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DO THEY DO WHAT THEY BELIEVE THEY CAN? GROUP-EFFICACY AND GROUP EFFECTIVENESS ACROSS TASKS AND CULTURES

CEO Publication
G 98-11 (339)

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October 28, 1998

In Press. ***Academy of Management Journal.***

The author would like to acknowledge the helpful comments provided by P. Christopher Earley, Herbert Heneman, Edwin Locke, Anne Miner, Terence Mitchell, Donald Schwab, Mary Waller, and Robert Wood and three anonymous reviewers on earlier drafts of this paper. Funding for the research was provided by the Center for Creative Leadership and the Graduate School of Management, University of California, Irvine. Administrative support and/or translations were provided by C.J. Farrar, Heather Conwell, Laura Durham, Peter Gibson, Alison Roots, Demce Simanjuntak, Cok Susila and Kenneth Law.

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ABSTRACT

Group-efficacy is a group's belief regarding its ability to perform effectively. It is argued that group-efficacy effects are complex and moderated by several contingency factors. Findings from two intercultural studies support the contingency approach. When task uncertainty was high, team members worked independently, and collectivism was low, group-efficacy was not related to group effectiveness. In contrast, when groups knew what was required to perform a task, worked interdependently, and valued collectivism, the relationship between group-efficacy and group effectiveness was positive. Implications for group-level social-cognitive theory are discussed.

Group-efficacy is a group's belief in its ability to perform effectively (Lindsley, Brass, & Thomas, 1995). Observations and self-report techniques have established that group-efficacy is a meaningful and measurable group attribute; levels of group-efficacy vary even among groups that appear to have equal skills, abilities and resources (Campion, Medsker, & Higgs, 1993; Earley, 1993; Guzzo, Yost, Campbell & Shea, 1993; Zander & Medow, 1963). For example, two groups of nurses who have equal training and supplies may hold very different beliefs about their group's ability to provide quality health care to the same group of patients. These beliefs may differ because the groups differ in the amount of information they have about their task, because they have different processes of sharing this information and communicating, or because they have different levels of commitment and identification among group members. Thus, groups that outwardly look similar in many respects, may form different beliefs about their groups' ability, due different group processes.

Because group-efficacy signals what a group thinks it can do, level of group-efficacy is often related to how much effort the group expends, and has been found to be a determinant of group effectiveness (Campion et al., 1993; Earley, 1993; Zaccaro, Blair, Peterson, & Zazanis, 1995). This follows logically from social cognitive research regarding individual work behavior, which demonstrates that the higher the level of self-efficacy, the better an individual performs (see Bandura, 1997 for a review).

However, unlike the relatively straight-forward relationships obtained at the individual level, at the group level, relationships between group-efficacy beliefs and group effectiveness are modest, complex, and seem to be moderated by other factors in the workplace (Campion et al., 1993; Earley, 1993; Guzzo et al.,1993 ; Parker, 1994; Prussia & Kinicki, 1996). Theoretically, it seems likely that

group-efficacy is distinct from the individual beliefs group members hold about themselves or the group, because group-efficacy arises through group interaction and the process of collective cognition. That is, group-efficacy forms as group members collectively acquire, store, manipulate, and exchange information about each other, their task, their context, process, and prior performance. Through processes of interaction, this information is combined, weighted, and integrated to form the group-efficacy belief. These same collective processes do not occur during self-efficacy formation or when members form individual beliefs about the group.

Combining and integrating information in groups opens up the possibility that distortions will occur (Klimoski & Mohammed, 1994; Lindsley et al.,1995). When information is exchanged and integrated in a group, members negotiate interpretations of factors influencing past efforts and factors required to increase chances of success (Walsh, Henderson, & Deighton, 1988). Many factors may complicate this process by prohibiting or encouraging information exchange or by making salient certain categories of information (Goodman, Ravlin, & Schminke, 1990).

For example, when investigating teachers' group-efficacy in their ability to teach mathematics, reading, and language arts, Parker (1994) found that group-efficacy was associated with actual achievement in mathematics, but not with the other two domains. Parker (1994: 55) suggests that this is due to the fact that "mathematics is a relatively concrete and 'culture free' domain as opposed to the more nebulous and culture-laden domains of reading and language arts." The nature of the task of teaching mathematics is different in content than the nature of teaching reading and language arts. Thus, characteristics of the teachers' task moderated the relationship between group-efficacy and actual effectiveness. Findings such as these indicate that a contingency approach is needed to understand the

impact of group-efficacy beliefs.

This paper thus addresses the research question, "What task and contextual factors impact the predictive power of group-efficacy beliefs?" by first reviewing literature on contingency factors that may moderate the relationship between group-efficacy and group effectiveness and then by proposing and testing hypotheses using two studies with distinct methods in two different cultural contexts.

