = 6.83$,

$p < 0.01$) such that as the time between the predictor and criterion collection increased, the relationships between the team design variables and team viability decreased (β = –0.24). Thus, whereas the total time the team had been together (i.e., team tenure) resulted in increases in team design variable/team viability relationships, when only the time between predictor and criterion collection was considered, the team design variable/team viability and the team design variable/team satisfaction relationships decreased.

Results Summary

Because a large number of hypotheses were tested in the present study, a summary of the hypotheses and whether or not each was supported is presented in Table 30. The majority of the hypotheses were either supported or at least partially supported. There were also several hypotheses that could not be tested because of an insufficient number of correlations that represented the hypothesized relationship.

Table 30
Summary Table of Hypotheses and Results

Hypotheses				Results
H1	Team GMA will be positively related to:			
		(H1a)	team performance.	*Partially supported*
		(H1b)	team viability.	*Not supported*
		(H1c)	team satisfaction.	*Some support (few rs)*
	(H1d) The team GMA/team effectiveness relationships will be strongest when team GMA is operationalized as the team mean or sum.			*Supported in field* *Partially supported in lab—mean, max, and min were all predictors*

Table 30 (continued)

Hypotheses			Results
H2	Team task–relevant expertise will be positively related to:		
	(H2a)	team performance.	*Supported*
	(H2b)	team viability.	*Could not be tested*
	(H2c)	team satisfaction.	*Could not be tested*
	(H2d) The team task–relevant expertise/team effectiveness relationships will be strongest when team task–relevant expertise is operationalized as the team mean or sum.		*Not supported (few configural rs)*
	Task–relevant expertise type diversity will have a curvilinear relationship:		
	(H2e)	team performance.	*Could not be tested*
	(H2f)	team viability.	*Could not be tested*
	(H2g)	team satisfaction.	*Could not be tested*
H3	Team conscientiousness will be positively related to:		
	(H3a)	team performance.	*Supported in field*
	(H3b)	team viability.	*Supported*
	(H3c)	team satisfaction.	*Some support (few rs)*
	(H3d) The team conscientiousness/team effectiveness relationships will be strongest when conscientiousness is operationalized as the team mean or sum.		*Supported in field*
H4	Team agreeableness will be related to:		
	(H4a)	team performance.	*Supported in field*
	(H4b)	team viability.	*Some support (few rs)*
	(H4c)	team satisfaction.	*Could not be tested*
	(H4d) The team agreeableness/team effectiveness relationships will be strongest when a configural operationalization is used to operationalize team personality.		*Partially supported–min and mean were both predictors*
H5	Team extraversion will be related to:		
	(H5a)	team performance.	*Supported in field*
	(H5b)	team viability.	*Some support (few rs)*
	(H5c)	team satisfaction.	*Could not be tested*
	(H5d) The team extraversion/team effectiveness relationships will be strongest when a configural operationalization is used to operationalize team personality.		*Partially supported–hetero, max, and mean were all predictors*
H6	Team emotional stability will be related to:		
	(H6a)	team performance.	*Supported in field*
	(H6b)	team viability.	*Some support (few rs)*
	(H6c)	team satisfaction.	*Could not be tested*

Table 30 (continued)

Hypotheses		Results
	(H6d) The team emotional stability/team effectiveness relationships will be strongest when a configural operationalization is used to operationalized team personality.	*Partially supported–hetero, max, and mean were all predictors*
H7a	Taskwork–related demographic variables (e.g., educational background, organizational tenure) will be related to team performance.	*Support for Educational Background & Org. Tenure*
H7b	The taskwork–related demographic variables/team performance relationship will be strongest when taskwork–related variables are operationalized as the team mean or proportion.	*Supported*
H7c	Teamwork–related demographic variables (e.g., age, race) will be related to team satisfaction.	*Some support for race (few rs)*
H7d	The teamwork–related demographic variables/team satisfaction relationship will be strongest when teamwork–related demographic variables are operationalized as heterogeneity (e.g., a configural operationalization).	*No support (few rs)*
H8	Preference for teamwork will be positively related to team satisfaction.	*Some support (few rs)*
H9a	Compared to teamwork–related predictors (i.e., agreeableness, extraversion, emotional stability), taskwork–related predictors (i.e., GMA, task–relevant expertise, conscientiousness) will be more strongly related to team performance.	*Supported*
H9b	As team interdependency increases, the strength of the teamwork–related predictors/team performance relationship will be similar to the strength of the taskwork–related predictor/team performance relationship.	*Mixed results*
H9c	Compared to teamwork–related predictors (i.e., agreeableness, extraversion, emotional stability), taskwork–related predictors (i.e., GMA, task–relevant expertise, conscientiousness) will have weaker relationships with team satisfaction.	*Could not be tested*
H10	Team task design that is consistent with effective job design principles (i.e., increased task variety, task significance, task identity, task feedback) will result in higher:	
	(H10a) team performance.	*Supported*
	(H10b) team viability.	*Could not be tested*
	(H10c) team satisfaction.	*Supported*
	H10d: Team task design that results in increases in task complexity will result in decreases in team performance.	*Not supported (few rs)*

Table 30 (continued)

Hypotheses			Results
H11	Conditions of the distribution of authority that support higher autonomy (e.g., no assigned leader, self–managing) will result in higher:		
	(H11a)	team performance.	*Supported*
	(H11b)	team viability.	*Could not be tested*
	(H11c)	team satisfaction.	*Supported (few rs)*
H12a	Compared to actual team size, relative team size will be more strongly related to team performance.		*Some support*
H12b	Using the relative team size operationalization, team sizes that are rated as appropriate relative to the task will be related to increased team performance.		*Supported*
H12 c–e	There will be a point at which the actual team size is too large and team size will be negatively related to team performance.		
	(H12c)	team performance.	*Not Supported*
	(H12d)	team viability.	*Not supported*
	(H12e)	team satisfaction.	*Not supported*
H13	Teams that have levels of outcome interdependence consistent with levels of task interdependence will have better performance, than those with inconsistent levels.		*Could not be tested*

Note. Max = Maximum, Min = Minimum, Hetero = Heterogeneity.

