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UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

THE FORMATION OF COLLECTIVE EFFICACY AND ITS RELATIONSHIP
TO SELF EFFICACY, GOALS, EFFORT AND GROUP PERFORMANCE: A
LONGITUDINAL PERSPECTIVE

A Dissertation

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

Doctor of Philosophy

By

DIANE FAYE BAKER

Norman, Oklahoma

1997

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THE FORMATION OF COLLECTIVE EFFICACY AND ITS RELATIONSHIP
TO SELF EFFICACY, GOALS, EFFORT AND GROUP PERFORMANCE: A
LONGITUDINAL PERSPECTIVE

A DISSERTATION

APPROVED FOR THE DIVISION OF MANAGEMENT

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Acknowledgments

Now that I have surely reached the end of my career as a full-time student, I am pleased that I have the opportunity to recognize some of those who have helped me on my academic journey.

Larry Michaelsen served as my dissertation chair and has been my mentor while I have been in the doctoral program. Most of what I know about teams, organizational behavior and classroom teaching came from our conversations and the times I spent working with him in the classroom.

My advisory committee members, past and present, included Daniel Wren, Patricia Smith, James Horrell, Frank Durso and R. Michael Buckley. All have made important contributions to this dissertation and to my general understanding of management and behavior.

Paul Kleine provided guidance in the early and late stages of this dissertation. His humor and knowledge about research design and the dissertation process saved me more than once.

My family has been a source of great support and encouragement. Mom and Dad always told me I could do anything . . . and they usually paid the associated costs. They have provided emotional and/or financial support for all my endeavors. Susan encouraged me to go ahead and "climb the mountain," and then shared the joys and frustrations of the ascent. Her "grammar hotline" was always available, and her words of wisdom were my lifeline. Jim, Janet and Sarah provided a restful haven on weekends and holidays; I cherish the time I spent in their home. I appreciate their encouragement and all the free meals at Carrabba's and Chili's.

My friends and fellow graduate students have showed great patience as I worked toward the doctoral degree. The lunches, dinners, movies, etc., made life in graduate school much more fun.

A final word of thanks to Elizabeth Baker, Mary Alice Kerrigan, Bill Karpenko, Jerrald Pfabe and other educators from my past who had confidence in my abilities. They encouraged me to press on . . . and so I did.

Table of Contents

Acknowledgments	iv
List of Tables	viii
List of Figures	xii
Abstract	xiii
Chapter I The Formation of Collective Efficacy and Its Relationship to Self Efficacy, Goals, Effort and Group Performance: A Longitudinal Perspective	
Introduction	1
Problem Statement	6
Research Questions	6
Chapter II Literature Review	
Efficacy in Groups: Terms and Definitions	8
Theories and Research Relevant to Collective Efficacy	22
Conclusions and Implications for Future Research	56
Chapter III Research Design and Methodology	
The Research Problem	57
Method	58
Analysis	68
Chapter Summary	76
Chapter IV Results of the Exploratory Analysis	
Introduction	77
Demographic Characteristics	77
Missing Data	80
Reliability of the Measures	82
The Development of a Shared Collective Efficacy	88
Performance, Collective Efficacy, Self Efficacy, Goal Level and Effort	95
Chapter Summary	128

Table of Contents (continued)

Chapter V Discussion of the Results

Introduction	129
Terms and Definitions	129
The Development of a Shared Collective Efficacy	130
Efficacy, Performance, Goal Setting and Effort	140
Applications to the Work Place	155
Limitations	157
Conclusion	161

References	164
------------	-----

Appendix

Appendix A	172
Appendix B	178
Appendix C	180
Appendix D	183
Appendix E	190
Appendix F	194

List of Tables

Table	Page Number
2.1 Measurement and Analysis Alternatives for Performance Beliefs	9
2.2 Distinctions Among Self Efficacy, Level of Aspiration, Collective Efficacy and Group Potency	11
2.3 Types of Beliefs	16
2.4 Task Attributes	24
2.5 Levels of Task Interdependence	28
2.6 Summary of the Key Collective Efficacy Studies	47
3.1 Characteristics of Classes	59
3.2 Timetable for the Administration of Surveys and Tests	61
4.1 Age of Subjects	78
4.2 Race of Subjects	79
4.3 Differences Among Classes	79
4.4 Reliability of Multi-Item Measures Used at Each Time Period	85
4.5 Overall Test Score Means for Each Class, Times 1 - 6	86
4.6 Repeated Measures Analysis: Group Membership, Collective Efficacy and Goal Setting	89
4.7 Eta Analysis: Group Membership, Collective Efficacy and Goal Setting	90
4.8 WABA I Results: Collective Efficacy and Goal Setting	91
4.9 WABA II Results: Collective Efficacy and Goal for the Group	93

List of Tables (continued)

Table	Page Number
4.10 Profile Analyses: The Relationship Between Gender or Minority Status and Collective Efficacy	94
4.11 Accuracy in Group Performance Expectations	96
4.12 Variables Correlated With Collective Efficacy	97
4.13 Summary of Regression Analyses: Collective Efficacy as the Dependent Variable	99
4.14 Profile Analyses: The Relationship Between Gender or Minority Status and Self Efficacy	101
4.15 Summary of Regression Results: Goal for the Group as the Dependent Variable	108
4.16 Profile Analyses: The Relationship Between Gender or Minority Status and Goal Setting	113
4.17 Comparison of Hours Studied for Individual Performance Quartiles	118
4.18 Comparison of Efficacy Scores for Individual Performance Quartiles	120
4.19 Variables That Were Correlated With Averaged Effort Measures	123
4.20 Comparison of Regression Equations for Effort Measures	124
4.21 The Relationship Between Expectation/Performance Discrepancy and Effort	125
4.22 Profile Analyses: The Relationship Between Gender or Minority Status and Effort Measures	127

List of Tables (continued)

Table	Page Number
B.1 Cronbach's Coefficient Alpha Comparisons, Pilot and Present Studies	178
B.2 Correlation and Reliability Comparisons, Pilot and Present Studies	179
C.1 Reliability of Efficacy Strength Measures Used at Each Time Period	180
C.2 Summary of Repeated Measures Analysis for Collective Efficacy Strength	181
C.3 Profile Analysis Comparing Male and Female and Minority and Non-Minority Subjects	181
C.4 Summary of Regression Analysis: Collective Efficacy Strength as the Dependent Variable	182
D.1 Correlation Analysis for Variables Measured at Time 1	183
D.2 Correlation Analysis for Variables Measured at Time 2	184
D.3 Correlation Analysis for Variables Measured at Time 3	185
D.4 Correlation Analysis for Variables Measured at Time 4	186
D.5 Correlation Analysis for Variables Measured at Time 5	187
D.6 Correlation Analysis for Variables Measured at Time 6	188
D.7 Correlation Analysis for One-Time Measures	189
E.1 Collective Efficacy and Performance Scores for Each Group	190
E.2 Collective Efficacy and Group Performance Means By Class	192

List of Tables (continued)

Table	Page Number
E.3 Group Performance, Class Rank and Group Potency Scores for Each Group	193
F.1 Means for S.D.S., Locus of Control Variables and Attitude Toward Group Work By Individual Performance Quartiles	195
F.2 Means for S.D.S., Locus of Control Variables and Attitude Toward Group Work By Individual/Group Performance Groups	196

List of Figures

Figure	Page Number
2.1 Difference Between Efficacy Expectations and Outcome Expectations	20
2.2 Contingencies in Collective Performance from the Collective Effort Model	53
4.1 Sample Means for Collective Efficacy, Self Efficacy, Group Performance and Individual Performance at Each Time	101
4.2 Collective Efficacy Scores and Actual Group Performance for the Highest and Lowest Performing Groups in Each Class	103
4.3 Correlation Between Collective Efficacy and Self Efficacy	105
4.4 Sample Means for Collective Efficacy, Actual Group Performance and Goal for the Group	109
4.5 Overall Means for Goal for the Group and Goal for the Individual	110
4.6 Means for Goal for the Group, Highest and Lowest Scoring Groups in Each Class	111
4.7 Goal for the Group, By Individual Performance	112
4.8 Combination Graph Depicting the Overall Trend for Perceived Effort and Hours Studied	115
4.9 Self-Reported Hours Studied, Highest and Lowest Scoring Groups	116
4.10 Self-Reported Effort, Highest and Lowest Scoring Groups	117
4.11 Self-Reported Hours Studied by Individual Performance Quartiles	119
5.1 The Efficacy-Performance Relationship Model	152

Abstract

The purpose of this dissertation was to determine the extent to which members of an ongoing group develop, over time, a shared collective efficacy. In addition, this study examined the relationship among collective efficacy, group performance, self efficacy, individual effort and goal setting. A model of the relationship among performance, efficacy, goals and effort was proposed.

Subjects were students from five undergraduate *Principles of Management* classes. They were assigned to groups early in the semester and these groups remained intact for the entire semester. Performance, efficacy, goal setting and effort measures were taken at six different points in time. Previous group experience, social desirability bias, locus of control and group potency were also measured.

Group members began to agree about the group's ability to perform a task early in the group's development. However, complete agreement did not develop because individual characteristics, such as self efficacy and attitude toward group work, continued to influence beliefs about group performance.

The relationships among past performance, collective efficacy, goal level and effort found in this study were similar to those found in self efficacy studies. Self efficacy was significantly related to collective efficacy at each time period, although the relationship decreased as group members developed greater trust in the capabilities of other members and in the group process. Collective efficacy was related to past group performance at each time. The goal that individuals had for their group was not an unchanging standard, but varied according to past group performance and beliefs about the group's ability. Higher levels of effort

were associated with higher levels of individual goals. Frequently, the highest levels of effort came from subjects who were apparently dissatisfied with their group scores, but continued to believe that their group could achieve high levels of performance.

Chapter I

The Formation of Collective Efficacy and Its Relationship to Self Efficacy, Goals, Effort and Group Performance: A Longitudinal Perspective

Introduction

After a tennis player wins the crucial fourth set in a five-set match, it is common for sports analysts to claim that the player has "momentum" going into the final set. Similarly, when a football team scores a touchdown to move ahead of its opponent, fans and players sense that the momentum has shifted in favor of the new leader. Momentum is thought to be a great advantage to any player or team. Those with momentum have renewed self confidence in their ability to win the game. Athletes and fans believe that momentum provides players with the motivation to run a little faster, push a little harder, leap a little higher. Does momentum really occur? Does it affect individual and team performance? If momentum affects performance on the tennis court or football field, could it also affect the performance of workers and work teams in manufacturing and service organizations?

Momentum is the term that sport fans use when an athlete's confidence in his or her ability to win inspires a higher level of play. Social scientists call a person's belief in his or her ability to perform a task *self efficacy*. More precisely, self efficacy is the belief that one has in his or her ability to perform a specific task. It is often associated with the cognitive component in social cognitive theory, which proposes that performance is affected by the interaction of

behavior, cognitions and the environment (Bandura 1977, 1986). Individuals use information about the task, their past behavior and the environment to form expectations about how well they will perform the task. Numerous studies have indicated that self efficacy impacts the level of goals that individuals set and the amount of effort that they devote to a task; consequently, it has an effect on performance (see Gist & Mitchel, 1992, or Lindsley, Brass & Thomas, 1995, for a review).

Recently, researchers have been struggling to understand efficacy at the group level of analysis. Football players, for example, not only hold beliefs about their own abilities, they also hold beliefs about the *team's* ability to perform. If the relationships that have been found in self efficacy research also exist at the group level, members' beliefs about their team's abilities will have an effect on performance because they influence goal setting, persistence and effort. However, we should not assume that self efficacy findings are generalizable to the group level. Research with ongoing groups is needed to ascertain 1) how beliefs about group performance are formed and evolve and 2) how these beliefs affect member motivation and group performance. Research findings will be highly relevant to managers who rely on teams of employees to make decisions and accomplish tasks efficiently and effectively.

Very few studies have actually been done to elucidate the nature of group level efficacy and develop or evaluate instruments for measuring it. In the studies that have been conducted, three terms have been used to refer to member expectations about group abilities: "level of aspiration" (Shelley, 1954; Zander & Medow, 1963), "collective efficacy" (cf., Bandura, 1977, George & Feltz, 1995; Gist, 1987; Lindsley, Brass & Thomas, 1995; Riggs & Knight, 1994) and "group

potency" (Guzzo, Yost, Campbell & Shea, 1993). Distinctions do exist between these terms, but definitions are not consistent across studies. The focus of this dissertation will be on collective efficacy, defined as a group member's personal belief about the group's ability to perform a specific task.

It is important to distinguish clearly between self efficacy and collective efficacy. As a member of a group, an individual holds two different but related expectations with respect to group performance. First, the individual has a belief about how well he or she can perform any individual assignments that must be accomplished in order for the group to achieve its goal. This is self efficacy. Second, the individual has a belief about how effectively the individuals within the group will perform and coordinate their various assignments in order for the group to accomplish its task. This is collective efficacy.

Research on collective efficacy is limited, and theories about it are heavily influenced by findings in self efficacy research. As Brown noted (1988), it is problematic to apply theories of individual behavior to groups due to the inevitable increase in complexity that occurs from the added interpersonal and intergroup relationships. Yet, because there have been numerous studies on self efficacy and many of the findings are fairly consistent, researchers have therefore relied on some of these findings to predict the relationship between collective efficacy and variables frequently discussed in self efficacy studies, including effort, persistence, goal setting and performance (cf., George & Feltz, 1995; Gist, 1987; Lindsley et al., 1995; Parker, 1994; Riggs & Knight, 1994).

Most researchers of self efficacy emphasize cognitive aspects, though the motivational implications are also often noted (Bandura & Cervone, 1983; Gecas, 1989; Gist & Mitchell, 1992). Bandura (1977) suggested that individuals form

their efficacy expectations using information from past performances, vicarious experiences, verbal exchanges and emotional arousal. Once a person has experience with a task, efficacy expectations are also affected by the individual's attributional assessment of the degree to which the performance level was due to ability, task difficulty, effort or luck (George & Feltz, 1995; Gist & Mitchell, 1992). The motivational impact of self-efficacy is evident in studies that show its effect on goal setting, effort, coping, persistence and emotional response (see Gist & Mitchel, 1992, or Lindsley, Brass & Thomas, 1995, for a review).

Past performances, vicarious experiences, verbal persuasion and emotional arousal, which are instrumental in forming self efficacy expectations, are also likely to influence collective efficacy expectations (Bandura, 1977). However, the coordination that is needed by group members to perform a task increases the number of variables that an individual must consider in order to make an accurate prediction about performance. A large component of collective efficacy is likely to be self efficacy (Bandura, 1982). At the same time, an individual must assess the skills and predict the amount of effort that other group members will use to accomplish the task. To the extent that group members are dependent upon each other for the successful completion of their individual assignments, the individual's beliefs about group process effectiveness necessarily affects collective efficacy. When a group must make a decision, for example, individuals with high self efficacy may have low collective efficacy if they do not believe that other group members will consider their opinions or ideas. Beliefs about uncontrollable intervening events also affect an individual's perceptions about the group's ability to perform.

Early in a group's development, member expectations about group

performance probably differ and are based largely upon perceptions of self efficacy. Over time, as individuals gain experience with the task, learn the capabilities of the other members, receive feedback from past performance and share their personal interpretations about performance and feedback, member predictions about group performance are likely to become similar to one another. A shared understanding of the group's abilities may emerge.

Extrapolating from self efficacy studies, researchers have hypothesized that collective efficacy is likely to affect group performance (Campion, Medsker, & Higgs, 1993; Gist, 1987; Lindsley et al., 1995; Parker, 1994; Riggs & Knight, 1994; Shea & Guzzo, 1987). Collective efficacy may impact group performance because it encourages members to set higher goals for the group. If these goals lead to performance norms and if individual contributions are identifiable, individual effort should be affected. Bandura (1982) also argued that collective efficacy would influence people's behavior in the group and their willingness to remain in the group when the group failed. However, very little research has been done to verify these suppositions. There is some evidence to suggest that there is a relationship between collective efficacy and group performance (George & Feltz, 1995; Parker, 1992; Riggs et al., 1994; Spink, 1990) and between group potency and group performance (Campion et al., 1993; Guzzo et al., 1993; Shea and Guzzo, 1987). The problem is that these studies were not designed to determine whether or not collective efficacy or group potency is a determinant of group performance. There is no study that measures the relationship between collective efficacy and group performance, goal level and individual effort.

There is also no study that measures how collective efficacy and its relationship to performance changes across time. This is needed because the

relationship between collective efficacy and performance is circular and dynamic. Group members use self-efficacy expectations, information about other group members and feedback from the group's past performance to form an expectation about future group performance. This expectation, or collective efficacy, is believed to affect group performance. In other words, collective efficacy is likely to affect group performance, but feedback about group performance, as interpreted by group members, will also have an impact on collective efficacy. We should therefore not assume that the relationship between collective efficacy and group performance can be fully understood at any one point in time. To determine how the relationship between efficacy and performance changes over time, Lindsley et al. (1995) recommended that, at minimum, researchers measure collective efficacy and group performance the first three times a group attempts a task. By measuring collective efficacy, individual effort, goal level and group performance over a period of time, the dynamic, motivational impact of collective efficacy on performance should become clearer.

Problem Statement

The purpose of this study was to determine the extent to which members of an ongoing group develop, over time, a shared collective efficacy. This study also examined the relationship among collective efficacy, group performance, self efficacy, individual effort and goal setting.

Research Questions

1. As group members work together over time, to what extent does a shared collective efficacy develop?

2. What is the relationship between collective efficacy and actual group performance?
3. What is the relationship between collective efficacy and self efficacy?
4. What is the relationship between collective efficacy and the goal level that members set for the group?
5. What is the relationship between collective efficacy and the effort that members exert on behalf of the group?

Chapter II

Literature Review

Efficacy in Groups: Terms and Definitions

Although researchers have investigated the nature and impact of group-level efficacy for several decades, the terms and definitions that they have used are inconsistent and vary from study to study. A literature review must therefore begin with a survey of how researchers have used and defined the terms that relate to group-level efficacy. Interestingly, the inconsistencies may actually reflect a now classic debate about whether or not group-level beliefs exist. In this dissertation, collective efficacy is defined as a group member's personal belief about the group's ability to perform a specific task. This definition was chosen after reviewing several key studies on self efficacy and group-level efficacy and evaluating how the variables in each study were defined and measured.

Efficacy as a Belief

Self efficacy, level of aspiration, collective efficacy and group potency are all terms that have been used to describe beliefs about performance. However, the nature of these beliefs vary according to 1) level of performance, 2) task specificity and 3) type of belief (see Table 2.1). First, researchers assess beliefs about either individual or group performance; individual performance is relevant for self efficacy studies and group performance is relevant for group-level efficacy studies. Second, performance is measured as the outcome of a specific

Table 2.1

Measurement and Analysis Alternatives for Performance Beliefs

Level of performance
•Individual
•Group
Task specificity
•Specific task
•General effectiveness
Type of belief being assessed
•Personal
•Group
Method of assessment
•Individual response
•Group consensus
Analysis
•Individual response paired with performance, other variables
•Aggregation of members' responses paired with performance, other variables
•Group consensus rating paired with performance, other variables

task or in terms of general effectiveness across time. Third, researchers typically attempt to measure an individual's personal belief or the group's belief about performance. Most of the definitional inconsistencies across group-level efficacy studies are with respect to the type of belief that is assessed. For example, collective efficacy has been defined both as an individually-held belief (e.g., Riggs & Knight, 1994) and as a group-held belief (e.g., Lindsley, et al., 1995).

The methods used to assess efficacy and analyze its relationship to performance and other variables also differ from study to study (see Table 2.1).

In some studies, individuals answered survey questions about performance expectations. Individual responses were either 1) compared to individual or group performance (or other variables of interest) or 2) aggregated by group and then compared to group performance. In other studies, group members were asked to discuss a group task and come to an agreement about performance expectations. Group ratings were then compared to actual group performance and other relevant variables.

Cognizant of the possible differences identified in Table 2.1, it is useful to examine specifically how collective efficacy and other related terms have been defined and measured in various studies. Inconsistencies can then more easily be identified, examined and resolved.

In two early studies on group-level efficacy, Shelley (1954) and Zander and Medow (1963) used the term "level of aspiration" (see Table 2.2). Shelley asked individual members to predict how effectively their group would do on a group problem solving task; he then averaged these scores for each group. Zander and Medow asked group members to discuss and come to an agreement on the score they expected to achieve on a group task requiring physical skill and coordination. Shelley (1954) and Zander and Medow (1963) intended to measure member expectation of future performance, but the term "level of aspiration" is one that these and other researchers did not differentiate from goal level (see also Chapman & Volkmann, 1939; Shaw, 1981; Zander, 1977). Although confounding may have occurred between performance expectations and performance goals, these studies were among the first to analyze the processes involved in the development of group-level efficacy.

Table 2.2

Distinctions Among Self Efficacy, Level of Aspiration, Collective Efficacy and Group Potency

	Self Efficacy <i>Bandura, 1977</i>	Level of Aspiration <i>Shelley, 1954</i>	Level of Aspiration <i>Zander &</i> <i>Medow, 1963</i>	Collective Efficacy <i>Riggs & Knight,</i> <i>1994</i>	Collective Efficacy <i>Lindsley et al.,</i> <i>1995</i>	Group Potency <i>Guzzo et al.,</i> <i>1993</i>
Level of performance	Individual performance	Group performance	Group performance	Group performance	Group performance	Group performance
Task specificity	Specific	Specific	Specific	Specific	Specific	General
Type of belief being assessed	Personal	Personal	Group	Personal	Group	Group
Method of assessment	Individual response: "I believe I can..."	Individual response: "I believe the group can..."	Group Consensus: "We believe the group can..."	Individual response: "I believe the group can..."	Individual response: "Our group believes it can..."	Individual response: "Our group believes it can..."

More recently, the terms "group potency" and "collective efficacy" have been used to refer to beliefs about group effectiveness (see Table 2.2). Guzzo, Yost, Campbell & Shea (1993) defined group potency as a *shared* belief among group members about the group's general effectiveness. In contrast to the concept of a shared belief, many researchers define collective efficacy as an *individually-held* belief about his or her group's ability to perform (Earley, 1993; George & Feltz, 1995; Guzzo, et al., 1993; Riggs & Knight, 1994; Riggs, Warka, Babasa, Betancourt & Hooker, 1994). However, the definition that Lindsley, Brass & Thomas (1995) gave for collective efficacy, comparable to Guzzo's et al. (1993) concept of group potency, focuses on the group's *collective* belief in its ability to perform. According to Lindsley et al., group members are informants who can estimate the group's collective belief about its ability to perform. The only distinction that Lindsley et al. made between group potency and collective efficacy was that collective efficacy is a shared belief in the group's ability to perform a specific task, whereas potency is a shared belief about the group's general effectiveness on various tasks attempted in various settings.

Self report instruments have been developed by Guzzo, et al. (1993) and Riggs et al. (1994). These instruments provide clarification about the researchers' definitions of collective efficacy and group potency. The items on the Guzzo et al. instrument require that the individual estimate *team* expectations and beliefs, such as "The team believes . . ." or "The team expects . . ." (p. 98). The Riggs et al. items do not ask about team expectations; instead, each group member is asked to provide his or her own personal perception about the group's ability to perform or the skills of other group members (e.g., "The department I work with has above average ability . . ." (p. 766). The Guzzo et al. instrument focuses on

general effectiveness. Although the items on the Riggs et al. instrument appear fairly broad, respondents are instructed to think specifically in terms of their own job tasks when they answer.

An important difference between the studies by Guzzo et al. (1993) and a study by Riggs and Knight (1994) that uses the Riggs et al. (1994) collective efficacy instrument is in how the data were analyzed. This difference reflects the distinction these researchers made between group potency and collective efficacy. Guzzo et al. averaged the individual responses within each group to arrive at a group potency score. This method was recommended by Lindsley et al. (1995), who described collective efficacy as a group-based belief, and rests on the assumption that individuals within the group can estimate the group's beliefs. In contrast, Riggs and Knight conducted all of their analysis at the individual-subject level. This method is consistent with their definition of collective efficacy as an individually-held belief. A third possibility acknowledged by Gist (1987) is to require group members to reach consensus on each item in the instrument. This approach is reminiscent of the Zander and Medow (1963) study, in which group members discussed and agreed upon a score that they thought the group would make on a task that was to be attempted in the immediate future. The difference is that, through the use of several items, the confounding between expectations and goals is less likely to occur. Before we can evaluate the validity of any of these methods, the definitions of the terms potency and collective efficacy must be clarified.

Individual versus Collective Beliefs

To reach a consensus on definitions, researchers must first address the significance of defining potency and/or collective efficacy as either an individually-held or a collective belief about group performance. Consistent with the definitions given by Guzzo et al. (1993) and Riggs and Knight (1994), the suggestion recommended in this dissertation is that collective efficacy be defined as an individually-held belief and potency be defined as a group-held belief. The significance of this distinction is tied to the nature of the relationship between an individual's beliefs and the group to which he or she belongs.

The nature of this relationship has long been debated. McDougall (1920) fueled the debate when he used the term "group mind" to explain how the thoughts and actions of group members are shaped by the group experience. To members and outsiders, a group seems to have a mind of its own, with its own identity, history, traditions and forms of expression that cannot be explained by the beliefs or actions of any single member. Allport (1924) dismissed the idea of a group mind, claiming that "There is no psychology of groups which is not essentially and entirely a psychology of individuals" (p.6). Other early researchers in social psychology recognized that, while beliefs are held by individuals, the group can have a significant impact on how an individual thinks and feels, whether or not group members are present (cf., Asch, 1952; Roethlisberger & Dickson, 1939; Sherif, 1966). More recently, Brown (1988) suggested that the behaviors and attitudes of individuals are affected by their membership in groups to a larger or smaller degree, depending upon how salient group membership is at the time of the behavior.

Not only do individuals see members of other groups in stereotyped ways, they also see themselves as being relatively interchangeable with others in their own group. Hence their attitudes and actions take on the uniformity which is so characteristic of group settings . . . (p. 6).

Indeed, the influence of the group on individual attitudes, beliefs and behavior is well documented (for a review of the literature, see Bettenhausen, 1991; Gist, Locke & Taylor, 1987; Levine & Moreland, 1990; Shaw, 1981).

Bar-Tal's (1990) distinction between personal, common and group beliefs help clarify the key issues with respect to group and individual beliefs (see Table 2.3). Bar-Tal defined beliefs as "units of knowledge," a broad definition that includes values, ideologies, hypotheses and impressions (p. 5). Individuals perceive that some of their beliefs are uniquely formed and held; these Bar-Tal labeled *personal* beliefs. *Common* beliefs are those that individuals perceive are shared by others. *Group* beliefs are those that individuals perceive 1) they share with others in their group and 2) serve to define the group's identity. The most fundamental of all group beliefs, according to Bar-Tal, is the one that acknowledges the existence of the group. Bar-Tal suggested that this definition of group beliefs:

describes a widely recognized phenomenon that group members share beliefs that may come to be viewed as the defining essence of that group. Sharing indicates neither that group beliefs are supernatural concepts nor that they exist outside of individuals. It merely means that group members hold the same beliefs due to

similar experiences, exposure to common contents, and the influence of social processes. (p. 33)

It is important to note that group members play an active role in the formation of group beliefs. Individuals bring their personal attitudes, beliefs, traits and history to the group and these will influence how they interact with other group members. For example, some members will have more influence in

Table 2.3

Types of Beliefs

Term	Level of Belief	Characteristics
Personal Beliefs	"I believe . . ."	•perceived as unique to the individual •shaped by personal experiences
Common Beliefs	"We believe . . ."	•perceived as being shared by others inside and outside the group •shaped by forces external to the group experience
Group Beliefs	"Our group believes . . ."	•perceived as being shared by group members •shaped by group experiences •contribute to the group's identity •support a sense of belonging among members •Fundamental group belief: "We are a group."

Note. Based on the typology described by Bar-Tal in his book, Group Beliefs, 1990.

the group because of superior interpersonal skills. Organizational and societal factors, such as norms, policies, regulations, power distribution, etc., will also affect the behaviors and attitudes that are eventually sanctioned by group members. In their explanation of collective efficacy as a collective belief, Lindsley et al. (1995) argued that "Although cognitions reside in the individual . . . they are emergent properties of the social system rather than the individual, and they cannot be reduced to their constituent parts" (p. 648). In the sense that shared attitudes and beliefs cannot be fully understood apart from the social context in which they developed, and to the extent that all members recognize certain beliefs as characteristic of their group, a 'group mind' does exist.

Based on the above discussion, it is apparent that the beliefs of group members have a dynamic quality and evolve with the development of the group. When a group is first formed, very few group beliefs are likely to exist, even those that may be relevant to group tasks. Beliefs about the group's abilities are based on the information members have and the attributions they make. Early in a group's existence, before it has attempted to complete the task, information is very limited. Group members may be inexperienced with the task, have no access to performance feedback and may be unfamiliar with the abilities of other members. At this point, the interaction between the members can be characterized as cautious; until trust is built, members may be hesitant to share openly about their perceptions, attitudes and beliefs. At this early stage in the group's development, member expectations about group performance will probably differ and may largely be based upon perceptions of self efficacy. Using Bar-Tal's (1990) terminology, member beliefs about performance at this early stage could be considered personal beliefs.

By defining collective efficacy as an individually-held belief, the researcher can begin measuring it at the start of a group's formation. Assuming that members do not share performance expectations early in their group's development, group potency or collective efficacy cannot yet exist, if either is defined as a collective belief about group performance. Defining or measuring a construct intended to capture a collective belief only makes sense for those beliefs that can be classified (using Bar-Tal's taxonomy) as a group belief. For the purposes of analysis, an aggregation of collective efficacy ratings, when defined as an individually-held belief, is inappropriate when collective efficacy is the dependent variable or when collective efficacy ratings vary significantly within the group (Rousseau, 1985). In keeping with the Riggs and Knight (1994) study, all variables should be analyzed at the individual level.

Over time, as individuals gain experience with the task, learn the capabilities of the other members, receive feedback from past performance and share their personal interpretations about performance and feedback, member predictions about group performance should become similar to one another. A shared understanding of the group's abilities will begin to emerge. Once a group belief has developed, the practical difference between what an *individual* believes about group performance and the individual's estimate about what the *group* believes about group performance becomes negligible. That is, a member's response to the question, "How well do you expect your group to perform?" would be no different than the response to the question, "How well does your team expect to perform?" This is not to say that individuals will perfectly agree on responses to items measuring group beliefs; however, when comparing groups, group membership should account for a significant amount of variance in item

responses. When this is the case, an aggregation of individual scores can be used to estimate the group belief. Bar-Tal (1990) suggested that the level of member agreement on an item is one way to measure the importance of the belief to the group.

Largely in recognition of the dynamic quality of group member beliefs, it is advisable to define collective efficacy as an individually-held belief and to define group potency as a shared belief. So defined, the validity of collective efficacy does not depend upon the extent of group development or the existence of group beliefs about performance. Guzzo et al. (1993) acknowledged that to measure group potency, the researcher must first establish that group members share a belief about group performance. In cross-level research that is typical of collective efficacy and group potency studies, researchers should be cognizant of the way in which each of the variables are measured before they draw any conclusions about relationships. For example, the relationship between collective efficacy and a group goal, the former measured at an individual level and the latter measured by aggregating individual responses or reaching group consensus, may be more tenuous than the relationship between group potency and a group goal, which are both measured by aggregating individual responses or reaching group consensus.

Specificity of the Task

Another distinction that is typically (though not always) made between group potency and collective efficacy is that potency refers to a belief about the group's overall effectiveness, and collective efficacy is frequently defined in terms of a specific task (Earley, 1993; Lindsley, Brass & Thomas, 1995; Riggs &

Knight, 1994; see Table 2.2). These definitions of collective efficacy were no doubt influenced by Bandura (1977), who defined self efficacy in terms of specific behaviors. In an attempt to differentiate collective efficacy from group potency as defined by Guzzo, et al. (1993) and to remain consistent with Bandura's definition of self efficacy, collective efficacy is defined in this dissertation as an individual expectation about group performance on a specific task.

Collective Efficacy, Outcome Expectancy and Goal Level

In collective efficacy studies, the distinction between collective efficacy and outcome expectancy can be easily blurred. Bandura (1977) defined an outcome expectancy "as a person's estimate that a given behavior will lead to certain outcomes" (p. 193). This is in contrast to an efficacy expectation, which is the person's assessment of his or her ability to perform the behavior that will lead to the outcome (see Figure 2.1). The same distinction holds true for collective

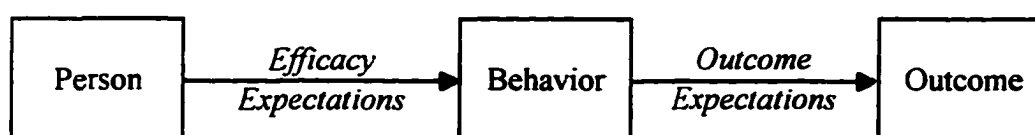


Figure 2.1. Difference between efficacy expectations and outcome expectations.

From "Self-Efficacy: Toward a Unifying Theory of Behavioral Change," by A. Bandura, 1977, Psychological Review, 84, p. 193.

efficacy expectations and outcome expectancies. Although the difference between these two variables may sometimes be difficult to discern, Gecas (1989) suggested that efficacy concerned beliefs about ability and outcome expectancy concerned beliefs about the response from the social system in which the performance takes place. This distinction between ability and environment is not entirely satisfactory, because perceptions about one's ability is often affected by perceptions of variables in the social system that may intervene before or during performance.