MODERATING FACTORS

The relationship between group-efficacy and effectiveness is expected to differ as a function of task and contextual characteristics (Gladstein, 1984; Goodman, Ravlin, & Schminke, 1990). Specific contingency relationships are delineated below and summarized in Figure 1.

Insert Figure 1 about here

Task Characteristics

Task characteristics can potentially moderate efficacy beliefs because they are related to the type of knowledge that group members possess about what is required to perform effectively and the degree to which members are able to combine and integrate the knowledge stored by any individual member (Gladstein, 1984; Goodman, Ravlin, & Schminke, 1990). Theoretical work in task design suggests that two of the most important variables are task uncertainty and task interdependence (Lindsley et al., 1995; Saavedra, Earely, & Van Dyne, 1993).

This paper adopts the task uncertainty framework developed by Gist and Mitchell (1992), which focuses on the degree to which it is known that if "x" is performed then a given outcome will result. In a group context, "x" might represent task strategies for effective performance. Task strategies

are clear under conditions of low task uncertainty and the group can be confident that certain strategies lead to effectiveness. The group can use this information to form an efficacy belief that is strongly related to actual group effectiveness in the future. Under conditions of high task uncertainty, such as might occur if the group is not sure how it achieved a previously effective level, there may be no efficacy-effectiveness link. Groups high in efficacy may set out on a path that they believe will lead to effective performance, but because of the inherent ambiguity of the task, their chance of actually achieving effective performance is low. Similarly, groups low in efficacy might sometimes discover the path to good performance; at other times they may take the wrong path due to the inherent uncertainty of the task. In either case, under conditions of high task uncertainty, there is no relationship between group-efficacy and actual effectiveness.

H1: The level of task uncertainty within a group moderates the relationship between group-efficacy and group effectiveness such that, when task uncertainty is low, group-efficacy is positively related to group effectiveness; when task uncertainty is high, group-efficacy is not related to group effectiveness.

Descriptions and observations of group process also suggest that interdependence moderates the relationship between group-efficacy and group effectiveness (Campion et al. 1993; Guzzo et al. 1993; Lindsley et al., 1995). Interdependence in groups can assume various forms; group members may rely on each other to obtain resources, to receive rewards, or to perform their task effectively. This last type is often referred to as task interdependence (Saavedra et al., 1993). Task interdependence is a structural feature of work; the instructions and materials that define a task create a level of interdependence that in turn influences how much members interact in executing the task (Wageman, 1995).

When task interdependence is low, communication occurs less frequently and knowledge about what is necessary for task completion may never be shared and integrated within the group (Wageman, 1995). Furthermore, in a low task-interdependent situation, interaction of resources is irrelevant to actual task performance. Instead, performance hinges on the individual skills of group members and how well they are matched to the individual task each must perform. That is, regardless of how group-efficacy is perceived, it makes no difference to the group's ability to do the task. When task interdependence is low, a group may incorrectly believe that it *does* have the capabilities to perform effectively, or incorrectly believe that it *does not* have the capabilities to perform effectively. In either case, little or no relationship between group-efficacy and group effectiveness results. Conversely, when task interdependence is high, information integration occurs more frequently, and group interaction about capabilities is important for task performance. Under these conditions, group-efficacy beliefs that are highly related to actual task performance can be formulated.

H2: The level of task interdependence within a group moderates the relationship between group-efficacy and group effectiveness such that, when task interdependence is high, group-efficacy is positively related to group effectiveness; when task interdependence is low, group-efficacy is not related to group effectiveness.

Contextual Characteristics

Groups are embedded within organizations and societies; therefore, group processes are likely influenced by the perceptions, values, and codes of conduct that are predominant in these larger cultural contexts (Erez & Earley, 1993). These contextual characteristics potentially moderate the explanatory power of group-efficacy because they help determine the type of information perceived and the degree to which this information is valued and salient during group interaction (Levine & Moreland, 1991).

Theorists developing cultural frameworks have indicated that field independence and collectivism are two of the most influential aspects of the cultural context (Triandis, 1989; Erez & Earley, 1993).

Witkin and his colleagues introduced the concept of field independence to capture how people perceive their context and environment (Witkin, Goodenough & Oltman, 1979). Field dependents tend to perceive context as a unidimensional, highly-related whole. They see an individual as embedded in a group, and a group as embedded in a larger social entity (Shaw, 1990; Carli et al., 1986). Field independents tend to disembed their environment into component parts. They perceive an individual as separate from the group and the group as distinct from its environment (Shaw, 1990; Carli, Lancia, & Paniccia, 1986).