DISCUSSION AND CONCLUSION

Overall, several team design variables within the team composition, team task design, and team structure groupings were related to team effectiveness. Further, many of the team design variable and team performance relationships represented at least a small to medium effect. Consistent with Hackman's (1987) call for the active design and management of teams to improve team effectiveness, many of the team design variables included in the present study appear to be promising means of improving team effectiveness. Several team design variable/team performance effects were notably larger than or similar to other meta–analytic effects observed for team process and performance relationships such as the team cohesion/team performance outcome relationship ($\rho = 0.17$; Beal et al., 2004) and the team conflict/team performance relationship (task conflict $\rho = -0.23$; relationship conflict $\rho = -0.22$; DeDrue & Weingart, 2003). Although designing teams may not be practical in every situation, the results here suggest that when feasible, researchers and practitioners can use team design to impact team performance.

State of the Team Design Literature

Despite consistent assertions in the literature that team effectiveness encompasses more than just team performance and that multiple criteria should be considered when evaluating the "effectiveness" of teams (e.g., Cohen & Bailey, 1997; Guzzo & Dickson, 1996; Hackman, 1987; Kozolowski & Bell, 2003; Sundstrom et al., 1990), the present review found a surprisingly few number of studies that tested the relationship between team design variables and team viability or satisfaction. The disconnect between the importance of team viability and satisfaction noted in the literature and the paucity of empirical research raises the question of whether or not understanding these outcomes is critical or whether team effectiveness should focus solely on team performance. Specifically, it could be argued that team viability and satisfaction are important only to the extent that they are related to team performance.

However, given that teams often remain together for an extended period of time, team viability may be of particular consequence when considering the effectiveness of teams. Survey results of managers and executives by Thompson (2000) suggest that on average teams have been together for 6 to 12 months. Moreover, fifteen percent have been together for 3–5 years and 7% have been together for 5 years or more. In addition, a survey by Devine et al. (1999) found that ongoing teams were more common than ad hoc teams. The longevity of teams was further reflected in the present study; teams in field settings had been together an average of 1.83 years (SD = 1.89 years). Thus, because teams in organizations remain intact for long periods of time, taking into account the capability of the team to work well together in the future (i.e., team viability) is imperative when considering the effectiveness of the team.

Although team satisfaction has also received very little empirical attention in the team design literature, it too may be an important criterion when investigating team effectiveness. Team satisfaction may be related to team performance. Meta–analytic researchers have found a medium sized relationship (ρ = 0.30) between individual–level job satisfaction and job performance (Judge, Thoresen, Bono, & Patton, 2001); a similar relationship may be observed for team satisfaction and team performance. Further, team satisfaction may not only impact the team's present performance, but also the team's capability to be effective in the future (i.e., team viability). Thus, the importance of team satisfaction as a dimension of team effectiveness has yet to be determined. Specifically, what are the consequences of team experiences that frustrate, rather than satisfy, team members for current and future performance?

Team Composition Variables

There were two consistent findings for the team composition variables included in the meta–analysis. The size and presence of relationships between team composition variables and team performance were strongly moderated by the setting in which the studies were conducted (field or lab). However, the present study also revealed a striking bias in the types of teams that are studied in each setting. The study setting had almost complete overlap with the team type, such that nearly all lab studies assessed the performance of intellectual teams (e.g., advisory, command, design) and nearly all field studies assessed the performance of physical teams (e.g., service, production, military). Thus, although it is clear there is a moderator (or moderators) affecting the team composition variable/team performance relationships, it is unclear whether it is study setting, team type, or both. Regardless, the strength of the relationships between the team composition variables and team performance differed across the study setting (or team type). In lab settings (intellectual teams), team GMA and team task–relevant expertise were the best predictors of team performance. The magnitudes of these relationships were strong (team GMA ρ's ranging from 0.35–0.38 for the maximum, mean, and minimum operationalizations; team task–relevant expertise ρ = 0.35). The only other team composition variable that had a relationship with team performance in lab settings (intellectual teams) that was not small (i.e., had a corrected population correlation greater than 0.10) was team mean preference for teamwork (ρ = 0.15). In lab settings (intellectual teams), none of the FFM personality variables had even a small relationship with team performance. In contrast, the strongest team composition predictors of team performance in field settings (physical teams) were team agreeableness (mean operationalization; ρ = 0.38), team conscientiousness (mean operationalization; ρ = 0.29), task–relevant expertise (all operationalizations; ρ = 0.28), team GMA (mean operationalization; ρ = 0.24), team emotional stability (mean operationalization; ρ = 0.24), team openness to experience (mean operationalization; ρ = 0.22), preference for teamwork (mean operationalization; ρ = 0.22), tenure with organization (mean operationalization; ρ = 0.18), and team extraversion (maximum and heterogeneity operationalizations; ρ = 0.16). Thus, whereas relatively few team composition variables were related to team performance in lab settings (intellectual teams), there were several team composition variables related to team performance in field settings (physical teams). Further, the relative importance of the team design variables varied across study setting such that team personality variables had no relationship with team performance in lab settings (intellectual teams), but in contrast, were some of the strongest predictors of team performance in field settings (physical teams).

These results offer some support for Devine's (2002) team typology. Devine suggested that team types differ according to what contributions are needed to be successful. In the present study, intellectual and physical teams had different team design variable/team performance relationships. However, because the two team types had almost complete overlap with the study setting, it is unclear which is responsible for the observed relationships. More research is needed to clarify these relationships. Of particular interest are future investigations of physical teams in lab settings and intellectual teams in field settings. Such investigations will provide information on whether the study setting, the team type, or both moderates the team design variable/team performance relationships. Because of the strong effect these moderators had on the team design variable/team performance relationships, a better understanding of which moderators are having an effect is critical to team design researchers and practitioners. Team type and study setting must be considered when conclusions are drawn regarding the importance of team design variables.

On a related note, a fair number of articles did not provide enough information for the teams to be categorized using the major team and task type taxonomies (e.g., Devine's [2002] team types, Tesluk et al.'s [1997] levels of interdependency, Steiner's [1992] task typology). Given the potential impact of the type of team on the relationships studied, articles reporting investigations of teams should include a comprehensive description of the teams involved in the study. Specifically, a short paragraph should be included that reports the type of team according to Devine's classification system, descriptions of the team tasks, and descriptions of the task interdependence between team members.

The second main finding of the present meta–analysis is that the relationships between team composition variables and team performance were moderated by the operationalization of the individual–level variable to the team level. No single operationalization was best for all composition variables; rather, the best operationalization was dependent on the specific team composition variable of interest. However, in general, consistent with the notion that taskwork–related predictors contribute to the execution of each member's taskwork, and thus the higher team members are on the taskwork–related predictors the better, the team mean was the best operationalization (i.e., conscientiousness, educational background, organizational tenure, GMA) or one of the best operationalizations (i.e., task–relevant expertise) of taskwork–related variables in field settings (physical teams). Teamwork–related variables were not always best operationalized as a configural operationalization as hypothesized. Specifically, the team mean of emotional stability was the best predictor of team performance, suggesting the more emotionally stable all members of the team are, the better the team performance. In addition, the team mean and minimum agreeableness were equivalent in terms of strength of the relationship with team performance in field settings (physical teams).