The difference between a goal and efficacy or outcome expectancy is more obvious. A goal is a standard to which an individual or group may strive to attain (Bandura, 1977; Bandura & Cervone, 1983; Locke, Cartledge & Koeppel, 1968; Locke, Frederick, Lee and Bobko, 1984). In contrast to collective efficacy or outcome expectancy, a goal is not an expectation, although an individual or group member may expect (or expect not) to achieve it.

The difficulty a researcher may have in distinguishing between collective efficacy, outcome expectancy and goals is exemplified in a study done by Spink (1990). To assess collective efficacy, he asked subjects who were competing on teams in a volleyball tournament to respond to the question, "What placing do you expect to attain in Supervolley?" This is arguably a collective efficacy measure because a team's ranking depends upon the ability of team members to serve, volley and spike. One can also argue that the respondent's prediction of the team's placing is an outcome expectancy because the final outcome depends not only on the team's ability, but also on environmental factors such as the abilities of other teams, the fairness of the tournament schedule and the accuracy of the refereeing. In addition, subjects may erroneously respond with their *desired*

ranking, which corresponds more closely to a goal than a belief about efficacy. Depending upon the respondent's interpretation, this item on Spink's survey may be a measurement of collective efficacy, outcome expectancy or goal level.

Defining Collective Efficacy: Summary and Conclusion

Collective efficacy is defined in this dissertation as an individually-held belief about group performance on a specific task. It differs from a goal and from outcome expectancy, in that it is a belief about performance, not a standard of performance nor an expectation about an outcome that is dependent upon performance. This definition is based on Riggs and Knight (1994), but differs from other terms and definitions that various researchers have used to describe group-level efficacy. Inconsistencies in the research largely reflects an unresolved dilemma that is common in group-level research of all kinds: Should constructs be defined, measured and analyzed on an individual or group level? The definition used in this dissertation was built on the assumption that individuals, not groups, hold beliefs, and aggregating data is premature until it is clear that members of the group share these beliefs. This is especially true when groups are studied from the time they are formed, as this dissertation does.

Theories and Research Relevant to Collective Efficacy

Despite volumes of research on group process and performance, very little has been done to empirically assess how collective efficacy develops in groups and how it affects performance. Shelley (1954) and Zander and Medow (1963) did some early work on level of aspiration. Bandura (1977, 1982) defined and discussed collective efficacy, but did not test his hypotheses about the concept.

Since 1989, however, several conceptual and empirical studies on collective efficacy have begun to appear in the management, applied psychology, social psychology and sports psychology literatures. In addition, findings from the social loafing literature are relevant because researchers have identified factors that are likely to increase or reduce individual effort on group tasks.

The Nature of the Task

The group task is obviously a critical component of any study on group performance. Before reviewing the collective efficacy literature it is therefore necessary to identify the characteristics of a task that might have an impact on research findings. Researchers have generally agreed that task characteristics will affect group process and performance variables (Goodman, et al., 1987; Gist, Locke & Taylor, 1987; Hackman, 1987; McGrath and Kravetz, 1982). Task characteristics are likely to influence member beliefs about their group's ability to perform.

Numerous approaches and attributes have been used to delineate how one task differs from another. Steiner's terms and definitions (1972; see Table 2.4) are among those most commonly used in studies on group performance (cf., Goodman, Ravlin & Schminke, 1987; Karau & Williams, 1993; Shaw, 1981; Wood, 1986). Researchers in group performance have placed a strong emphasis on interdependence, the extent to which the performance of one group member depends upon another (cf., Goodman, et al., 1987; Johnson, Johnson, Ortiz & Stanne, 1991; Kiggundu, 1983; Mitchell & Silver, 1990; Shaw, 1981; Straus & McGrath, 1994; Thompson, 1967; Van de Ven, Delbecq & Koenig, 1976; Wood, 1986). Researchers have also described tasks in terms of uncertainty,

complexity, cognitive requirements, behavioral requirements, etc. (see Goodman et al., 1987 for a review). Goodman et al. (1987) noted that task typologies typically either describe what individuals do, such as generate or choose, or identify attributes of the task, such as degree of interdependence or uncertainty.

Table 2.4
Task Attributes

Attribute	Description
Divisible	The task can be divided into parts and assigned to different individuals.
Unitary	The task cannot be divided into parts.
Maximizing	The task requires that group members produce as much output as possible or as quickly as possible.
Optimizing	Group members find the best or correct solution.
Disjunctive	The task involves a decision, or a choice among alternatives; if one person in the group can complete the task, the group can complete it.
Conjunctive	Each group member must perform the task.
Additive	The group output is dependent upon the summation of each member's contribution.
Discretionary	It is up to group members discretion as to whether the task is disjunctive, conjunctive or additive.

Note. Based on the work of Steiner, 1972.

No single typology or set of dimensions has been widely accepted. Wood (1986) claimed that the task classification systems used in empirical studies fail to adequately distinguish one task from another, often because the specified task attributes confound task and nontask elements. For example, attributes within a typology may confuse task characteristics with the characteristics of the individual or the organization. Others have criticized that many typologies were created to describe tasks done in a laboratory setting and may be of limited use in a field setting, where tasks are much more complex (Goodman et al., 1987; Wood, 1986; see also McGrath, 1990, Mitchell & Silver, 1990).

Wood (1986) suggested that because the definitions of task characteristics have no construct validity, empirical studies have often been unable to show the extent to which differences in task attributes affect the variables (see also Gladstein, 1984; Karau & Williams, 1993). Interestingly, reviewers of group research always mention the importance of task characteristics on group process and performance, but they provide little evidence for this conclusion (see Bettenhausen, 1991; Gist, Locke & Taylor, 1987; Levine & Moreland, 1990). In response to the deficiencies he cited, Wood (1986) identified and empirically tested three independent constructs that, when considered altogether, define task complexity.

Wood (1986) suggested that all tasks contain three distinct elements: acts, information cues and products. Products are the outputs, derived from acts and information cues, and should be defined in terms of quantity, quality, cost, etc. Acts are the behaviors that must be emitted in order to get a product. Information cues provide the information that is needed for the actors to perform the acts. They are the body of facts that must be processed in order to make the judgments

necessary for successful completion of the acts. Wood advised researchers to describe clearly all three components of the task that is used in any study.

According to Wood, task complexity determines the amount of knowledge, skill and resources that an individual must draw upon to successfully complete a task. There are three components of complexity: component, coordinative and dynamic. Component complexity refers to the number of distinct acts that must be performed and information cues that must be processed in order to successfully get an output, the product. Coordinative complexity refers to the relationship among the information cues, acts and products in terms of concerns such as the sequencing, timing, intensity and location of inputs. Dynamic complexity refers to the likelihood and extent of changes that occur during the completion of acts and processing of information cues. For example, individuals may have to adapt to an unstable environment by changing their actions, or interpret information cues differently to make appropriate adjustments. This type of flexibility often requires greater knowledge and a broader array of skills.

Wood, Mento & Locke (1987) conducted a meta-analysis to determine the extent to which task complexity, as defined by Wood (1986), moderated the relationship between goal setting and performance. Using Wood's (1986) approach, Wood et al. (1987) did find that goal setting is less effective on complex tasks than on simple tasks.

Wood's (1986) model appears to reduce the confounding that is prevalent with other approaches. However, Wood admitted that his definitions were developed primarily for individual performers. Wood's model is nonetheless appropriate for a group task. Overall task complexity, as Wood defined it, would

increase for individuals performing in a group setting, primarily due to an increase in coordinative and dynamic complexity. Perhaps most notably, the level of complexity would increase as the level of interdependence among members increase. Thus, despite the fact that member interdependence contributes to, and is therefore not independent of the task complexity construct, it is useful to review the levels of interdependence that occurs during group performance.

Researchers in group performance have long recognized that interdependence is likely to affect group performance and related variables (cf., Goodman, et al., 1987; Johnson et al., 1991; Kiggundu, 1983; Mitchell & Silver, 1990; Shaw, 1981; Thompson, 1967; Van de Ven et al., 1976; Wood, 1986). The literature is filled with various definitions and levels of interdependence but little has been done to conceptually or empirically validate them (Johnson et al., 1991). For the purposes of this dissertation, Van de Ven's et al. (1976) definitions (see Table 2.5), which expanded on Thompson's (1967) work, are used. According to Van de Ven et al., at the lowest level of task interdependence, individuals work alone but their outputs are pooled together. At the highest level of task interdependence, team members are present at the same time and location (or virtual location) to solve problems and collaborate in a way that makes it impossible to measure each person's contribution. This task-related interdependence differs from goal interdependence, which may be defined as a member's perception that his or her goal cannot be achieved until other group members achieve their goals (Johnson et al., 1991).

At the core of group performance is the task. Characteristics of the task may affect the relationship among collective efficacy, goals, effort and

performance. Consequently, as researchers evaluate the empirical work that has been done and contemplate experimental designs to test these relationships, they must consider how the task might affect results. Wood's (1986) definition of task complexity and Van de Ven's et al. (1976) typology of levels of interdependence will be used to describe task characteristics in the following review of collective efficacy research.

Table 2.5

Levels of Task Interdependence

Level	Description
Pooled/Independent	Individuals work independently; contributions of group members are then pooled to achieve group goal
Sequential	The outputs of one individual or process become the inputs for another.
Reciprocal	Each member provides and receives inputs from other members.
Team	Members work together to diagnose, problem solve and collaborate; individual contribution is difficult to isolate or measure.

Note. Based on the work of Van de Ven et al., (1976) and Thompson (1967).

The Hypothesized Relationship Between Efficacy and Performance

According to Bandura (1977, 1982), an individual uses past performance, vicarious experience, verbal persuasion and emotional arousal to form beliefs about both individual and group performance. Furthermore, he proposed that self efficacy is a core component of collective efficacy; individuals with low self efficacy were not likely to have strong collective efficacy. Bandura also suggested that collective efficacy will influence what tasks a group chooses to accomplish, how hard an individual will work on behalf of the group and the extent to which an individual is willing to stay with a group in the face of failure. These suppositions, including the hypothesized relationship between collective efficacy and performance, have not been thoroughly tested.

In an attempt to capture what has been described as the cyclic nature of the efficacy-performance relationship, Lindsley et al. (1994) proposed the existence of collective efficacy-performance spirals. These spirals may be upward, downward or self-correcting. For example, a downward spiral begins when initial low collective efficacy and poor performance is followed by a decrease in collective efficacy and performance. According to their definition, a downward or upward spiral consists of three consecutive decreases or increases in both efficacy beliefs and performance, respectively. A self-correcting spiral occurs when low collective efficacy or poor performance is followed by an increase in either collective efficacy, performance or both.

Lindsley et al. suggested that the ideal efficacy-performance spiral is self-correcting. Downward spirals are obviously undesirable because they lead to poor performance and ultimately avoidance or withdrawal behaviors. Upward spirals are not always beneficial, because success may reduce members' attention

to new information or feedback and may decrease experimentation. The greatest gains in long term performance, they proposed, are likely to come when the group experiences occasional failure, because it reduces the tendency for group members to get complacent. A self-correcting spiral occurs when a group uses information from a failure to find a way to improve performance.

The primary interest of Lindsley et al. focuses on variables that effect the continuation or stoppage of the upward or downward spiral trend. Thus, they identified feedback, task uncertainty, task complexity and task experience as factors that trigger upward or downward spirals. Further, they suggested that internal, stable and uncontrollable attributions, automatic information processing, expectations and emotional arousal lead to the continuation of spirals on their downward or upward trend. Finally, they hypothesized that redefining success and failure, breaking tasks down into smaller components and restructuring the group could help stop a spiral from continuing on its downward or upward course.

Lindsley et al. did not spend much time discussing the efficacy-performance relationship in terms of cause and effect. They acknowledged that one variable affects the other, but causality is not unidirectional; efficacy and performance variables alternate as cause and effect. The authors also hypothesized that labeling an individual or group as a success or failure may lead to the continuation of an upward or downward spiral. The spiral is fueled when people slip into self-fulfilling patterns of behavior. The implication is that performance expectations actually play a role in making the expectations become reality.

Lindsley et al. provided some interesting hypotheses for future research, but conducted no studies. So, although they theorize that the efficacy-

performance relationship is a reciprocal, "deviation-amplifying loop" (p. 645), in which a change in one variable leads to a change in the other, there is currently no empirical evidence to support this position. Their propositions do suggest, however, that the efficacy-performance relationship is a complex one. One cannot assume, for example, that teams whose members have high collective efficacy will perform at high levels. In addition, lower levels of collective efficacy may lead to high performance when members are motivated to remedy past mistakes, but may lead to low performance when members give up and reduce their efforts. Because group members will respond differently to past performance and various levels of collective efficacy, findings from aggregated data across groups may not clarify the efficacy-performance relationship.

Empirical Studies on Collective Efficacy

Shelley (1954). Shelley conducted early studies on group-level efficacy using undergraduate students as subjects. Nineteen groups of three to four members each were given five problem solving tasks. Success and failure on each problem was manipulated. In the failure conditions, the problems had no solution. Unknown to the other members, each group had a confederate member who made sure that the groups in the success conditions solved the problems. Six groups failed and seven groups succeeded on the first four problems. Three groups failed on the first and third problems and succeeded on the second and fourth problems (FSFS). The final three groups succeeded on the first and third problems and failed on the second and fourth problems (SFSF).

After the third problem and again after the fourth problem, each subject was asked to rate, on an 11 point scale, how well he thought the group would do

on the next problem. Shelley averaged individual responses for each group. These average ratings were used to measure what Shelley called "level of aspiration," a phrase that was also used in reference to goal level in some of the literature at this time. Because he asked individual members to rate how well they expected the group to do on a specific task, rather than what they hoped to do on the task, what Shelley called "level of aspiration" was in fact a measurement of group-level efficacy.

Not surprisingly, ratings from groups that had just experienced success demonstrated that members expected to perform better than those who had just experienced failure. The highest ratings came from the groups that always experienced success (mean rating after times 3 and 4: 7.1, 7.2). The lowest ratings came from those who had always experienced failure (mean rating after times 3 and 4: 2.3, 1.9). The mean rating for the SFSF groups was 6.0 after the third problem, but slipped to 4.9 after failing the fourth problem. The mean rating for the FSFS groups was 4.5 after failing the third problem and rose to 5.6 after experiencing success on the fourth problem. Shelley also found that the members of the successful groups had a more positive attitude toward their group and greater acceptance of the group's solutions.

Shelley's study, like so many studies involving groups, has limited applicability because the groups were newly formed, the task was not complex and subjects received nothing of much value for successfully completing the task. Under these conditions, subjects had to rely primarily on past experience to estimate future performance. Interestingly, the average rating for those who experienced success for each problem was no higher than 7.2 on an 11 point scale. Although this rating was significantly higher than the average rating given

by members who had experienced failure, it is a bit surprising that the rating was not closer to 11.

Zander and Medow (1963). Another early group-level efficacy study was conducted by Zander and Medow. Like Shelley (1954), they used the term "level of aspiration," which they defined as the score that a person or group expects to achieve on a trial in the immediate future. This definition is consistent with that of group level efficacy. However, they also stated that level of aspiration should be a publicly-stated decision derived from group discussion. A decision about a level of achievement implies a standard as opposed to an expectation. Inevitably, confounding between goal level and level of aspiration occurred in this study because of the way in which Zander and Medow defined and measured level of aspiration. In fact, Zander later cited this study in a discussion on group goals (Zander, 1977).

Subjects were high school boys. The task involved using a rubber-tipped pole to push a croquet ball down a channel toward a specified mark. Points were awarded according to how close the ball came to this mark. This task was performed by individuals and by groups of 3 - 5 boys. To manipulate success and failure, the subjects were told that their performance was either superior or inferior to scores obtained by others. The subjects in the control group received no comparison information.

Each subject was asked to write down what score he thought the group would be able to achieve on the next trial and to rate how confident he was that the group would achieve that score. Group members then came to a consensus about what score the group would be able to achieve. Zander and Medow used the consensus score to measure level of aspiration. Because the researchers asked

the boys what they believed they would be able to achieve, rather than what they expected they would achieve, it is not clear whether the group members agreed on an expectation or decided on a goal.

Zander and Medow found that both groups and individuals generally raised their aspirations after a performance that exceeded previous aspirations and lowered their aspirations after an unexpectedly poor performance. However, groups raised their aspirations to a greater extent following a success than they lowered their aspirations following a failure. In addition, individuals were more likely to keep their aspirations at the same level after a failure than groups were.

Failure and success also affected attitudes and evaluations about performance. Individuals who worked alone rated their performance lower in the failure condition than group members rated their personal performance in the failure condition. Members were less satisfied with the team's performance and evaluated other members' performance lower in the failure condition than in the control or success conditions.

As in the Shelley study, the groups were apparently newly formed, and the task was fairly trivial and without any lasting consequences for the subjects. However, subjects were asked how important it was to perform well on the task, and the mean rating on a 7-point Likert scale (7 = very important) ranged from 4.6 for the failure group to 5.4 for the success group, indicating that subjects believed doing well was moderately important.

The studies by Shelley (1954), Zander and Medow (1963) reflect early attempts to understand how success and failure affects group-level efficacy. These studies were flawed because they did not clearly distinguish group-level efficacy from goal setting. Of course, success and failure affect both efficacy and

goal setting, and authors have since hypothesized that efficacy affects the goal level that individuals set for themselves or for their groups (cf., George & Feltz, 1995; Gist, 1987; Riggs & Knight, 1994). Developments in goal setting, expectancy and social cognitive theories (see Bandura, 1977, 1982; Locke, 1968; Steers & Porter, 1979) served to clarify the difference between goals and efficacy and highlighted the importance of experimental designs that could distinguish between the two concepts.

Kerr (1989). Kerr used a social dilemma task to determine how the size of a group affects subjects' willingness to take a personal risk in exchange for a possible group-wide gain. Subjects (undergraduate students) were asked to evaluate various investment scenarios and make investment decisions. If enough group members decided to invest \$10 in any given scenario, then everyone in the group, regardless of whether they invested or not, would receive \$20. The researchers varied the size of group and the proportion of group members who would have to invest in order for everyone to receive the \$20. The investment decisions were made in private, and the subjects did not know the other group members; they were only aware of the size of the group.

Kerr defined self efficacy as the degree to which a personal decision to invest would affect the group's probability of earning the investment payoff. Collective efficacy was defined as the subject's belief about the probability that the group would earn the investment payoff. Objective probabilities can be estimated using probability theory, but Kerr was interested in subjects' perceptions of probabilities. In general, self efficacy and collective efficacy, as Kerr measured them, were higher when the groups were smaller. In the case of

collective efficacy, this was true even in those situations when the mathematical probability of receiving a payoff was higher for the larger groups.

The findings from this study suggest that individuals tend to believe that their actions will have a greater impact on outcomes with smaller groups. One may therefore conclude that group size will affect the relationship between self efficacy and collective efficacy. However, the nature of the task and the use of the efficacy terminology used in this study is problematic. The decision to invest is not based on one's ability, but on one's values and willingness to take a risk on behalf of the group. It is therefore different from most tasks used in efficacy studies. Typically, efficacy studies focus on the individual's or group's ability to do a task; attitudes are of interest because they may affect or are affected by success or failure of the task. In this study, the task involved a social dilemma and Kerr defined self and collective efficacy in terms of an individual or a percentage of individuals making a value judgment.

Further, the groups in Kerr's experiments were pseudo-groups, in that members were not actually in groups, but were only told that they were in groups. There was no interaction between group members, although members were dependent upon each other for the investment payoff. Members estimated the likelihood of a payoff without any information about the values and behavioral tendencies of other group members. There are few reasons to take risks on behalf of a group when one knows nothing about or has limited commitment toward members. The application to the work place or classroom, where individuals have at least some interaction with their peers, is limited.

Spink (1990). Spink examined the relationship between group cohesion and collective efficacy for casual players on recreational volleyball teams and

elite players in an open volleyball league. As mentioned earlier in this chapter, because he assessed collective efficacy by having subjects respond to the question, "What placing do you expect to attain in Supervolley?", some confounding between collective efficacy, goal level and outcome expectancy may have occurred. Group cohesion was measured using the four-scale Group Environment Questionnaire. In stepwise discriminant analyses, Spink used the four cohesion scores to classify subjects into two collective efficacy groups, those who expected their team to finish first, and those who expected their team to finish below third place. Spink conducted the discriminant analysis separately for the recreational and open league teams.

Spink found that the cohesion variables correctly classified 73.6% of the elite players into low and high collective efficacy groups, but these variables did not discriminate between the low and high collective efficacy groups in the recreational league. At the end of the tournament, the high collective efficacy groups ranked higher than those with low collective efficacy. However, no analyses were conducted to ascertain whether a causal relationship between collective efficacy and performance existed.

Spink attributed the difference he found between recreational and open league teams to the goals members had for the group. In the elite teams, winning was an important goal, and the cohesion variables may reflect member perception about how well the team was meeting this goal. In contrast, it is likely that many recreational members joined the team for social reasons. In many instances, cohesiveness was actually the goal.

The strength of the Spink's study is that participants were members of ongoing groups and had goals that they were trying to achieve through the group.

This is in contrast to laboratory groups in which subjects are asked to join groups or pseudo-groups to accomplish a task in which they have little or no interest. In addition, task complexity was higher than most studies on group-level efficacy and the level of interdependence was reciprocal; group members had to plan and coordinate their actions to achieve success.

Parker (1994). Parker compared the relationship between self efficacy, collective efficacy and school-wide gains in students' achievement scores. She sent questionnaires to elementary school teachers in a large school district; 19 schools participated in the study. Parker first asked teachers to rate how confident they were that their particular *class* would achieve grade level gains on the California Test of Basic Skills (CTBS) in reading, math and language. Parker identified 12 different levels of performance that were possible, and asked teachers to rate the likelihood that their class would achieve each level. To arrive at a self efficacy score, Parker summed the confidence ratings across all 12 levels of performance. This is a common method used to measure self-efficacy strength (see Lee & Bobko, 1994). To calculate collective efficacy, Parker used the same approach, except that teachers were asked to rate how confident they were that their *school* would achieve grade level gains on the standardized tests.

The correlation coefficients between the self efficacy and collective efficacy scores were high in each teaching domain. The Pearson correlation for self and collective efficacy in mathematics was .60 ($p < .001$); in reading, the correlation was .73 ($< .001$); in language, the correlation was .73 ($p < .001$). Parker found some relationship between years of teaching experience and self efficacy. To assess the relationship between collective efficacy, self efficacy, achievement and socioeconomic variables, Parker used the mean collective

efficacy and self efficacy scores for each school. This reduced the sample size to 19, which severely limited the ability to detect relationships among variables. Nonetheless, school means on teachers' collective efficacy ratings were significantly correlated ($p < .05$) with several socioeconomic variables, although self efficacy ratings were not. Collective efficacy means for each school were correlated with actual reading and language achievement on the CTBS ($p < .05$), but no other correlation coefficients reached statistical significance. No relationships were found between efficacy and achievement when Parker controlled for prior academic achievement. This is not surprising considering the fact that past and present achievement were highly correlated; it is likely that collective efficacy judgments were largely based upon past performance.

Essentially, Parker adapted an accepted method of measuring self efficacy to measure collective efficacy. The resulting high correlation between self efficacy and collective efficacy is a concern, because it raises some question about whether this approach was actually able to capture different constructs. Part of the high correlation was no doubt due to common method bias. However, there are numerous other explanations for such a high correlation. This result may reflect Bandura's (1982) contention that self efficacy is a core component of collective efficacy. Another reason for the high correlation would be that individuals perceived that their co-workers were as competent at the group task as they were at their own task, or that competent co-workers could compensate for lower performers.

The exact reason for a high correlation is frequently a function of the nature of the task. For example, teachers may perceive low instrumentality between their teaching skills and their students' achievement scores. If this is

true, teachers are not likely to believe that skill differences among teachers in the school would have much impact on overall achievement scores for the school. Other variables that are common to all teachers, such as students' intelligence and motivation, school resources, parental support, etc., are likely to have a large impact on scores. It seems likely that self efficacy would be highly correlated with collective efficacy when subjects believe that common intervening variables have considerable effect on both individual and group level performance.

The task in Parker's study can be characterized as one that involved primarily pooled interdependence. Some team teaching occurred and resources had to be shared, but in general, each teacher worked independently with his or her class of students to teach math, reading and language. In essence, all group members performed exactly the same type of task, albeit independently, to achieve individual and group level performance. The degree of interdependence involved in a task is likely to affect the relationship between self efficacy, collective efficacy and other relevant variables.

Riggs and Knight (1994). Riggs and Knight relied on Bandura's social cognitive theory to develop and test a model depicting the relationship among success, failure, self efficacy, collective efficacy, rewards, job satisfaction and organizational commitment. Riggs and Knight hypothesized that group success or failure would affect self efficacy, personal outcome expectancy, collective efficacy and collective outcome expectancy, and that these would then affect job satisfaction and organizational commitment.

To test this model, Riggs and Knight surveyed 480 adult and student employees at a large university and state cooperative extension service in the midwest. These employees formed 79 work groups, with an average group size of

6 members. Riggs and Knight defined a work group as a group with a common identity and whose members depended upon each other to achieve a common goal.

The survey consisted of seven scales. The researchers used the Minnesota Satisfaction Questionnaire--Short Form (Weiss, Dawis, England & Lofquist, 1967) to measure job satisfaction and the Organizational Commitment Questionnaire (Mowday, Steers & Porter, 1979) to measure organizational commitment. They adapted a series of scales that had been developed and tested by Riggs, Warka, Babasa, Betancourt, & Hooker, 1994) to measure group success and failure, self efficacy, personal outcome expectancy, collective efficacy and collective outcome expectancy. Each measure was 6 to 10 items in length and was anchored on a 6-point Likert-type scale. In particular, the Collective Efficacy Beliefs Scale was a 7 item measure that measured group member beliefs about the effectiveness of his or her department. These scales covaried significantly, but a factor analysis indicated that each scale measured a distinct construct.

Because all the data came from a single survey instrument, common method bias was a concern. To test for common method bias, Riggs and Knight first set aside 23 of the 79 groups in their sample and split each of these groups into 3 subunits. They then calculated the mean of the success-failure scores for each group's first subunit, the mean of the efficacy belief scores and outcome expectancy scores for each group's second subunit and the mean of the job satisfaction scores and organizational commitment scores for the third subunit. Group means were also computed for these scales for the other 56 groups in the sample, but all members' scores for all the scales were used. Riggs and Knight then compared the univariate correlation coefficients between the variables from

the subset of 23 to the univariate correlation coefficients found in the subset of 59. When they transformed the r values to Z scores and tested for differences, only the success/failure scale and organizational commitment correlation was significantly different ($p < .05$). They concluded that these results were not enough to indicate that the degree of common method bias was enough to distort the actual relationships between the variables.

Riggs and Knight used structural equation path model analysis to assess the relationship among the variables. All analyses were conducted on an individual level. The researchers found that the success/failure variable had a direct effect on all the beliefs measured, i.e., personal efficacy, personal outcome expectancy, collective efficacy, collective outcome expectancy, and on the two attitudes measured, i.e., job satisfaction and organizational commitment. The authors did not find a significant link between personal efficacy or collective outcome expectancy and the attitudinal variables. The only cognitive variables that mediated between success/failure and satisfaction or commitment were personal outcome expectancy and collective efficacy. The authors suggested that other intervening cognitive variables, specifically internal and external attributions, were missing from the model and may explain why the direct links between success/failure and satisfaction and between success/failure and organizational commitment were so strong. Collective efficacy was only weakly associated with satisfaction and organizational commitment.

Riggs and Knight also calculated η^2 to determine the extent to which within-group membership accounted for the variance in the group success-failure, collective efficacy and collective outcome expectancy measures. The η^2 was

significant for all these measures: group success-failure, $\eta^2 = .45$; collective efficacy, $\eta^2 = .44$; collective outcome expectancy, $\eta^2 = .30$.

Riggs and Knight did not assess the extent to which collective efficacy affects future performance. In addition, the groups in the study varied with respect to how long members had been working together, the type of tasks that they performed and the extent to which members were dependent upon each other for task accomplishment. Nevertheless, the Riggs and Knight study is an important one for collective efficacy research. It defined collective efficacy as a personal belief and used a tested instrument to measure it as such. In addition, Riggs and Knight effectively distinguished between efficacy and outcome expectancy variables, on both personal and collective levels. Further, they were able to demonstrate the importance of success and failure on collective efficacy and its subsequent impact on job satisfaction and organizational commitment.

Prussia and Kinicki (1996). The goal of the Prussia and Kinicki study was to test Bandura's social cognitive theory (1989) by assessing the relationship among collective efficacy, goals, feedback, vicarious experience, group affective evaluations and group effectiveness. They used a 3 (positive, negative or no feedback) X 2 (vicarious experience or no vicarious experience) between-subjects design. Their sample consisted of 324 undergraduates who were assigned to 81 groups. After subjects watched a lecture video on the brainstorming technique, groups performed a brainstorming task. Groups that received feedback compared their scores with a bogus normative standard. In the positive feedback condition, groups learned that their scores were above the norm; those in the negative feedback condition learned that their scores were below the norm. Subjects in the vicarious experience condition then watched a video that showed a group

performing a brainstorming task. All groups filled out a survey and then performed a second brainstorming task.

Variables were derived via a survey instrument, group discussion and judge's ratings. To measure collective efficacy, the survey listed nine different levels of idea output. Using an 11-point scale, subjects rated how confident they were that their group would generate each level of output on the second brainstorming task. A similar approach was used to measure the extent to which subjects were confident their group would use appropriate brainstorming behaviors on the second brainstorming task. Group affective evaluations were measured with 2 items that asked subjects the extent to which they were satisfied with output quantity and group process behaviors. All survey data was aggregated for analysis on a group level. After the initial brainstorming task, group members discussed and set goals for idea generation and appropriate brainstorming behaviors for the second task. A group effectiveness rating was assigned by judges for output quantity and brainstorming behaviors.

Prussia and Kinicki conducted several analyses to determine if it was appropriate to aggregate individual survey responses into group level data. They conducted one-way ANOVAs to derive η^2 ; η^2 ranged from .41 to .47. WABA I analysis was inconclusive, but WABA II analysis indicated that variance was mostly attributable to between group covariation. Median interrater agreement was also found to be sufficiently high for each variable. The authors concluded that aggregation of the individual scores was therefore appropriate.

To assess the relationship among the variables, Prussia and Kinicki conducted covariance structure analysis. They found that the relationship between feedback and group effectiveness was mediated by group affective

evaluations and collective efficacy. Collective efficacy was related to group effectiveness for both the first and second brainstorming tasks, the level of goals that groups set, feedback sign, and vicarious experience. The groups in the vicarious experience condition had higher group effectiveness ratings for task 2, and there was evidence that collective efficacy mediated the relationship between vicarious experience and effectiveness. Groups apparently set goals based on members' perceptions of efficacy, and feedback influenced, at least in part, members' perceptions of collective efficacy. Neither feedback nor group goals were directly related to effectiveness for the second brainstorming task. However, dissatisfaction with performance on the first task was.

The groups in this study were newly formed and it is unlikely that the task was very meaningful for the participants. Thus, it is unclear whether the results can be generalized to ongoing teams in the work setting. Nevertheless, some of the results are interesting and are highly relevant for collective efficacy research. For example, the relationship between goals and subsequent performance, a consistent finding at the individual and group levels (Locke & Latham, 1990; O'Leary-Kelly, Martocchio & Frink, 1994), was not found in this study. The authors suggested that the relationship between group goals and performance in past studies may actually have been a spurious one that occurred because collective efficacy was not measured. However, the goals-efficacy-performance relationship found in this study does not clarify whether collective efficacy has any motivational impact on group members. The motivational effect of collective efficacy may vary according to the level of group development and the importance of the task to group members.

It is also noteworthy that, after performance on one task, statistical analysis indicated that aggregation of individual responses was appropriate for analysis. Conclusions from analyses such as WABA and η^2 are largely based on the researcher's judgments about what is an acceptable ratio of between-groups to within-groups variance. Even so, this finding is somewhat surprising. After working together on just one task, group members developed similar feelings about the group and perceptions about future performance. It is likely that the context had a lot to do with this result. The brainstorming task was low in complexity, output was easily measured and the feedback was unambiguous. There was little reason for group members to be committed to the group or to the task. In this laboratory setting, little information was available or needed to evaluate the group and its performance.

A Summary of the Empirical Findings from Collective Efficacy Studies

Table 2.6 provides a summary of the research studies on collective efficacy. It is no surprise that group members who experience success have higher levels of collective efficacy than those who experience failure. However, there is some evidence to indicate that group members tend to raise their performance expectations to a greater extent following success than they lower expectations following failure. Success and failure on group tasks have been shown to be related to job satisfaction, goal setting, organizational commitment, satisfaction with the group, self efficacy and expectations about the outcomes that result from job performance. Individuals may be less willing to accept the responsibility for poor group performance than for poor individual performance.