For a relationship between group-efficacy and effectiveness to occur, group members must be able to perceive important influences on their performance. In cognitive research, field dependent subjects have demonstrated more reliance on contextual detail characteristics and externally derived memory; they tend to be more aware of the relation between their group and the context (Durso, Reardon & Jolly, 1985; Kondstadt & Forman,1965). Being more aware of important environmental contingencies, they may be better able to adjust their performance in accordance with their efficacy beliefs. As a result, a strong relationship between group-efficacy and effectiveness should exist. Japanese, Chinese, Indonesians, Indians, and Mexicans tend to be field dependent (Gundykunst, Ting-Toomey & Chua, 1988; Witkin & Berry, 1975). In contrast, field independent groups are likely to separate their group from the environment; structuring their context into parts that pertain directly to the group and those that do not. In doing so, they may fail to make valuable connections between factors in the context and the behavior of the group. As a result, in field independent groups, there may be little or

no relationship between group-efficacy and actual effectiveness. Swiss, Germans, Scandinavians and Americans tend to be field independent (Gundykunst et al., 1988; Witkin & Berry, 1975).

H3: The level of field independence within a group moderates the relationship between group-efficacy and group effectiveness such that, in field dependent groups, group-efficacy is positively related to group effectiveness; in field independent groups, group-efficacy is not related to group effectiveness.

The construct of collectivism involves a cultural pattern, often referred to as a cultural value (Hofstede, 1980). Values provide abstract ideas and long-range concerns that guide the selection of the means and ends of specific actions and they serve as criteria by which objects, actions, or events are evaluated (Bar-Tal, 1990). Although individuals differ with respect to the values they hold or consider important, it is possible to characterize group contexts by the values that are prevalent within that context (Kluckhohn, 1951). For example, most Latin American, Asian, and African cultures tend to have high levels of collectivism; most North American and northern and western European cultures tend to be low in collectivism (Triandis, 1989).

Cognitive researchers have suggested that collectivism is related to the value placed on certain kinds of knowledge (Greenwald & Pratkanis, 1984; Triandis, 1989). In a collectivistic group setting, feedback and knowledge pertaining to the group is more valued than is knowledge pertaining to any one individual member of the group. Combining and integrating this group-oriented knowledge allows collectivistic groups to obtain tighter linkages between their efficacy beliefs and actual group effectiveness. Less collectivistic groups value knowledge pertaining to each individual member. Knowledge pertaining to the group may be considered secondary or unimportant and, therefore, will not link the group's efficacy belief to actual effectiveness (Earley, Gibson & Chen, 1998).

H4: The level of collectivism within a group moderates the relationship between group-efficacy and group effectiveness such that, when collectivism is high, group-efficacy is positively related to group effectiveness; when collectivism is low, group-efficacy is not related to group effectiveness.

Two intercultural empirical studies testing these hypotheses are described below. Only one task condition was investigated in each study to avoid potential confounds. The first study, a complex business simulation, tested H1 regarding task uncertainty, H3 concerning field independence, and H4 concerning collectivism. The second, a field study of group-efficacy beliefs and effectiveness among teams of nurses over an 8-week period, also provided a test of H3 and H4. In addition, the natural variance on task interdependence in health care settings presented an opportunity to test H2.

SIMULATION STUDY

The experimental design employed in the first study allowed direct manipulation of task uncertainty, the proposed moderator, to test H1. Group-efficacy and group effectiveness were measured with surveys. This study also investigated the moderating effects of field independence (H3) and collectivism (H4). Variation on these characteristics was attained by sampling across countries; based on previous research U.S. participants were expected to be higher on field independence and less collectivistic than Hong Kong participants (Erez & Earley, 1993).

Method

Sample. A sample of 294 U.S. and Hong Kong university students was randomly divided into 30 groups in each country; group size ranged from 4 to 5 members with a mean of 4.90 members. Participants were undergraduate (52%), masters' (28%) and executive (20%) business students who received partial course credit for participation. Approximately half the sample were women. There

were no significant differences across countries or groups in terms of group size, education level, gender, age, and socio-economic status. The U.S. sample represented an ethnic and cultural mix, consisting of 47% Asians, 30% White, 15% Latino, 5% Pacific Islanders, and 2% Black participants; the Hong Kong sample was 91% Asian and 8% White.

Task. "Looking Glass Inc." (Lombardo, McCall & DeVries, 1989), an elaborate business simulation, was modified to test the hypotheses. Looking Glass is a flexible, realistic, and engaging way of assessing managerial behavior. Each division of the Looking Glass company consisted of five managers who interacted with each other collectively as a group for a two-hour period. Previous research indicates that the simulation is sufficiently engaging to develop group identity and to study collective cognitive processes (Chatman & Barsade, 1995; Lombardo et al., 1989). Participants' formal evaluations of their experience in the simulation indicate that they become attached to their group and reflective about the causes and consequences of their groups' performance. Furthermore, participants given the opportunity to interact socially following the simulation often remain in their roles and discuss potential explanations for their groups' performance, long after the simulation is adjourned. A final piece of evidence that groups in the simulation have sufficient time to develop strong group beliefs is provided by the magnitude of the group-efficacy beliefs recorded on the group-efficacy measure used in this study (described below).