The results of this study have implications for the concern that simplistic operationalizations may not adequately capture team personality. One implication is that despite the use of simple statistical operationalizations to capture team personality, several of the team personality variable/team performance relationships were quite notable. The prospect of obtaining even stronger relationships if team personality is more adequately captured by a more complex operationalization (Arthur, Bell, et al., 2004) is encouraging for the use of personality variables in team design. A second implication is that results from the hierarchical regressions suggest that for some variables, different operationalizations of the same composition variable explained unique variance in team performance. This may suggest that more complex operationalizations of composition variables that represent several aspects of simple operationalizations (e.g., mean *and* maximum) are needed. In addition to the general effects noted above, some of the specific team design variable/team effectiveness effects are outlined below.

General Mental Ability. Consistent with findings from an earlier meta–analysis on team GMA (Devine & Phillips, 2001), team GMA was related to team performance. However, the larger number of correlations included in the present meta–analysis allowed for additional insights into and a better understanding of the team GMA/team performance relationship. First, Devine and Phillips (2001) concluded that setting moderated the team GMA/team performance relationship. A stronger effect in lab settings compared to field settings was repeated here with similar effect sizes, however, an inspection of the type of teams studied in each setting revealed that correlations from lab settings almost exclusively measured the effect in intellectual teams (e.g., design, command). In field settings, the team GMA/team performance relationship was tested mostly in physical teams (e.g., service teams, production). The degree of overlap leads to uncertainty regarding which variable is moderating the team GMA/team performance relationship. One could easily suggest that intellectual teams may be more demanding of cognitive resources than physical teams and therefore team type might be moderating the team GMA/team performance relationship. Suggesting that cognitive resource demands (and thus, team type) will moderate the team GMA/team performance relationship is consistent with the individual–level research on GMA which has found that the relationship between GMA and job performance varies across job complexity (e.g., Hunter & Hunter, 1984; Salgado et al., 2003).

Further, in field settings (physical teams), the team mean GMA was the best predictor of team performance, whereas in lab settings (intellectual teams) the mean, minimum, and maximum all had similar relationships with team performance. In lab settings, the team mean was highly correlated with the maximum and minimum, and each operationalization explained a unique amount of variance in team performance. This may suggest that for teams that are more demanding of cognitive resources (i.e., intellectual teams), the team GMA/team performance relationship may be more complicated and require more complex operationalizations that consider all dimensions of the team's distribution on the variable (i.e., mean, minimum, maximum).

Task–Relevant Expertise. Team task–relevant expertise had a positive medium relationship with team performance regardless of operationalization, study setting, or team type. It was one of the most consistent predictors of team performance across the investigated moderators. This is likely due to the construct itself. An expertise or ability that is related to the team's task (e.g., a knowledge test in an intellectual team, a driving test for a transportation team) should be related to performance.

Specified Personality Variables. Some of the most striking team composition results were the relatively strong relationships between team personality variables and team performance in field settings (physical teams). However, it is again unclear whether the study setting or the team type is moderating the relationship. Because the team personality effects were observed in field settings, the effects are consistent with the notion that teamwork–related variables may be more related to performance in teams that are intended to do multiple tasks because of the increased coordination demands needed to effectively execute a variety of tasks (Cannon–Bowers et al., 1995). It is likely that teams in field settings, regardless of specific team type (i.e., intellectual or physical) engage in a wider variety of tasks than teams in lab settings. The results obtained here indicate that, for physical teams in field settings, some of the strongest team composition variable/team performance effects were observed for team personality variables. Specifically, the team mean agreeableness explained a substantial amount of variance in team performance (14%, $\rho = 0.38$). The more agreeable members of the team were, the better the performance of the team. Agreeable individuals have been described as considerate, trusting, and friendly. Team members high on these traits may be able to coordinate effectively with each other and increase team performance through positive teamwork interactions. Team minimum agreeableness was also related to team performance and highly redundant of the team mean (sample–weighted mean correlation between minimum and maximum operationalizations was 0.78). Thus, the results also indicate that the lower in agreeableness the "jerk" of the team was, the worse the team performed.

Other notable personality effects include a medium effect size for team conscientiousness (operationalized as the team mean) and team performance ($\rho = 0.29$), suggesting that the higher the team members' conscientiousness, the better the team performance. Conscientious individuals are described as organized, systematic, steady, and prompt. Although some authors have suggested that conscientiousness may be a better predictor for nonteam jobs (Mount et al., 1998), the results obtained here suggest a larger effect (ρ = 0.29) for the team conscientiousness/team performance relationship than the individual–level conscientiousness/job performance relationship presented elsewhere (ρ = 0.22 across all jobs; Hurtz & Donovan, 2000). It should be noted, however, that the team–level estimate presented here is based on substantially fewer correlations than the individual–level conscientiousness/job performance effect.

As suspected, the team conscientiousness/team performance relationship was contingent upon study setting (field) and operationalization (mean). Tett and Burnett (2003) suggested that personality variables are related to job performance to the extent that cues that trigger the expression of the trait are provided. Compared to lab settings, team conscientiousness may be related to team performance in organizational (field) settings because of the opportunity for team members to display conscientiousness–related behaviors and demonstrate their level on the trait. It would seem that team members have more opportunities to express conscientiousness–related behaviors in field settings. For example, team members can fail to attend meetings (but still be a part of the team), not bring their appropriate taskwork to meetings, or not complete assigned tasks. In lab settings, team members may have fewer opportunities to display conscientiousness–related behaviors. For example, lab participants may only be required to be present at one meeting and those who do not attend may never even be included in the study. Thus, the study setting may provide cues for expression of the team members' conscientiousness.

Given the intuitive appeal of team members' personalities impacting the way the team members coordinate and subsequently perform, the team personality effects presented here are promising. The tested moderators of study setting and team type also help explain the inconsistent results observed in team personality and team effectiveness research. Because some of the effects reported here were based on a limited number of correlations (particularly when multiple moderators were tested simultaneously), continued research that investigates the relationship between team composition variables and team performance in different types of teams and settings is warranted. Further, research that reports multiple operationalizations of team composition variables is needed. In addition, although the team personality variable effects on team performance were quite large in field settings, future research should assess the relationships using unique or new operationalizations that seek to represent the complexity of team personality (e.g., team–level ratings of personality) to see if the strength of the relationship increases. Stronger relationships may also be observed by examining personality facets within each factor of the FFM of personality (e.g., LePine, 2003).