Table 2.6

Summary of the Key Collective Efficacy Studies

Authors	Subjects	Type of Group	Task	Collective Efficacy Assessment	Findings
Shelley (1954)	Undergraduates	Ad hoc	Problem-solving scenario	Aggregation of individual responses	Success led to expectations of continued success; Failure reduced expectations of success; Success and failure affected attitude toward the group
Zander & Medow (1963)	Undergraduates	Ad hoc	Pushing a ball toward a specified mark	Group consensus	Raised aspirations followed success; lowered aspirations followed failure; Success and failure affected attitude toward the group
Kerr (1989)	Undergraduates	Pseudo-group	Social dilemma scenario	Individual response	Size of group affected individual action and beliefs
Spink (1990)	Adults from the community	Ongoing	Volleyball	Individual response	Collective efficacy and cohesion were related in the competitive league only
Parker (1994)	Teachers	Ongoing	Teaching elementary students	Aggregation of individual responses	Self efficacy and collective efficacy were highly correlated; There was no relationship between efficacy and scholastic achievement when prior achievement was controlled
Riggs & Knight (1994)	Adult and student employees	Ongoing groups	Different work tasks	Individual responses	Success or failure had a direct effect on personal efficacy, collective efficacy, outcome expectancy, satisfaction and organizational commitment
Prussia & Kinicki (1996)	Undergraduates	Ad hoc	Brainstorming	Aggregation of individual responses	Collective efficacy was related to group effectiveness, goal level, feedback sign and vicarious experience

The relationship between collective efficacy and performance is still not clear. Group members are often accurate when they predict future performance, but there is no evidence about whether or not collective efficacy has a motivational effect. If the Lindsley et al. (1994) collective efficacy-performance spiral model is correct, the relationship between collective efficacy and performance changes through time. For example, after repeated successes, high collective efficacy may lead to poor performance if members become complacent. The dynamic nature of the relationship causes havoc for researchers who try to capture the relationship at any single point in time. Findings from the Prussia and Kinicki (1996) study indicate that dissatisfaction with group performance on a first task may lead to higher levels of performance on a second task. Prussia and Kinicki (1996) also found that group members set goals based on perceptions of collective efficacy, but goals were not related to group effectiveness.

A few of Bandura's (1977, 1982) hypotheses about collective efficacy received some empirical support. The relationship between self efficacy and collective efficacy was consistently strong. In addition, past performance and vicarious experience did affect collective efficacy. Bandura thought that collective efficacy would determine the extent to which an individual would remain a member of a group that experienced failure. However, Spink (1990) found that group cohesion was not related to collective efficacy when group members did not value the outcomes associated with high group performance. Cohesion was related to collective efficacy for members who valued high group performance, but it is still not clear how long members would remain with a group that started to perform poorly.

Researchers used various approaches to measure and analyze collective efficacy. Riggs and Knight (1994) used an instrument tested by Riggs et al. (1994) that assessed

collective efficacy, effectively differentiating it from outcome expectancy. Two studies (Parker, 1994; Prussia & Kinicki, 1996) measured collective efficacy by adapting questions commonly used to assess self-efficacy strength (see Lee & Bobko, 1994). Other studies asked subjects to predict a score (e.g., Zander & Medow, 1963) or group rankings (Spink, 1990). Common method bias becomes a danger in some collective efficacy studies due to a reliance on survey data; Riggs and Knight (1994) tested for this in their study and determined that it was not distorting the relationships among the variables. Data was analyzed on an individual-level (e.g., Riggs & Knight, 1994; Spink, 1990) and by aggregating data (e.g., Parker, 1994; Prussia & Kinicki, 1996). Riggs and Knight (1994) and Prussia and Kinicki (1996) calculated η^2 as a way to determine the extent to which group members held similar beliefs about performance. To this end, Prussia and Kinicki (1996) also calculated WABA I, WABA II and interrater reliabilities. Based on these statistics, the researchers claimed that group members shared efficacy beliefs after working together for just one task. Each of these methods for measuring and analyzing collective efficacy have strengths and benefits.

Collective Efficacy and Effort

No empirical studies have yet explored the relationship between collective efficacy and effort. According to social cognitive and expectancy theories, collective efficacy should lead to increased effort as long as the individual believes that his or her effort will contribute to successful group performance and that group performance will lead to a valued outcome. Shamir (1990) suggested that collective efficacy may also be a motivating force because group members enjoy being associated with a successful group. Nevertheless, Shamir also noted that other factors may motivate members to work hard

on behalf of the group, even when the group is not successful at a particular task. For example, a group member may be motivated by internalized values and norms that are unaffected by the group's overall success or failure. In addition, when individuals define themselves, at least in part, by membership in a group, they are likely to expend effort on behalf of the group in order to affirm or maintain their identities. In contrast to the assumption that collective efficacy will lead to increased effort, Lindsley et al. (1994) suggested that it could actually lead to decreased effort if group members, after repeated successes, become complacent.

Although there have been no studies that directly test the relationship between effort and collective efficacy, researchers in social psychology have long studied the relationship between effort and group work. In particular, studies that identify the factors that lead to increased or decreased effort in group settings provide insight about the possible relationship between collective efficacy and effort.

Insights from Studies on Group Productivity Loss

Extensive research in the field of social psychology has been conducted on social loafing and social facilitation. Social loafing occurs when an individual reduces his or her effort when working with others. In contrast, social facilitation is defined as an increase in effort when individuals work with others present. In the classic 1913 study, Ringelmann (see Kravitz & Martin, 1986) conducted a rope-pulling experiment and found that students pulled harder on the rope when they were alone than when they were in a group. A few years earlier, Triplett (1898, see Sanna, 1992) found that children wound more fishing line when working by others who were doing the same task than when they worked alone. Dozens of studies have since been conducted to ascertain the

conditions under which social loafing and social facilitation occur (see Karau & Williams, 1993 for a review). Some researchers have relied on social cognitive theory and/or expectancy theory to develop theories and hypotheses about social loafing and facilitation.

Self efficacy, group performance and effort. Sanna (1992) hypothesized that the contradictory results found in the social loafing and social facilitation studies could be explained, at least in part, by self efficacy. He conducted two experiments with undergraduate subjects. Subjects in both experiments were divided into three groups: 1) those who worked alone; 2) those who worked in the presence of others; and 3) those who were told that their scores would be combined with the scores of another subject. In the first experiment, subjects worked on a vigilance task at a computer and pressed a computer key every time they saw a dot flash on the screen. Self efficacy was manipulated by telling individuals how their accuracy score compared to the scores of others doing the same task. In a second experiment, students were asked to solve either easy or difficult verbal tasks. Subjects in the high efficacy condition worked on easy tasks, while those in the low efficacy condition worked on difficult tasks.

Findings indicated that self efficacy did moderate the effect of the presence of others on performance. In the low self efficacy condition, the subjects who worked in the presence of others performed lower than any other subjects. Conversely, in the high self efficacy condition, the highest performers were those who worked with others present. In both the high and low self efficacy condition, the scores of subjects who worked alone and those who thought their scores would be combined did not differ.

Sanna concluded that the presence of others will have little or no effect when a person expects to receive nothing but a neutral evaluation. When subjects expect to be

evaluated, they will perform better than in a neutral condition when they have a high self efficacy about the task, and will perform worse than in a neutral condition when they have a low self efficacy about the task. The implication is that individuals must have some incentive to exert extra effort on a laboratory task. The belief that they will be evaluated provides some of this incentive. However, individuals must also believe that their efforts will produce a performance level that will lead to the valued outcome. Subjects in the high efficacy condition believed that their efforts would lead to a high evaluation, and they exerted more effort. In contrast, those in the low efficacy condition were not confident that their efforts would lead to failure anyway, and evidently reduced efforts as a result.

Meta-analysis of social loafing literature. Karau and Williams (1993) reviewed the social loafing literature and conducted a meta-analysis to test the conditions and magnitude of the social loafing phenomenon. Informed by expectancy theory, they proposed the "Collective Effort Model", to explain social loafing (see Figure 2.2). Consistent with expectancy theory and social cognitive theory, the model was built around the assumption that the amount of effort that individuals exert depends upon the extent to which they believe that their efforts will be instrumental to the attainment of valued outcomes. In a group setting, this means that individuals must believe that there is a relationship between 1) individual effort and individual performance, 2) individual performance and group performance, 3) group performance and group outcomes, and 4) group outcomes and individual outcomes. Further, individuals must value the final individual outcome before they are willing to put forth any effort. The authors do recognize that some valued outcomes do not necessarily depend upon the successful completion of a task. Some tasks, for example, are intrinsically rewarding. For some

people, working with other people is rewarding, whatever the task may be. In general, however, individuals are not likely to expend effort unless they believe there is some benefit to be derived.

Karau and Williams used 78 social loafing studies in their meta-analysis. With a few exceptions, the studies that Karau and Williams analyzed involved very simple tasks, such as clapping and shouting, folding paper, pumping air, counting tones, brainstorming, solving mazes, etc. In many cases, group members worked independently on tasks, and then individual outputs were pooled together for group performance scores. Sometimes

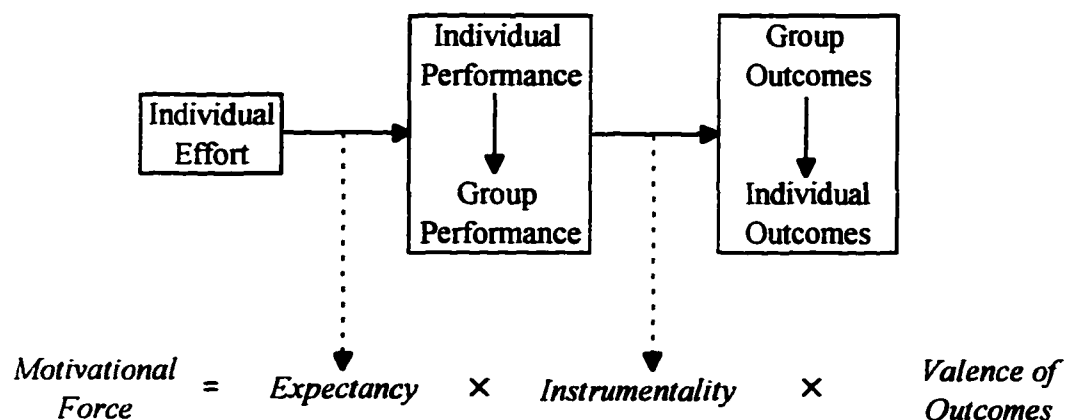


Figure 2.2. Contingencies in collective performance from the Collective Effort Model. From "Social Loafing: A Meta-Analytic Review and Theoretical Integration," by S. J. Karau and K. D. Williams, 1993, *Journal of Personality and Social Psychology*, 65, p. 685.

the subjects worked alone; the experimenter simply told them that they were members of a group. Some groups consisted of strangers. Occasionally, field studies were conducted with group performing a meaningful task. The vast majority of studies were performed in the laboratory and the quality of task performance certainly had no long-term impact on the subjects.

The meta-analysis revealed a small to moderate social loafing effect when individuals worked in groups. Social loafing tended to decrease under the following circumstances: 1) individual contributions to group performance could be evaluated, 2) the task was meaningful to the subjects, 3) subjects valued group membership, 4) group-level comparisons were made and 5) group size decreased. Karau and Williams also suggested that social loafing was more likely when individuals expected the other group members to perform well or if their contribution to the task was redundant with the contributions from other members. There was some evidence that subjects from Western cultures reduced their efforts in a group setting to a greater extent than those from Eastern cultures. Social loafing occurred for samples of men, women and mixed gender, although the effect was greatest for male samples. Various types of tasks were used in the studies including maximizing and optimizing tasks, additive and compensatory tasks, and tasks that required physical, cognitive, perceptual or evaluative performance. Although the meta-analysis indicated that task type had no an effect on the magnitude of social loafing, this is probably due to the fact that the task attributes used to differentiate one task from another were not valid constructs (Wood, 1986).

The results of the meta-analysis provided support for Karau's and Williams' Collective Effort Model. The perceived link between individual effort and valued

outcomes is much more tenuous in a group setting. Task, group and personality characteristics influence subjects' beliefs about what outcomes are likely to occur at various levels of individual effort. In addition, task group and personality characteristics affect the extent to which an individual values these outcomes. The mundane tasks and temporary nature of the groups in the laboratory setting rarely provide valued outcomes for subjects. Field studies are needed to provide a better test of the Collective Effort Model.

A Summary of the Empirical Findings on Social Loafing

The relationship between collective efficacy and effort is still untested, and we must therefore look to the social psychology literature for insight into the relationship between group membership and effort. Findings from social loafing studies suggest that the tendency to reduce individual effort while working in a group may offset any motivation gained through collective efficacy. The social loafing phenomenon was reduced or eliminated, however, when individual contributions could be evaluated, the task was meaningful, subjects valued their membership in the group, group-level competition was present or members believed that their contributions were needed for the group to be successful.

Notably, the vast majority of social loafing studies and a number of the collective efficacy studies relied on newly formed groups or pseudo-groups that performed simple, inconsequential tasks. In the collective efficacy and social loafing studies just reviewed, for example, subjects were asked to push a ball with a stick, watch for flashing dots on a computer screen, brainstorm, and solve riddles. It is likely that the relationship among collective efficacy, effort, goal setting and performance is attenuated in these types of

studies. Social cognitive theory and expectancy theories predict that individuals will reduce their efforts when they do not value the outcomes they associate with performance (Bandura, 1977; Karau & Williams, 1993; Steers, et al., 1979). Valuable outcomes, such as social relationships, self esteem, promotions, grades, etc., are rarely present in laboratory studies.

Conclusions and Implications for Future Research

Intuitively, sports fans recognize that the confidence players have in their team's ability to play is important to winning. Of course, other factors, such as the skills, coaching and equipment, are also critical to success. To the extent that beliefs about one's abilities and the abilities of the team affect effort, goal setting and persistence, high self efficacy and collective efficacy will increase a team's chances of winning. The same variables are thought to be relevant, though perhaps not as obvious or dramatic, in the work place. As this review of the literature has demonstrated, the study of collective efficacy has begun. However, further research is needed to enhance our understanding of the cognitive development of groups and clarify the relationship between collective efficacy, self efficacy and performance. By increasing our understanding of the cognitive and motivational processes underlying group development, we will gain greater insight about the type of environment that is needed to ensure high levels of group performance.

Chapter III

Research Design and Methodology

The Research Problem

As first stated in chapter 1, the purpose of this study was to determine the extent to which members of an ongoing group develop, over time, a shared collective efficacy. This study also examined the relationship among collective efficacy, group performance, self efficacy, individual effort and goal setting.

This study investigated the following research questions:

1. As group members work together over time, to what extent does a shared collective efficacy develop?
2. What is the relationship between collective efficacy and actual group performance?
3. What is the relationship between collective efficacy and self efficacy?
4. What is the relationship between collective efficacy and the goal level that members set for the group?
5. What is the relationship between collective efficacy and the effort that members exert on behalf of the group?

In this chapter, the method and analyses used to explore these questions are described. Because so few studies have been done on collective efficacy, an exploratory design was conducted. The ultimate goal of the dissertation was to propose a model of the relationships among performance, collective efficacy, self efficacy, goals and effort that can be tested in future studies.

Method

Subjects and Setting

The subjects were juniors and seniors enrolled in five different course sections of *Principles of Management* (see Table 3.1 for a list of class characteristics). The advantage of using groups in the classroom was that data could be collected before groups were formed and at various points during group development. Classes met 2 1/2 hours a week for sixteen weeks, and students earned three undergraduate college credits. Four of the classes met twice a week and one class met once a week. Two different instructors taught these courses, and both used a Team Learning design (Michaelsen and Black, 1994; Michaelsen, Watson, Cragin & Fink, 1982), which involved the extensive use of group activities during class time. The instructors assigned subjects to groups within the first three hours of class time and these groups remained intact for the duration of the semester. Demographic data was used by the instructors to make group assignments, ensuring that groups were similar with respect to work experience and cultural background. Each group had five to seven members.

Unlike many laboratory studies, the groups in these classes remained intact for four months and worked on problems and assignments that had meaningful outcomes for the members. Students therefore had several reasons to become committed to the success of the group. First, a significant percentage of students' course grades was based upon group performance. Second, members were likely to value group success because it reflected well on them as members of the group. Social identity theorists (see Mackie and Goethals, 1987, or Oakes, Haslam & Turner, 1994, for a review) have suggested that members seek to affirm their self-concept by making favorable comparisons between their group

and relevant out-groups. Studies have indicated that individuals begin to show in-group favoritism early in the group's formation, even when subjects are arbitrarily assigned to groups (Billig & Tajfel, 1973; Locksley, Ortiz & Hepburn, 1980, Oakes & Turner, 1980). Given the large amount of group work required in the Team Learning classes, it is likely that subjects in the present study identified with their group and that their self-image was at least somewhat affected by group performance. Finally, Shamir (1990) suggested that members may exert effort on behalf of their group because they hold internalized norms of cooperation and social responsibility. Because course grades were dependent upon group performance, some group members probably felt a moral obligation to help the group succeed.

Table 3.1

Characteristics of Classes

	Class 1	Class 2	Class 3	Class 4	Class 5
Meeting time	Tues/Thurs 9:00am	Tues/Thurs 12:00am	Mon/Wed 3:00pm	Mon/Wed 4:30pm	Thurs 6:30pm
Class size	60 students 10 groups	53 students 10 groups	41 students 7 groups	45 students 7 groups	42 students 7 groups
Weight set for individual tests	5% of total course grade	5% of total course grade	10% of total course grade	11% of total course grade	13.5% of total course grade
Weight set for group tests	19.5% of total course grade	18% of total course grade	18% of total course grade	18.75% of total course grade	18% of total course grade

Immediately after individuals were assigned to groups, subjects participated in an activity that facilitated the formation of group-based identities. In this activity, students chose how heavily various class assignments would count toward the final course grade (i.e., grade weights). First, students met in their groups and came to an agreement about these grade weights. Once members from each group determined their grade weight preferences, they sent a representative to the front of the class to negotiate with representatives from the other groups in the class. With the rest of the students watching, the representatives came to an agreement about the grade weights. While representatives negotiated with each other, they were not allowed to speak with their group members. At the request of two or more students in the class, representatives were sent back to confer privately with their group members. As a result of this public negotiation process, group members very likely developed in-group, out-group perceptions.

Individual and Group Tasks

The tasks that subjects performed were six tests, consisting of 16-20 questions each. During the class period following the grade weight setting, the students took their first test. See Table 3.2 for a timetable delineating when the remaining five tests were administered. The testing procedure followed those recommended by Michaelsen, Watson & Schraeder (1985; see also Michaelsen and Black, 1994). First, each subject took the test and then turned in his or her answer sheet. The subjects then took the exact test again as a group; group members had to agree on the answers for each question. Once the group turned in

the test, the individual and group tests were graded immediately and returned to the subjects. When students missed a test, they received the same group score that the other group members earned in their absence. In three of the classes, students could take the individual tests they had missed at the end of the semester. In two of the classes, students were permitted to drop their lowest individual test score.

Each test consisted of multiple choice and true/false questions that were based on readings and class discussions. Although the same textbook was used in all five classes, two different sequence of topics were covered and two

Table 3.2

Timetable for the Administration of Surveys and Tests

	Class 1	Class 2	Class 3	Class 4	Class 5
Initial survey	Week 1	Week 1	Week 1	Week 1	Week 1
Groups formed	Week 2	Week 2	Week 1	Week 1	Week 1
Grade weights set	Week 2	Week 2	Week 1	Week 1	Week 1
Test 1	Week 2	Week 2	Week 2	Week 2	Week 2
Test 2	Week 4	Week 4	Week 3	Week 3	Week 3
Test 3	Week 5	Week 5	Week 5	Week 5	Week 5
Test 4	Week 7	Week 7	Week 7	Week 7	Week 7
Test 5	Week 11	Week 11	Week 11	Week 11	Week 10
Test 6	Week 13	Week 13	Week 14	Week 14	Week 11
Final Survey	Week 15	Week 15	Week 15	Week 15	Week 13

different sets of tests were used. In total, 59% of the questions on the set of tests used in two classes and 61% of the questions on the set of tests used in three classes tested students' ability to recall or recognize facts. The remaining questions tested their ability to classify objects or apply rules (see Gagne, Briggs & Wager, 1992, for a taxonomy of learning outcomes). To do well on the individual tests, students had to be able to recall information from textbook readings and class discussion and/or apply concepts and theories to examples given on the test.

To score well on the group tests, members could not simply rely on their best member to provide the correct answers to test questions. In their study of groups in a Team Learning setting, Watson, Michaelsen & Sharp (1991) found that group scores exceeded the highest scoring member 70% - 74% of the time. The best predictor of group score at time 1 and time 2 was the best member score. However, at time 3, the average member score became a better predictor of group score. Notably, a group's highest performer was never the same person at all three time periods. It is therefore no surprise that cumulative group scores surpassed best member scores 98% of the time. Based on the evidence from their study, Watson et al. (1991) concluded that group consensus led to better decisions in this environment. Their findings indicated that group members must not only be able to read, recall and apply facts and ideas; they must also be able to communicate, resolve conflict, solve problems and reach consensus. The group environment increases the complexity of the test-taking task, and members heavily depend upon each other's knowledge and interpersonal skills to achieve high scores.

Measures

Each student privately completed a total of 8 surveys (see Table 3.2 for a timetable listing when surveys and tests were given). One survey was completed before the groups were formed to measure experience with group work and attitudes toward group work. Students also completed a survey before they took each test. These six surveys measured collective efficacy, self efficacy, effort and goals. A final survey was administered after all the tests had been completed and subjects knew their individual and group scores on all the tests. This last survey measured locus of control, social desirability response bias and various demographic variables. A copy of the instruments are provided in Appendix A.

Several steps were taken to encourage students to be honest with their responses. At the beginning of the semester, subjects invented a personal code name. Anytime subjects completed a survey, they wrote their personal code names in the space provided on the form and identified the group to which they belonged. Personal code names were used to assure the subjects that their responses would remain confidential. At the end of the semester, after all the questionnaires had been completed, subjects were asked to match their personal code name to their posting identification number so that individual test scores could be matched to survey responses.¹ The following statements were placed at the top of the surveys, again urging students to be honest: "Please be realistic and honest. Do not discuss these questions with your group members." In another attempt to ensure confidentiality, each student was encouraged to place his or her completed survey in a 10" X 13" envelope, which prevented other students from handling the form and viewing the responses.

¹Nine subjects could not be matched to individual performance scores.

To test the reliability of the collective efficacy, self efficacy, effort and goal measures, a pilot study was conducted with 34 juniors and seniors enrolled in a *Principles of Management* course that used the Team Learning model. Statistical analyses conducted for each set of items indicated that the items were sufficiently reliable. Results are included in the Appendix B.

Performance. Group test scores were used to measure group performance. Similarly, individual test scores were used to measure individual performance. In the Team Learning model, students learn their group's test score within minutes of completing the test. Although students had the opportunity to raise this score through an appeals process, the initial test score was used as the performance measure. Appeals were graded and returned to students one or more class periods later, long after students had made an initial assessment of their performance on the test. The initial assessment was of interest in this study, and not each subjects' assessment of their group's ability to write an appeal in support of their initial (errant) response.

Collective efficacy. Data from two different types of collective efficacy measures were collected. First, collective efficacy *strength* was measured using a method that is common among self efficacy studies (Gist & Mitchell, 1992; Lee & Bobko, 1994). Students indicated the level of confidence they had that their group would 1) achieve a perfect score, 2) miss 3 or fewer points, 3) miss 6 or fewer points and 4) miss 9 or fewer points. Second, students were asked "How many points do you expect your group to miss on this test?" Lee and Bobko (1994) found that both methods of efficacy measurements had adequate predictive and convergent validity.

Self efficacy. Self efficacy was measured the same way as collective efficacy (see Gist & Mitchell, 1992 and Lee & Bobko, 1994). First, students indicated the level of confidence they had that they would 1) achieve a perfect score, 2) miss 3 or fewer points, 3) miss 6 or fewer points and 4) miss 9 or fewer points. This is typically referred to as self efficacy strength (Lee & Bobko, 1994). In addition, students were asked "How many points do you expect to miss on this test?"

Hours studied and perceived effort. Johnson, Saccuzzo and Larson (1995) conducted a study to determine if self-reported measures of effort could be valid. These researchers concluded that if the verbal measures were specific to the task, they can provide valid and informative data (see also Ericsson & Simon, 1980). For the purposes of this dissertation, two measures of effort were used. Subjects were asked to estimate the number of hours they spent studying for the test (see Mitchell & Nebeker, 1973; Schmitz & Skinner, 1993). In addition, subjects were asked to what extent they agreed with four statements: "I put in a lot of effort to prepare for this test," "I have put more effort than usual into preparing for this test," "I have done all that I can to make sure this group succeeds on this test," and "I have worked harder than most of the other members of my group to prepare for this test." These items were adapted from a study by Pritchard & Sanders (1975). Pritchard & Sanders used a seven-point Likert-type scale and reported a median intercorrelation between their four items of .52. Six-point Likert-type scales were used with the following choices: strongly agree, agree, agree somewhat, disagree somewhat, disagree, strongly disagree. This second measure of effort is referred to as "perceived effort" in this study.

Goals. Of interest in this study is each subject's personal goal and his or her goal for the group. Because collective efficacy focuses on a specific task, member performance goals for the same specific task, in this case, the test, were measured. Using a method of measurement similar to Mone & Baker (1992), goal level and minimum satisfactory scores for individual and group tests were assessed. To measure goal level for each test, subjects were asked to respond to "My goal for my group for this test is to" Subjects chose from among the six responses that differed slightly depending upon how many questions were on the test. For example, if the test consisted of 60 points (20 questions, 3 points each), the possible responses were, "achieve a perfect score," "score a 57 or higher," "score a 54 or higher," "score a 51 or higher," "I don't have a goal for the group," and "We should just try to do our best." To determine minimum satisfactory group scores, subjects were asked to respond to "On this test, I will be satisfied with my group's performance as long as we score at least" Again, the responses were changed slightly depending on the length of the test. If the test consisted of 60 points, the following alternatives were listed: "51 points," "54 points," "57 points," "I will be satisfied with any score we receive," or "I won't be satisfied unless our group achieves a perfect score." Mone & Baker (1992) reported an alpha of .70 for their items.

Attitude toward group work (prefers to work alone). Two items were used to assess the subjects' attitude toward working in groups. These questions were answered before group assignments had been made. The questions were, "To what extent do you enjoy working in groups on class activities and assignments?" and "How much do you agree with this statement: 'Given a choice, I would rather work alone than in a group.'"

Experience with groups. Experience with groups was also measured before group assignments were made. Subjects were first asked whether they had taken a class that used the team learning format. A second question asked, "How much experience do you have working in task groups (at school, work, volunteer organizations, etc.)?"

Locus of control. Locus of control has been defined as "a generalized expectancy pertaining to the connection between personal characteristics and/or actions and experienced outcomes" (Lefcourt, 1991, p. 414). Specifically, locus of control measures are intended to assess the extent to which a subject believes that achievement is due to effort, luck, ability or context. These measures were important to this study because beliefs about individual or group-level efficacy are likely to be affected by whether performance is attributed to effort, luck, ability or the context. Lefcourt (1991) recommended that researchers use locus of control measures that are specific to the task being studied, rather than relying on global measures. Lefcourt and his colleagues (see Lefcourt, 1991) developed and tested an instrument specifically designed for students in an academic environment, the Multidimensional-Multiattributinal Causality Scale. Subjects in this study responded to 24 items that measured causal beliefs about achievement.

Social desirability response bias. To control for possible social desirability response bias, subjects completed a short version of the Marlowe-Crowne Social Desirability Scale (Strahan & Gerbasi, 1972). The Marlowe-Crowne Social Desirability Scale is frequently used when subjects may feel tempted to provide socially desirable answers on self-reported measures (see Paulhus, 1991). Subjects answered "true" or "false" to statements describing

behaviors that are discouraged in this culture (e.g., "I like to gossip at times").

After conducting a series of tests to assess validity, Fischer & Fick (1993) found that Strahan's and Gerbasi's (1972) short version of the Social Desirability Scale had high internal consistency and was highly correlated with the original 33-item scale.

Group potency. An eight item measure described by Guzzo, Yost, Campbell & Shea (1993) was used to assess perceptions about overall group-level effectiveness. Although it was taken individually, group members were asked to estimate group-level beliefs, e.g., "This team expects to be known as a high-performing team." The authors reported an internal consistency reliability of .88 and a mean intra-group agreement correlation of .95. Previous studies on group potency indicated that it was correlated to some measures of group performance (see Guzzo et al., 1993 for a review).

Demographics. Subjects were asked to give information about their age, race and gender. In addition, cumulative grade point averages were obtained from students' academic records.

Class. Subjects came from five different classes of *Principles of Management*. When appropriate, class membership was used as a covariate.

Analysis

An exploratory analysis was conducted in an attempt to clarify the relationships among collective efficacy, effort, goal level and performance across time. The study included analysis at both the individual and group levels. Results of the study are provided in chapter 4.

Demographic Differences

It is not known whether a subject's age, race, gender or achievement in college courses influenced his or her perception of collective efficacy or the relationship among collective efficacy, performance, effort and goal setting. In case demographic variables were related to subjects' responses, ANOVA and Chi-square tests were used to determine whether the five classes in the study differed with respect to age, cumulative grade point average, race and gender.

Profile analysis was also used to evaluate group-based differences on the multiple response measures. In this study, collective efficacy, self efficacy, perceived effort and hours studied were measured at six different points in time. Rather than testing how groups differ on a measure at any single point in time, profile analysis can be used to compare groups on a measure across several time periods (see Harris, 1985; Morrison, 1990). Group means are calculated at each time period; these six means form a response vector. Three hypotheses can then be tested. The first hypothesis is that the slopes of the response vectors are equal for each group (parallel test):

$$\mu_{\text{slope}, 1} = \mu_{\text{slope}, 2} = \dots = \mu_{\text{slope}, 41}$$

The second hypothesis is that the means of all the groups, when the six responses are summed together across time, are equal (levels test):

$$\mu_{\Sigma X_i, 1} = \mu_{\Sigma X_i, 2} = \dots = \mu_{\Sigma X_i, 41},$$

$$\text{where } \mu_{\Sigma X_i, 1} = \mu_{1,1} + \mu_{2,1} + \mu_{3,1} + \mu_{4,1} + \mu_{5,1} + \mu_{6,1}$$

The third hypothesis is that the combined means for the responses, pooled across all groups, are equal (flatness test). If the combined means are equal, the combined response vector is flat:

$$\mu_{\text{slope}} = 0$$

A repeated measures analysis can be used to test for parallelism (test #1). If responses are not parallel, the repeated measures analysis reveals a group-by-response interaction. When a group-by-response interaction occurs, the levels test and flatness test cannot be interpreted and are therefore not meaningful. Profile analyses were conducted to compare the responses made by 1) males and females and 2) minorities and non-minorities. Specifically, gender and minority status were compared with respect to 1) perceptions of collective efficacy at each time period; 2) perceptions of self efficacy at each time period; 3) level of goals set for the group at each time period; 4) perceived effort at each time period; and 5) hours studied at each time period.

Missing Data and Reliability of the Measures

In a longitudinal study, missing data was inevitable. ANOVA, Pearson chi-square and t-tests were used to determine whether those individuals with missing data differed from those with complete data sets with respect to gender, race, grade point average, etc.

To assess the reliability of multi-item measures obtained through survey data, Cronbach's coefficient alpha was calculated for each of the following:

attitude toward group work, group potency, perceived effort, collective efficacy strength, self efficacy strength, goal for oneself and goal for the group.

Variance Within and Between Groups

One of the goals of this study was to determine the extent to which group members develop a shared perception of collective efficacy over time. Repeated measures analysis, η^2 and within and between analysis (WABA) were conducted to test the null hypothesis that group membership had no impact on subjects' perceptions of collective efficacy and goal setting. The results of these tests also provided some information about the extent to which members' beliefs about the group's abilities became more similar over time.

Repeated measures analysis was used to test whether there was a group-by-repeated factor interaction across time. In separate analyses, collective efficacy and group goals were analyzed as the repeated factor, with group ($J = 41$) as the between factor. A group-by-factor interaction indicates that variables unique to each group affected member beliefs about performance.

Riggs & Knight (1994) and Prussia and Kinicki (1996) used η^2 to assess the extent to which group members agreed about the group's ability to perform a task. For the present study, ANOVA was conducted at each time period with group as the independent variable to derive η^2 for collective efficacy, goal for the group and group potency. η^2 was calculated by dividing between sum of squares by total sum of squares.

Another approach sometimes used to assess the extent to which group members agree on a measure is WABA (within and between analysis; Prussia and Kinicki, 1996; Dansereau, Alutto & Yammarino, 1984). This measure is most

commonly used to determine whether it is appropriate to aggregate measures by group. WABA I compares the within and between variance of each variable separately. WABA II analyzes how two variables co-vary, and compares within and between co-variance. WABA was used to analyze collective efficacy and goals for the group at all six time periods.

In WABA I, the dependent variables, for example, collective efficacy and goal for the group, are considered separately. The values needed for WABA I analysis are derived by conducting ANOVA, with groups as the independent variable. The traditional eta, η_b , is derived by calculating the square root of the total sum of squares divided by the between sum of squares. In addition, η_w is calculated by taking the square root of the total sum of squares divided by the within sum of squares.

$$\eta_b = \text{sq root } (SS_b/SS_t)$$

$$\eta_w = \text{sq root } (SS_w/SS_t)$$

An $\underline{E}$ ratio is then derived by dividing η_b by η_w . The $\underline{F}$ statistic that is commonly calculated from the ANOVA is simply:

$$E^2((N - J)/(J - 1))$$

where $\underline{N}$ = the number of subjects and $\underline{J}$ = the number of groups. In WABA I, $\underline{E}$ and $\underline{F}$ statistics are used to compare between and within variance. If total variance is completely explained by between-group variance, $\underline{E}$ approaches infinity. In contrast, if total variance is completely explained by within-group

variance, $\underline{E}$ equals 0. When half of the variance is explained by within-group deviations and half by between-group deviations, $\underline{E}$ equals 1. Dansereau et al. (1984) referred to this latter occurrence as the "ideal equivocal condition." Averaging group scores is appropriate as $\underline{E}$ approaches infinity, because all the information about variance comes from between-group differences. When both within-group and between-group deviations are equal or when within-group deviation accounts for a larger percent of the variance, information is lost when group scores are averaged. An $\underline{F}$ test can be used to confirm that between-group deviations are greater or less than within-group deviations.

WABA II compares how two variables co-vary within the group with how they co-vary between groups. To the extent that group members shared beliefs about efficacy and goals, the ratio of between variance to within variance increases. The key components of WABA II are $\underline{A}$, $\underline{Z}'$, $\underline{Z}$, $\underline{R}_b$ and $\underline{R}_w$.