All participants were fluent in English. Even so, precautions were taken to ensure that the underlying meaning of the materials would be the same in Hong Kong and the U.S. A Hong Kong Chinese research assistant and an American research assistant reviewed the experimental materials and the instructions to identify vocabulary (i.e., American colloquialisms) and procedures that might have

been unclear. The materials and procedures were then edited using their suggestions.

Procedure. Participants were randomly assigned to groups to help prevent internal validity threats, such as selection bias, as well as pre-existing differences in skills, abilities or prior effectiveness on similar tasks (Cook & Campbell, 1979). Groups were randomly assigned to either the Advanced Products Division ("APD") or the Commercial Glass Division ("CGD"). The experimental setting was arranged to resemble an executive board room with a table, chair, and office supplies. Each division interacted in a separate room (their "division headquarters") to emphasize their "groupness."

Assignment to the division constituted the task uncertainty manipulation. The APD (high task uncertainty groups) experienced heavy competition, exotic materials, dependence on innovation, a diverse product line that quickly becomes obsolete, many markets, unpredictable profits, and a brief history. APD groups were essentially asked to "revise policies" and given substantial latitude as to how to accomplish this. They were provided with few task parameters; key problems were ambiguous, information pertaining to the key problems was embedded within memos that also discussed other issues.

The CGD (low task uncertainty groups) enjoyed a low level of competition, slowly changing technologies, high volume, a small customer base, a certain market, stable forecasts, and a long history. CGD groups were told to focus on personnel policies and given four sets of problems to address. They received structured parameters and information pertaining to the key problems was presented explicitly in memos that focused on potential solutions to these problems.

Following a brief introduction to the study, both APD and CGD participants completed surveys assessing demographic characteristics, field independence, and collectivism. Participants were then

given a file folder containing a set of 5 -10 memos (their "in-basket"). The first memo described their role, their division, and corporate objectives. The other memos provided information and suggested that the group discuss and decide on actions the division should take. The final memo in the in-basket instructed participants to develop an "outcome memo" containing the basic elements of a strategic plan for their division.

Before groups began working, they were informed that their sessions would be videotaped for review by a panel of experts and that these experts would rate the effectiveness of their group process, the quality of their outcome memo, and the overall effectiveness of their group. The researcher further explained that the experts would specifically evaluate communication and information-sharing processes, and whether the strategic plan developed in the memo addressed key issues in a feasible and cost efficient manner. Finally, groups were informed that the experts would rate overall effectiveness by comparing the general effectiveness of their group (both process and outcomes), to other groups in the simulation.

After these instructions, participants read through their in-basket materials and began interacting as a group, collectively identifying problems, sharing information, analyzing this information, discussing courses of action, and developing solutions. After interacting in the simulation for ninety minutes, groups collectively completed a measure of group-efficacy. Completing the efficacy measure at this time allowed group members to gain experience with each other to help inform their efficacy beliefs. At the end of the simulation, each group drafted its "outcome memo." Last, participants completed a 6-item post-experimental survey assessing the uncertainty manipulation.

Measures. *Group-efficacy* was measured with a 5-item survey. The instrument and

technique were developed by incorporating the recommendations of Locke et al. (1984) and other research on constructing measures of group-efficacy (Gibson, Randel, & Earley, 1998; Gist, 1987; Guzzo et a. 1993; Zander & Medow, 1963). Each group received one copy of the survey. Each item represented a different level of overall effectiveness (Item #1=lowest level of effectiveness; #5=highest level of effectiveness). The group was asked to discuss how certain it was that the group would achieve each level of effectiveness and indicate its certainty using a 100-point scale (0=certain the effectiveness level cannot be achieved;100=certain the effectiveness level can be achieved). The certainty scores were obtained through open discussion and interaction as group members reviewed previous experience, situational constraints, and factors expected to facilitate the group's effectiveness. One group member then recorded certainty scores for each of the five levels of effectiveness on the group's survey (See Note 1).

Similar techniques have been used to measure self-efficacy (Locke et al., 1984). In their study, Locke et al. found that there was little variance across individuals in their certainty they could achieve the lowest level of performance (e.g., a rating of "1") or the highest level (e.g., a rating of "5"). Nearly all individuals responded that they were 100% certain they could achieve level 1 and 0% certain they could achieve level 5. Locke et al. demonstrated that creating a composite score that averages certainty on items representing moderate levels of performance (e.g., a rating of 2, 3, or 4 or as Locke et al. state "the levels that neither all nor none can achieve") resulted in the best measure of self-efficacy in terms of predicting individual performance. More recent research comparing various measures of group beliefs suggests this is also true when constructing a measure of group-efficacy (Gibson et al., 1998). In this study, the certainty scores for items 2, 3 and 4 representing moderate levels of effectiveness were

averaged to arrive at a composite score, with higher scores representing higher group-efficacy. As expected, variance was highest on these items, and they formed the most internally reliable measure.