Demographic Variables. Results presented here suggest that taskwork–related demographic variables were best operationalized as the mean. Using the team mean operationalization, both team education level and tenure with the organization were positively related to team performance. Other researchers have assessed demographic variables in terms of diversity. For example, Webber and Donahue's (2001) meta–

analysis on highly and less job–related diversities suggested no relationships between either type of diversity and performance. They offer several explanations for their lack of findings including: (a) that the literature has not discussed the magnitude of these relationships that turned out to be quite small, (b) the moderating influence of time, (c) the tenure of the team, and (d) the organizational climate toward diversity. The lack of a relationship between highly job–related diversities and team performance is not surprising. The results of the present meta–analysis clarify the relationship between team demographics and team performance. Specifically, results from the present meta–analysis indicate that if the demographic of interest is taskwork–related then the more the demographic is represented in the team the better and, thus, the demographic is best operationalized as the team mean. Further, broad groupings (e.g., highly job–related diversities) may not be useful. The results presented here indicate varying relationships between team demographics and team performance based on the specific variables (e.g., race, educational background).

Preference for Teamwork. It was hypothesized that preference for teamwork—an attitude—would have a direct effect on team satisfaction. Preference for teamwork was not expected to be related to team performance because, as an attitude, preference for teamwork was not likely to serve as a task–relevant KSA or assist in the coordination of those KSAs. However, results indicate that preference for teamwork is not only related to team satisfaction, but is also positively related to team performance. Future research endeavors can investigate the link between preference for teamwork and team performance to better understand why preference for teamwork is related to team performance. Specifically, do team members who have a preference for teamwork display different behaviors? And thus, are team members high on preference for teamwork better able to coordinate their efforts? Or, is the relationship between preference for teamwork and team performance an indirect effect that is mediated by team satisfaction? Regardless of the underlying mechanisms of the preference for teamwork and team performance relationship, the results of the present study suggest that the two are positively related.

Team Task Design

Task design was the least studied area of team design. Results indicate consistent, positive, small to medium effects between team task design strategies and team performance. Yet, despite the promise of potential effects of team task design on team performance, this area is understudied, undertheorized, and remains substantially behind individual–level job design research (e.g., Morgeson & Campion, 2003). Morgeson and Campion (2003) have recently proposed a model of job design. They suggest that aspects of the task are all facets of the larger dimension of job complexity. Consistent with Morgeson and Campion, team task design features were similarly related to team performance, and it is unclear whether the specific features of task design are truly different or instead all represent some larger dimension. However, it is not clear that in teams the overarching task design dimension is task complexity. Whereas there was a positive relationship between team task design and team performance, direct ratings of team task difficulty or complexity were unrelated to team performance. Thus, these findings may suggest a difference between team task design and traditional job/work design. Perhaps motivational properties of the task (e.g., task significance) may be increased without necessarily increasing the complexity (e.g., cognitive complexity) of the task for the individual team members. In other words, in teams, motivational team task design features and task complexity may be distinct dimensions. Future research should investigate the relationship between motivational task design principles (e.g., task significance, task variety) and task complexity at the team level.

Team Structure

Several of the team structure variables were related to team performance. Although there is a strong conceptual basis for the relationship between the degree of team self–management and team satisfaction, results presented here indicate that the degree of team self–management is also related to team performance. This is a particularly promising finding. The use of self–managing teams can be beneficial to organizations because empowering teams can result in decreased decision times and reduce the need for supervisory or middle management positions (Dunphy & Bryant, 1996). Because a greater degree of team self–management is related to better team performance, implementing self–managing teams is an even more appealing strategy in organizational design. However, although the degree of team self–management was positively related to team performance, the standard deviation of the corrected population correlation was large suggesting the presence of moderators. And, although team effectiveness measures were collected an average of 20.12 days (*SD* = 85.71) *after* the assessment of the degree of team self–management, an explanation of the degree of team self–management/team performance relationship could be that better performing teams are given more self–managing responsibilities. The causal direction of the team self–management/team performance relationship has implications for team design. If the positive relationship between the degree of team self–management and team performance reflects better performing teams being given more self–managing responsibilities, then suggesting that teams should be given a higher degree of self–management to increase subsequent team performance would be inappropriate. However, if the positive relationship between the degree of team self–management and team performance reflects increased motivation when the teams are given more self–managing responsibilities and thus better performance, then practitioners would be able to use the degree of self–management as a means for increasing team performance. Future research should investigate the causal direction of the team self–management/team performance relationship and the impact of increasing teams' self–managing responsibilities on later performance.

Team Size. As expected, actual team size was not related to team performance. This is an important finding because team size is commonly used as a covariate in team design studies even when it is not related to performance or outcomes of interest in the specific study, with past positive or mixed research findings cited as the rationale (e.g., Harrison, Price, Gavin, & Florey, 2002; Werner & Lester, 2001). The results here suggest that there is no reason to use team size as a covariate on the basis of some mythical relationship between team size and team performance. Although an effect in a particular study may warrant its use as a covariate in that study, the results presented here suggest there is no basis for systematically using actual team size as a covariate.

On the other hand, there was some indication that relative team size was related to team performance. Measures of relative team size capture Hackman's (1987) original suggestion that the number of people on a team should be the number required to perform the task. The results presented here indicate that although there may be no magical team size number, ratings of relative team size may be an informative alternative measure of team size. However, because the relationship between relative team size and team performance was based on a limited number of correlations, additional investigations of the relationship are needed. The implication of a positive relative team size/team performance relationship is that short measures that assess relative team size such as the questions presented by Campion et al. (1993) may be utilized to make sure that teams are staffed with an appropriate number of people.

Structural Interdependency. There was limited research that tested the effect of matching the level of outcome interdependence with the level of task interdependency on team performance; however, given its intuitive appeal, research in this area is warranted. Several correlations represented the task interdependency/team performance relationship and the outcome interdependency/team performance relationship. Results suggest that both ratings of task and outcome interdependency are positively related to team performance.