$\underline{A}$ is the angular difference of the within- and between-group correlations (Dansereau et al., 1984, p. 129-130). "A within-cell correlation is the correlation of one variable (x) with another variable (y) based on within-cell deviation scores. A between-cell correlation is the correlation of one variable (x) with another variable (y) based on between-cell deviation scores" (Dansereau et al., 1984, p. 122). The within- and between-group correlations are converted to angles, with values ranging between 0 and 90 degrees, and then subtracted. When $\underline{A}$ is greater than 0, the between-group correlation is larger than the within-group correlation. $\underline{A}$ is sometimes converted from degrees to radians, which vary from -1.57 to 1.57.

The within- and between-group correlations are also converted to Fisher's $\underline{Z}$ scores ($\underline{Z}'$). The within-group $\underline{Z}'$ score is subtracted from the between-group $\underline{Z}'$ score, adjusting for degrees of freedom (Dansereau, et al., 1984), to arrive at the $\underline{Z}$

score. This is an appropriate procedure, given that the within- and between-group correlations are independent. Again, a positive Z score provides a statistical test to determine whether the difference between the within- and between-group correlations is significantly different from 0. Z scores approximate a normal distribution, and range from minus infinity to positive infinity.

The R ratio represents the magnitude of association (Dansereau, et al., 1984). R_b represents the between-group association, and R_w represents within-group association. Each is derived by taking the correlation and dividing by the square root of 1 - the correlation. R values range from 0 to infinity. A t -test can then be conducted after dividing the R score by degrees of freedom ($J - 2$ for between-group; $N - J - 1$ for within-group.)

The A and R tests are considered practical tests and are used simply to compare within and between variances. Z and t scores can be used as tests of statistical significance.

Measures of Association

Numerous analyses were used to determine the how collective efficacy was related to actual group performance, self efficacy, goal level and effort. Correlation and regression analyses were used to test the null hypothesis that collective efficacy, group performance, self efficacy, goal level and effort were independently distributed variables. Graphical analysis was also conducted to clarify whether the relationships among these variables changed over time. ANOVA and repeated measures analysis were used to test the null hypothesis that individual performance levels had no affect on subjects' collective efficacy and effort.

Initially, the correlation between collective efficacy and the other cognitive and motivational variables in the study were calculated to begin to understand how these variables might be related. Through graphical analysis, the relationship among the variables were examined over time.

Three series of regression analyses were conducted to assess the general association among collective efficacy, past performance, self efficacy, goals effort, and attitude toward group work. In the first series of analyses, collective efficacy or collective efficacy strength was the dependent variable. Six regression equations were calculated, one for each performance test. In the second series of analysis, goal for the group was the dependent variable. Again, a regression equation was calculated for each test. In a final series of regression equations, two equations were calculated, one with perceived effort as the dependent variable, and the other with hours studied as the dependent variable. In contrast to the first two series of equations, perceived effort and hours studied were averaged across time. In all regression analyses, a class membership variable was entered first as a covariate, to control for variance that might have occurred from the use of different tests and differences in time of day, instructor influences, difficulty of content, etc.

To determine how individual performance may have affected collective efficacy, effort and goal setting, individuals were divided into four groups (i.e., quartiles) based upon their overall individual performance on the six tests. For the purposes of this study, total individual performance was averaged over all the tests that the individual had taken so that absences would not adversely affect the final tabulation. To test the null hypothesis that perceptions of collective efficacy, effort and goal for the group did not differ according to a subjects'

individual performance level, ANOVA was conducted. In addition, ANOVA was used to assess whether individuals from different performance quartiles responded differently to scales designed to measure various dispositional characteristics. The following scales were compared:

• *Social Desirability Scale*. 0 - 10 scale. In general, the higher the score, the more likely the subject is concerned with providing socially desirable responses.

• *Locus of control variables*. 0 - 4 scale. Higher scores indicate that subjects attribute performance to that particular variable, i.e., effort, luck, context or ability.

• *Attitude toward group work* (prefers working alone): 1 - 5 scale. Higher scores indicate the extent to which individuals prefer working alone.

Chapter Summary

This study was designed to explore how collective efficacy developed over time and to assess the relationship among collective efficacy, self efficacy, effort and goals. Methods of analysis were selected to test whether 1) group membership had an impact on subjects' perception of collective efficacy, 2) collective efficacy, group performance, self efficacy, goal level and effort were independently distributed variables and 3) performance levels and demographic characteristics were related to subjects' collective efficacy and effort. The ultimate goal of the dissertation was to build a model depicting how these variables change as group members learn more about the task, environment and each other.

Chapter IV

Results of the Exploratory Analyses

Introduction

The goals of this study were to determine the extent to which a shared perception of collective efficacy increases over time and to explore the relationship among collective efficacy, goals, effort and performance over time. This was an exploratory study and numerous analyses were therefore conducted to clarify how these variables might be related at each of the six times they were measured. Several tests were conducted to determine if the classes included in the sample differed with respect to gender, age, grade point average (G.P.A.) and race. The extent and impact of missing data were evaluated. Pearson correlation coefficients and Cronbach's coefficient alpha were calculated to assess the reliability of the measures used in the study. Measures of variance, including repeated measures analysis and within and between analysis (WABA), were used to assess the extent to which group members developed a shared collective efficacy. Measures of association, such as correlation and regression analysis, were used to assess the relationship among the variables.

Demographic Characteristics

Descriptive statistics, ANOVA, and Pearson chi-square statistics were calculated to evaluate demographic differences among the subjects in the sample. ANOVA and chi-square statistics were used to determine if the five classes in the study differed according to age, gender, race or G.P.A.

G.P.A., Gender, Age and Race

The sample consisted of 241 subjects, divided into 41 groups of five to seven members each. The average cumulative G.P.A. was 2.92 (standard deviation was .49, $n = 232$). There were 153 males, 80 females and 8 subjects whose gender was not known. Fifty-eight subjects identified themselves as African American, American Indian, Asian or Hispanic. For comparison purposes, these subjects were grouped together and categorized as having minority status in later analyses. Age and race information are provided in Tables 4.1 and 4.2.

Table 4.1

Age of Subjects

Age category	Frequency
18-20	37
21-25	144
26-30	14
31-35	5
36-40	0
41-45	4
Missing	37

Table 4.2**Race of Subjects**

Race	Frequency
White	162
African American	14
American Indian	9
Asian	30
Hispanic	5
Missing	21

Class Differences

Five classes were used in the sample. The test statistics and significance levels used to determine the extent to which classes differed on the demographic variables are listed in Table 4.3. For categorical variables, a Pearson chi-square test was used; otherwise, ANOVA was run to derive an F value. Analysis indicated that classes did not differ with respect to age, gender, race or cumulative G.P.A.

Table 4.3**Differences Among Classes**

Variable	Test Statistic	Significance
Age	$\chi^2 = 20.85$	$p = .184$
Gender	$\chi^2 = 1.90$	$p = .754$
Race	$\chi^2 = 12.26$	$p = .726$
G.P.A.	$F = 1.65$	$p = .163$

Missing Data

Surveys were administered at eight different points during a 15 week span of time. Although attendance was generally quite high, absences and tardiness did occur. Consequently, some subjects were not present to complete one or more of the eight instruments. Overall, 241 subjects provided answers to questions on at least 3 surveys. Twenty-seven subjects were not present for the first survey, which assessed group experience and attitude. Twenty-nine subjects were not present for the last survey, which measured group potency, social desirability response bias and locus of control.

Surveys were also given immediately prior to the administration of each performance test. Six performance tests were given. A total of 43 subjects missed at least one of the surveys that they were to complete before they took the test. Missed surveys were scattered across the sample and across time. Of the 43 who missed at least one of these surveys, 30 subjects missed it once, 11 missed it twice and 2 missed it three times. Chi-square and t -tests were conducted to determine if subjects who missed any of the surveys were significantly different from other subjects with respect to gender, minority status or G.P.A. On average, subjects who missed at least one survey had a lower G.P.A. than those who never missed (G.P.A. = 2.77, 2.97, respectively; $t = 2.48$, $p = .014$). No other differences were found.

Missing data also occurred as a result of subjects choosing not to reveal their personal posting identification number. As described in chapter 3, subjects used code names to ensure confidentiality. At the end of the semester, after all the questionnaires had been completed, subjects were asked to match their

personal code name to their posting identification number so that individual test scores could be matched to survey responses. It was not possible to obtain grade point averages and individual performance scores for subjects who could not be matched with their posting identification number.

Occasionally, subjects skipped an item or responded to items incorrectly. At each time period, there were subjects who left one or two items unanswered on an otherwise completed survey form. When it was apparent that subjects did not understand a survey question, their responses to that particular question were excluded from the database. Errors occurred primarily with respect to the collective efficacy strength and self efficacy strength items.¹

To take advantage of all the information available, none of the original 241 subjects were excluded from the database. Listwise deletion was used for within and between analyses (WABA) and regression analyses when conducted on data from each of the six time periods. In this way, the same subjects could be compared across time. Listwise deletion was also used for repeated measures analysis and profile analysis. An alternative would have been to replace the missing data with predicted values or means, but such estimates were not appropriate for analyses that were intended to assess group-by-factor interaction and/or changes over time. The entire data set was included for most correlation and graphical analyses. For example, the means that are depicted on the graphs

¹*Collective efficacy* was measured by asking subjects to predict the score their group would make on the test. *Collective efficacy strength* was measured by asking subjects to estimate, using 10 point scales, the level of confidence they had that their group would 1) achieve a perfect score, 2) answer all questions correctly except one; 3) answer all questions correctly except two; and 4) answer all questions correctly except three. The *collective efficacy strength* score was derived by averaging the responses from these four questions for each subject. A similar distinction was made between *self efficacy* and *self efficacy strength*.

were calculated from all available data. Consequently, the n may vary from time period to time period. Sample sizes are noted in the description of the results.

It was not feasible to exclude from the sample all those subjects with missing data points. To do so would have significantly decreased the size of the sample. In addition, the subjects who had a complete data set did not adequately represent the original sample. Minority subjects, many of whom spoke English as a second language, were over-represented in the group of subjects who incorrectly completed the efficacy strength items ($\chi^2 = 10.67$; $p = .001$). As noted above, subjects who completely missed one or more surveys had, on average, lower grade point averages.

Reliability of the Measures

A series of analyses were used to determine the extent to which the measures in the study were reliable. Descriptions of the analyses and their results are described below.

Efficacy

The collective and self efficacy constructs were measured by both a single item and a multiple-item index (see footnote 1). A decision had to be made regarding whether the single item, the multiple-item index or a combination of the two should be used. As explained in chapter 3, both single-item measures and multiple-item indexes have been used and validated in previous efficacy studies. There are advantages and disadvantages to each method of measurement.

An advantage of the single-item collective efficacy measure was that it demonstrated face and convergent validity. The single item, "How many points

do you expect your group to miss on this test?", was a straightforward question that required subjects to predict their group's performance score. The single-item efficacy measures correlated with the four-item efficacy strength measures (see Appendix D for correlation matrices). The correlation coefficients between collective efficacy and collective efficacy strength ranged from .46 (time 2, $p < .001$) to .67 (time 6, $p < .001$). The correlation between self efficacy and self efficacy strength ranged from .60 (time 3, $p < .001$) to .70 (time 4, $p < .001$).

The single-item measures were also easy for the subjects to understand and answer. A total of 55 subjects had missing data for the single-item collective efficacy measure on one or more of the surveys taken prior to each performance test. Eighty-eight percent of the missing data were due to absenteeism or tardiness, rather than a misunderstanding of the question. These subjects did not differ with respect to gender or minority status from those with complete collective efficacy data, although grade point averages were lower for those with missing data ($p < .01$).

The major advantage of the four-item collective efficacy strength measure was that it demonstrated high internal consistency in this study (see Appendix C). Previous studies have also indicated that multi-item efficacy strength measures are reliable and valid (see Gist & Mitchell, 1992 or Lee and Bobko, 1994 for reviews). An important disadvantage, however, was that subjects in the present study had a difficult time completing the four-item efficacy strength measures correctly. The measure was obviously not valid for those who completed the items erroneously.

As noted earlier, items that were completed erroneously were entered as missing data points. A total of 81 subjects had missing data for the four-item

collective efficacy strength measure. Grade point averages were lower for subjects with missing data ($p < .001$). No difference in gender was detected between those with complete data and those with missing data. Notably, minority subjects were more likely to have missing collective efficacy strength data than the other subjects in the sample ($p < .001$). Similar results occurred for the self efficacy strength measure.

After consideration of the advantages and disadvantages of both measures, it was decided that the single-item efficacy measures would be used for all analyses. The decision was based primarily on the advantages associated with the larger sample size that was possible by using the single-item measures. A larger sample size was desirable because it increased the power of statistical analyses. In addition, the subjects who could be included in the analyses were more representative of the entire sample of 241 subjects. As described later, minority and non-minority subjects responded differently to the effort measures, and reducing the number of minority subjects would have distorted the findings.

In order to verify that results were due to actual relationships among the variables rather than the method of measurement, many of the analyses were conducted twice, first with the single-item collective efficacy measure and then again with the four-item collective efficacy strength measure. These parallel analyses provided tests of convergent validity. Analyses conducted with the four-item efficacy strength measures are provided in Appendix C.

Goal and Effort

Reliability of the goal and effort items was tested using Cronbach's coefficient alpha. All the items demonstrated adequate reliability. The two items

used to measure subjects' attitude toward group work had a standardized alpha of .78 ($n = 213$). Reliability for the multi-item measures that were assessed before each test are given in Table 4.4.

Table 4.4

Reliability of Multi-Item Measures Used at Each Time Period

Measure	Cronbach's Coefficient Alpha (n)					
	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
Perceived effort (questions 1-4) ^a	.86 (238)	.87 (231)	.88 (238)	.90 (239)	.92 (229)	.92 (223)
Goals for self (questions 19-20) ^a	.74 (237)	.81 (229)	.83 (235)	.80 (229)	.79 (227)	.83 (222)
Goals for group (questions 17-18) ^a	.68 (236)	.65 (230)	.74 (233)	.75 (226)	.70 (225)	.70 (222)

^a See Appendix A, Surveys Administered Preceding Each Test, for the questions used to measure each variable.

Performance

Subjects in this sample came from five classes that were taught by one of two instructors. Each instructor used her own set of performance tests. ANOVA was conducted to determine whether total individual tests scores, from all six time periods, differed between classes. Analysis revealed that there was no statistical difference between the first four classes with respect to individual

performance on the tests ($F = .335$, $p = .800$). Two of these classes took the first set of tests, two took the second set of tests. Students in the fifth class took the second set of tests, and these students scored significantly lower than the other four classes. When all five classes were included in the ANOVA, $F = 4.68$ and $p = .001$. Reverse Helmert contrast analysis confirmed that individual performance scores in class five were significantly different from the first four classes ($t = 4.137$, $p < .001$), but the first four classes were not different from each other. Overall group performance did not differ between classes ($F = .827$, $p = .517$). These findings indicated that, overall, the tests were comparable in difficulty. The test score means for each class are listed in Table 4.5.

Table 4.5

Overall Test Score Means for Each Class, Times 1 - 6

Class	Overall Individual performance mean	Overall Group performance mean
Class 1	.72 ($n = 60$)	.87 ($n = 10$)
Class 2	.73 ($n = 53$)	.90 ($n = 10$)
Class 3	.71 ($n = 37$)	.88 ($n = 7$)
Class 4	.73 ($n = 40$)	.91 ($n = 7$)
Class 5	.66 ($n = 42$)	.87 ($n = 7$)

Group Potency

Group potency was measured at the end of the semester with the instrument developed by Guzzo et al. (1993). The instrument consisted of 8 items, and the alpha was .94 ($n = 211$). There were no differences in group potency scores based on gender ($t = .75$, $p = .452$) or minority status ($t = .13$, $p = .900$).

Summary

Data were collected from 241 subjects during a 15 week span of time. Surveys were used to gather data on collective efficacy, self efficacy, effort and goals at six different points in time, immediately prior to the administration of the performance tests. There were 198 subjects who were present to take all six surveys. Subjects who were present for all the surveys did not differ with respect to gender or minority status from those who were absent one or more times, but tended to have slightly higher grade point averages.

Analyses were conducted to evaluate the reliability of the measures used in this study. Measures for effort, goals and group potency demonstrated adequate internal consistency. Although the two instructors who taught the five classes in the study used different tests to measure performance, the tests appeared to be comparable in difficulty. The single-item collective efficacy measure was used for all statistical analyses because a large number of subjects did not correctly complete the four-item collective efficacy strength measure. As a precaution, however, many of the analyses were conducted twice, first with the single-item collective efficacy measure and then again with the four-item collective efficacy strength measure (see Appendix C).

Based on the results of these analyses, the collective efficacy, self efficacy, goals, effort and performance measures were included, as described in the methods section of chapter 3, to investigate the five research questions.

The Development of a Shared Collective Efficacy

The first research question was, "To what extent does a shared collective efficacy develop?" To answer this question for the group members in this sample, repeated measures analysis, one-way between subjects ANOVA and within and between analysis (WABA) were conducted. It was necessary to determine whether or not individual-level factors affect beliefs about group performance, because they may impede the formation of a shared collective efficacy. Consequently, profile analysis was used to assess the extent to which two individual-level variables, gender and minority status, were related to collective efficacy scores.

Group-Level Effects on Collective Efficacy and Goal Setting

Repeated measures analysis was conducted to assess the extent to which group-level factors may have influenced subjects' expectations about group performance and goal setting. An one within-subjects factor (collective efficacy) and one between-subjects factor (group membership) design was used to determine whether collective efficacy changed over time and whether there was a group-by-collective efficacy interaction. Both a main effect and a group-by-collective efficacy interaction did occur (see Table 4.6). Another analysis was conducted with the variable, goal for the group, as the within-subjects factor. Again, there was a main effect and group-by-goal interaction. These findings

Table 4.6**Repeated Measures Analysis: Group Membership, Collective Efficacy and Goal Setting**

Within-subjects factor	Between-Subjects Factor: Group Membership	
	Pillais $\underline{F}$	Wilks $\underline{F}$
Collective efficacy ($n = 186$)		
Main effect	25.26 (.000)	25.26 (.000)
Interaction	1.68 (.000)	1.71 (.000)
Goal for group ($n = 186$)		
Main effect	14.22 (.000)	14.22 (.000)
Interaction	1.62 (.000)	1.62 (.000)

Note. p-values in parentheses.

indicated that group-level factors affected the goals that members set for their group and their beliefs about the group's ability to perform on each test.

When a group-by-factor interaction occurs, Maxwell and Delaney (1990) recommended conducting a between-subjects, one-way ANOVA at each level of the repeated factor. These analyses also provide eta values, which can be used to evaluate whether it is appropriate to aggregate collective efficacy scores (see Riggs & Knight, 1994).

Comparing Variance Within and Between Groups

Table 4.7 gives the η^2 from several one-way analysis of variance calculations. For each analysis, the independent variable was group membership ($J = 36$). Collective efficacy and goal for the group were analyzed separately as the dependent variable at times 1 - 6. Group potency, which was measured after all the tests had been taken, was also analyzed.

The η^2 value for collective efficacy became statistically significant ($p < .05$) at time 2 and remained significant through time 6. In contrast, goal for the group was statistically significant ($p < .05$) at all 6 times. For both variables, η^2 reached its highest value at time 3. The η^2 value associated with group

Table 4.7

Eta Analysis: Group Membership, Collective Efficacy and Goal Setting

Dependent Variable	Between-Subjects Factor: Group Membership					
	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
Collective efficacy	$\eta^2 = .27$ $F = 1.34$ $p = .121$	$\eta^2 = .31$ $F = 1.69$ $p = .018$	$\eta^2 = .51$ $F = 3.84$ $p = .000$	$\eta^2 = .41$ $F = 2.54$ $p = .000$	$\eta^2 = .47$ $F = 3.26$ $p = .000$	$\eta^2 = .40$ $F = 2.48$ $p = .000$
Goal for the group	$\eta^2 = .38$ $F = 2.29$ $p = .000$	$\eta^2 = .32$ $F = 1.76$ $p = .013$	$\eta^2 = .44$ $F = 2.90$ $p = .000$	$\eta^2 = .36$ $F = 2.07$ $p = .002$	$\eta^2 = .35$ $F = 1.97$ $p = .000$	$\eta^2 = .34$ $F = 1.92$ $p = .005$
Group Potency	--Not measured--					$\eta^2 = .53$ $F = 3.62$ $p = .000$

Note. $n = 165$, $J = 36$.

potency was comparable to that for collective efficacy at time 3. It is important to note that the variance associated with collective efficacy continued to decrease after time 3 within groups, but it also decreased for the entire sample over time (see Appendix E).

Within and between analysis I (WABA I) is very similar to η^2 analysis; both are based on ANOVA design, and group membership was the independent variable (see chapter 3 for a full description). The results were therefore parallel to those described above, although more information was available because both within and between variance were used to compute the $\underline{E}$ ratio. The results of the WABA I analysis for collective efficacy, collective efficacy strength and group goals are provided in Table 4.8.

Table 4.8

WABA I Results: Collective Efficacy and Goal Setting

Dependent Variable	Between-Subjects Factor: Group Membership					
	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
Collective efficacy	$\eta_b = .52$	$\eta_b = .56$	$\eta_b = .71$	$\eta_b = .63$	$\eta_b = .69$	$\eta_b = .63$
	$\eta_w = .86$	$\eta_w = .83$	$\eta_w = .70$	$\eta_w = .77$	$\eta_w = .73$	$\eta_w = .77$
	$\underline{E} = .60$	$\underline{E} = .68$	$\underline{E} = 1.02$	$\underline{E} = .83$	$\underline{E} = .94$	$\underline{E} = .82$
Goal for the group	$\eta_b = .62$	$\eta_b = .57$	$\eta_b = .66$	$\eta_b = .60$	$\eta_b = .59$	$\eta_b = .59$
	$\eta_w = .78$	$\eta_w = .82$	$\eta_w = .75$	$\eta_w = .80$	$\eta_w = .81$	$\eta_w = .81$
	$\underline{E} = .79$	$\underline{E} = .69$	$\underline{E} = .89$	$\underline{E} = .75$	$\underline{E} = .73$	$\underline{E} = .72$

Note. $n = 165$; $J = 36$; $\eta_b = \text{sq root } (SS_b/SS_t)$; $\eta_w = \text{sq root } (SS_w/SS_t)$; $\underline{E} = \eta_b/\eta_w$.

As noted in Table 4.8, all but one of the $\underline{E}$ ratios were below 1, indicating that between-cell deviations were smaller than within-cell deviations. For collective efficacy, the $\underline{E}$ ratio was lowest at time 1, increased at time 2 and peaked at time 3. The $\underline{E}$ ratio for goal for the group was lowest at time 2, peaked at time 3 and remain steady at times 4 - 6. According to the 30⁰ test described by Dansereau's et al. (1984), $\underline{E}$ ratios falling between .58 and 1.73 are considered in the equivocal condition because both within- and between-cell deviations are making significant contributions to variance. Most $\underline{E}$ ratios in these analyses fell within this range. As Dansereau et al. suggested, the $\underline{E}_w$ statistic was derived for each variable that fell below 1 to test each within-eta correlation,² but none were statistically significant ($p < .05$). These results confirmed that the $\underline{E}$ ratios in this study were equivocal.

WABA II can be used to compare how two variables co-vary within and between groups (see chapter 3 for further explanation). Collective efficacy and goal for the group were tested because they measured an individual-level belief and goal regarding a group-level task. The results of these analyses are provided in Table 4.9. $\underline{A}$ is the angular difference (in radians) of each within- and between-cell correlation and can vary from -1.57 to 1.57; a large $\underline{A}$ value indicates that the between-cell correlation is stronger than a within-cell correlation. $\underline{A}$ was converted to a $\underline{Z}$ score, and these are given in Table 4.9. Also listed in Table 4.9 is the magnitude of between-cell association, $\underline{R}_b$, and within-cell association, $\underline{R}_w$. An $\underline{R}$ value greater than 1 indicates a correlation higher than .71 (which therefore explains at least 50% of the variance). $\underline{R}_b$ and $\underline{R}_w$ are

² $\underline{E}_w = \eta^2_w(J - 1) / \eta^2_b(N - J)$

Table 4.9

WABA II Results: Collective Efficacy and Goal for the Group

Between-Subjects Factor: Group Membership					
Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
$\underline{A} = .34$ $\underline{Z} = 2.14$ $p = .016$	$\underline{A} = -.23$ $\underline{Z} = -1.34$ $p = .910$	$\underline{A} = .43$ $\underline{Z} = 2.89$ $p = .002$	$\underline{A} = .21$ $\underline{Z} = 1.56$ $p = .059$	$\underline{A} = .30$ $\underline{Z} = 2.06$ $p = .020$	$\underline{A} = .24$ $\underline{Z} = 1.72$ $p = .043$
$\underline{R}_b = .97$ $p = .000$	$\underline{R}_b = .39$ $p = .021$	$\underline{R}_b = 1.24$ $p = .000$	$\underline{R}_b = 1.26$ $p = .000$	$\underline{R}_b = 1.14$ $p = .000$	$\underline{R}_b = 1.22$ $p = .000$
$\underline{R}_w = .46$ $p = .000$	$\underline{R}_w = .68$ $p = .000$	$\underline{R}_w = .50$ $p = .000$	$\underline{R}_w = .82$ $p = .000$	$\underline{R}_w = .61$ $p = .000$	$\underline{R}_w = .75$ $p = .000$

Note. $n = 165$; $J = 36$

independent, and can be tested for significance with t-tests. The p-values in Table 4.9 reflect the results of t-tests.

Based on the 15^0 test described in Dansereau, et al. (1984), $\underline{A}$ values above .26 plus a $\underline{Z}$ value greater than or equal to 1.66 indicate sufficient agreement within the group to justify conducting all analyses at a group-level. For collective efficacy and goal for the group, this occurred at times 3 and 5. At time 2, $\underline{R}_w$ was actually larger than $\underline{R}_b$. Consistent with WABA I, the greatest difference between between-cell correlation and within-cell correlation came at time 3. At times 4 - 6, $\underline{R}_b$ values remained above 1, but increases in $\underline{R}_w$ caused $\underline{A}$ to decrease.

Gender and Racial Differences

Profile analysis was conducted to determine if responses to collective efficacy varied according to gender or minority status (Table 4.10). The advantage of using profile analysis is that it can detect between-group differences in longitudinal data. The flatness test indicated that collective efficacy scores changed over time. There was no gender-by-efficacy or minority status-by-

Table 4.10

Profile Analyses: The Relationship Between Gender or Minority Status and Collective Efficacy

Between-Subjects Factor	Repeated Factor: Collective Efficacy		
	Parallel Test	Levels Test	Flatness Test
Gender 118 males 63 females	$\underline{F} = .92$ $\underline{p} = .467$	Mean ^a M = .93 F = .91 $\underline{t} = 2.38$ $\underline{p} = .018$	$\underline{T}^2 = 125.05$ $\underline{F} = 24.45$ $\underline{p} = .000$
Minority Status 131 non-minority 45 minority	$\underline{F} = .89$ $\underline{p} = .488$	Mean ^a NM = .92 Min = .92 $\underline{t} = 1.04$ $\underline{p} = .301$	$\underline{T}^2 = 124.49$ $\underline{F} = 24.33$ $\underline{p} = .000$

Note. M = males, F = females, NM = non-minority subjects, Min = minority subjects.

^aMean for each test.

efficacy interaction. A levels test for minority status was not significant, but gender differences did occur.

The levels tests revealed that males responded to the collective efficacy item differently than females ($p < .05$). Further analyses indicated that males had a total collective efficacy score of 5.56 (averaging .93 per test) while females had a total collective efficacy score of 5.46 (averaging .91 per test). In other words, males expected group scores to be 2 percentage points higher than the females.

Summary

Repeated measures, eta and within and between analyses revealed that group members held similar beliefs about the group's ability to perform a task. Further, they began sharing beliefs as early as time 2. Members held similar goals for their group from time 1. Expectations about group performance became more similar within and between groups over time. Profile analysis indicated that some of the differences within each group regarding group performance expectations may be related to gender. Specifically, males tended to have higher expectations about the group's ability to perform a task than females.

Performance, Collective Efficacy, Self Efficacy,

Goal Level and Effort

The remaining four research questions investigated in this dissertation focused on the relationship among group performance, collective efficacy, self efficacy, goals and effort. Measures of association, including correlation, regression and graphical analyses, clarified these variables were related.

Performance and Collective Efficacy

The second research question in this study was, "What is the relationship between collective efficacy and group performance?" The relationship between group performance and collective efficacy was analyzed using descriptive statistics and correlation, regression and graphical analyses.³

Accuracy of efficacy expectations. The number of subjects whose groups scored above, equal to or below their expectations was calculated. Subjects generally predicted that they would do better than they actually did, except at times 4 and 5. In Table 4.11, the number and percentage of subjects who predicted their group would score higher, lower or equal to what they actually did is provided.

Table 4.11

Accuracy in Group Performance Expectations

	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
Group scored higher than predicted	32 14.3%	78 35.8%	59 25.9%	99 45.2%	90 41.6%	42 19.9%
Accurate prediction	12 5.4%	28 12.8%	30 13.1%	33 15.1%	58 26.9%	45 21.3%
Group scored lower than predicted	180 80.3%	112 51.4%	139 61.0%	87 39.7%	68 31.5%	124 58.8%
Missing	17	23	13	22	25	30

Note. Average performance scores for tests 1- 6 were .82, .87, .87, .92, .94 and .90, respectively (see Appendix E).

³Analysis of variance was also conducted to determine how psychosocial traits, such as locus of control and attitude toward group work, were related to performance. These results are provided in Appendix F.

The performance/efficacy relationship. Past group performance, collective efficacy and future group performance were frequently correlated in this study. Consequently, it was difficult to distinguish whether collective efficacy was correlated with past group performance, future group performance, or both. The results of a correlation analysis between group performance and collective efficacy are provided in Table 4.12 (see Appendix D for complete correlation matrices). Findings indicated that collective efficacy was more strongly related to past performance ($t - 1$) than to future performance. In addition, at times 5 and

Table 4.12

Variables Correlated With Collective Efficacy

Variable	Correlation with Collective Efficacy					
	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
Group Performance	.05	.13	.24	.08	.23	.17
Group Performance, t-1	—	.16	.44	.37	.29	.19
Total Group performance	.13	.12	.25	.37	.39	.34
Individual Performance	.11	.13	.15	.09	.16	.00
Individual Performance, t-1	—	.21	.14	.12	.11	.13
Self efficacy	.51	.55	.61	.58	.56	.46
Goal for the group	.50	.41	.56	.63	.47	.57
Goal for oneself	.41	.35	.49	.49	.26	.25
Hours	.06	.03	.04	.03	.04	.10
Perceived effort	.17	.09	.22	.18	.18	.29

Note. n varies from 215 to 236; $p < .05$ when $r = .14$

6, overall group performance was more strongly related to collective efficacy than previous ($t - 1$) group performance.

A regression analysis was conducted to assess the relationship among collective efficacy, performance and self efficacy⁴ (see Table 4.13). Collective efficacy was the dependent variable. Initially, the variables, class,⁵ attitude toward group work (prefers to work alone), gender, social desirability scale (S.D.S.), minority status and locus of control, were included in the analysis. S.D.S., minority status and the locus of control variables were not significant ($p > .05$), so the regression analysis was conducted again without them. Three variables, class, attitude toward group work and gender, were significant in one or more of the regression equations and were kept in at each time as covariates. By controlling for these variables at each of the six time periods, the B values for performance and self efficacy could be compared more easily across time.

It is important to note that this regression analysis was conducted as part of an exploratory study, and inferences must be made with caution due to a number of limitations. For example, sample size was reduced from 241 to 161 when subjects with missing data were dropped from the analysis so that the same subjects could be compared across time. In addition, some variables in these analyses were not independently distributed (see Appendix D for correlation matrices).

The intent of this series of regression analyses was to clarify the relationship between collective efficacy and the other variables at each time period, and not to support or disprove causality. The variables that are typically

⁴Findings relevant to self efficacy are discussed later, within the context of the third research question.

⁵Subjects were students in one of five classes. The "class" variable had a value of 1 - 5.

referred to as "predictor" variables, and in a confirmatory analysis would ordinarily be interpreted as determinants of the dependent variable, were not, in

Table 4.13

Summary of Regression Analyses: Collective Efficacy as the Dependent

Variable

	Test 1 B	Test 2 B	Test 3 B	Test 4 B	Test 5 B	Test 6 B
Variables						
Past group performance (t-1)	—	.185 (.000)	.240 (.000)	.254 (.000)	.241 (.000)	.158 (.006)
Self Efficacy	.427 (.000)	.405 (.000)	.419 (.000)	.344 (.000)	.286 (.000)	.220 (.000)
Covariates						
Class	-.002 (.521)	-.004 (.207)	-.007 (.047)	-.003 (.220)	-.009 (.006)	-.004 (.141)
Attitude: Prefers to work alone	-.010 (.046)	-.003 (.498)	-.001 (.749)	-.002 (.646)	-.008 (.039)	-.005 (.173)
Gender	.015 (.115)	.016 (.058)	.028 (.001)	.029 (.000)	.015 (.061)	.011 (.149)
Constant	.604 (.000)	.441 (.000)	.387 (.000)	.436 (.000)	.525 (.000)	.639 (.000)
Statistical Significance						
Adjusted R^2	.325	.441	.534	.458	.425	.247
Standard error	.056	.050	.051	.043	.049	.044
F	20.27	26.26	37.60	28.07	24.61	11.49
p	.000	.000	.000	.000	.000	.000

Note. $n = 161$; p-values are in parentheses.

this case, true predictors or determinants. Each regression coefficient listed in the table was the result that occurred when the variable was entered into the equation after all other variables. In essence, the results assessed the relationship between collective efficacy and each variable while holding all other variables constant. In the context of this exploratory study, the findings provided some insight about how performance and self efficacy were related to collective efficacy and how these relationships changed over time.