Group effectiveness was assessed by one U.S. and one Hong Kong Chinese observer who viewed videotapes of the groups' interactions. These expert observers were blind to the experimental conditions and were extensively trained. The observers viewed the videotapes in separate rooms over a six-week period. They rated each group on 11 dimensions derived from studies of planning task effectiveness (McGrath,1984), process effectiveness (Hackman, 1987), and general group effectiveness (Ancona & Caldwell, 1992). Specifically, items assessed the effectiveness of group information exchange, time management, cooperation, productivity, adequacy of problem-identification, feasibility, and quality of their plan using a 10-point scale (1=very low effectiveness; 5=average effectiveness; 10=very high effectiveness). As the observers assessed each dimension, they also reviewed the written "outcome memo." The reliability of the group effectiveness measure was estimated at.85 using the inter-rater reliability procedure described by Tinsley and Weiss (1975). Based on these results, the two observers' ratings were averaged; a principal component analysis conducted on these averaged scores demonstrated that the 11 items loaded on a single factor having an eigenvalue of 9.28 and accounting for 84.4% of the variance. The factor loadings ranged from .94 to .89. Given this estimate, the 11 items were averaged to create a single composite effectiveness score for each group.

Task uncertainty was a dichotomous group-level variable that represented the condition to which a group was assigned (1=high task uncertainty in the APD condition; 0=low task uncertainty in the CGD condition). The six-item post-experimental survey of perceived uncertainty was averaged for use as a manipulation check. A *t* test comparing means across the two conditions indicated that the

manipulation was effective. APD participants reported significantly higher task uncertainty (m=3.50, sd=.57) than did CGD participants (m=3.28, sd=.57)(t=3.11, df=291, p<.01).

Field independence was measured using the Group Embedded Figures Test (GEFT) (Oltman, Raskin, &Witkin, 1971). Reliability and validity of the GEFT as a measure of field independence has been demonstrated in several studies (for a review see Hansen-Strain, 1990). The GEFT is a perceptual test that requires participants to outline a simple geometric shape embedded within a series of complex designs. Participants who solve the figures quickly view the design context as multidimensional, easily disembedding focal components from the environment, disregarding the global nature of the design. Alternatively, participants who solve the figures slowly typically view the context as unidimensional; they are unable to disembed focal components from the context because they focus more on the global nature of the design and the relationship of the parts to the context. A numerical score was assigned based on number of correct solutions achieved in two 10-minute periods with higher scores indicating field independence (Hansen-Strain, 1990). Because this measure has two equal parts, reliability of the GEFT was estimated at .94 using the Spearman-Brown coefficient. A field independence score consisting of the total number of problems completed across two sections was computed for each individual.

Collectivism was measured on a 5-point scale (1=strongly disagree, 5=strongly agree) using three items from a questionnaire developed by Earley (1993). Items focus on collectivism in the workplace, asking respondents if they agree with statements such as, *"If my workgroup is slowing me down, it is better to leave it and work alone."* Higher scores reflect greater collectivism. The reliability of this scale (Cronbach's Alpha) was .87. A principal component analysis demonstrated that

the items loaded on a single factor having an eigen value of 4.19 and accounting for 52.3% of the variance. Factor loadings ranged from .65 to .81. Based on these analyses, a collectivism score was created for each individual by taking the mean of his or her responses across the three items.

Aggregation Issues. Because all variables in this study were conceptualized as group-level attributes, individual scores on the cultural context variables (field independence and collectivism) had to be aggregated to the group level by taking the average of group members' scores. To justify aggregation, both between-group differences and within-group agreement on a measure must demonstrated (Goodman et al., 1990). At a minimum, evidence for differences across groups is provided when between-group variance is greater than within-group variance and the ANOVA F-ratio comparing these variances exceeds 1.00 (Hays, 1981). Field independence (F=1.41, df=59, p<.001) and collectivism (F=2.16, df=59, p<.05) both met these requirements.

Within-group agreement was estimated using the method (r_{wg}) developed by James, Demaree, and Wolf (1993). This technique estimates the consistency within a group with respect to ratings of a common target (e.g., group members' ratings of the group). The average r_{wg} coefficient across groups was .94 for field independence and .82 for collectivism, demonstrating within-group agreement. To verify between-group differences, WABA I was conducted as suggested by Dansereau, Alutto, and Yammarino (1984). This test compares the between-group eta to the within-group eta by computing an E ratio that can be tested for both statistical and practical significance. The field independence E ratio met tests of both statistical significance (F=1.44, df=(59, 234) p<.05) and practical significance (0 degree test; See Note 2). The collectivism E ratio was also statistically (F=2.21, df=(59, 234), p<.01) and practically (0 degree test; See Note 2) significant. These analyses suggest it was appropriate to

infer group-level constructs.