Recent research has indicated that the extent to which team members can correctly identify and recognize team tasks as interdependent is related to team performance (Arthur, Edwards, et al., 2004). One possible explanation for the team interdependency/task performance relationships observed here is that the teams are more accurately identifying team–based aspects of the task. If they can correctly identify the team task as interdependent, they may also have a better understanding of the appropriate techniques needed to effectively execute the task. If team members have a better understanding of the task, this may result in increases in team performance.

Additional Moderators of the Team Design and Team Effectiveness Relationships

Although supportiveness of the organizational context could not be assessed as a moderator of the relationship between team design variables and team performance, results indicated a large relationship between perceived organizational support and team performance. As to be expected, when the organization is perceived as more supportive, organizational teams have better performance. This was one of the strongest effects observed in the meta–analysis (ρ = 0.54). The size of this effect is similar to the strong relationship between perceived organizational support and individual–level outcomes such as job satisfaction (ρ = 0.62; Rhoades & Eisenberger, 2002), however the relationship is much larger than that observed for perceived organizational support and individual–level in–role and extra–role performance (ρ = 0.18 and 0.22 respectively; Rhoades & Eisenberger, 2002). Thus, there is some indication that consistent with Hackman's (1987) assertion of the importance of the supportiveness of the organizational context, perceived organizational support is strongly related to team performance.

Team tenure was another moderator considered in the team design and team effectiveness relationships. Team tenure did not moderate the team design and team satisfaction or performance relationships. Team tenure did, however, moderate the relationship between team design and team viability. Specifically, as the team tenure increased, the relationship between the team design variables and team viability increased. This finding may be because as the team is together longer, the team's viability is better understood and more accurately rated. With more accurate ratings of the team viability, the relevance of design variables and how they are related to future performance may be better captured resulting in stronger team design variable/team performance relationships.

The time between predictor and criterion collection and its effect on the team design variable/team effectiveness relationships was also tested as a moderator. Results indicated that time between predictor and criterion collection did not moderate the team design variables/team performance relationship. However, the time between predictor and criterion collection did moderate the team design variable/team satisfaction relationship and the team design variable/team viability relationship. Specifically, as the time between the predictor and criterion collection increased, the relationships between the team design variables and team satisfaction decreased. The same effect was observed for team viability such that as the time between the predictor and criterion collection increased, the relationships between the team design variables and team viability decreased. The effect of the time between predictor and criterion collection on team satisfaction and viability, but not performance is expected. As time passes, the impact of team design variables on team satisfaction and viability should be reduced as team process impacts these outcome variables. Team process variables such as conflict have been more strongly related to team satisfaction than to team performance (e.g., relationship conflict and satisfaction $\rho = -0.54$; relationship conflict and performance $\rho =$

–0.23; DeDrue & Weingart, 2003). Taken together, it appears that as time passes in teams, other factors (e.g., team process) may impact the relationships between team design variables and team satisfaction and viability, but not the relationship between team design variables and team performance.

Future Research

In addition to the future research discussed so far, another potentially fruitful area of investigation is the interaction between the different areas of team design. Many research questions can be developed when team composition, team task deign, and team structure variables are considered in concert. For example, which team composition variables are needed for self–managing team to be effective (e.g., is conscientiousness important)? Or, when team tasks are designed to have increased task variety, are there additional demands on team member KSAs such the need for higher levels of GMA? And, will the importance of GMA observed at the individual level for increases in job complexity (e.g., Schmidt & Hunter, 1998) also be observed at the team level?

Limitations

A limitation of the present study was the unavailability of data for testing some of the proposed hypotheses (e.g., team satisfaction, team viability). Also, as to be expected with teams, the relationships between team design variables and team performance were often complex; several moderators appear to be simultaneously affecting those relationships. Although the influence of several moderators was tested (e.g., study setting, team type, operationalization, time and team tenure), a large amount of variance remained unexplained by artifact corrections for some of the variables (e.g., degree of self–management) indicating that there may be additional moderators present beyond those tested here.

In addition, when the influence of several moderators (i.e., operationalization, study setting) of the team composition/team performance relationship was tested simultaneously, some of the relationships were represented by few correlations. A limitation of this study was the inability to perform a fully hierarchical moderator analysis (i.e., levels of a moderator nested within other moderator levels; Hunter & Schmidt, 1990) with a large number of correlations at each moderator level. Fully hierarchical moderator analyses are notably rare in meta–analytic research (Arthur et al., 2001). And although they are often not feasible due to the limited number of correlations available, interpretation errors may result when the influence of combinations of moderators is not tested on a reported relationship (Hunter & Schmidt, 1990). Because the present study was a large scale meta–analysis (several hundred correlations), several moderators were assessed in combination and revealed interactive effects between operationalization and setting. And, in spite of the fact that some of the relationships represented a small number of correlations, these analyses provided some clarification and guidance for future team design research.

A second limitation was that the majority of the primary studies used correlational designs (88.28%). And, even in those studies that used experimental or quasi–experimental designs, the team design variable of interest was rarely the manipulated or grouped variable. Thus, this limits the casual conclusions that can be drawn from the data. However, all studies collected team effectiveness data at the same time (concurrent design) or after (predictive design) the team design variables. On average, team effectiveness variables were collected 56 days (*SD* = 245 days) after the team design variables were collected. Inferring causality from primary studies with correlational designs may be particularly problematic for team design variable/team performance relationships in which the theoretical causal direction is unclear (e.g., degree of self–management and team performance). However, for those team design variable/team performance relationships for which there is a strong theoretical rationale for assuming a causal direction, the use of correlational designs in the primary studies is less of an issue (e.g., team performance is not likely to affect team GMA, thus the effect of team GMA on team performance can be assumed). Future research that includes experimental or quasi–experimental designs and *a priori* manipulations of teams' standing on team design variables (see Edwards, Day, Arthur, & Bell, 2004) can lead to a better understanding of the causal direction of the team design and team effectiveness relationships.

Specific Recommendations for Effective Team Design

One of the major goals of the present study was to make theoretically– and empirically–based recommendations for the design of the effective teams. Although there is still the need for additional team design research, some conclusions can be made regarding increasing team performance through team design. The conclusions are outlined below in the form of 13 recommendations for researchers and practitioners to implement at the design stage of teams. Researchers and practitioners can take team design variables into account when selecting individuals into teams, designing the team task, and structuring the team. Given the magnitudes of the relationships between many of the design variables and team performance, the recommendations should be incorporated whenever appropriate and possible (e.g., organizational restructuring, selection for team–based jobs, selection into teams). It should also be noted that these are general guidelines that may not be appropriate if there is reason to believe that implementing a specific aspect of team design will lead to poor team performance in the particular team situation (e.g., too many agreeable individuals in a team that may be at risk for groupthink). Most of the recommendations are consistent with Hackman's (1987) original suggestions for the design and management of effective teams. However, many of the recommendations are more specific, and they are all are based on the empirical results of the present meta–analytic review of the team design research.