Overall, each equation explained a significant ($p < .001$) amount of variance in collective efficacy. Adjusted R^2 varied from .247 at time 6 to .534 at time 3. Past group performance ($t - 1$) was a significant predictor ($p < .001$) from time 2 to time 6.

In Figure 4.1, individual performance, group performance, collective efficacy and self efficacy means are shown for each time period. At time 1, individuals generally expected their group's scores to be higher than their individual scores. Although this prediction was accurate, actual individual and group performance scores were substantially lower than expected. Overall collective and self efficacy scores only slightly decreased at time 2. Mean individual and group performance increased slightly at time 2, but were still below expectations. After time 2, individual performance, group performance, collective efficacy and self efficacy generally increased over time, although actual group performance declined at time 6. Individuals were better at predicting group scores than their own scores, although the smaller difference between collective efficacy and actual group performance may have been, at least in part, due to ceiling effects, as actual scores neared 100%.

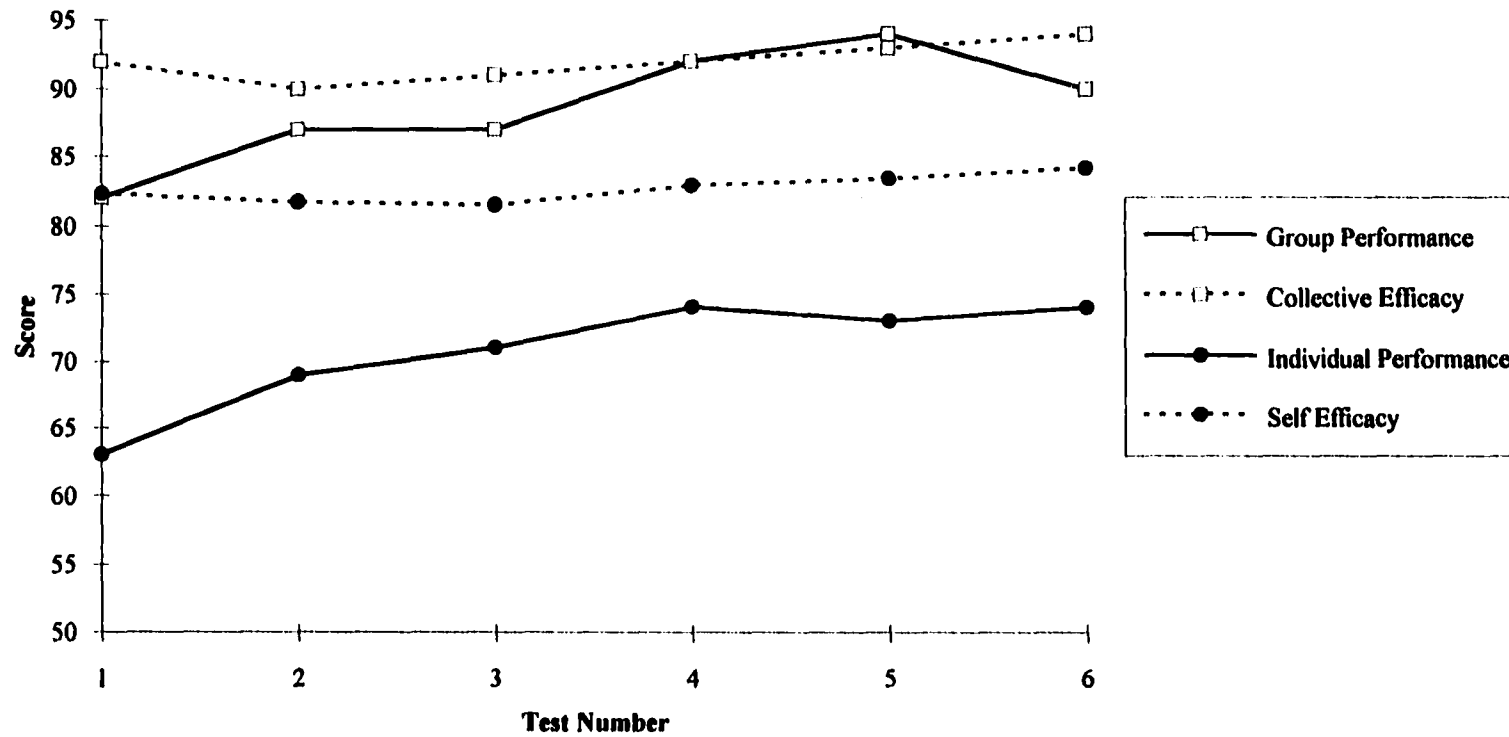


Figure 4.1. Sample means for collective efficacy, self efficacy, group performance and individual performance at each time.

To clarify how past performance might be affecting collective efficacy responses, collective efficacy and actual group performance scores were compared between two sets of subjects at opposite ends of the performance continuum: those whose group performance scores were the highest in their class and those whose group performance scores were the lowest in their class (see Figure 4.2). A total of ten groups were therefore compared, two groups from each of the five classes. Although performance scores improved for both groups from time 1 to time 6, the increase was much more dramatic for those who scored at the bottom of their class. Interestingly, this analysis indicated that those from the lowest performing groups had average collective efficacy scores above actual performance from time 1 through time 6, while those from the highest performing groups had average collective efficacy values below actual performance scores at times 2, 3, 5 and 6. Collective efficacy values at times 1, 2 and 3 were not statistically different for the two groups (t values times 1 - 3: .72, 0, .96; $p > .05$; t values times 4 - 6: 4.29, 3.47, 2.89; $p < .01$). Again, ceiling effects probably reduced overall collective efficacy values for the highest scoring groups. Nevertheless, the large gap between the group test scores and collective efficacy values for those in the lowest ranked groups is of interest.

Summary. Correlation and regression analyses revealed that past group performance ($t - 1$) and expectations about group performance were consistently related across time. On average, expectations exceeded actual group performance at times 1, 2, 3 and 6, but group performance exceeded expectations at times 4 and 5. Beliefs about group performance changed only slightly at each time, but overall group performance scores kept increasing through time 5. Subjects from the lowest performing groups had the same average level of confidence in their

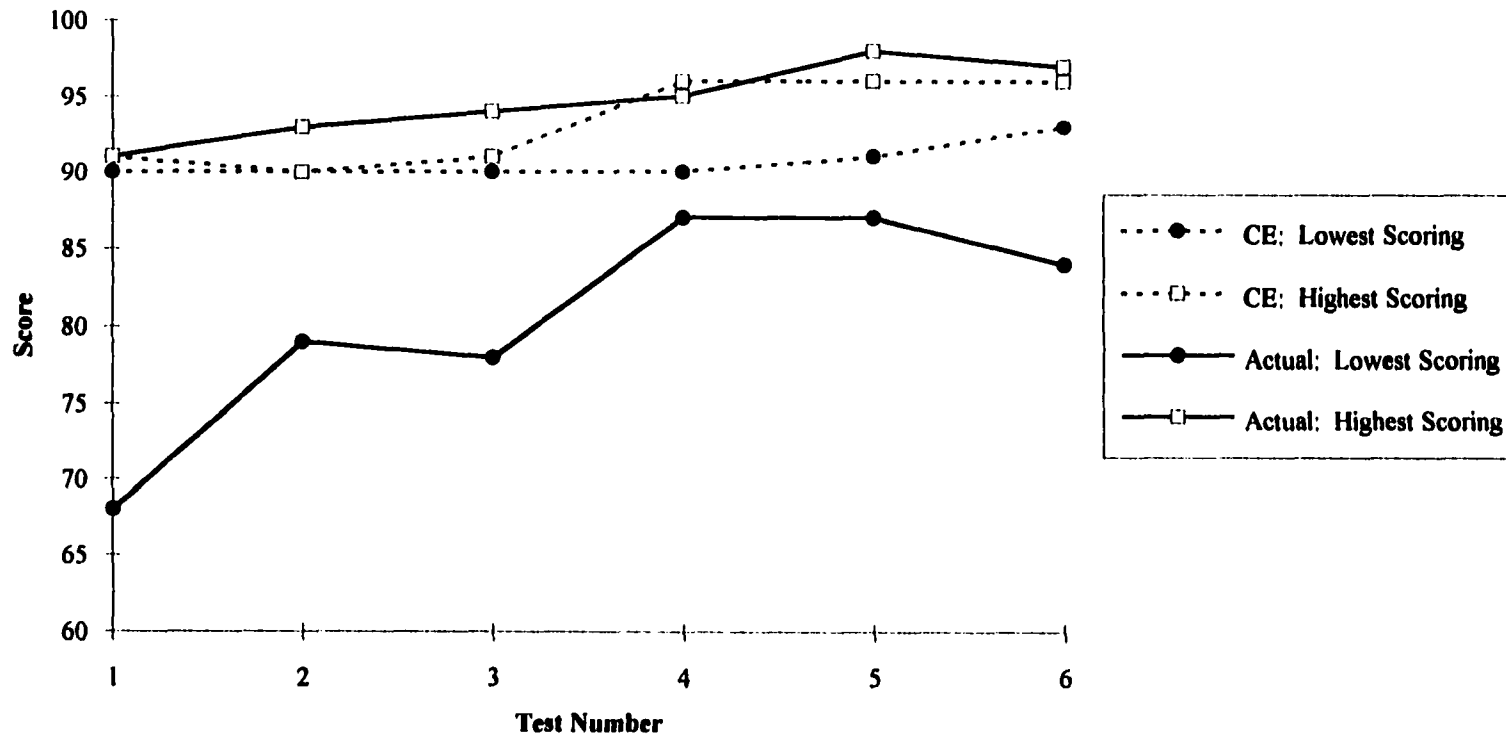


Figure 4.2. Collective efficacy (CE) scores and actual group performance for the highest performing groups in each class and lowest performing groups in each class are compared.

group's ability as those from the highest performing groups until time 4. Subjects from the lowest performing groups also tended to overestimate their group's ability to perform, while subjects from the highest performing groups frequently underestimated their ability to perform.

Collective Efficacy and Self Efficacy

The third research question was, "What is the relationship between collective efficacy and self efficacy?" The relationship between these two variables, and how this relationship changed over time, was analyzed using graphical, correlation and regression analyses. Profile analyses were also conducted to determine if gender or minority status was related to self efficacy.

The collective efficacy/self efficacy relationship. Correlation analysis revealed that self efficacy was highly correlated with collective efficacy at each time (see Table 4.12 and correlation matrices in Appendix D). Figure 4.3 graphically depicts the correlation between self efficacy and collective efficacy over time. The relationship became stronger until time 3 and then began to decrease. One must recognize, of course, that common method bias may have inflated the correlation between self and collective efficacy at each time period.

The strong relationship between self efficacy and collective efficacy was also found in the regression equations that are summarized in Table 4.13. With collective efficacy as the dependent measure, B values for self efficacy were significant ($p < .001$) at all 6 times periods, although the values declined over time from .427 at time 1 to .220 at time 6.

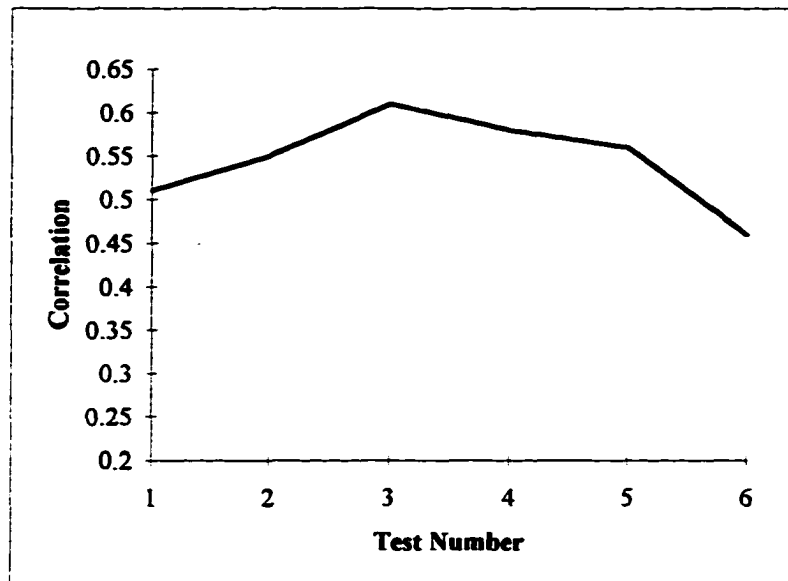


Figure 4.3. Correlation between collective efficacy and self efficacy.

Gender and racial differences. Profile analysis was conducted to determine whether differences in self efficacy responses were related to gender or minority status (see Table 4.14). The parallel and levels tests were not significant ($p > .05$). The flatness tests indicated that self efficacy scores changed over time.

Summary. There was a significant relationship between self efficacy and collective efficacy at each time period. Subjects who were confident about their own ability to perform a task had greater confidence in their group's ability to perform the task. Over time, however, this relationship declined. Self efficacy was not related to gender or minority status.

Table 4.14

Profile Analyses: The Relationship Between Gender or Minority Status and Self Efficacy

Repeated Factor: Self Efficacy			
Between-Subjects Factor	Parallel Test	Levels Test	Flatness Test
Gender	$F = .160$	Mean ^a	$\chi^2 = 23.42$
120 Males	$p = .986$	$M = .83$	$F = 4.58$
60 females		$F = .82$	$p = .000$
		$t = .53$	
		$p = .596$	
Minority Status	$F = .80$	Mean ^a	$\chi^2 = 24.15$
133 non-minority	$p = .550$	$NM = .82$	$F = 4.72$
45 minority		$Min = .83$	$p = .005$
		$t = .77$	
		$p = .527$	

Note. M = males, F = females, NM = non-minority subjects, Min = minority subjects.

^aMean for each test.

Collective Efficacy and Goal for the Group

The fourth research question was, "What is the relationship between collective efficacy and the goal level that members set for that group?" Of interest was whether goal level and performance expectations were related at each time period and whether the relationship changed over time. The relationship between the two variables, collective efficacy and goal for the group, was analyzed using correlation, regression, graphical and descriptive analyses.

Profile analyses were also conducted to determine if gender or minority status was related to the goal level that members set for their group.

Performance, efficacy and goals. The variable, goal for the group, was strongly related to personal goal and collective efficacy measures at each time period ($p < .001$; see correlation matrices in Appendix D). In addition, goal for the group was correlated with past ($t - 1$) group performance until time 6 ($p < .05$) and with future (t) group performance at times 2 - 5 ($p < .05$). When controlling for past ($t - 1$) group performance, this relationship remained significant at times 2 and 4.⁶

Regression analyses were conducted to evaluate how past performance ($t - 1$) and collective efficacy were related to goal for the group (see Table 4.15). Goal for the group was entered as the dependent variable. Class was entered as a covariate, and proved to be significant ($p < .05$) at various times.

Collective efficacy and past performance were significantly related to goal for the group. The B values for the collective efficacy were significant at the .001 level at all times, but the size of these values increased and decreased with no clear pattern. The highest B values came at times 4 and 6. The regression coefficients for past group performance were significant at times 3 and 5.

The overall trends in collective efficacy, actual group performance and goal for the group are compared in Figure 4.4, a combination graph that tracks the sample mean for each of these variables at each time period. While collective efficacy decreased slightly at time 2 and then increased through time 6, goal for the group and group performance were either constant or increased until time 6, when both decreased slightly. The difference between the highest and lowest

⁶ $r = .19, .02, .14, .05, -.04$, at times 2 - 6, respectively; $p < .05$ when $r > .13$. The size of n varied from 218 - 227 for these analyses.

value for goal mean was .44; Hotelling's T^2 indicated that the mean did significantly change over time ($T^2 = 74.49$; $F = 14.58$; $p = .000$; $n = 186$).

Table 4.15

Summary of Regression Results: Goal for Group as the Dependent Variable

	Test 1 B	Test 2 B	Test 3 B	Test 4 B	Test 5 B	Test 6 B
Variables						
Past group performance ($t - 1$)	—	.643 (.243)	2.081 (.003)	.928 (.168)	2.029 (.006)	-.205 (.782)
Goal for oneself	.427 (.000)	.483 (.000)	.406 (.000)	.416 (.000)	.326 (.000)	.333 (.000)
Collective efficacy	3.644 (.000)	2.909 (.000)	3.378 (.002)	6.576 (.000)	4.769 (.000)	8.159 (.000)
Covariate						
Class	-.108 (.011)	-.095 (.005)	-.068 (.088)	-.027 (.403)	-.071 (.052)	-.027 (.397)
Constant	.821 (.344)	1.197 (.133)	-.817 (.390)	-2.817 (.003)	-2.155 (.020)	-3.440 (.001)
Statistical Significance						
Adjusted R^2	.411	.551	.542	.626	.474	.584
Standard error	.765	.593	.657	.573	.634	.562
F	41.73	54.76	52.69	74.22	40.40	62.31
p	.000	.000	.000	.000	.000	.000

Note. $n = 176$; p -values are in parentheses.

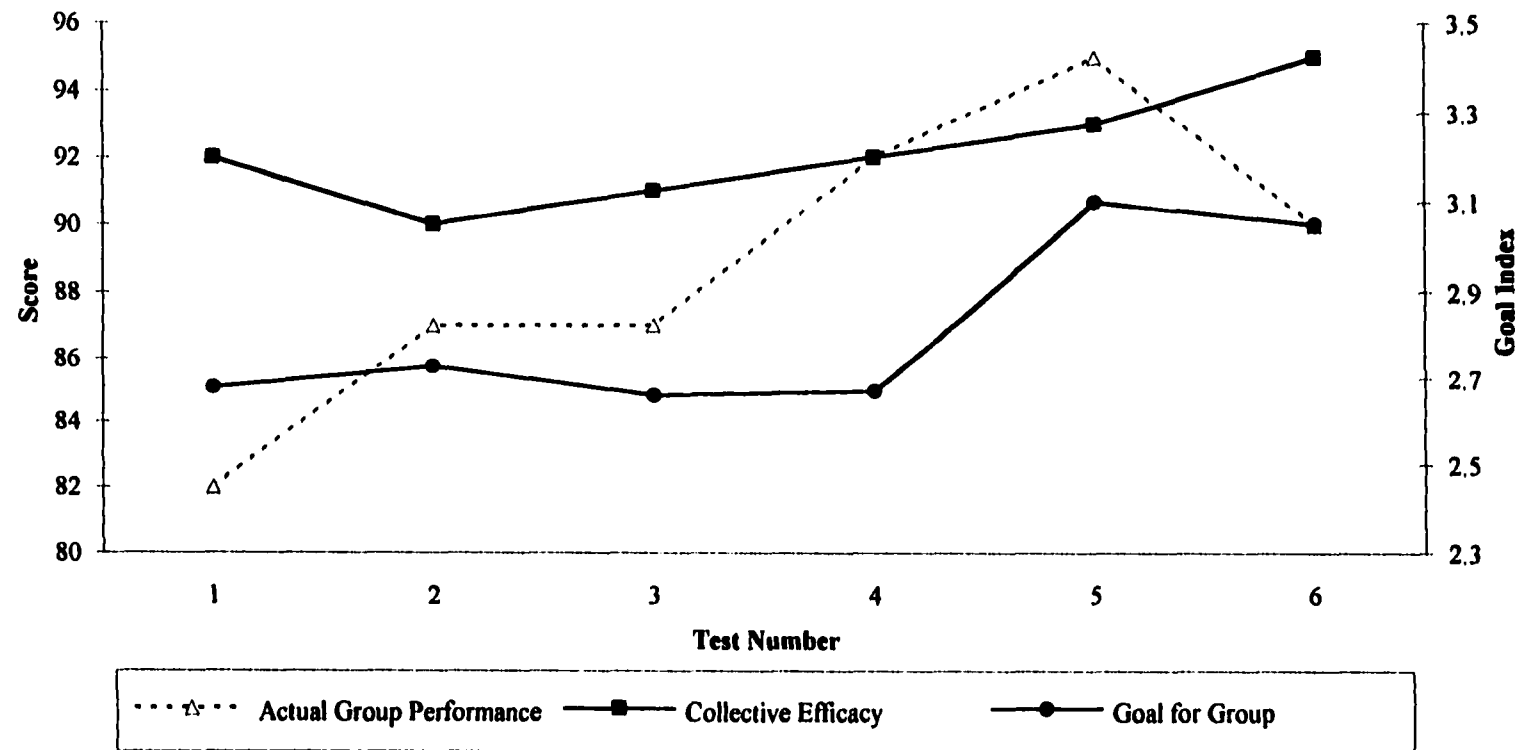


Figure 4.4. Sample means for collective efficacy, actual group performance and goal for the group.

The relationship between individual and group goals is illustrated in Figure 4.5, which depicts the trend for the sample means for these variables at each time period. In general, individual goals mirrored the pattern of group goal, although the difference between the two increased slightly over time.

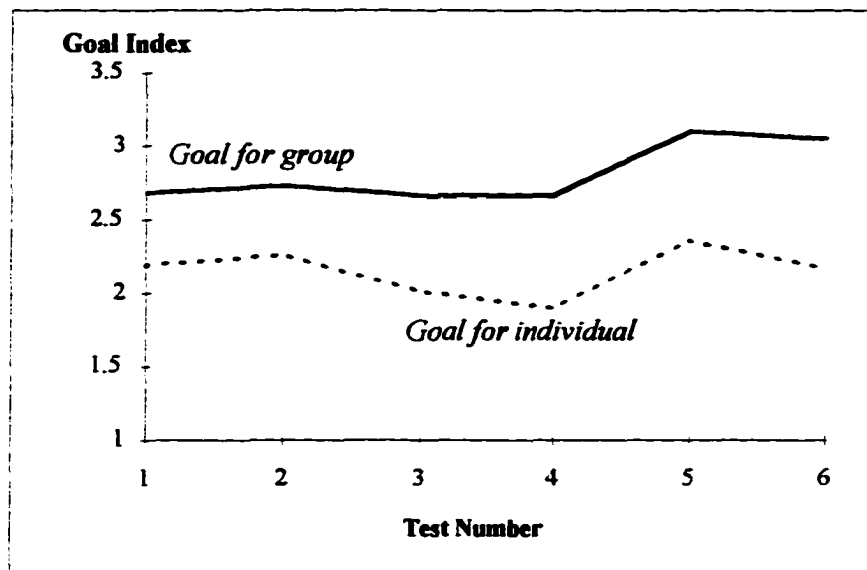


Figure 4.5. Overall means for goal for the group and goal for the individual.

Figure 4.6 compares the overall trends of two groups, those students whose group had the highest overall performance average and those whose group had the lowest overall performance average in their class. A total of ten groups were therefore compared, two groups from each of the five classes. Although those in the lower scoring groups initially had, on average, a goal for the group that was higher than those in the higher scoring groups, the reverse was true for times 2, 3, 4, 5 and 6. The difference was significant at time 4 ($t = 3.07$, $p = .000$). At time 5, however, the gap narrowed as group goal means for both groups increased. Means for both groups also decreased at time 6.

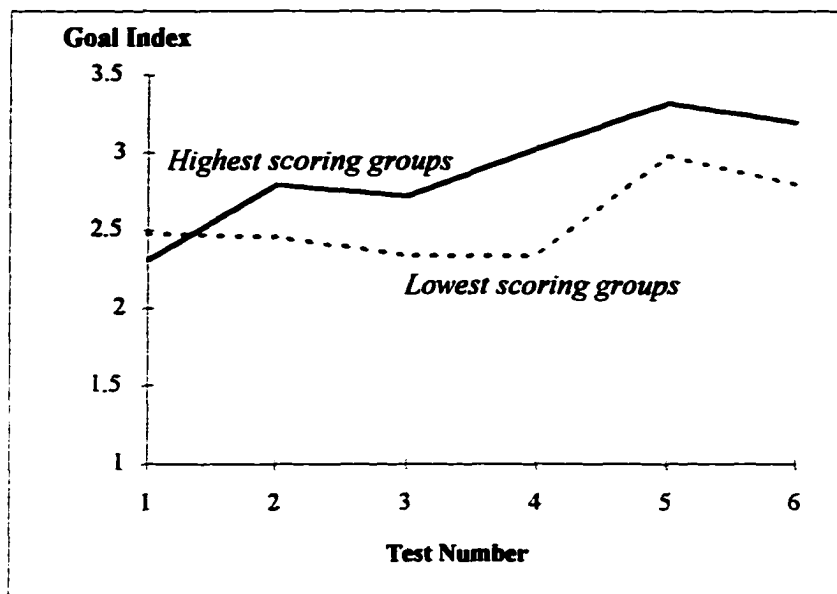


Figure 4.6. Means for goal for the group, highest and lowest scoring groups in each class.

Subjects were divided into four equal groups (i.e., quartiles) based on their overall individual performance scores. Figure 4.7 is a graph that compares the variable, goal for the group, among these four groups of subjects. The overall trend was similar for all four groups, but the goals of the highest individual performers were higher than the other subjects at each time period. The difference was statistically significant at time 4 ($F = 3.90, p = .010$) and time 6 ($F = 2.67, p = .049$).

Gender and racial differences. Profile analysis revealed no group-by-goal interaction and no differences in overall goal level set by males and females and by minority and non-minority subjects (see Table 4.16). As noted above, the flatness test indicated that goal level changed over time.

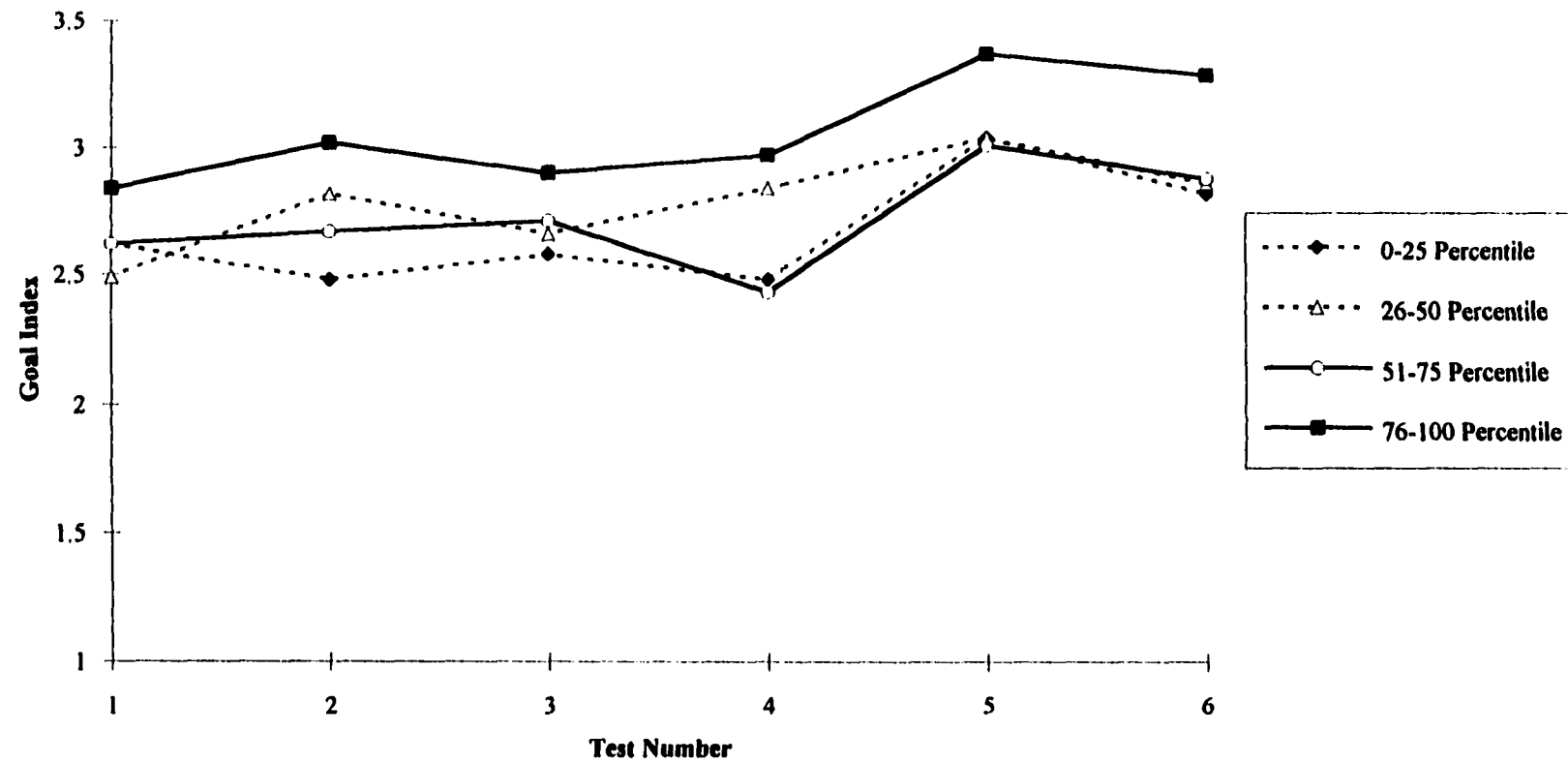


Figure 4.7. Goal for the group, by individual performance.

Table 4.16

Profile Analyses: The Relationship Between Gender or Minority Status and Goal Setting

Repeated Factor: Goal for the Group			
Between-Subjects Factor	Parallel Test	Levels Test	Flatness Test
Gender	$\underline{F} = .99$	Mean ^a	$\underline{T}^2 = 76.30$
116 males	$\underline{p} = .427$	$M = 2.86$	$\underline{F} = 14.92$
64 females		$F = 2.78$	$\underline{p} = .000$
		$\underline{t} = .74$	
		$\underline{p} = .461$	
Minority Status	$\underline{F} = .57$	Mean ^a	$\underline{T}^2 = 68.78$
131 non-minority	$\underline{p} = .720$	$NM = 2.84$	$\underline{F} = 13.44$
42 minority		$Min = 2.80$	$\underline{p} = .000$
		$\underline{t} = .27$	
		$\underline{p} = .788$	

Note. M = males, F = females, NM = non-minority subjects, Min = minority subjects.

^aMean for each test.

Summary. Although no clear trend emerged, members' beliefs about their group's ability to perform a task were related to the goals that they set for the group. Individuals with high personal goals also tended to have high goal levels for the group. Correlation and graphical analyses indicated that the goals members set for their group increased as group performance increased. The exact nature of the relationship between goals and future performance was unclear due to the correlation between past and future performance. Nevertheless, there was

some evidence to suggest that goal level was also related to future group performance.

Collective Efficacy and Effort

The fifth research question was, "What is the relationship between collective efficacy and the effort that members exert on behalf of the group?" Correlation, regression and graphical analyses were conducted to clarify the relationship between effort and collective efficacy. Profile analyses were also conducted to determine if gender or minority status was related to the amount of effort that members exerted.

A comparison of the effort measures. Perceived effort was measured with 1) a four-item measure and 2) a single-item that asked students to estimate the number of hours spent on each test. The correlation for these measures varied from .43 at time 3 to .55 at time 6 ($p < .001$; see Appendix D for correlation matrices).

Figure 4.8 is a combination graph that depicts the overall trend for perceived effort and hours studied at all six time periods. Hours studied and perceived effort had the same basic trend. At time 2, the mean values for both variables increased, and then mean values decreased over time.

The effort/efficacy relationship A correlation analysis between perceived effort and collective efficacy revealed a statistically significant ($p < .05$), positive relationship at times 1, 3, 4, 5 and 6 (see Appendix D for correlation matrices). The correlation between hours studied and collective efficacy was positive at each time period, but never statistically significant. The

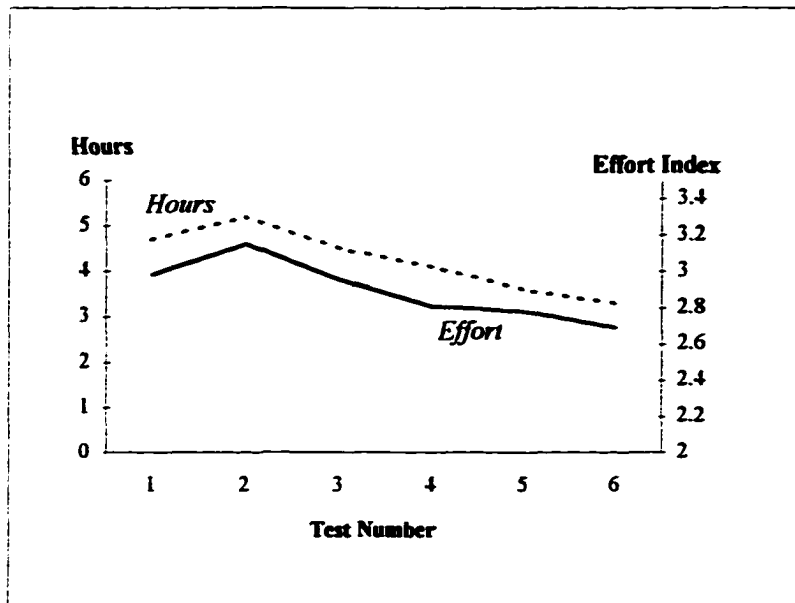


Figure 4.8. Combination graph depicting the overall trend for perceived effort and hours studied.

relationship between collective efficacy and perceived effort changed, however, when controlling for the variable, goal for oneself. The partial correlation between collective efficacy and perceived effort, controlling for goal for oneself, was .03, -.06, 0, 0, .09 and .21 for times 1 - 6, respectively.⁷ Based on this partial correlation, the relationship was not significantly different from zero until time 6.