Analysis Overview

Descriptive analyses were run on all variables to check for non-normal distributions. Hierarchical multiple regression models were used to test the hypotheses. Group effectiveness was the dependent variable. In the first step, a control variable for country was entered to allow examination of the effects of field independence and collectivism *after* controlling for the effects of country. Group-efficacy was entered in the second step. In the third step, main effects of the proposed moderators were entered. In the fourth step, all terms representing the multiplicative interaction of group-efficacy with each moderator were entered because there was no a priori reason to enter them in a specific hierarchical order. A statistically significant change in R^2 indicated support for moderating effects. Significance of $\underline{t}$ for betas for each interaction term was examined to determine which variables were moderators. Significant interactions were examined using post hoc subgroup analyses.

A final step not directly related to the tests of hypotheses was conducted. In this fifth step of the regression analysis, the interaction of country with group-efficacy was entered into the model and an F-test for change in R^2 was conducted. The hypotheses suggest that group efficacy, task uncertainty, field independence, and collectivism, rather than country of origin, drive the hypothesized relationships. After accounting for the variance attributable to field independence and collectivism, the country interaction *should not explain additional variance*. If it *does* explain additional variance there may be other aspects of culture than field independence and collectivism, associated with country of origin, that drive the moderating relationships.

Results

Preliminary results. Examination of residuals from the regression models did not reveal any indications of non-linearity or heteroscedasticity. A series of t tests indicated statistically significant country differences for field independence (t= 2.15, df=58, p<.05), collectivism (t=6.50, df=58, p<.001), and group-efficacy (t= -2.81, df=58, p<.01). Those in Hong Kong had higher field independence and collectivism, and lower group-efficacy than in the U.S. These country differences confirm that sampling in the U.S. and Hong Kong increased variance on the constructs; however, they also confirm the need to control for country. The means, standard deviations and intercorrelations of the variables in the regression models are shown in Table 1.

Insert Table 1 About Here

Results obtained in the hierarchical multiple regression models appear in Table 2. Standardized partial regression coefficients and the change in R^2 are listed for each step. In the first step, country was not a significant predictor of group effectiveness. In the second step, adding group-efficacy resulted in a .09 increase R^2(DF=5.89 (2, 57), p<.01); the significant predictor was group-efficacy. Altogether, in the second step, 10% of the variance in group effectiveness was predicted. In the third step, the addition of uncertainty, field independence, and collectivism resulted in a .12 increase in R^2 (DF=2.64 (5, 54), p<.05), predicting a total of 22% variance in group effectiveness. Group-efficacy and uncertainty were significant predictors.

Insert Table 2 About Here

Tests of hypotheses. In the fourth step of the model, entering the interaction terms with the proposed moderators resulted in a .04 increase in R^2, predicting a total of 26% of the variance in group effectiveness; however, this change failed to reach statistical significance. Only the group-efficacy x task uncertainty interaction effect was a marginally significant predictor of group effectiveness (B=-1.24, p<.10). In support of H1, this indicated that task uncertainty moderated the relationship between group-efficacy and group effectiveness. No support was obtained for H3 concerning field independence, nor for H4 concerning collectivism.

To interpret the significant group-efficacy x task uncertainty interaction, post hoc subgroup contrasts were conducted comparing group effectiveness under conditions of low and high task uncertainty. Results provided additional support for H1, in that when task uncertainty was low, the correlation between group-efficacy and group effectiveness was positive (r=.35, p<.001). When task uncertainty was high, there was no relationship between group-efficacy and group effectiveness (r=-.09, n.s.). In the fifth step, entering the group-efficacy x country interaction failed to result in a significant change in R^2, suggesting that no other characteristics confounded with country interacts with group-efficacy to predict group effectiveness.

FIELD STUDY

A field study was designed to test the moderating effects of interdependence (H2), field independence (H3), and collectivism (H4) on the relationship between group-efficacy and group effectiveness in the U.S. and Indonesia. This design addressed a potential limitation of the simulation—lack of representativeness of the samples. Inadequate representation of extreme cultures in the simulation may explain the failure to obtain significant moderating effects for culture. The field study

incorporated cultural contexts identified in prior research as having greater variance in field independence and collectivism. For example, Indonesians often rate at the most collectivistic extreme, whereas Americans rate at the extreme opposite end of the continuum (Hofstede, 1980). Further, Indonesian official state ideology (*Pancasila)* reinforces the collectivistic culture among members of the society and may serve to amplify the expected impact of variables associated with the cultural context (McBeth, 1994).