Recommendations 1–7 include aspects of team composition that should be considered during the selection of individuals into teams. Specifically:

1. Organizational teams should be composed of agreeable individuals. On a related note, careful consideration should be made before assigning low agreeable individuals to teams. The lower in agreeableness the "jerk" of the team is, the worse the team will perform.

2. Organizational teams should be composed of conscientious individuals. Team members who are conscientious will be able to effectively contribute and complete their portion of the teams' taskwork.

3. Particularly intellectual teams but also physical teams should be composed of individuals with high GMA.

4. Organizational teams should be composed of individuals who are competent in their area of expertise (i.e., have high task–relevant expertise).

5. Organizational teams should be composed of team members high in openness to experience and emotional stability. These variables are likely to aid in the effective coordination of the team and lead to better performance.

6. Organizational teams should be composed of team members who like teamwork (i.e., have a preference for teamwork). If possible, individuals who dislike teamwork or prefer to work autonomously should be allowed to self–select out of the team.

7. Organizational teams should be composed of team members who have been with the organization long enough to be socialized (i.e., greater organizational tenure) and therefore effectively perform in teams.

Guidelines 8–11 focus on the aspects of team task design. When possible, the team task should be designed to include motivational task properties. Specifically:

8. The team task should allow team members to use a variety of skills (i.e., task variety).

9. The team task should result in a meaningful and identifiable piece of work (i.e., task identity).

10. The team's work should have significant consequences for other people (i.e., task significance). Further, the team members should be made aware of how their work leads to significant consequences for others.

11. The team task should generate frequent and accurate feedback about how the team is performing (i.e., task feedback).

And finally, recommendations 12 and 13 should be considered during the structuring of the team. Specifically,

12. The number of people in the team should be appropriate to the task. The appropriate number can be estimated and once the team is intact, the appropriateness of the team size to the task can be rated by team members using short questionnaires. Team size can then be adjusted in several ways including adding or removing team members, or not replacing team members when they turnover.

13. Teams should be given some self–managing responsibilities. Team performance should be assessed periodically, and provided that the team is performing well, the team should be given additional self–managing responsibilities.

Conclusion

In summary, the present study sought to investigate the relationship between team design variables and team effectiveness. Several team design variables were identified that researchers and practitioners should have a reasonable degree of control over through selection into teams, design of the team task, and also the structuring of teams. Many of these team design variables appear to be a promising means of increasing team effectiveness. Study setting and team type were notable moderators of the team composition variable/team performance relationships. Specifically, the strength of the team design variable/team performance relationships was dependent on the study setting (lab or field); however the study setting had considerable overlap with the type of team assessed (intellectual or physical). For lab studies (intellectual teams), team GMA and task–relevant expertise were strong predictors of team performance, while team personality variables were unrelated to team performance. In field studies (physical teams), team agreeableness and conscientiousness had stronger relationships with team performance than team GMA and team task–relevant expertise. Team task design variables (e.g., task significance) had consistent, positive relationships with team performance, and several team structure variables (e.g., degree of self–management) were also positively related to team performance. Researchers and practitioners can use the recommendations based on the results of the meta–analysis to help effectively design and manage teams in organizations.