A pair of graphs were created to clarify the relationship between effort and the collective efficacy variables. Figures 4.9 and 4.10 compare the overall trends of two groups, those students whose group had the highest overall performance average and those whose group had the lowest overall performance average in their class. On average, subjects from the lower performing groups reported studying longer than those from the higher performing groups at times 2,

⁷Correlation coefficients of plus or minus .14 or greater were statistically significant at the .05 level; n varied from 216 - 233.

3, 4, 5 and 6 (Figure 4.9). The largest difference came at time 2, but the difference was not statistically significant ($t = 1.69$, $p = .097$). The perceived effort measure showed a similar pattern: with the exception of time 5, the lowest performing groups had a higher mean perceived effort value than the highest performing groups (Figure 4.10). The difference reached statistical significance at time 2 ($t = 2.03$, $p = .048$).⁸ As noted earlier, the mean collective efficacy scores for these two groups were very similar until time 4 (see Figure 4.2). Apparently, these subjects believed their efforts would result in higher group scores.

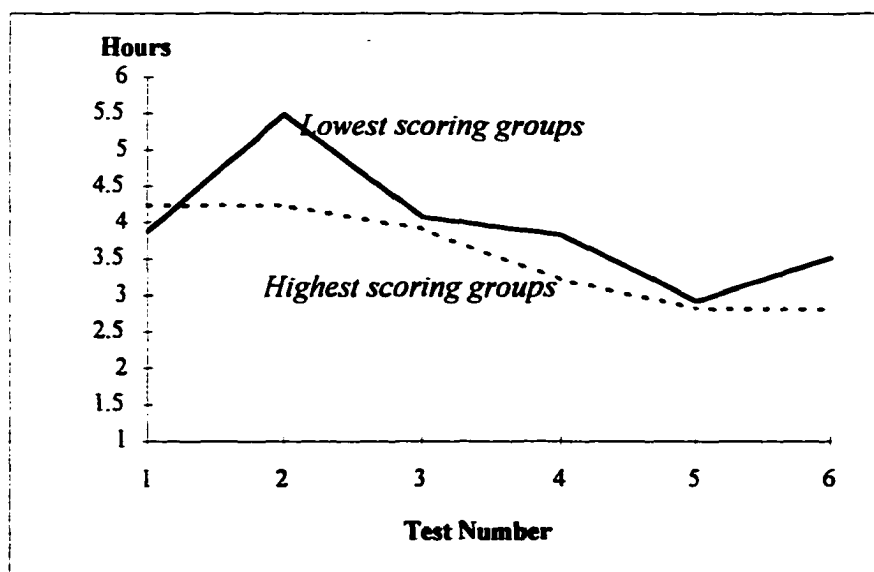


Figure 4.9. Self-reported hours studied, highest and lowest scoring groups.

⁸The difference between effort values at time 3 approached statistical significance: $t = 1.72$, $p = .09$.

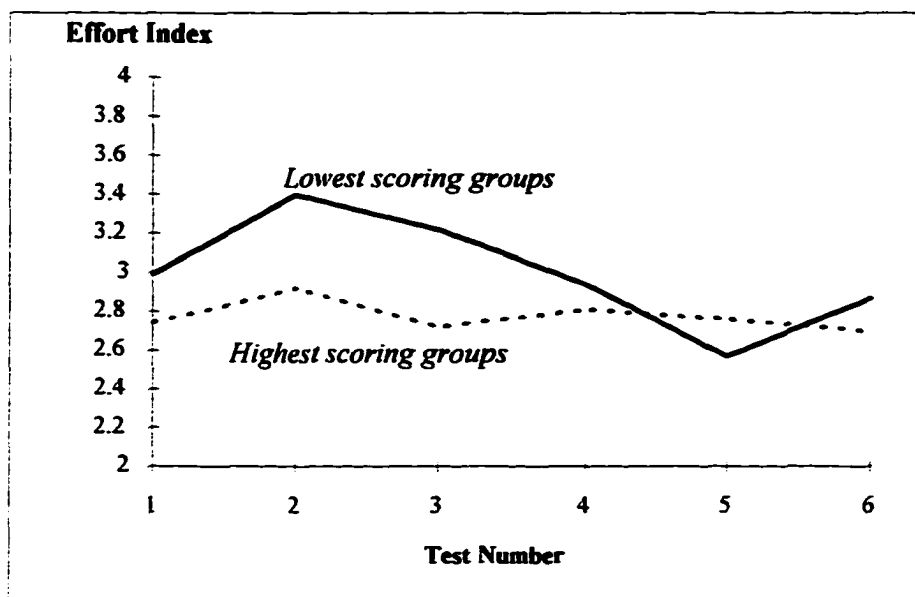


Figure 4.10. Self-reported effort, highest and lowest scoring groups.

Descriptive statistics also revealed that some lower performing subjects may have studied longer than the highest performers. Subjects were divided equally into four groups (i.e., quartiles) based upon their overall individual performance scores. As indicated in Table 4.17, subjects whose overall individual scores fell within the 51-75 quartile range reported studying longer for each test than any other quartile group. This is graphically illustrated in Figure 4.11. During the course of the semester, subjects in this group studied an average of 5 hours longer than those in the next highest percentile group (ANOVA for all 4 groups produced an F of 2.67, $p = .048$). As a group, these subjects studied longer despite collective efficacy and self efficacy scores that were lower than the highest performing quartile (see Table 4.18). Overall, perceptions of perceived effort were very similar.

Table 4.17**Comparison of Hours Studied For Individual Performance Quartiles**

Individual Performance Level^a	Hours (standard deviation)						Mean 1 - 6
	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	
75% percentile ($\underline{n}$ = 40)	4.60 (2.25)	5.10 (2.51)	4.37 (2.05)	4.36 (2.85)	3.80 (2.60)	3.15 (1.66)	4.23 (2.01)
50% percentile ($\underline{n}$ = 45)	5.81 (4.41)	6.09 (4.20)	5.40 (4.11)	4.28 (2.69)	4.68 (4.08)	3.91 (2.82)	5.03 (3.22)
25% percentile ($\underline{n}$ = 46)	3.98 (2.38)	4.68 (2.94)	4.21 (2.17)	3.96 (2.99)	3.10 (2.00)	2.78 (1.75)	3.79 (1.75)
0% percentile ($\underline{n}$ = 37)	4.54 (3.25)	4.62 (2.52)	3.70 (2.12)	3.66 (2.38)	2.88 (2.18)	3.39 (2.34)	3.80 (1.70)
Mean (standard deviation)	4.74 (3.2)	5.15 (3.16)	4.46 (2.80)	4.07 (2.75)	3.64 (2.87)	3.31 (2.20)	4.23 (2.29)
ANOVA F (p-value)	2.59 (.054)	1.99 (.117)	2.74 (.045)	.53 (.660)	3.40 (.019)	1.09 (.104)	2.84 (.040)

^aThese groups were unequal in size due to missing hour and/or efficacy data from one or more of the six time periods.

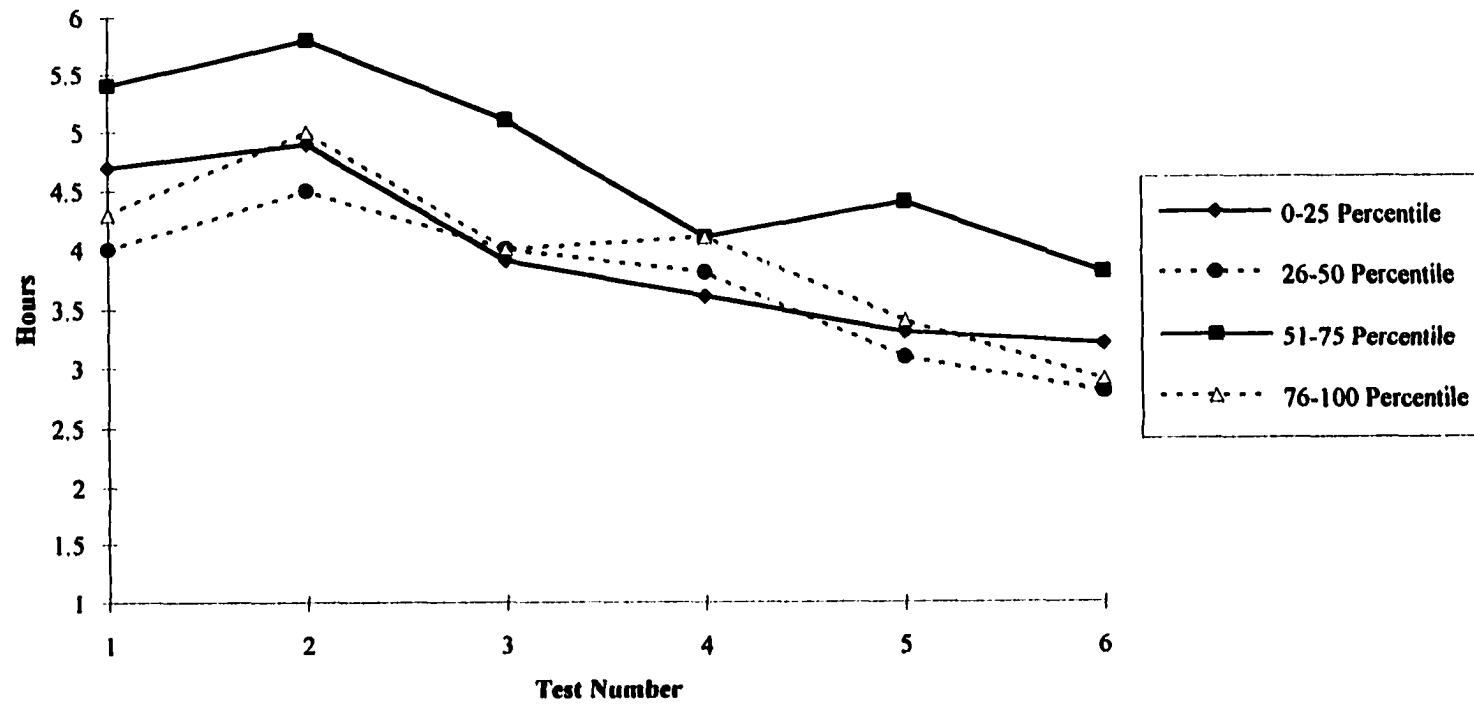


Figure 4.11. Self-reported hours studied by individual performance quartiles.

Table 4.18**Comparison of Efficacy Scores For Individual Performance Quartiles**

Individual Performance Level^a	Collective Efficacy (Self Efficacy)						Mean 1 - 6
	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	
75% percentile (<i>n</i> = 40)	.93 (.86)	.91 (.86)	.94 (.87)	.94 (.88)	.95 (.88)	.95 (.89)	.94 (.87)
50% percentile (<i>n</i> = 45)	.93 (.84)	.89 (.82)	.92 (.82)	.90 (.81)	.93 (.85)	.95 (.85)	.92 (.83)
25% percentile (<i>n</i> = 46)	.92 (.83)	.89 (.80)	.90 (.80)	.92 (.82)	.92 (.79)	.94 (.83)	.92 (.81)
0% percentile (<i>n</i> = 37)	.91 (.82)	.89 (.78)	.89 (.77)	.91 (.83)	.93 (.80)	.95 (.81)	.91 (.80)

^aThese groups are unequal in size due to missing hour and/or efficacy data from one or more of the six time periods.

The number of tests that an individual missed due to absenteeism could be considered another measure of effort. It takes effort to come to class and participate with other members on the group task. Subjects from each quartile were compared with respect to absenteeism.⁹ Subjects in the lower 25% performance group were more likely to miss a test. Of the 19 people (*n* = 230) who missed at least one test, 9 were from the lowest percentile; 5 were from the middle-lower percentile; 3 were from the middle upper percentile and 2 were from the upper percentile (Pearson chi-square = 6.41, *p* = .093). Individuals who

⁹For the purposes of this study, total individual performance was an average of all the tests that the individual had taken; absences did not adversely affect the final tabulation.

missed a test received full credit for the performance that their group achieved in their absence. Some absences were undoubtedly inevitable and did not necessarily reflect the subject's motivation. Nevertheless, it is interesting that lowest performing students were absent almost five times as often as the highest performing students.

Each of these analyses showed a consistent pattern indicating that those subjects whose group or individual scores were not at the top of their class tended to exert more effort than those who were performing at the top of the class. That is, those in second place tried harder. However, none of these statistics provided conclusive evidence that this was the case. Additional correlation and regression analyses were conducted in search of the variables that were most closely related to perceived effort and/or hours studied.

Analysis of effort averaged across time. The relationship between perceived effort, hours studied and other variables in this study were not consistent at each time period. Separate regression equations at each time, with either effort or hours studied as the dependent variable, provided little insight. This is likely due to the many variables inside and outside the classroom that affected the amount of time that a subject was willing to spend studying for any given test. In an attempt to determine the most critical predictors of perceived effort and/or hours studied over time, each variable was averaged across all 6 time periods. Average hours studied or averaged perceived effort were essentially persistence measures; subjects who sustained a high level of effort at each time period had a higher overall average. The correlation between average perceived effort and average hours studied across the 6 tests was .42 ($p < .001$). Perceived effort and hours studied were correlated with the following variables:

- Locus of control variables: ability, effort, luck, context
- Social Desirability Scale
- Attitude toward group work (prefers to work alone)
- Difference between group performance and collective efficacy for each test
- Difference between individual performance and self efficacy for each test
- Goals for group for each test
- Goals for self for each test
- Group rankings within each class for tests 1 - 6
- Individual performance quartile
- Individual performance total
- Group performance total

The variables listed in Table 4.19 were correlated with both average hours studied and average perceived effort ($p < .07$).

The means for the variables, goal for the group and goal for oneself, were calculated across all six tests. A stepwise regression was then conducted with perceived effort average as the dependent variable. Included in the analysis were class (as a covariate) and those variables that correlated with both perceived effort and hours studied: locus of control (ability), goal for oneself (mean), goal for the group (mean), minority status, actual group performance minus collective efficacy at time 1, and group rank at time 1. The variables that remained in the equation were class, goal for oneself and group rank at time 1 (see Table 4.20).

Another stepwise regression was conducted, this time with average hours studied as the dependent variable. The predictor variables were again class, locus of control (ability), goal for oneself (mean), goal for the group (mean), minority

status, actual group performance minus collective efficacy at time 1 and group rank at time 1. The two variables left in the equation were goal for oneself and minority status (see Table 4.20). Whether perceived effort or hours studied was the dependent variable, the amount of variance that was explained with the variables available in this study was quite small. Numerous variables obviously affected the extent to which subjects prepared outside of class, but at least a few of them were not measured in this study. The goal that individuals had for the

Table 4.19

Variables That Were Correlated With Averaged Effort Measures

Variable	Correlation Coefficients	
	Perceived Effort	Hours Studied
Locus of control (ability)	.18	.13
Goal for group, time 1	.27	.14
Goal for group, time 2	.31	.16
Goal for group, time 3	.27	.14
Goal for oneself, time 1	.29	.26
Goal for oneself, time 2	.34	.23
Goal for oneself, time 3	.29	.22
Goal for oneself, time 5	.25	.17
Goal for oneself, time 6	.28	.12
Group ranking after first test	.18	.12
Minority status (minority/non-minority)	.12	.29
Collective efficacy minus actual group performance, time 1	.22	.15

Note. $p < .05$ when $r = .14$

Table 4.20**Comparison of Regression Equations for Effort Measures**

	Dependent Variable: Effort	Dependent Variable: Hours
	<u>B</u>	<u>B</u>
Variables		
Class	-.089 (.003)	---
Goal for oneself	.270 (.000)	.704 (.000)
Minority status	---	1.384 (.000)
Group ranking, time 1	.044 (.008)	---
Constant	3.676 (.000)	7.179 (.000)
Statistical Significance		
Adjusted R ²	.222	.123
Standard error	.579	2.297
<u>F</u>	19.50	14.51
<u>p</u>	.000	.000

Note. $n = 194$; p -values for regression coefficients are in parentheses.

individual test was related to both perceived effort and hours studied. Minority students studied more hours than non-minorities. Perceived effort increased to the extent that subjects were displeased with their group's ranking after the first test.

Additional investigation revealed that discrepancy between expected and actual group performance was frequently correlated with perceived effort at the

next time period (see Table 4.21). In other words, when performance was lower than expected, perceived effort increased at the following time period, except at time 3. The correlation coefficient was significant ($p < .05$) at times 2, 5 and 6. The apparent increase in motivation due to this discrepancy was especially high at time 6. The discrepancy measure is an indicator of the extent to which group members may have been disappointed with their group's performance. Another measure of interest would have been the difference between goal for the group and performance. Unfortunately, goal for the group was measured with a Likert-type scale that made direct comparison difficult.

Table 4.21

The Relationship Between Expectation/Performance Discrepancy and Effort

Variables	Correlation with Perceived Effort
Time 1 discrepancy & Time 2 effort	.18 (.009)
Time 2 discrepancy & Time 3 effort	-.09 (.212)
Time 3 discrepancy & Time 4 effort	.09 (.190)
Time 4 discrepancy & Time 5 effort	.18 (.009)
Time 5 discrepancy & Time 6 effort	.31 (.000)

Note. n varies from 204 to 216; p -values are in parentheses.

Gender and racial differences. Additional evidence from profile analyses (see Table 4.22) confirmed that minority subjects, many of whom spoke English as a second language, studied longer and had higher perceived effort scores than non-minority subjects. Minority subjects reported studying an average of 1 hour and 38 minutes longer for each test than non-minority subjects. When summed across all six times, perceived effort scores averaged 1 point higher (on a six-point scale) for minority subjects.

On average, females reported studying 40 minutes longer than males for each test, but the levels test was not quite significant at the .05 level. There were no significant differences in perceived effort values.

Parallel tests were not significant for gender or minority status. The flatness tests were all significant, indicating the scores changed across time.

Summary. The nature of the relationship between effort and collective efficacy was difficult to discern. When controlling for personal goals, the relationship between collective efficacy and effort was close to zero, except at time 6. In general, subjects with higher personal goals reported exerting more effort than those with lower personal goals and minority subjects reported studying longer than non-minority subjects. Often, the subjects who reported exerting the greatest effort were students who had individual and/or group scores that were below the highest scores in their class. Effort generally increased when performance was lower than expected at the previous time period.

Table 4.22

Profile Analyses: The Relationship Between Gender or Minority Status and Effort Measures

Between-Subjects Factor	Repeated Factor	Parallel Test	Levels Test	Flatness Test
Gender 126 males 66 females	Perceived Effort	$\underline{F} = 1.18$ $\underline{p} = .319$	Mean ^a M = 2.88 F = 2.93 $\underline{t} = .53$ $\underline{p} = .595$	$\underline{T}^2 = 26.06$ $\underline{F} = 5.10$ $\underline{p} = .000$
Gender 116 males 55 females	Hours studied	$\underline{F} = 1.27$ $\underline{p} = .281$	Mean ^a M = 4.02 F = 4.69 $\underline{t} = 1.78$ $\underline{p} = .078$	$\underline{T}^2 = 72.93$ $\underline{F} = 14.21$ $\underline{p} = .000$
Minority Status 138 non-minority 46 minority	Perceived Effort	$\underline{F} = .79$ $\underline{p} = .559$	Mean ^a NM = 2.84 Min = 3.08 $\underline{t} = 2.19$ $\underline{p} = .030$	$\underline{T}^2 = 22.92$ $\underline{F} = 4.48$ $\underline{p} = .000$
Minority Status 123 non-minority 41 minority	Hours studied	$\underline{F} = .425$ $\underline{p} = .831$	Mean ^a NM = 3.87 Min = 5.50 $\underline{t} = 4.05$ $\underline{p} = .000$	$\underline{T}^2 = 64.90$ $\underline{F} = 12.63$ $\underline{p} = .000$

Note. M = males, F = females, NM = non-minority subjects, Min = minority subjects.

^aMean for each test.

Chapter Summary

Numerous methods of analysis were employed to assess the extent to which a shared collective efficacy developed among group members and to investigate the relationship among performance, collective efficacy, goals and effort. A significant amount of variance in collective efficacy responses was explained by group-level factors, most notably group performance. Individual-level factors, such as gender and self efficacy, were also related to beliefs about group performance. The extent to which members agreed about their group's ability to perform the task increased through time. Many subjects overestimated their group's ability to perform the task, but the gap between expected and actual performance was larger for those from the lowest performing groups.

Individuals with high expectations for group performance set higher goals for the group. Effort was more strongly related to goals, particularly individual performance goals, than to collective efficacy, except at time 6. Evidence indicated that subjects exerted more effort when a discrepancy between expected and actual performance had occurred. On average, subjects who had individual or group performance scores just below the upper tier of performance scores exerted more effort than those who had scores among the highest in the class.

The relationship among several of these variables changed over time. Collective efficacy and self efficacy were highly related at time 1, but this relationship continued to decrease through time 6. The relationship between past ($t - 1$) group performance and expectations about future performance increased and then decreased over time. The relationship between collective efficacy and effort was strongest at time 6. The implications of these and the other findings noted in this chapter are discussed next.

Chapter V

Discussion of the Results

Introduction

The results reported in chapter 4 provided insight about the cognitive and motivational processes that occurred within the groups over time as members worked together to accomplish tasks. In this chapter, these results are interpreted within the context of the study's research questions, which are grouped into two major issues: 1) the extent to which group members developed a shared collective efficacy and 2) the relationship among performance, collective efficacy, self efficacy, goals and effort. A model of the relationship among performance, efficacy, goals and effort is also proposed. Limitations of the research design are addressed and suggestions for future research are offered.

Terms and Definitions

Before the research questions are addressed, it is important to recall the terms and definitions that provided the foundation for the measures used in this study. The focus of this study was on group members' personal beliefs about their group's ability to perform a specific task, that is, collective efficacy.

Collective efficacy can be distinguished from a belief about the group's *overall* effectiveness, sometimes referred to as group potency. Guzzo et al. (1993) defined group potency as a shared belief among group members about the group's general effectiveness. After group members have worked together on numerous tasks, they know the group's potential; consequently, their beliefs about

general group effectiveness remain fairly stable. In contrast, expectations about performance on any given task at any given moment in time may change. When the designated task is a test, for example, several things occur that affect a member's beliefs about how well the group will do: the presence or absence of a key member, the difficulty of the material to be covered on the test, the amount of time spent preparing for the test, etc. Nevertheless, because group potency develops in response to a group's performance on a series of tasks, it is related to collective efficacy.

Collective efficacy is a belief and differs from the standard toward which group members strive, that is, goal level. This study investigated the relationship between collective efficacy and the performance goals that individuals held for the group. Personal goals for the group should not be confused with group goals, that is, goals for the group that are known and accepted by all the group members.

The Development of a Shared Collective Efficacy

The objective of the first research question was to determine the extent to which members of an ongoing task group develop a shared collective efficacy. This was a worthwhile objective for at least two reasons. First, the results of a study on collective efficacy development may help to resolve the classic debate about whether it is ever appropriate to study the psychology of a group, as opposed to the psychology of the individuals within the group. To determine when subjects in this study began to share collective efficacy perceptions, and to assess the extent to which they shared these perceptions, collective efficacy was measured at six different points in time during a 13 week period. Second, by determining if and when group members agree about their group's ability to

perform a task, researchers will be better informed as to when it is appropriate to aggregate collective efficacy scores by group. Although it is sometimes useful to aggregate collective efficacy measures, it may significantly reduce the amount of information available to the researcher, unless it has been established that members agree about their group's ability to perform a task.

In addition to assessing the extent of member agreement about collective efficacy, analyses were conducted to determine the extent to which members set similar goals for their group. It is appropriate to discuss goal setting within the context of this first research question because findings provide insight relevant to discussions about aggregation and the psychology of the group. Both collective efficacy and goal setting were measured at an individual-level, but both required judgment about a group-level task. Variation in the two variables, collective efficacy and goal for the group, was analyzed because the results have implications about the extent to which group members develop a "group mind" (McDougall, 1920).

Early Agreement on Efficacy, Goals

Data were gathered from the time groups were formed so that analyses could be conducted to determine when group members first began to agree about their group's abilities to perform a specific task. Group members began to hold similar beliefs about the group's ability after the group had received feedback from their first task attempt. More specifically, between-group variance accounted for a significant portion of the total variance from time 2 through time 6.

Surprisingly, group members shared similar goals for group performance beginning at time 1, before the task had ever been attempted. Subjects were asked not to talk about the surveys before filling them out, so there was little, if any, overt collusion. The result may have been due to the impact of a group activity that was held just after the groups were formed and prior to the first test. This 20 to 60 minute activity involved negotiation among the groups in each class about how much group, individual and peer scores would each count toward the final course grade (see chapter 3 for a detailed description) and served to begin building group identity. In completing this activity, subjects had already been together longer than the groups used in many other studies on collective efficacy and social loafing (cf., Kerr, 1989; Prussia & Kinicki, 1996; Shelley, 1954; Zander & Medow, 1963; see also Karau & Williams, 1993).

Authors' observations reported in the literature (e.g., Michaelsen, Cragin and Watson, 1981) and personal observation in the classes in which data for the study were collected indicate that group members often share their opinions about performance standards with other group members during the activity to set grade weights. This occurs because the activity involves making decisions about the extent to which course assignments and tests count toward the final grade. There is frequently some discussion about members' academic abilities, past experience with group tests, the experience of friends who have taken the class, etc., all of which give members the opportunity to discuss performance goals. As the group forges an agreement about grade weights, the rationale used by one or more members to persuade the others may involve setting goals for group performance. This process also facilitates the emergence of a shared collective efficacy within each of the groups.

The Impact of Working Together Over Time

Data were collected for a total of six tasks, and it was therefore possible to determine whether members' beliefs about their group's abilities became increasingly similar over time. In fact, group members' expectations about group performance did become increasingly similar as group members learned about each other's skills, became familiar with the task, received feedback from past performances and shared expectations with each other.

However, evidence from this study indicated that differences in group members' beliefs about group abilities would always exist. There are reasons why agreement about collective efficacy might, at some point, fluctuate or plateau in the Team Learning environment. After each test, more information is available to the subjects about the factors relevant to group performance. Subjects may process and weight this new information differently. By the third test, for example, members have received feedback about their performance on two tests; at time four, they have feedback on three tests, etc. Some members may believe that the score on one test was more reliable than others; other members may take a rough average to help predict future scores.

As groups gain experience with a task, more information is also learned about other group members. Members may form different conclusions about the ability and willingness of other group members to contribute to the success of the group. As information about these and other factors multiplies, it is possible that agreement about the group's ability to perform no longer increases and perhaps, at times, actually decreases.

In this study, subjects not only had to process information about their own group's performance, but they also had to consider the performance of the other groups in their class. Bandura (1977, 1982) suggested that vicarious experience, that is, the experience of other groups, also affects collective efficacy. By the time subjects in this study were about to take test 6, they had feedback on as many as 50 test scores from their group and the other groups in the class. It is quite likely that group members processed this information differently and developed different performance expectations.

A regression equation at each time period revealed that variables unique to the individual, specifically, self efficacy, gender and attitude toward group work, were predictors of collective efficacy in this study. Thus, while factors common to all group members, most notably performance feedback, affected collective efficacy, factors unique to the individual also had an impact on collective efficacy. The extent of agreement of the group's ability is bound to be limited, therefore, by individual characteristics and dispositions.

Issues in Measurement

The problems and trends that occurred in the data collected in this study are relevant for those researchers who use WABA and eta analysis to determine whether it is appropriate to aggregate data that have been collected from individuals (e.g., Prussia and Kinicki, 1996; Riggs and Knight, 1994). Specifically, the results identified measurement problems that can occur and clarified the extent to which members form similar beliefs about performance as their group develops and performance improves. The advantage of this study was that data were collected six times during a 13 week period from ongoing groups.

More information about measurement issues and group-level beliefs are therefore available than from those studies that depend upon one or two performance trials and ad hoc groups. In addition, the tests used in this study were more complex than many of the tasks typically used in efficacy research (see chapter 2), and are therefore more characteristic of the complex tasks performed by groups in organizations outside the classroom.

In this study, differences in group performance expectations decreased both within and between groups through time. As mentioned earlier, group members' beliefs about their group's abilities became more similar through time 6. Expectations about group performance also became more similar between groups because overall group performance scores improved over time and performance differences between groups decreased. Collective efficacy scores reflected higher levels of group performance, and as performance and efficacy scores approached 100%, differences between groups decreased.

As total variance decreased, the collective efficacy and performance measures used in the study may not have been sensitive enough to accurately delineate within- and between-group differences for several reasons. After taking the same survey time after time, subjects may have become less thoughtful about their responses. The task, a test, was not identical at each time period. The number of questions on the tests were not consistent at each time and it is not clear how changes in the number of test questions affected individual's collective efficacy scores. Reliability was restricted because the tests were short, consisting of 16 to 20 questions.

After time 3 in this study, ANOVA and WABA results were similar to those of collective efficacy studies conducted by Riggs and Knight (1994) in a

field study involving ongoing groups and Prussia and Kinicki (1996) in a laboratory study involving ad hoc groups.¹ Although Riggs and Knight chose to conduct all analyses at the individual level, Prussia and Kinicki aggregated their data. Prussia and Kinicki justified their decision to aggregate based on WABA results that met the least restrictive guidelines described by Dansereau et al. (1984). Similarly, in the present study, WABA analyses indicated that calculating group averages from scores collected from individual group members (i.e., collective efficacy and goal for the group) was appropriate at times 3 and 5.²

Notably, findings from this study indicated that aggregation was not appropriate, based on Dansereau's et al. (1984) guidelines, at times 1, 2, 4 and 6. At times 1 and 2, there was not enough agreement within groups about performance expectations or goals to justify aggregation. As suggested earlier, the measures used in this study may not have been sensitive enough at times 4 and 6 to delineate within- and between-group differences in collective efficacy and goal setting. It is likely that the extent of agreement found among group members in the Prussia and Kinicki (1996) study was due to the laboratory setting and the simple brainstorming task that they used to measure group performance. When the group task is complex and outside influences affect members' beliefs and behaviors that are relevant to the group task, agreement about group performance expectations and goal level takes more time to develop.

¹The η^2 values for collective efficacy from time 3 - 6 found in this study ($\eta^2 = .51, .41, .47, .40$), were equal to or higher than those found by Riggs and Knight (1994) and Prussia and Kinicki (1996). See chapter two for detailed descriptions.

²In both this study and the Prussia and Kinicki (1996) study, WABA I results were equivocal, meaning that both between-group and within-group deviation explained a significant amount of the variance. A values found in this study from WABA II were also comparable to those found in the Prussia and Kinicki study, except at time 2, when the A value in this study dropped to $-.23$ (see Table 4.10). The largest A value in the Prussia and Kinicki study was $.37$ ($Z = 4.35, p < .05$) for the two variables, confidence in the group's output quantity and confidence in the group's process behaviors.

Conclusions About Shared Expectations and Goals

The findings from this study indicated that group members formed similar, though seldom identical, group performance expectations and goals. For most groups, members' expectations about group performance became increasingly similar during the time they were together, although differences remained throughout the study. Results from this study suggest that factors unique to the individual influence collective efficacy formation and goal setting. These factors include self efficacy, attitude toward group work, gender and personal goals.

Implications of the Findings

This study contributes to the literature on group research by providing evidence that clarifies 1) whether or not group-level beliefs exist and 2) when it is appropriate to aggregate data that have been collected from individuals. These two issues are important for researchers because they affect the way in which data are collected, analyzed and interpreted.

Individual versus collective beliefs. Over 70 years ago, McDougall (1920) and Allport (1924) defended opposing views about the role of the group in shaping the minds of its members. McDougall used the term "group mind" because he believed that the group could greatly influence the attitudes and beliefs of its members. Allport insisted that, to understand behavior, beliefs and attitudes, the researcher had to study the individuals within the group, and not the group as a single entity. According to Allport, group beliefs do not exist.

The debate about whether we should study the "psychology of the group" or the "psychology of individuals" (Allport's terms, 1924, p. 6) has not yet been fully resolved, although it is often ignored in multi-level research. When researchers aggregate group-level data, for example, they are choosing to ignore differences that are occurring within the group. When the data involve attitudes or beliefs, they are, in essence, assuming that a group mind exists, at least to some degree.

Evidence from this study indicated that group-level factors did influence member perceptions about the group's ability to perform a task. However, during the entire course of the study, there were enough differences within the group to suggest that factors unique to the individual also had an important effect on beliefs about the group's ability. Individuals considered group factors, such as group performance, and individual factors, such as self efficacy, to make a determination about collective efficacy.

To be more precise, individual- and group-level factors interacted to affect an individual's beliefs. Self efficacy was an individual-level factor that had an important impact on collective efficacy. However, the formation of self efficacy was partially affected by group-level factors, including feedback from group performance and the performance of other members. Individuals who had less favorable attitudes toward group work may have behaved in ways that were detrimental to the success of the group. Poor group performance served to reinforce their negative attitudes and expectations. Other individuals with negative group attitudes had positive experiences with their groups. As a result, some of these individuals became more optimistic about group work. Others merely assumed that the positive experience was unlikely to occur again. Clearly,

then, group-level factors influenced individual beliefs, but the extent of this influence and the ultimate outcome were dependent upon individual-level factors such as disposition and prior attitudes.

Of the variables investigated in this study, group potency was more characteristic of what Bar-Tal (1990) called a group belief than collective efficacy. Defined in chapter two, a group belief is one that is shaped by group experiences, is thought to be shared with other group members and contributes to the group's identity. In most groups, collective efficacy beliefs varied too much and were too dependent upon individual-level factors to be considered group beliefs. Group potency also varied according to such individual-level factors as attitude toward group work, but not to the extent that collective efficacy did. While members shared a general sense about how effective the group was overall, agreement about performance on any given task was more limited by factors that were unique to the individual, external to the group and/or varied from time to time.