Method

Sample. Previous research indicated that variance could be obtained on task-related variables such as interdependence within the healthcare industry, especially for nursing teams within hospitals (Argote, 1982). Four hospitals in the U.S. and four in Indonesia were invited to participate based on similarities in size (50-200 beds), technical domain (general), and access (public). Discussions with administrators also indicated that similarity of facilities (wards) was necessary to control for potential confounds associated with day-to-day operations. Only sites with four types of wards (in-patient, out-patient, emergency, and obstetrics) were invited.

Directors representing two hospitals in the U.S. and one hospital in Indonesia agreed to participate. Pre-assessment interviews were conducted with 5-10 nursing supervisors in each facility to: (1) identify teams, (2) develop the procedures, and (3) adapt effectiveness assessment techniques. All nurses within the hospitals were invited to participate. In both the U.S. and Indonesia naturally occurring subsets of 2-5 nurses within a ward considered themselves permanent teams and shared the same schedule. Team members interacted regularly, frequently completing as a team tasks such as admitting and discharging patients, periodic recording of vital signs, and starting or changing IV. In both

countries, teams varied in interdependence. The sampling strategy resulted in 43% participation at U.S. site #1 and 55% participation at U.S. site #2. At the Indonesian site, 69% participated. The final sample across the two countries was 71 teams (36 U.S. and 35 Indonesian) represented by 185 nurses (94 U.S. and 91 Indonesian). Each team was represented by 2-5 members with a mean of 2.69 nurses per team.

Post-survey interviews confirmed that nurses who did not participate were unable to do so due to factors beyond their control such as scheduling conflicts (e.g., being called off duty due to low patient count, being scheduled off for vacations, or being absent due to illness). For those participating, there were no organizational or team differences in resource availability, compensation structure, and human resource policies. Analyses of variance verified no systematic differences across organizations, wards, or shifts in prior team performance as measured by quality of patient care. Responses to demographic surveys confirmed no statistically significant differences across countries or teams in gender, age, years employed, education, or longevity of the team; a majority of the teams had been intact for approximately four years.

Procedure. In Indonesia, all project sessions were conducted with the aid of an interpreter. All English-version materials were reviewed by U.S. and Indonesian nursing supervisors who recommended changes in the content, design, and presentation of the instruments. The materials were then given to an interpreter to be translated into *Bahasa Indonesian*. The Indonesian version was given to a bilingual nurse to translate back into English. These back-translations were reviewed by the researcher and the nursing administrators to ensure the intended meaning remained consistent across the translations. Discrepancies were resolved by discussing the intended meaning and modifying both the

English and translated materials.

In both countries, teams reported to a conference room for a 45-minute introductory session. Objectives of the project were introduced and nurses were asked to complete surveys assessing task interdependence, field independence, collectivism and efficacy. Next, it was explained that quality of care for each team would be assessed and data would be distributed back to them to improve their effectiveness. Each of the team members were given quality assessment packets to distribute to two patients, two peers and to a supervisor and then completed a self-appraisal of their own team. Assessment packets contained the following: (1) introduction and instructions, (2) assessment survey, and (3) a blank envelope with a team code. Patients, peers, supervisors, and team members completed the anonymous assessment within two weeks and placed it in a sealed container in each ward. After four weeks, the researcher retrieved the packets and averaged these ratings (as described below) to measure team effectiveness. During week eight, all teams met with the researcher for a 45-minute feedback session.

Measures. *Group-efficacy, field independence,* and *collectivism* were measured with the same instruments used in the simulation study; similar factor structures and reliability were obtained (i.e., nurses met as a team and completed one group discussion measure of group-efficacy per team; nurses completed individual measures of field independence and collectivism). Aggregate, group-level indices of field independence and collectivism were created by averaging individual scores. Both field independence ($\underline{F}$=5.66, $\underline{df}$=67, $\underline{p}$<.001) and collectivism ($\underline{F}$=1.33 $\underline{df}$=67, $\underline{p}$<.10) met the requirement for between-group differences; adequate within group agreement was also demonstrated (r_{wg}=.82 for field dependence; r_{wg}=.70 for collectivism). For field independence, E-ratios calculated using WABA I

indicated both statistical (F=5.79, df=(70,115), p<.01) and practical (30 degree test; See Note 2) significance. Collectivism E-ratios also indicated statistical (F=1.36, df=(70, 115), p<.05) and practical significance (0 degree test; See Note 2). Overall, these analyses provide adequate evidence for inferring group-level constructs.

Task interdependence was measured by asking each nurse to answer the following question: "*Please indicate the extent to which nurses in these teams are dependent on each other for completion of their daily tasks*" (1=to no extent; 5=to a very great extent). All nurses familiar with a team rated each team. Aggregate, group-level indices of interdependence were created by averaging individual team member scores. Adequate between-group differences (F=4.92, df=67, p<.001) and within-group agreement (r_{wg}=.72) were demonstrated. The E ratio calculated using WABA I met tests of statistical significance (F=4.93, df=(70,115), p<.01) and practical significance (15 degree test; See Note 2), providing strong evidence for inferring a group-level construct.