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APPENDIX A

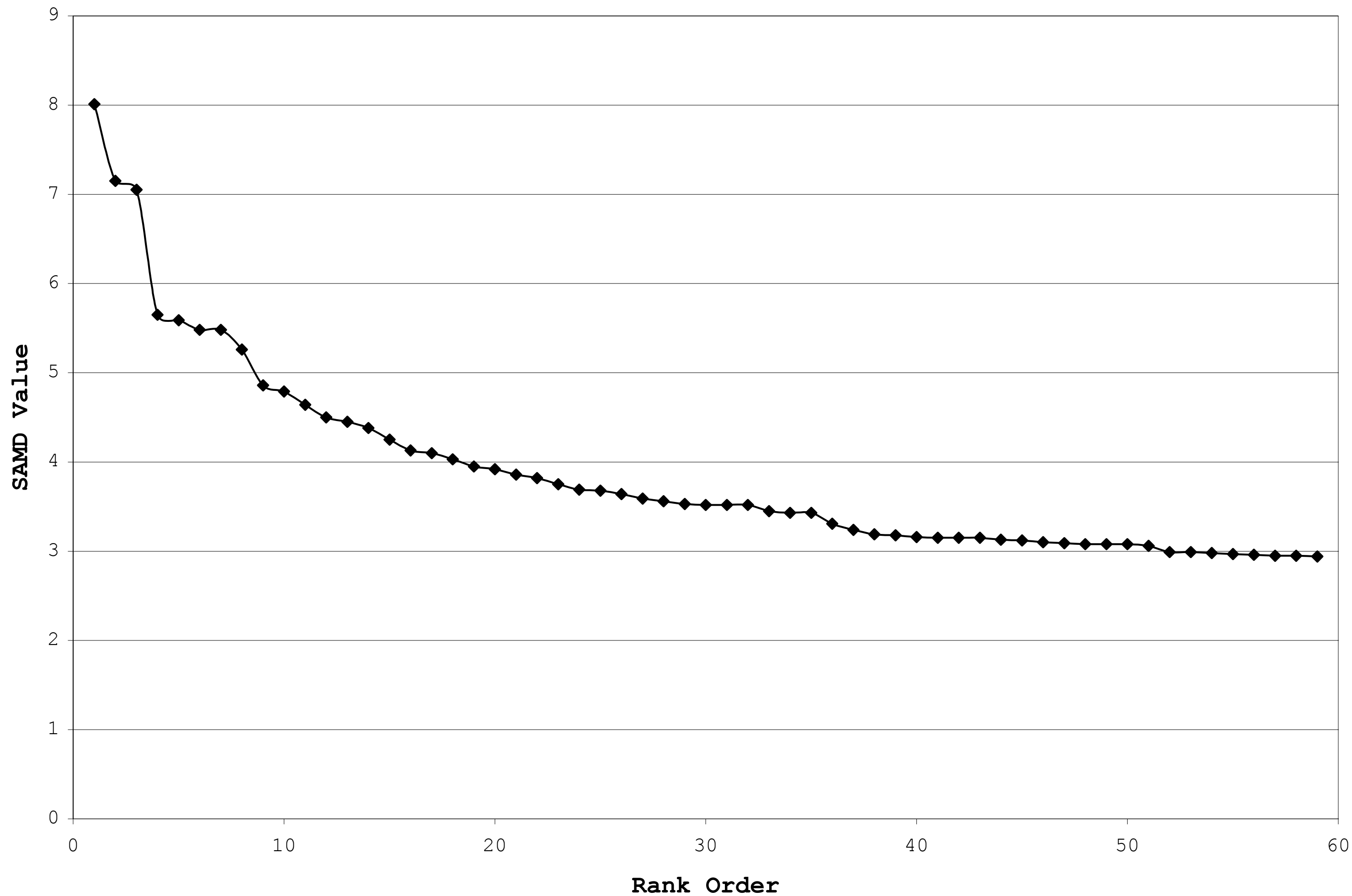

Figure A.1. Outlier scree plot.
Note. Correlations before the break in the slope were reviewed for possible exclusion. A break was detected between the eighth and ninth correlation.

APPENDIX B

ARTICLES INCLUDED IN THE META–ANALYSIS

* The article with an asterisk reported the correlation that was identified as an outlier and was removed.

Aladwani, A. M. (1996). *Factors influence the performance of information system project teams: A theoretical model and empirical validation.* Unpublished doctoral dissertation, Southern Illinois University.

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APPENDIX C

Table C.1

Team GMA Operationalization Intercorrelations

	GMA		
	Mean	Maximum	Minimum
Mean			
Maximum	2(298) 0.76		
Minimum	2(298) 0.77	2(298) 0.33	
Performance	21(1,866) 0.29	7(823) 0.28	7(832) 0.30

Note. Intercorrelations are for lab teams only. The format of each of the cells in the table is as follows: *k*(*N*)*SWMr,* where *k* = number of correlations, *N* = number of teams, *SWMr* = sample–weighted mean correlation. Harmonic mean is 462.

Table C.2

Team Conscientiousness Operationalization Intercorrelations

	Conscientiousness		
	Mean	Minimum	Heterogeneity
Mean			
Minimum	3(157) 0.67		
Heterogeneity	3(157) –0.36	2(157) –0.73	
Performance	5(217) 0.24	6(296) 0.23	5(217) –0.16

Note. Intercorrelations are for field teams only. The format of each of the cells in the table is as follows: *k*(*N*)*SWMr,* where *k* = number of correlations, *N* = number of teams, *SWMr* = sample–weighted mean correlation. Harmonic mean is 200.

Table C.3

Team Agreeableness Operationalization Intercorrelations

	Agreeableness	
	Mean	Minimum
Mean		
Minimum	3(157) 0.78	
Performance	5(217) 0.31	6(296) 0.31

Note. Intercorrelations are for field teams only. The format of each of the cells in the table is as follows: *k*(*N*)*SWMr,* where *k* = number of correlations, *N* = number of teams, *SWMr* = sample–weighted mean correlation. Harmonic mean is 214.

Table C.4

Team Extraversion Operationalization Intercorrelations

	Extraversion Mean	Extraversion Maximum	Extraversion Heterogeneity
Mean			
Maximum	3(157) 0.68		
Heterogeneity	4(239) –0.13	3(157) 0.44	
Performance	5(295) 0.10	4(177) 0.14	4(177) 0.13

Note. Intercorrelations are for field teams only. The format of each of the cells in the table is as follows: *k*(*N*)*SWMr,* where *k* = number of correlations, *N* = number of teams, *SWMr* = sample–weighted mean correlation. Harmonic mean is 200.

Table C.5

Team Emotional Stability Operationalization Intercorrelations

	Emotional Stability Mean	Emotional Stability Maximum	Emotional Stability Heterogeneity
Mean			
Maximum	2(75) 0.40		
Heterogeneity	4(239) 0.02	2(75) 0.17	
Performance	3(157) 0.20	3(157) 0.18	3(157) 0.13

Note. Intercorrelations are for field teams only. The format of each of the cells in the table is as follows: *k*(*N*)*SWMr,* where *k* = number of correlations, *N* = number of teams, *SWMr* = sample–weighted mean correlation. Harmonic mean is 120.

Table C.6

Team Openness to Experience Operationalization Intercorrelations

	Openness to Experience Mean	Openness to Experience Maximum
Mean		
Maximum	2(106) 0.60	
Performance	3(126) 0.19	3(123) 0.14

Note. Intercorrelations are for field teams only. The format of each of the cells in the table is as follows: *k*(*N*)*SWMr,* where *k* = number of correlations, *N* = number of teams, *SWMr* = sample–weighted mean correlation. Harmonic mean is 118.

Table C.7

Intercorrelations Between Specified Composition Variables Using Operationalization with the Largest SMWr With Team Performance

	1. Mean GMA	2. Task–Relevant Expertise	3. Mean Consc.	4. Minimum Agree.	5. Maximum Extra.	6. Mean Emotional Stability	7. Mean Openness to Experience	8. Team Performance
1.								
2.	1(79) 0.12							
3.	3(150) 0.20	2(99) –0.09						
4.	1(51) 0.02	1(20) 0.24	3(157) 0.04					
5.	1(51) 0.26	1(20) 0.26	3(157) 0.11	3(157) 0.01				
6.	2(130) 0.06	1(79) –0.03	5(318) 0.28	3(157) 0.05	3(157) 0.26			
7.	2(99) 0.04	2(99) –0.05	5(287) 0.19	2(106) 0.15	2(106) 0.07	4(267) 0.01		
8.	4(286) 0.20	7(308) 0.23	5(217) 0.24	6(296) 0.31	4(177) 0.14	3(157) 0.20	3(126) 0.19	

Note. Intercorrelations are for field teams only. The format of each of the cells in the table is as follows: *k*(*N*)*SWMr,* where *k* = number of correlations, *N* = number of teams, *SWMr* = sample–weighted mean correlation. Consc. = Conscientiousness, Agree. = Agreeableness, Extra. = Extraversion. Harmonic mean is 108.