Aggregation. It is sometimes useful to aggregate data that have been collected from individual group members, depending upon the goals of the researchers. Although analyses may reveal that a significant portion of total variance can be explained by between-group differences, the researcher should not assume that the sources of within-group variance can be ignored. The evidence from this study suggested that aggregation of group-level data will likely eliminate key information about the group process because it overlooks the traits and dispositions of the group members. Whenever possible, therefore, analysis should be conducted at the individual level to better understand how both

individual and group factors interact to create the outcomes that are being investigated.

Efficacy, Performance, Goal Setting and Effort

The remaining four research questions for this dissertation focused on the relationship among collective efficacy, self efficacy, performance, goals and effort. The goal of this dissertation was not to confirm or disprove cause-and-effect relationships; the absence of a theoretical framework and paucity of empirical studies make such an attempt premature. Rather, information was gathered in an attempt to develop a model that can be tested in a future study. Collective efficacy, self efficacy, performance, goal setting and effort are discussed separately in the following sections. A model is then proposed that depicts how they are related.

Overall Levels of Collective Efficacy

Collective efficacy scores were fairly high among the subjects throughout the course of the study; the relationship among collective efficacy, self efficacy, effort and goals must be evaluated in light of this fact. At each time period, most subjects reported that they expected their group to score above 90%, and several subjects expected their group to achieve a perfect score. High collective efficacy scores were not unique to subjects in the highest performance groups; very few of the subjects in the lowest scoring groups believed that their group would score below 88% on any of the performance tests. In other words, few subjects lost faith in their group's ability to score well on a test. Some of the findings from this

study may therefore not apply to subjects who have no confidence in their group's ability to perform a task successfully.

The Relationship Between Collective Efficacy and Self Efficacy

Collective efficacy and self efficacy data were collected for six performance tests, and changes in the relationship could therefore be observed. In this study, collective efficacy and self efficacy were related at each time period. However, the strength of the relationship declined over time when other factors (i.e., past group performance, gender, class and group attitude) were taken into account. In this section, the requirements of the task are described in order to clarify why the relationship between collective efficacy and self efficacy remained strong through six tests. An explanation for the decline in the relationship is also offered.

Task requirements and self efficacy. To better understand why collective efficacy and self efficacy were related in this study, it is first necessary to identify the factors that affected group performance. Lindsley et al. (1995) proposed that the relationship between collective efficacy and self efficacy was dependent upon the size of the group, the complexity of the task, the uncertainty of the environment, and the type of contributions required by each member. These factors impact the relationship between self and collective efficacy in that they affect the extent to which a group member perceives that there is a link between his or her performance and the group's performance. The factors identified by Lindsley et al. are used in the following discussion to describe the task performed by the groups in this study.

The tests used in this study required five to seven group members to make a series of decisions involving correct and incorrect choices. Successful performance required recalling and applying concepts from two to three chapters in a textbook and understanding the intent of the questions and foils on the test. A portion of the information that was needed to make a correct choice was often shared by two or more members. Theoretically, of course, it was possible for the group to do well simply by relying on their highest scoring member. Frequently, however, only one person in the group had the relevant information, and that person could be any member of the group.

Effective decision making also required that group members identify relevant information, discard erroneous information and consider the implications of each choice so that a correct choice could be made. Hence, group process skills were also needed to achieve a high score. For example, if a group could not arrive at a consensus on an answer, they were forced to split their answer among two or more foils, thereby ensuring a loss of points on the test. The most assertive member and/or the member with the highest grade point average was not necessarily right. Group members could err if they neglected to fully consider everyone's opinion.

Successful group performance on the task depended upon the ability of the members to do well individually. Those who understood the relevant concepts were critical to the successful performance on the group test. Although groups typically had group scores above the highest performing member, the most successful groups in this study had at least one member with an individual performance average that was among the top quartile of averaged individual scores. Although lower performers made important contributions when they

shared relevant ideas and facilitated the group process, the group needed members who were able to learn the material and provide the information necessary to make correct choices.

In this setting, collective efficacy and self efficacy were related at all six times. Group members recognized the importance of individual contributions to the performance of their group. The relationship between individual performance and group performance was clear because the knowledge that was required for individual performance was identical to the knowledge that was required for group performance. The groups were small, which increased the degree to which an individual could influence the group's decisions and probably contributed to the perception that members could play an important role in the final outcome of the task. Even if a member only contributed to one or two questions, the feedback about the helpfulness of his or her input was immediate and unambiguous because the test was graded immediately after it was completed. The presence of this type of feedback served to strengthen the connection between an individual's contributions and group performance.

Changes over time. The relationship between collective and self efficacy remained strong, but declined over time. The relationship between collective and self efficacy weakened as individuals became familiar with the abilities of other group members, learned that group members were committed to high levels of performance and gained confidence in the group's ability to make good decisions. Similar to the results reported by Watson, Michaelsen and Sharp (1991), cumulative group performance scores in this study quickly rose above the highest scoring members. Over time in a Team Learning environment, it becomes clear that, working as a team, group members can answer more

questions correctly than any single member. As members work together, group success depends less and less on the best individual member. Subjects learned quickly that other members' contributions were valuable and would help make the group successful. As a result, self efficacy was related to collective efficacy at all six times, but the relationship decreased over time.

The Relationship Between Performance and Collective Efficacy

The relationship between collective efficacy and future performance was difficult to delineate because both variables were correlated with past performance. Evidence from this study indicated that past performance ($t - 1$) was more strongly related to collective efficacy than future performance. In addition, subjects' beliefs about their own groups' abilities appeared to have been affected by subjects' awareness of the performance of other groups.

Past performance. Past group performance was a significant predictor of collective efficacy at times 2 - 6, but correlation and beta coefficients suggested that subjects may not have relied as much on the first test to form beliefs about future group performance as they did on later tests. Group scores at time 1 were as low as 57%, and the overall group performance average was 82%. Despite these low performance scores, collective efficacy scores at time 2 dropped only an average of 2%. Overall, group members expected to achieve 90% on the second test. Perhaps subjects believed that a dramatic learning curve would occur after time 1. After taking test 1, they knew more about the type of questions that would be asked and may have felt more confident about how to prepare for the next test.

Past performance was a significant predictor of time 3 collective efficacy. After the low performance at time 1, subjects studied an average of thirty minutes longer. They were familiar with the testing process and knew what kind of questions to expect. Subjects may have felt that time 2 performance was a more accurate reflection of how well they were able to perform.

Vicarious experience. There was evidence to suggest that, as Bandura (1977, 1982) proposed, subjects eventually used the experience of other groups to form expectations about their own group's abilities. For example, collective efficacy scores for subjects from the lowest scoring group in each class did not significantly differ from those of the subjects in the highest scoring group in each class until time 4. This despite an average performance gap of 23, 14 and 16 percentage points at times 1 - 3 respectively. On average, members of the higher performing groups underestimated their group's ability to perform, and members of the lower performing groups overestimated their group's ability to perform. One explanation for this is that subjects not only used information about their own group's performance to form expectations about future performance; they also considered how well other groups performed.

Future performance. Group members in this study became more accurate in their predictions of group performance. The more interesting issue, however, is not how well members can predict their group's performance, but whether expectations about performance actually can change the group's performance level. If collective efficacy does affect performance, it is most likely to do so because of its relationship to goal setting and effort.

The Relationship Between Collective Efficacy and Goal Setting

The objective of this study was to investigate the performance goals that members held for the group and to determine to whether they were related to group performance and collective efficacy. Evidence from previous studies suggest that past performance, efficacy and goals are positively related. In this study, personal goals for the group changed in response to past performance and collective efficacy. These findings are of interest because performance goals encourage individuals to focus on the task, formulate useful strategies and exert the amount of effort needed to achieve the goal, and thereby lead to higher performance (see Locke & Latham, 1990; O'Leary-Kelly, Martocchio & Frink, 1994).

Previous findings. Most empirical evidence regarding the relationship among efficacy, performance and goals come from self efficacy studies (see Gist & Mitchell, 1992 for a review). Self efficacy has been shown to be related to both past performance and goal level. Specifically, feedback from past performance is thought to affect self efficacy, which then influences the goal level that an individual sets (Bandura & Cervone, 1983; Locke et al., 1984). Motivation to exert effort is maximized when task feedback, high self efficacy and goals are all present.

Prussia and Kinicki (1996) also found that collective efficacy was positively related to past performance and goals in their study of groups working on a brainstorming task. Based on their findings, they concluded that beliefs about the group's ability to perform a task mediated the relationship between task feedback and group goals. They further concluded that collective efficacy, not group goals, was related to continued group effectiveness. They suggested that

the relationship found in other studies between group goals and group effectiveness was exaggerated because collective efficacy was never measured. Had collective efficacy been measured in these studies, they proposed, the relationship between group goals and group effectiveness would have been greatly reduced.

Current findings. Findings from this study, consistent with the findings noted above and others (cf., Locke, Frederick, Lee & Bobko, 1984; Shaw, 1981; Zander, 1977), indicated that subjects' goals for group performance changed over time in response to past performance and their beliefs about the group's ability to perform the task. It is possible that some subjects confused expected performance (i.e., collective efficacy) with desired performance (i.e., goals). Because there have been numerous examples of the same phenomenon occurring in previous research, however, it is likely that the subjects in this study did in fact modify their goals to match their changing perceptions of collective efficacy.

There were, however, three key differences between the present study and those discussed above. First, subjects in self efficacy studies performed their tasks alone, rather than as members of a group. Second, tasks in previous studies were much simpler than the one used here. Subjects in the Bandura & Cervone (1983) study pedaled an exercise bike. Studies by Locke et al. (1984) and Prussia and Kinicki (1996) involved brainstorming tasks. Third, the outcomes associated with performance of simple laboratory tasks were probably not as meaningful as the outcomes associated with the task in the present study. In this study, group scores on the performance tests had an impact on the subjects' grade for the course. As members of ongoing groups, subjects were also concerned with their group's image among other groups in the class. Performance as a group member,

a more complex task and meaningful outcomes are likely to affect efficacy and goal setting. Despite these differences, a consistent finding was that a strong relationship existed among efficacy, goal level and past performance.

The Relationship Between Collective Efficacy and Effort

Of interest in this study was the extent to which individual- and/or group-level factors affected the effort that an individual exerted in preparation for the tests. Clearly, individual-level factors, most notably the goals that subjects set for the individual tests, were related to effort. The relationship between effort and collective efficacy was less direct and difficult to detect. There was some evidence indicating that subjects who were not satisfied with their group's performance but had high levels of collective efficacy tended to exert more effort in preparation for the next test than subjects with high collective efficacy who were satisfied with their individual and group performance. It is possible that the modest relationship between collective efficacy and effort was due to procedures that were used in the classes.

Individual-level factors related to effort. Two individual-level factors, personal goals and minority status, were related to effort. The most consistent finding in this study was that higher goals for individual performance were associated with greater effort. In addition, minority students spent more time studying than non-minority students. Many of the minority students spoke English as a second language and may have needed more time to read the two to three chapters of the text that each test covered.

Dissatisfaction with past performance. Results from regression and descriptive analyses were far from conclusive but provided indirect evidence that

dissatisfaction with past results, coupled with high collective efficacy, led to higher levels of effort. Subjects in the highest scoring groups had the highest levels of collective efficacy. However, they were not as likely to spend as much time studying as those who believed that their groups could perform well, but were scoring below the highest performing groups in the class. Bandura and Cervone (1983) found similar results in their study of self efficacy (see also Gist, 1987).

There is no evidence in this study to suggest that lower levels of effort were due to a lack of confidence in the group's ability to perform. As mentioned earlier, most subjects remained confident in their group's ability to perform at an "A" level. Less than 7% of the subjects expected that their group would answer fewer than 80% of the questions correctly at any given time period. According to Bandura's social cognitive theory (1977) and expectancy theory (see Karau & Williams, 1993; Steers & Porter, 1979), individuals are willing to exert effort if they believe that their efforts will lead to desired performance levels and outcomes. The subjects in the lower performing groups apparently expected that their effort would lead to scores comparable to the highest performing groups. In contrast, those in the highest performing groups had enough confidence in their group's ability to believe that less effort was needed to sustain these high performance levels.

Team Learning and effort. The relationship between collective efficacy and effort may have been attenuated from the motivational impact inherent in the Team Learning structure. Karau and Williams (1993), in their review of social loafing studies, identified five conditions that reduce the tendency for individuals to decrease their efforts when working in groups (i.e., social loafing). All five

conditions are present in the Team Learning environment. Karau and Williams found that social loafing was less likely to occur when 1) individual contributions to the group can be evaluated, 2) the task is meaningful, 3) subjects value group membership (assuming that the group members value high performance), 4) group level comparisons are made and 5) groups have fewer members.

The Team Learning design provided the incentives that encouraged subjects to exert a significant amount of effort on behalf of their group. The contribution of each group member was partially measured through his or her performance on an individual test taken just prior to the group test. The task was meaningful to most students because the individual and group tests made a contribution to their course grade. Individual tests were worth 5% to 13.5% of the course grade. In addition, several practices used by the instructors made it highly likely that students would be aware of other members' scores. Groups were together all semester and numerous activities helped build group identity. Group scores were written on the chalkboard to encourage comparison among groups. None of the groups had more than seven members, which was small enough so that each member could make a meaningful contribution to the group. Under these conditions, Karau and Williams (1993) predicted that social loafing would be minimal. The relevant point for the purposes of this study is that these conditions were likely to have led to a reduction in the variance associated with the amount of effort exerted by subjects in this study.

Summary: Collective Efficacy, Performance, Goals and Effort

The relationships among past performance, collective efficacy, goal level and effort found in this study were very similar to those found in self efficacy

studies. Self efficacy was significantly related to collective efficacy at each time period, although the relationship decreased as group members developed greater faith in the capabilities of other members and in the group process. Collective efficacy was related to past group performance at each time. The goal that individuals had for their group was not an unchanging standard, but varied according to past group performance and beliefs about the group's ability. Higher levels of effort were associated with higher levels of individual goals. Frequently, the highest levels of effort came from subjects who were apparently dissatisfied with their group scores, but continued to believe that their group could achieve high levels of performance. In contrast to findings in self efficacy research, collective efficacy was not as strongly related to future performance as it was to past performance.

An Performance-Efficacy Model

Figure 5.1 is a model that depicts the relationships among self efficacy, collective efficacy, goal level, effort and group performance, based upon social cognitive theory, expectancy theory and evidence from this study.

As Bandura suggested, both collective efficacy and self efficacy are determined by feedback from past experience, vicarious experience and verbal persuasion (1977, 1982). In the context of a group task, feedback is available from the individual performances of group members, the performance of the group and the performance of other groups doing the same task. The skills and knowledge of an individual affects his or her self efficacy. At the group level, a general assessment of the group's skills and abilities, group potency, has an impact on collective efficacy. Efficacy is also affected by the encouragement and

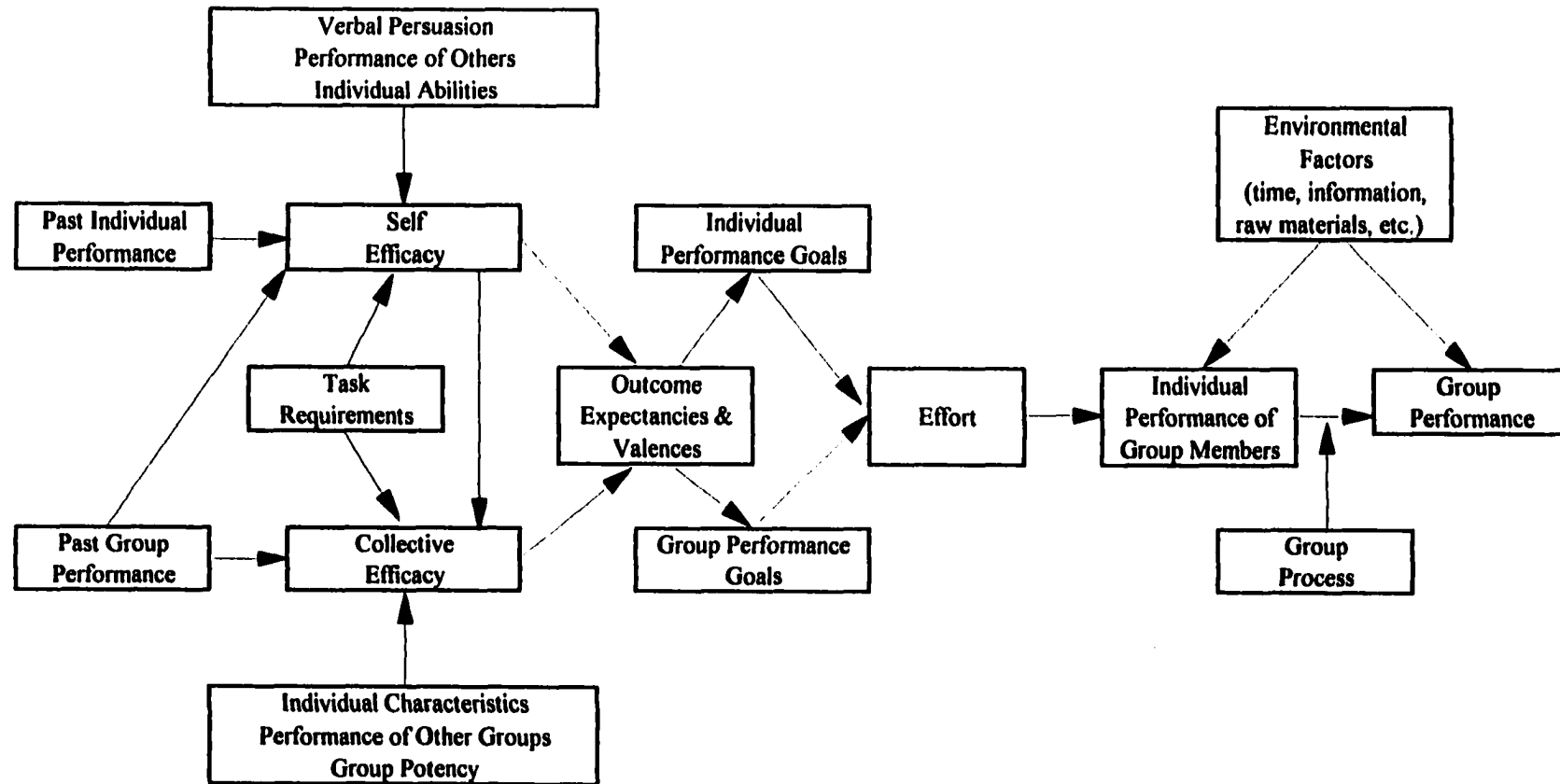


Figure 5.1. The Efficacy-Performance Relationship.

advice that members receive from people within and outside the group. As demonstrated in this study, individual characteristics, such as gender and attitude toward group work, may affect collective efficacy. Self efficacy has an important effect on collective efficacy; the strength of the relationship depends largely on the characteristics of the task.

In a group setting, self efficacy and collective efficacy interact to affect group performance. Self and collective efficacy levels and outcome expectancies influence the level of performance goals that individuals set for themselves and the group.³ These goals motivate members to exert effort in a number of ways. If past performance does not meet desired goal levels, but efficacy remains high, then individuals will exert more effort to achieve the goals. If individuals believe that the goal level is not attainable, even with extra effort, then efficacy decreases and consequently, goal level decreases. Effort will decrease as individuals reduce their goal levels. Interestingly, effort may also decrease if goals are achieved and group members are confident that they will continue to meet the goals.

For maximum effort, individuals must believe that desired outcomes are contingent upon both individual- and group-level performance goals. If individual outcomes are dependent upon group performance alone, those with higher self efficacy, assuming they value the outcomes, will usually exert the most effort on behalf of the group. Those with high self efficacy tend to have high collective efficacy because they believe that they can ensure that the group will excel. Those with low self efficacy have fewer reasons to exert much effort because they do not believe that their efforts contribute to the group's

³Members may value social-based outcomes more than performance-based outcomes. When this occurs, performance goals, and consequently effort, may actually decline, depending upon the group's norms.

performance. Although all members may value the outcomes associated with high group performance, a reduction in effort will more likely occur when group members do not believe that their contributions will have a positive affect on group performance.

The proposed model applies to groups at any stage of development. However, the strength of the relationship between any two variables may change over time. For example, there will always be a relationship between self efficacy and collective efficacy, though it is likely to decrease over time to a certain extent. The relationship between past group performance ($t - 1$) and collective efficacy is likely to increase when group members are first learning a task, but then decrease once members have become familiar with the task and have received feedback from several attempts.

Because of the relationship among performance, efficacy, goal setting and effort, a decline in one variable may lead to the eventual decline in the others, unless an external force intervenes to counteract the downward spiral. The spiral can be reversed if someone within or outside the group initiates a change in one of the variables that are identified in the model. For example, information can be provided about the successful performance of other groups, which will increase collective efficacy; a challenging goal level can be established and rewarded; training can be provided to increase a member's skills and self efficacy.

Ultimately, group performance primarily depends upon the individual contributions of group members. Groups that perform at high levels have group members who perform at high levels. The relationship between individual contributions and group performance is mediated, however, by group process variables, including decision-making procedures, communication skills, conflict

resolution strategies, etc. (see also Bettenhausen, 1991; Gist, Locke & Taylor, 1987; Hackman, 1987; Levine and Moreland, 1990; Shaw, 1981). In addition, group members must have access to necessary external resources such as time, information, raw materials, machinery, etc. Nevertheless, the group's most valuable assets are the skills, knowledge and abilities of its members.

Applications to the Work Place

Managers rely on teams of workers to complete the organization's tasks (cf., Bolman & Deal, 1991; Galbraith & Lawler, 1993; Hammer & Champy, 1993; Katzenbach & Smith, 1993; Peters, 1992; Wellins, Byham & Wilson, 1991). It is therefore necessary for managers to understand the factors that affect the motivation of team members. Collective efficacy is one such factor. It affects the goals that members set for themselves and their team and the amount of effort that they are willing to exert to achieve these goals.

The evidence from this study suggested that productivity is positively affected when team members have confidence in themselves and in the team's abilities to perform tasks. High levels of self efficacy are desirable because workers tend to be more confident in their team's abilities when they are confident in their own abilities. Workers use performance feedback to form perceptions about their abilities. It seems logical that job training, access to resources and words of encouragement are a few ways to help workers develop higher levels of self efficacy. To enhance collective efficacy, managers can supply information about the team's performance and the performance of other teams that are doing the same type of task under similar conditions. As this study

indicated, the success of one's team, or the success of other teams doing the same task, has a positive effect on collective efficacy.

Self efficacy and collective efficacy are important largely because they impact the goal level that team members set for the team. Most group members in the study did not set a single standard over the course of the study. Instead, goals varied according to past performance and efficacy levels. Consequently, it seems necessary for managers to help teams set challenging but achievable goals for the group. When original goals are not achieved, teams members should be encouraged to identify and resolve the problems that led to poor performance rather than allowed to lower performance standards. Findings from studies (e.g., Karau, S. J., & Williams, K. D., 1993; Locke & Latham, 1990; Mackie, & Goethals, 1987) suggest that goals should be reinforced with rewards that are valued by the team members, which give members a reason to exert the effort necessary to achieve the goals. Evidence from this study indicated that effort may decline over time unless members continue to be challenged by a high standard. If goals are too challenging, however, failure will have a negative effect on collective efficacy and will likely have a negative impact on effort.

Both individual- and group-level performance should be rewarded. When individuals are accountable for their performance, team members are more likely to put forth effort on behalf of the group. Members who believe that their contributions to the team are unimportant have little incentive to exert effort unless their individual inputs are identifiable and rewarded. The members who are most susceptible to reducing their efforts are those who have low self efficacy and are not accountable for individual performance.

The results of this study indicated that the people most likely to exert effort toward task completion are those who have strong self and collective efficacy and accept high individual and group performance goals. Managers have some control over these variables. The first steps, of course, include hiring and training competent workers. Beyond that, managers who supply individual and group performance feedback, encourage the setting of challenging but achievable goals, and who provide meaningful rewards for both individual and group performance help to create a work environment that encourages workers to exert effort on behalf of the team and organization.

Limitations

The study had several limitations, some of which have already been discussed. The findings from this study and their applicability to other settings were affected by the choice of subjects used for the sample, method of collecting the data, missing data and the classroom setting in which the study took place.

This was a sample of convenience. Subjects from the study were undergraduates who were enrolled in five classes of *Principles of Management* at the University of Oklahoma and were taught by instructors using a Team Learning design. The students in this study were not randomly selected, and may not be representative of the other students at the university or students in general. In addition, because the subjects were undergraduates, most of whom were under the age of 25, it is not clear whether findings are fully applicable to a work setting in which non-students and older adults are employed.

Most of the measures used in the study came from survey data, which caused several problems. Relationships between the variables may have been

inflated due to common method bias. Subjects were asked to complete eight surveys and may have become complacent in their responses. The size of each survey was limited so that the subjects would continue to participate in the study. There was a concern that if the repeated surveys were longer than a page in length, the subjects would refuse to answer questions or be unwilling to answer each question thoughtfully. Additional variables that are likely to impact either collective efficacy, goal level or motivation, such as outside time constraints, outcome expectancies, satisfaction with past performance, etc., could not be adequately measured without significantly extending one or more of the surveys.

Researchers who depend on survey data must also be concerned about whether subjects were willing and/or able to accurately report on their attitudes, expectations and behaviors. The subjects in this study were asked to report on current perceptions and recent behavior, and the timeliness of each survey probably increased the validity of these measures (Ericsson & Simon, 1980; Johnson et al., 1995). Admittedly, their responses may have been incorrect or insincere. For example, it is likely that some subjects did not want group members or the instructor to know how they answered the questions. In this study, it was hoped that the use of code names provided some feeling of anonymity for the students. Subjects were also discouraged from talking with each other about the survey and placed their own surveys in a manila envelope after completing each form. No steps were taken to assess the extent to which subjects believed that their responses were anonymous.

There was a significant amount of correlation among the variables in the study, which made it difficult to fully understand how one variable affected another. High correlation coefficients were expected, but they may have been

exaggerated by common method bias. Cause and effect relationships are very difficult to identify in such situations, and some results may have been caused from the intercorrelation. For example, beta values are known to fluctuate when the predictor variables in a regression equation are correlated, and the sign may be opposite of what one would expect because of the relationship among the other predictor variables (Borg & Gall, 1989; Van de Geer, 1971).

Several of the problems associated with the design of this study were comparable to those typically found in field studies. Classroom constraints prevented the manipulation of the variables because the study was secondary to the learning goals of the courses. For example, the number of test questions varied according to content and learning objectives. The small number of test questions may have negatively affected reliability. The amount of reading required for each exam also varied. Ceiling effects began to emerge as test scores approached 100%. Other manipulations, such as reducing the amount of individual accountability, was not possible because it was likely to reduce learning. Variables outside the classroom, including family responsibilities and requirements of other courses, could not be controlled and no doubt affected variables in the study.

Given that eight separate surveys were given at eight different times, missing data were inevitable. Not all subjects were present for every test and survey. In addition, subjects occasionally omitted or improperly completed survey items. Some subjects provided efficacy data, but refused to be identified; consequently, their demographic and individual performance information could not be used.

This was an exploratory study, and by definition, was never intended to test specific hypotheses. The research on collective efficacy has just begun and it was believed that an exploratory study would be of greater value so that a model of collective efficacy could be developed for testing in the future. Although there were limitations, the setting was ideal for this type of study because the groups were observed from the time they were formed and group performance outcomes were meaningful for the subjects.

Further Study

Given the exploratory nature of this dissertation, the next logical step is to conduct a confirmatory analysis to verify the proposed model and other conclusions. The challenge is to develop measures that can distinguish the subtle differences that exist among efficacy, goals and outcomes. Further, these relationships need to be tested in a field setting, with adult subjects, to determine if differences between student and non-student populations exist. Ideally, future studies can be designed to reduce the number of limitations that were discussed in the previous section.

Future studies are required to clarify how changes in one variable affects the relationship among efficacy, goals, effort and performance. In the present study, changes in task experience and group development were found to affect the relationship among the key variables. That is, as group members worked together and gained experience with the task, the relationships among past performance, self efficacy, collective efficacy, goals and effort changed. Changes in task complexity, group membership, individual accountability, goal setting process, etc., may also affect relationships among the key variables.

Perhaps the most important issue that remains unresolved is the extent to which collective efficacy actually has an impact on performance. In this study, past performance clearly influenced collective efficacy formation. It is not known, however, if collective efficacy had a meaningful effect on future performance. This relationship is difficult to discern due to the high correlation of past performance with future performance.

Conclusion

The purpose of this dissertation was to determine the extent to which members of an ongoing group develop, over time, a shared collective efficacy. In addition, this study examined the relationship among collective efficacy, group performance, self efficacy, individual effort and goal setting. Findings indicated that members begin to agree about the group's ability to perform a task early in the group's development. However, complete agreement is not likely to develop because individual characteristics, such as self efficacy and attitude toward group work, continue to influence beliefs about group performance.

A model that depicts the relationship among the performance, efficacy, effort and goal variables was proposed. Although this model is thought to be applicable at any stage of group development, as individuals gain experience with the task and learn more about other group members, the strength of the relationship between any two variables may change.

A recent event from the world of sports illustrates the relationship among efficacy, effort, goals and performance that has been described in this study. The Texas Rangers slid into a six game losing streak in the middle of June, 1997, and sunk from first to third place in their division. Extra fielding and batting practice

did not immediately turn the streak around. Desperate for a win, the team brought two "good luck" lamas into the stadium during practice. The stunt did not work; they lost by one run in a game that was marred by three Ranger errors. On the next day, the ball team finally won. The manager told reporters that the losses were not due to a lack of effort: "Rusty Greer [an outfielder] said we needed to try *easier* [italics added]. I like that because we've been trying too hard . . ." (Baldwin, p. 19).

After the team dropped to third place, self efficacy and collective efficacy among the players may have decreased slightly, if at all; but the players increased their efforts because the team's performance did not meet their expectations. Their goals were ambitious: they wanted to break out of the losing streak and regain first place in their division. They worked vigorously to achieve this goal, more so than when they were in first place. Those who worked the most diligently were probably the regular starters on the team, the people who believed that the team needed their strong individual performance in order to succeed. For a psycho-motor skill like baseball, extra practice is likely to improve performance, although many other variables, such as talent or conflicting personal goals, may interfere with the team's performance.

The relationship among collective efficacy, goals, effort and performance may be more subtle in the work place. Worker skills and organizational resources are likely to be more critical to performance than collective efficacy. And yet, in an era of intense, international competition, small differences in performance, when multiplied by the number of teams that compose a company's workforce, can mean the difference between profit and loss. In order to create an environment that allows groups of workers to achieve the highest levels of

performance possible, it is important to understand the cognitive and motivational processes that occur as group members work together to accomplish tasks. This dissertation contributed to our understanding of these processes by examining how beliefs about individual and group performance develop and affect effort and goal setting.

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Appendix A

First Survey Instrument Assessing Past Group Experience

1. In the past, were you ever a member of a class in which students first took a test as an individual and then took the same test again as a group?
☐ Yes
☐ No
 2. How much experience do you have working in task groups (at school, work, volunteer organizations, etc.)?
☐ I have been a member of a *great number* of task groups.
☐ I have been a member of a *considerable* number of task groups.
☐ I have been a member of *several* task groups.
☐ I have been a member in a *small* number of task groups.
☐ I have *never* been a member of a task group.
 3. How would you describe your past experience with task groups?
☐ Very positive.
☐ Somewhat positive.
☐ Neither positive nor negative.
☐ Somewhat negative.
☐ Very negative.
 4. As a group member, how does the quality of your work typically compare to the quality of work of other group members? "*The quality of my work is typically....*"
☐ significantly higher than other members.
☐ somewhat higher than other members.
☐ about the same as other members.
☐ somewhat lower than other members.
☐ significantly lower than other members.
 5. To what extent do you enjoy working in groups on class activities and assignments?
☐ to a great extent
☐ to a considerable extent
☐ to some extent
☐ to a limited extent
☐ to no extent
 6. How much do you agree with this statement: "*Given a choice, I would rather work alone than in a group.*"
☐ Strongly agree
☐ Agree
☐ Agree somewhat
☐ Disagree somewhat
☐ Disagree
☐ Strongly disagree
-

Surveys Administered Preceding Each Test

How much do you agree with these statements?

	Strongly Agree	Agree	Agree Somewhat	Disagree Somewhat	Disagree	Strongly Disagree
1. I put in a lot of effort to prepare for this test.	1	2	3	4	5	6
2. I have put more effort than usual into preparing for this test.	1	2	3	4	5	6
3. I have done all that I can to make sure this group succeeds on this test.	1	2	3	4	5	6
4. I have worked harder than most of the other members of my group to prepare for this test.	1	2	3	4	5	6
5. Although an "A" would be nice, I would be satisfied with a "B" in this class.	1	2	3	4	5	6

6. How many POINTS (1 question = 3 points) do you expect to miss on this test? _____ (Best guess)

7. How many POINTS (1 question = 3 points) do you expect your group to miss on this test? _____ (Best guess)

Use a scale of 1 (not at all confident) to 10 (completely confident), to answer questions 8 - 15 below.

How confident are you that *you* will...

Not confident.....Completely confident

8. achieve a perfect score today?	1	2	3	4	5	6	7	8	9	10
9. score at least a 57?	1	2	3	4	5	6	7	8	9	10
10. score at least a 54?	1	2	3	4	5	6	7	8	9	10
11. score at least a 51?	1	2	3	4	5	6	7	8	9	10

How confident are you that *your group* will...

Not confident.....Completely confident

12. achieve a perfect score today?	1	2	3	4	5	6	7	8	9	10
13. score at least a 57?	1	2	3	4	5	6	7	8	9	10
14. score at least a 54?	1	2	3	4	5	6	7	8	9	10
15. score at least a 51?	1	2	3	4	5	6	7	8	9	10

16. How many hours did you study for this test (including any time you spent reading the chapters)? _____

17. My goal for my group for this test is to:

- a) achieve a perfect score c) score a 54 or higher e) I don't have a goal for the group.
b) score a 57 or higher d) score a 51 or higher f) We should just try to do our best.

18. On this test, I will be satisfied with my group's performance as long as we score *at least*:

- a) 51 points c) 57 points e) I won't be satisfied unless our group achieves a perfect score.
b) 54 points d) I will be satisfied with any score we receive.

19. My goal for the individual test is to:

- a) achieve a perfect score c) score a 54 or higher e) I don't have a goal.
b) score a 57 or higher d) score a 51 or higher f) I should just try to do my best.

20. On this test, I will be satisfied with my performance on the individual test as long as I score *at least*:

- a) 51 points c) 57 points e) I won't be satisfied unless our I achieve a perfect score.
b) 54 points d) I will be satisfied with any score I receive.

Final Survey, Administered After Tests Had Been Taken

Previous group experience

1. Before you took this class, were you ever a member of a class in which students first took a test as an individual and then took the same test again as a group?

_____ Yes
_____ No

Demographic information

1. Gender

_____ Male
_____ Female

2. Age

_____ 17-20
_____ 21-25
_____ 26-30
_____ 31-35
_____ 36-40
_____ 41-45
_____ 46-50
_____ over 50

3. Race

_____ White
_____ African American
_____ American Indian
_____ Asian
_____ Hispanic
_____ Other (please specify): _____

Final Survey, Continued

Listed below are statements about the team that you work with in this class. Please circle the number that best reflects the extent to which each statement is true.

	To no extent	To a limited extent	To some extent	To a considerable extent	To a great extent
1. My team has confidence in itself.	1	2	3	4	5
2. My team believes it has become unusually good at producing high-quality work.	1	2	3	4	5
3. My team has become known as a high-performing team.	1	2	3	4	5
4. My team feels it can solve any problem it encounters.	1	2	3	4	5
5. My team believes it can be very productive.	1	2	3	4	5
6. My team can get a lot done when it works hard.	1	2	3	4	5
7. No task is too tough for my team.	1	2	3	4	5
8. My team has had a lot of influence around here.	1	2	3	4	5

Listed below are a number of statements concerning personal attitudes and traits. Read each item and decide whether the statement is true or false as it pertains to you.

True/False

- ____ 1. I like to gossip at times.
- ____ 2. There have been occasions when I took advantage of someone.
- ____ 3. I'm always willing to admit it when I make a mistake.
- ____ 4. I always try to practice what I preach.
- ____ 5. I sometimes try to get even rather than forgive and forget.
- ____ 6. At times I have really insisted on having things my own way.
- ____ 7. There have been occasions when I felt like smashing things.
- ____ 8. I never resent being asked to return a favor.
- ____ 9. I have never been irked when people expressed ideas very different from my own.
- ____ 10. I have never deliberately said something that hurt someone's feelings.

Final Survey, Continued

Listed below are statements concerning the grades you have received in college. Please circle the number that best represents the degree to which you agree or disagree with each statement.

	DISAGREE				AGREE
	0	1	2	3	4
1. When I receive a poor grade, I usually feel that the main reason is that I haven't studied enough for that course.					
2. If I were to receive low scores it would cause me to question my academic ability.	0	1	2	3	4
3. Some of the times that I have gotten a good grade in a course, it was due to the teacher's easy grading scheme.	0	1	2	3	4
4. Sometimes my success on exams depends on some luck.	0	1	2	3	4
5. In my case, the good grades I receive are always the direct result of my efforts.	0	1	2	3	4
6. The most important ingredient in getting good grades is my academic ability.	0	1	2	3	4
7. In my experience, once a professor gets the idea you're a poor student, your work is much more likely to receive poor grades than if someone else handed it in.	0	1	2	3	4
8. Some of my lower grades have seemed to be partially due to bad breaks.	0	1	2	3	4
9. When I fail to do as well as expected in school, it is often due to a lack of effort on my part.	0	1	2	3	4
10. If I were to fail a course it would probably be because I lacked skill in that area.	0	1	2	3	4
11. Some of my good grades may simply reflect that these were easier courses than most.	0	1	2	3	4
12. I feel that some of my good grades depend to a considerable extent on chance factors such as having the right questions show up on the exam.	0	1	2	3	4

Final Survey, Continued

	DISAGREE				AGREE
	0	1	2	3	4
13. Whenever I receive good grades, it is always because I have studied hard for that course.					
14. I feel that my good grades reflect directly on my academic ability.	0	1	2	3	4
15. Often my poorer grades are obtained in courses that the professor has failed to make interesting.	0	1	2	3	4
16. My academic low points sometimes make me think I was just unlucky.	0	1	2	3	4
17. Poor grades inform me that I haven't worked hard enough.	0	1	2	3	4
18. If I were to get poor grades I would assume that I lacked ability to succeed in those courses.	0	1	2	3	4
19. Sometimes I get good grades only because the course material was easy to learn.	0	1	2	3	4
20. Sometimes I feel that I have to consider myself lucky for the good grades I get.	0	1	2	3	4
21. I can overcome all obstacles in the path of academic success if I work hard enough.	0	1	2	3	4
22. When I get good grades, it is because of my academic competence.	0	1	2	3	4
23. Some low grades I've received seem to me to reflect the fact that some teachers are just stingy with points.	0	1	2	3	4
24. Some of my bad grades may have been a function of bad luck, being in the wrong course at the wrong time.	0	1	2	3	4

Appendix B

Pilot Study Findings

A pilot study was conducted with 34 juniors and seniors enrolled in a *Principles of Management* course to test the reliability of the measures that were to be used for the current study. Specifically, collective efficacy, self efficacy, effort and goal measures were tested. The instructor for this course used a Team Learning design. The subjects had been assigned to one of six groups at the beginning of the semester. The survey was given to the subjects prior to the administration of a sixth and final test. Typical of the Team Learning model, students took the test individually first, and then again as a group. Correlation and reliability analyses were conducted. The results, together with the results conducted from time 6 in the present study, are provided in Tables B.1 and B.2

Table B.1

Cronbach's Coefficient Alpha Comparisons, Pilot and Present Studies

Variables	Cronbach's Coefficient Alpha	
	Pilot Study	Present Study, Time 6
Collective efficacy strength	.95	.92
Self Efficacy strength	.84	.97
Perceived effort	.87	.92
Goals for the group	.84	.83

Table B.2**Correlation and Reliability Comparisons, Pilot and Present Studies**

Variables	Correlation Coefficients		Standardized Cronbach's Coefficient Alpha	
	Pilot Study	Present Study^a	Pilot Study	Present Study
Perceived effort and hours studied	.50*	.55***	.56	.71
Self efficacy and self efficacy strength	.62***	.66***	.94	.79
Collective efficacy and collective efficacy strength	.63***	.67***	.93	.80

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

^a Correlation coefficients are from test 6.

Appendix C

Analyses Conducted with Collective Efficacy Strength

Several analyses were conducted with the collective efficacy strength measure; the findings are summarized in the tables that follow. These results may be compared to the findings from identical analyses that were conducted with the single-item collective efficacy measure, which are summarized in Tables 4.7, 4.11 and 4.14 in chapter 4.

Table C.1

Reliability of Efficacy Strength Measures Used at Each Time Period

Measure	Cronbach's Coefficient Alpha (n)					
	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
Collective efficacy strength (questions 12-15)	.94 (217)	.92 (216)	.94 (223)	.91 (221)	.94 (210)	.92 (214)
Self efficacy strength (questions 8-11)	.95 (206)	.94 (213)	.95 (222)	.96 (216)	.95 (213)	.97 (217)

Table C.2

Summary of Repeated Measures Analysis for Collective Efficacy Strength

Within-subjects factor: Collective Efficacy Strength	Between-Subjects Factor: Group Membership	
	Pillais $\underline{F}$	Wilks $\underline{F}$
Main effect	13.76 (.000)	13.76 (.000)
Interaction	1.61(.000)	1.64 (.000)

Note. $n = 160$.

Table C.3

Profile Analysis Comparing Male and Female and Minority and Non-Minority Subjects

Repeated Factor	Parallel Test	Levels Test	Flatness Test
Collective efficacy strength 102 males, 52 females	$\underline{F} = .78$ $p = .569$	Mean ^a M = 8.65 F = 7.98 $\underline{t} = 2.87$ $p = .005$	$\underline{T}^2 = 60.42$ $\underline{F} = 11.77$ $p = .000$
Collective efficacy strength 117 non-minority 32 minority	$\underline{F} = 1.79$ $p = .118$	Mean ^a M = 8.36 F = 8.45 $\underline{t} = .35$ $p = .723$	$\underline{T}^2 = 63.24$ $\underline{F} = 12.31$ $p = .000$

^a Mean for each test.

Table C.4**Summary of Regression Analysis: Collective Efficacy Strength as the Dependent****Variable**

	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
	<u>B</u>	<u>B</u>	<u>B</u>	<u>B</u>	<u>B</u>	<u>B</u>
Variables						
Past group performance (t-1)	—	3.056 (.012)	4.717 (.002)	4.302 (.026)	5.390 (.000)	4.557 (.011)
Self Efficacy Strength	.417 (.000)	.490 (.000)	.453 (.000)	.348 (.000)	.362 (.000)	.280 (.000)
Covariates						
Class	-.071 (.362)	-.105 (.189)	-.194 (.058)	-.099 (.218)	-.144 (.104)	-.229 (.009)
Attitude: Prefers to work alone	-.177 (.110)	.147 (.193)	-.207 (.167)	-.141 (.206)	-.222 (.055)	-.255 (.029)
Gender	.484 (.029)	.551 (.012)	.341 (.167)	.776 (.005)	.265 (.243)	.173 (.447)
Constant	6.509 (.000)	2.371 (.044)	2.281 (.154)	3.274 (.026)	2.349 (.108)	3.970 (.026)
Statistical Significance						
Adjusted R ²	.381	.466	.456	.421	.393	.291
Standard error	1.218	1.255	1.415	1.273	1.284	1.331
<u>F</u>	22.13	26.66	25.51	22.83	19.51	13.586
<u>p</u>	.000	.000	.000	.000	.000	.000
<u>n</u>	138	148	147	151	144	154

Note. p-values are in parentheses.

Appendix D

Correlation Matrices, Tests 1 - 6

Table D.1

Correlation Analysis for Variables Measured at Time 1

	1	2	3	4	5	6	7	8	9
1. Collective Efficacy									
2. Collective Efficacy Strength	.56 212								
3. Self Efficacy	.51 233	.43 212							
4. Self Efficacy Strength	.35 203	.61 203	.64 203						
5. Goal for Group	.49 231	.53 215	.50 231	.50 204					
6. Goal for Oneself	.41 232	.41 216	.55 232	.62 205	.61 236				
7. Hours Studied	.06 228	.01 231	.19 228	.16 202	.13 232	.23 233			
8. Perceived Effort	.18 233	.17 217	.48 233	.50 206	.31 236	.36 237	.50 233		
9. Class	-.10 233	-.14 217	-.09 233	-.15 206	-.22 236	-.09 237	.00 233	-.14 241	
10. Performance (t)	.04 233	.07 217	0 233	.03 206	.05 236	.05 236	0 233	-.04 238	-.04 241

Note. $\bar{r}$ = top number and $\bar{n}$ = bottom number for each set of variables; $p < .05$ when $\bar{r} = .13$.

Table D.2

Correlation Analysis for Variables Measured at Time 2

	1	2	3	4	5	6	7	8	9	10
1. Collective Efficacy										
2. Collective Efficacy Strength	.46 212									
3. Self Efficacy	.54 227	.31 212								
4. Self Efficacy Strength	.33 213	.63 209	.69 213							
5. Goal for Group	.41 226	.54 215	.38 226	.46 215						
6. Goal for Oneself	.34 225	.45 214	.56 225	.64 214	.70 228					
7. Hours Studied	.02 222	.02 212	.21 222	.13 211	.07 225	.22 225				
8. Perceived Effort	.09 227	.15 216	.48 227	.49 216	.27 230	.41 229	.46 226			
9. Class	-.13 227	-.24 216	-.04 227	-.20 216	-.34 230	-.28 229	.12 226	-.05 231		
10. Past Performance ($t - 1$)	.19 227	.18 216	.05 227	-.05 216	.16 230	.02 229	-.14 226	-.20 231	-.04 241	
11. Performance (t)	.14 227	.19 216	.03 227	.06 216	.25 230	.18 229	-.04 226	-.04 231	-.44 241	.48 241

Note. r = top number and n = bottom number for each set of variables; $p < .05$ when $r = .13$.

Table D. 3

Test 3

	1	2	3	4	5	6	7	8	9	10
1. Collective Efficacy										
2. Collective Efficacy Strength	.57 222									
3. Self Efficacy	.63 236	.30 223								
4. Self Efficacy Strength	.53 221	.65 218	.60 222							
5. Goal for Group	.47 232	.56 219	.42 233	.49 218						
6. Goal for Oneself	.50 234	.38 221	.57 235	.63 220	.69 233					
7. Hours Studied	.04 230	-.01 217	.23 231	.11 216	.12 228	.23 230				
8. Perceived Effort	.23 236	.22 223	.42 237	.51 222	.30 233	.42 235	.43 232			
9. Class	-.34 236	-.39 223	-.14 237	-.37 222	-.38 233	-.26 235	.09 232	-.15 238		
10. Past Performance (t - 1)	.45 236	.38 223	.17 237	.19 222	.41 233	.22 235	-.03 232	.08 238	-.44 241	
11. Performance (t)	.22 236	.20 223	.17 237	.07 222	.20 233	.12 235	.03 232	.01 238	-.21 241	.47 241

Note. $\bar{r}$ = top number and $\bar{n}$ = bottom number for each set of variables; $p < .05$ when $\bar{r} = .13$.

Table D.4**Test 4**

	1	2	3	4	5	6	7	8	9	10
1. Collective Efficacy										
2. Collective Efficacy Strength	.61 220									
3. Self Efficacy	.58 228	.31 221								
4. Self Efficacy Strength	.50 215	.55 214	.70 216							
5. Goal for Group	.63 225	.51 219	.45 226	.46 214						
6. Goal for Oneself	.49 228	.35 221	.63 229	.60 216	.69 226					
7. Hours Studied	-.04 219	.07 213	.23 220	.16 208	.14 217	.22 220				
8. Perceived Effort	.17 228	.15 221	.48 229	.49 216	.22 226	.35 229	.53 220			
9. Class	-.17 228	-.11 221	-.05 229	.00 216	-.14 226	-.06 229	-.01 220	-.01 229		
10. Past Performance (t - 1)	.36 228	.28 221	.08 229	.06 216	.28 226	.10 229	-.03 220	-.07 229	-.21 241	
11. Performance (t)	.07 228	.03 221	.12 229	.14 216	.16 226	.15 229	-.06 220	-.06 229	.25 241	.09 241

Note. $\bar{r}$ = top number and $\bar{n}$ = bottom number for each set of variables; $p < .05$ when $\bar{r} = .13$.

Table D.5

Test 5

	1	2	3	4	5	6	7	8	9	10
1. Collective Efficacy										
2. Collective Efficacy Strength	.61 208									
3. Self Efficacy	.56 224	.37 208								
4. Self Efficacy Strength	.44 209	.62 202	.67 209							
5. Goal for Group	.47 220	.47 206	.38 220	.47 210						
6. Goal for Oneself	.34 222	.24 208	.56 222	.55 212	.60 225					
7. Hours Studied	.04 216	.09 201	.21 216	.20 205	.14 216	.25 218				
8. Perceived Effort	.18 224	.20 210	.43 224	.47 213	.21 225	.32 227	.49 219			
9. Class	-.13 224	-.16 210	-. 224	-.15 213	-.07 225	.05 227	-.20 219	-.29 229		
10. Past Performance (<u>t</u>- 1)	.28 224	.20 210	.11 224	.14 213	.26 225	.14 227	-.12 219	-.09 229	.25 241	
11. Performance (<u>t</u>)	.25 224	.16 210	.11 224	.08 213	.12 225	.16 227	-.06 219	-.08 229	.24 241	.26 241

Note. r = top number and n = bottom number for each set of variables; $p < .05$ when r = .13.

Table D.6

Test 6

	1	2	3	4	5	6	7	8	9	10
1. Collective Efficacy										
2. Collective Efficacy Strength	.67 212									
3. Self Efficacy	.46 219	.37 212								
4. Self Efficacy Strength	.42 215	.51 212	.66 215							
5. Goal for Group	.57 219	.55 213	.35 219	.42 216						
6. Goal for Oneself	.30 219	.30 213	.60 219	.60 216	.60 221					
7. Hours Studied	.10 215	.20 209	.26 214	.32 211	.14 216	.26 217				
8. Perceived Effort	.29 220	.35 214	.37 220	.57 217	.25 222	.32 222	.55 217			
9. Class	-.16 220	-.28 214	-.11 220	-.30 217	-.19 222	-.12 222	.14 216	-.37 223		
10. Past Performance ($t-1$)	.20 220	.07 214	.01 220	-.08 217	.08 222	-.02 222	-.11 217	-.14 223	.24 241	
11. Performance (t)	.19 219	.06 213	.07 219	-.12 216	-.01 221	-.10 221	-.08 216	.13 222	.36 241	.51 241

Note. $\bar{r}$ = top number and $\bar{n}$ = bottom number for each set of variables; $p < .05$ when $\bar{r} = .13$.

Table D.7

Correlation Analysis for One-Time Measures

	1	2	3	4	5	6	7	8
1. Collective Efficacy Avg.								
2. Self Efficacy Average	.64 241							
3. Gender^a	.26 233	.10 233						
4. Social Desirability Scale	.05 212	-.02 212	.00 211					
5. Locus of control: Ability	.08 211	.08 211	.00 210	.00 211				
6. Locus of control: Context	.02 211	-.04 211	.12 210	-.18 211	.27 211			
7. Locus of control: Effort	.06 211	.00 211	-.07 210	.04 211	.21 211	-.15 211		
8. Locus of control: Luck	-.07 211	-.17 211	.15 210	-.08 211	.15 211	.64 211	-.26 211	
9. Group Attitude: Prefers to work alone	-.11 213	-.06 213	-.08 206	-.01 187	-.03 186	.06 186	-.02 186	-.03 186

Note. $\bar{r}$ = top number and $\bar{n}$ = bottom number for each set of variables; $p < .05$ when $\bar{r} = .13$.

^aA dummy variable was used to find the correlation; 0 = female, 1 = male.

Appendix E

Performance and Collective Efficacy Scores

Table E.1

Collective Efficacy and Performance Scores for Each Group

Grp	Test 1		Test 2		Test 3		Test 4		Test 5		Test 6	
	CE	Perf	CE	Perf	CE	Perf	CE	Perf	CE	Perf	CE	Perf
1	.97	.83	.89	.85	.87	.80	.92	1.00	.96	1.00	.96	.95
s.d.	.04		.07		.07		.06		.03		.04	
2	.89	.78	.83	.82	.80	.83	.88	.95	.91	1.00	.91	.95
s.d.	.05		.06		.08		.05		.06		.06	
3	.92	.88	.93	.92	.94	.95	.97	1.00	1.00	1.00	.98	.95
s.d.	.05		.04		.06		.04		.00		.04	
4	.91	.85	.92	.75	.87	.95	.91	1.00	.99	1.00	.98	.95
s.d.	.20		.04		.02		.04		.03		.03	
5	.96	.73	.89	.92	.93	1.00	.92	1.00	.97	1.00	.97	.90
s.d.	.04		.09		.06		.08		.04		.05	
6	.88	.63	.90	.63	.89	.72	.85	.88	.88	.88	.88	.80
s.d.	.05		.02		.05		.01		.05		.07	
7	.82	.63	.75	.78	.75	.85	.87	.93	.85	.90	.90	.80
s.d.	.16		.08		.17		.08		.13		.07	
8	.90	.88	.92	.90	.90	.85	.89	.95	.96	1.00	.93	1.00
s.d.	.06		.04		.04		.04		.03		.04	
9	.94	.78	.90	.90	.94	.83	.94	1.00	.97	1.00	.98	1.00
s.d.	.06		.06		.03		.05		.03		.03	
10	.88	.80	.88	.87	.89	.80	.90	.85	.85	.94	.92	.85
s.d.	.05		.06		.06		.06		.05		.04	
11	.95	.83	.94	.85	.89	.95	.89	.90	.91	1.00	.90	.95
s.d.	.04		.05		.04		.07		.05		.04	
12	.91	.90	.88	.85	.90	.83	.93	.95	.88	1.00	.94	.95
s.d.	.05		.04		.04		.02		.05		.04	
13	.89	.75	.89	.75	.87	.95	.93	.85	.86	1.00	.94	.95
s.d.	.10		.12		.11		.06		.16		.08	
14	.89	.93	.91	.95	.93	.85	.92	1.00	.93	.94	.92	1.00
s.d.	.13		.06		.05		.05		.06		.03	
15	.92	.88	.80	.85	.83	.95	.94	.90	.93	1.00	.96	.95
s.d.	.07		.27		.15		.04		.05		.04	
16	.88	.88	.91	.90	.90	.92	.90	.90	.90	.88	.94	.95
s.d.	.08		.02		.03		.05		.03		.03	
17	.92	.77	.83	.83	.85	.75	.87	.97	.89	.98	.91	.95
s.d.	.09		.15		.06		.04		.08		.08	
18	.99	.85	.91	.68	.82	.85	.94	.95	.92	.94	.84	.82
s.d.	.03		.09		.08		.10		.09		.14	
19	.93	.73	.91	.75	.90	.85	.92	.85	.92	1.00	.89	.90
s.d.	.07		.11		.06		.06		.05		.10	

Table E.1, continued

Grp	Test 1		Test 2		Test 3		Test 4		Test 5		Test 6	
	CE	Perf	CE	Perf	CE	Perf	CE	Perf	CE	Perf	CE	Perf
20	.91	.77	.91	.70	.88	.75	.91	.97	.98	.88	.99	.95
s.d.	.07		.05		.09		.06		.03		.02	
21	.86	.83	.90	.83	.86	.77	.89	.95	.92	.94	.94	.85
s.d.	.10		.02		.09		.04		.05		.03	
22	.93	.57	.92	.85	.89	.83	.91	.72	.91	.89	.94	.78
s.d.	.07		.05		.05		.05		.05		.05	
23	1.00	.87	.93	.94	.99	.88	.95	.89	.97	.94	.96	.89
s.d.	.00		.04		.03		.03		.04		.03	
24	.91	.80	.90	.69	.88	.88	.92	.89	.91	.94	.92	.83
s.d.	.09		.09		.09		.06		.06		.06	
25	.94	.85	.90	.98	.96	.94	.93	1.00	.98	.98	.99	.78
s.d.	.08		.04		.04		.07		.04		.02	
26	.92	.87	.91	.94	.94	.88	.93	1.00	.94	.89	.95	.83
s.d.	.08		.05		.04		.03		.03		.01	
27	.91	.80	.87	.90	.93	.88	.90	.82	.91	.83	.93	.89
s.d.	.06		.09		.06		.06		.06		.05	
28	.92	.94	.94	.94	.94	.94	.96	.89	.98	.94	.98	1.00
s.d.	.06		.04		.00		.02		.03		.03	
29	.91	.83	.90	.90	.92	.83	.91	.77	.93	1.00	.93	.94
s.d.	.08		.09		.05		.03		.04		.05	
30	.90	.94	.98	1.00	.97	.94	.97	.79	.94	1.00	.97	.89
s.d.	.07		.03		.05		.03		.05		.05	
31	.89	.78	.85	.81	.88	.75	.83	.88	.84	.78	.91	.78
s.d.	.04		.04		.04		.08		.05		.06	
32	.89	.89	.93	.94	.93	.94	.97	1.00	.98	1.00	.99	.89
s.d.	.03		.07		.03		.03		.04		.03	
33	.99	.78	.84	.94	.95	.88	.97	.89	.94	1.00	.98	.96
s.d.	.02		.06		.03		.03		.06		.03	
34	.99	.76	.94	.94	.96	.94	.97	.93	.96	.94	.95	.94
s.d.	.02		.05		.03		.03		.02		.04	
35	.92	.61	.90	.88	.94	.79	.93	.93	.93	.78	.90	.83
s.d.	.08		.09		.06		.05		.05		.05	
36	.95	.87	.93	.81	.93	.81	.91	.81	.93	.83	.93	.80
s.d.	.05		.05		.03		.08		.03		.03	
37	.94	.83	.88	.94	.98	.88	.91	.89	.91	.83	.92	.89
s.d.	.06		.04		.03		.04		.03		.07	
38	.94	.81	.93	.94	.95	.94	.88	.95	.97	.93	.98	.94
s.d.	.07		.07		.05		.10		.03		.03	
39	.94	.94	.93	1.00	.95	.94	.98	1.00	.98	1.00	.91	.87
s.d.	.04		.03		.06		.03		.03		.03	
40	.93	.89	.90	1.00	.95	1.00	1.00	.95	.98	1.00	.98	.94
s.d.	.07		.03		.05		.00		.03		.03	
41	.91	.83	.88	.96	.93	.81	.91	1.00	.91	.94	.97	.89
s.d.	.06		.07		.05		.05		.06		.03	

Note. s.d. = standard deviation, CE = collective efficacy score, Perf = Group performance score, Grp = group number

Table E.2

Collective Efficacy and Group Performance Means By Class

	Test 1 n = 233	Test 2 n = 227	Test 3 n = 236	Test 4 n = 228	Test 5 n = 224	Test 6 n = 220
Class 1 (10 groups)						
Group performance means (std. dev.)	.83 (.11)	.89 (.09)	.87 (.06)	.87 (.09)	.92 (.07)	.86 (.08)
Collective efficacy means (std. dev.)	.92 (.07)	.91 (.06)	.93 (.06)	.92 (.06)	.93 (.06)	.95 (.05)
Class 2 (10 groups)						
Group performance means (std. dev.)	.82 (.09)	.93 (.06)	.89 (.07)	.94 (.06)	.93 (.08)	.90 (.05)
Collective efficacy means (std. dev.)	.94 (.06)	.90 (.06)	.95 (.04)	.94 (.06)	.95 (.05)	.95 (.05)
Mean for Classes 1 & 2 (std. dev.)	.82 (.10)	.91 (.08)	.88 (.06)	.90 (.08)	.92 (.08)	.88 (.07)
Class 3 (7 groups)						
Group performance means (std. dev.)	.76 (.10)	.81 (.10)	.87 (.10)	.97 (.05)	.97 (.06)	.90 (.07)
Collective efficacy means (std. dev.)	.91 (.10)	.88 (.08)	.87 (.10)	.90 (.06)	.94 (.08)	.94 (.06)
Class 4 (7 groups)						
Group performance means (std. dev.)	.84 (.07)	.87 (.06)	.87 (.06)	.93 (.06)	.98 (.03)	.96 (.05)
Collective efficacy means (std. dev.)	.91 (.07)	.91 (.07)	.90 (.06)	.91 (.05)	.91 (.08)	.94 (.05)
Class 5 (7 groups)						
Group performance means (std. dev.)	.82 (.06)	.79 (.08)	.83 (.08)	.93 (.04)	.94 (.05)	.91 (.06)
Collective efficacy means (std. dev.)	.91 (.09)	.88 (.13)	.86 (.09)	.90 (.05)	.92 (.06)	.93 (.08)
Mean for Classes 3 - 5 (std. dev.)	.81 (.08)	.82 (.09)	.86 (.08)	.94 (.05)	.96 (.05)	.92 (.06)
Overall Performance (std. dev.)	.82 (.09)	.87 (.09)	.87 (.07)	.92 (.07)	.94 (.07)	.90 (.07)
Collective Efficacy (std. dev.)	.92 (.08)	.90 (.08)	.91 (.08)	.92 (.06)	.93 (.06)	.94 (.06)

Note. Subjects in classes 1 and 2 took different performance tests and had a different instructor than those in classes 3, 4 and 5.

Table E.3

Group Performance, Class Rank and Group Potency Scores for Each Group

Group Number	Total Group Performance (mean)	Class Rank	Group Potency Score
1	.91	4	4.52
2	.89	5	3.67
3	.95	1	4.48
4	.92	3	4.45
5	.93	2	4.35
6	.76	7	3.54
7	.82	6	2.84
8	.93	2	4.65
9	.92	3	4.64
10	.85	7	4.46
11	.91	4	3.54
12	.91	5	4.12
13	.88	6	3.70
14	.95	1	4.58
15	.92	1	4.60
16	.90	2	4.69
17	.87	3	4.5
18	.85	5	2.28
19	.85	6	4.58
20	.83	7	4.35
21	.86	4	3.88
22	.77	10	3.71
23	.90	4	4.55
24	.84	8	2.93
25	.92	3	4.20
26	.90	4	3.22
27	.85	7	3.20
28	.94	1	4.65
29	.88	6	3.23
30	.93	2	4.46
31	.80	9	2.55
32	.94	3	3.81
33	.91	5	3.6
34	.91	5	4.23
35	.80	10	3.48
36	.82	9	3.21
37	.88	8	3.88
38	.92	4	4.60
39	.96	1	4.35
40	.96	1	4.65
41	.91	5	4.52

Appendix F

Differences in Psychosocial Variables by Performance

To determine whether there was any relationship between performance and several psychosocial variables that had been measured in the study, individuals were divided into groups, based on individual performance and group performance scores. For the first set of analyses, individuals were divided into four equal groups (i.e., quartiles) based on overall individual performance scores. For a second set of analyses, subjects were divided into four groups based on both overall individual and group performance scores. The means for several scales that measured individual attributes or attitudes could then be compared: Social desirability scale (S.D.S.), locus of control (effort, luck, context and ability) and attitude toward group work. The S.D.S. and locus of control scales were taken by the subjects after all the tests had been completed toward the end of the semester. The attitude variable was measured before groups had been assigned. The means and results of an one-way ANOVA for each scale are given in Tables F.1. and F.2.

Some differences did exist. Lower performers had higher S.D.S. scores. The difference in S.D.S. scores was more pronounced when subjects were divided by individual and group performance, reaching statistical significance at the .051 level. Lower performers also tended to attribute classroom performance more to luck and less to effort than higher performers. The higher performers preferred to work alone rather than in groups. It is important to note that the cell sizes in the second set of analyses, as noted in Table F.2., were not equal, and actual alpha may therefore be somewhat higher or lower than the alpha given.

Table F.1

Means for S.D.S., Locus of Control Variables and Attitude Toward Group Work By Individual Performance Quartiles

Percentile	SDS	Locus: Effort	Locus: Luck	Locus: Context	Locus: Ability	Prefer working alone
0-24%	5.28 $\underline{n} = 47$	2.97 $\underline{n} = 47$	2.08 $\underline{n} = 47$	2.44 $\underline{n} = 47$	2.29 $\underline{n} = 47$	2.57 $\underline{n} = 51$
25-49%	4.98 $\underline{n} = 50$	2.75 $\underline{n} = 50$	1.97 $\underline{n} = 50$	2.15 $\underline{n} = 50$	2.05 $\underline{n} = 50$	2.81 $\underline{n} = 50$
50-74%	4.64 $\underline{n} = 53$	3.10 $\underline{n} = 52$	1.82 $\underline{n} = 52$	2.24 $\underline{n} = 52$	2.27 $\underline{n} = 52$	3.09 $\underline{n} = 50$
75-99%	4.40 $\underline{n} = 55$	3.11 $\underline{n} = 55$	1.65 $\underline{n} = 55$	2.22 $\underline{n} = 55$	2.26 $\underline{n} = 55$	3.10 $\underline{n} = 50$
ANOVA results	$\underline{F} = 1.53$ $p = .207$	$\underline{F} = 3.54$ $p = .016$	$\underline{F} = 2.84$ $p = .039$	$\underline{F} = 1.42$ $p = .237$	$\underline{F} = 1.60$ $p = .190$	$\underline{F} = 3.52$ $p = .016$

Table F.2

Means for S.D.S., Locus of Control Variables and Attitude Toward Group Work By Individual/Group Performance Groups

Group	SDS	Locus: Effort	Locus: Luck	Locus: Context	Locus: Ability	Prefer working alone
Low group, low individual scores	5.44 $\underline{n} = 64$	2.81 $\underline{n} = 64$	2.81 $\underline{n} = 64$	2.22 $\underline{n} = 64$	2.06 $\underline{n} = 64$	2.76 $\underline{n} = 66$
Low group, high individual scores	4.40 $\underline{n} = 30$	3.19 $\underline{n} = 29$	3.19 $\underline{n} = 29$	2.21 $\underline{n} = 29$	2.26 $\underline{n} = 29$	3.27 $\underline{n} = 30$
High group, high individual scores	4.52 $\underline{n} = 33$	2.94 $\underline{n} = 33$	2.94 $\underline{n} = 33$	2.43 $\underline{n} = 33$	2.37 $\underline{n} = 33$	2.56 $\underline{n} = 35$
High group, high individual scores	4.56 $\underline{n} = 78$	3.08 $\underline{n} = 78$	3.07 $\underline{n} = 78$	2.24 $\underline{n} = 78$	2.27 $\underline{n} = 78$	3.03 $\underline{n} = 73$
ANOVA results	$\underline{F} = 2.63$ $\underline{p} = .051$	$\underline{F} = 3.14$ $\underline{p} = .027$	$\underline{F} = 3.14$ $\underline{p} = .027$	$\underline{F} = .76$ $\underline{p} = .517$	$\underline{F} = 2.17$ $\underline{p} = .093$	$\underline{F} = 3.08$ $\underline{p} = .011$