APPENDIX D

Table D.1
Meta–Analytic Results for the Relationship Between Team Design Variables and Team Viability

	k	*N*	*SWM r*	*SW SD*	*% Var. due to Sampling Error*	*95% Conf. Int.*		*ρ*	*SDρ*	*% Var. Acc. for*	*95% CV$_L$*
						L	*U*				
GMA	6	292	-0.02	0.21	48.06	-0.13	0.10	-0.02	0.17	48.06	-0.30
Mean	3	139	-0.08	0.28	28.04	-0.24	0.09	-0.09	0.27	28.04	-0.54
Configural	3	153	0.04	0.08	100.00	-0.12	0.20	0.05	0.00	100.00	0.05
Concientiousness	9	404	0.08	0.11	100.00	-0.02	0.18	0.10	0.00	100.00	0.09
Mean	2	91	0.20	0.00	100.00	0.00	0.40	0.23	0.00	100.00	0.23
Configural	7	313	0.05	0.11	100.00	-0.06	0.16	0.06	0.00	100.00	0.06
Maximum	2	91	0.06	0.02	100.00	-0.15	0.27	0.07	0.00	100.00	0.07
Minimum	2	91	0.18	0.02	100.00	-0.02	0.38	0.21	0.00	100.00	0.21
Heterogeneity	2	91	-0.08	0.08	100.00	-0.28	0.13	-0.09	0.00	100.00	-0.09
Agreeableness	9	404	0.06	0.17	82.87	-0.04	0.16	0.07	0.08	82.89	-0.06
Mean	2	91	0.16	0.00	100.00	-0.04	0.37	0.20	0.00	100.00	0.20
Configural	7	313	0.03	0.18	73.45	-0.08	0.14	0.04	0.11	73.45	-0.15
Maximum	2	91	-0.14	0.04	100.00	-0.35	0.06	-0.18	0.00	100.00	-0.18
Minimum	2	91	0.19	0.01	100.00	-0.01	0.39	0.23	0.00	100.00	0.23
Heterogeneity	2	91	-0.08	0.01	100.00	-0.29	0.12	-0.10	0.00	100.00	-0.10
Extraversion	4	204	0.20	0.13	100.00	0.06	0.33	0.24	0.00	100.00	0.24
Emotional Stability	4	204	0.13	0.04	100.00	0.00	0.26	0.15	0.00	100.00	0.15
Sex (% only)	3	123	0.03	0.13	100.00	-0.15	0.21	0.03	0.00	100.00	0.03
Actual Size	3	101	-0.08	0.27	42.12	-0.28	0.11	-0.09	0.23	42.12	-0.46

Note. Results are corrected for predictor and criterion unreliability except for sex and actual size results which are corrected for criterion unreliability only. Artifact distributions of the design variable and criterion of interest were used for corrections. *k* = number of correlations; *N* = number of teams; *SWMr* = sample–weighted mean correlation; *SWSD* = sample–weighted standard deviation; *% Var. due to Sampling Error* = percentage of variance due to sampling error; *95% Conf. Int. L* = lower 95% confidence interval; *95% Conf. Int. U* = upper 95% confidence interval; *ρ* = corrected population correlation; *SDρ* = standard deviation of the corrected population correlation; *% Var. Acc. for* = percentage of variance accounted for by sampling error and artifact corrections; *95% CV$_L$* = lower 95% credibility value.

Table D.2

Meta–Analytic Results for the Relationship Between Team Design Variables and Team Satisfaction

	k	*N*	*SWM r*	*SW SD*	*% Var. due to Sampling Error*	*95% Conf. Int.*		*ρ*	*SDρ*	*% Var. Acc. for*	*95% CV* $_L$
						L	*U*				
GMA (Mean only)	2	281	0.12	0.10	63.39	0.02	0.23	0.13	0.07	64.10	0.02
Concientiousness	2	288	0.07	0.10	76.83	-0.05	0.18	0.08	0.05	77.10	-0.01
Task Design	6	699	0.29	0.18	23.09	0.22	0.36	0.35	0.19	100.00	-0.01
Self-Managing	3	261	0.36	0.25	14.12	0.25	0.46	0.42	0.27	15.47	-0.03
Actual Size	7	604	0.07	0.10	100.00	-0.01	0.15	0.08	0.00	100.00	0.08
Outcome Interdep.	3	251	0.17	0.33	10.41	0.05	0.29	0.22	0.41	10.63	-0.45

Note. Results are corrected for predictor and criterion unreliability except for sex and actual size which are corrected for criterion unreliability only. Artifact distributions of the design variable and criterion of interest were used for corrections. *k* = number of correlations; *N* = number of teams; *SWMr* = sample–weighted mean correlation; *SWSD* = sample–weighted standard deviation; *% Var. due to Sampling Error* = percentage of variance due to sampling error; *95% Conf. Int. L* = lower 95% confidence interval; *95% Conf. Int. U* = upper 95% confidence interval; *ρ* = corrected population correlation; *SDρ* = standard deviation of the corrected population correlation; *% Var. Acc. for* = percentage of variance accounted for by sampling error and artifact corrections; *95%* CV_L = lower 95% credibility value.

VITA

Suzanne Tamara Bell

Permanent Address: 55 Castle Coombe Dr.
Bourbonnais, IL 60914

Education

Ph.D. *Texas A&M University* August 2004
Psychology Major, Industrial and Organizational emphasis.

M.S. *Texas A&M University* August 2001
Psychology Major, Industrial and Organizational emphasis.

B.A. *Olivet Nazarene University* (Magna Cum Laude) May 1998
Psychology and History Majors, Business minor.

Selected Publications

Arthur, W. Jr., Bell, S. T., Edwards, B. D., Day, E. A., Tubré, T. C., & Tubré, A. H. (in press). Convergence of self–report and archival motor vehicle crash involvement data: A two–year longitudinal predictive follow–up. *Human Factors.*

Bourgeois, A. E., Bell, S. T., Meyers, M. C., & LeUnes, A. D. (in press). The influence of impression management and self–deception upon the Competitive State Anxiety Inventory–2 subscales. *Applied Research in Coaching and Athletics Annual*.

Arthur, W. Jr., Bennett, W. Jr., Edens, P. S., & Bell, S. T. (2003). Effectiveness of training in organizations: A meta–analysis of design and evaluation features. *Journal of Applied Psychology, 88,* 234–245

Arthur, W. Jr., Doverspike, D., & Bell, S. T. (2003). Information processing tests. In M. Hersen (Series Ed.) & J. C. Thomas (Vol. Ed.), *The comprehensive handbook of psychological assessment: Vol. 4. Industrial/organizational assessment* (pp. 56–74). New York: Wiley

Selected Awards

Texas A&M Distinguished Graduate Student in Teaching Award, 2003
Texas A&M Distinguished Graduate Student in Masters Research Award, 2002