Team effectiveness was measured based on *quality of nursing care* (Harvey, 1991). Two instruments were adapted: (1) the Slater Nursing Competencies Rating Scale, focusing on the effectiveness as rated by supervisors and peers, and (2) the Quality of Patient Care Scale (Qualpac), focusing on the quality of care received as rated by patients (Wandelt & Stewart, 1975). Both instruments are in widespread use today and measure the same facets of care using slightly different wording, depending on whether nurses and supervisors, as opposed to patients, are rating the care provided. Scales include such items as "*The team adapts nursing procedures to meet the needs of individual patients*" and "*The team recognizes physical distress and acts to provide relief for the patient*."

Ten nursing supervisors (five in each country) helped reduce the overall length of the surveys by identifying the 20 most important items. Each team was rated by 4-5 raters using a 5-point scale (1=poorest care; 5=best care). Team members, nurses, and supervisors used 20 items worded as on the Slater scale; patients used 20 items measuring the same facets of care, but worded as on the Quality of Patient Care Scale. The configuration of raters varied across the teams, but all had at least two outside raters. The James et al.(1984) within-group agreement (r_{wg}) of the ratings was .95. Given this, ratings on each item were averaged across raters for each team and subjected to principal component analysis. Results indicated all 20 items loaded on a one factor, with an eigen value of 12.95 accounting for 64.7 percent of the variance. Based on these results, scores across the 20 items were averaged to arrive at a composite score for team effectiveness.

Overview of Analyses

Analyses were conducted as in the simulation study. Hierarchical multiple regression models were run with group effectiveness as the dependent variable to test the moderating effects of interdependence (H1), field independence (H3), and collectivism (H4) on the relationship between group-efficacy and group effectiveness.

Results

Preliminary results. Residual plots of regression analyses did not reveal any significant indications of non-linearity or heteroscedasticity. A series of *t* tests indicated statistically significant country differences for group-efficacy (t=-4.99, df=69, p<.001); field independence (t=-14.39, df=69, p<.001); collectivism (t=7.45, df=69, p <.001). Indonesians had lower levels of group-efficacy and

field independence, and higher levels of collectivism than U.S. participants. These differences confirm that sampling in the U.S. and Indonesia increased variance on the constructs, and also confirm the need to control for country. Means, standard deviations and intercorrelations of the variables are shown in Table 3.

Insert Table 3 About Here

Results obtained in the regression models appear in Table 4. Standardized partial regression coefficients and the change in R^2 are listed for each step. In step one, country predicted significant variance in group effectiveness (R^2= .16, F=12.80(1, 69), p<.001). In the second step, adding group-efficacy resulted in a .03 increase in R^2 (DF=2.58, (2, 68) p<.10). Both country and group-efficacy contributed significantly to the prediction of 19% of group effectiveness. In the third step, the addition of interdependence, field independence, and collectivism resulted in a .05 change in R^2 predicting 24% of the variability in group effectiveness; however, this change failed to reach statistical significance.

Insert Table 4 About Here

Tests of hypotheses. Adding the multiplicative interaction terms in the fourth step of the model resulted in a .10 change in R^2 for the model (DF=2.99, (8, 62) p<.05), indicating moderating effects, and predicting a total of 33% of the variability in group effectiveness (F=3.89, (8, 62) p<.001). The group-efficacy x interdependence and group-efficacy x collectivism interaction terms were significant, providing support for H2 and H4. No support was obtained for H3 regarding field

independence. To interpret the significant group-efficacy x interdependence interaction, effectiveness was compared in groups highest and lowest in interdependence using a median split. Results provided further support of H2, in that the correlation between group-efficacy and group effectiveness was positive for groups high in interdependence (r=.53, p<.001) and there was no relationship for groups low in interdependence (r=.21, n.s.). To interpret the significant group-efficacy x collectivism interaction, effectiveness was compared in groups highest and lowest in collectivism using a median split. In further support of H4, the correlation between group-efficacy and group effectiveness was positive for groups high in collectivism (r=.62, p<.001) and there was no relationship for groups low in collectivism (r=-.02, n.s.). Finally, entering the country x group-efficacy interaction term in the fifth step of the model failed to result in any change in R^2, suggesting no other characteristic confounded with country interacts with group-efficacy.

DISCUSSION

This research confirms that group-efficacy is a meaningful construct, both in the laboratory and in the field. Results indicate that high group-efficacy is not always an asset to groups, providing evidence for a contingency approach that contrasts with self-efficacy effects. Findings demonstrated the complexity of collective cognition, as discussed further below.

Theoretical Implications and Future Research Directions

Results substantiate and extend theory in four areas: (1) collective cognition, (2) task design, (3) cultural characteristics, and (4) operationalization of group constructs. First, evidence for moderators may explain why relationships between group-efficacy and group effectiveness have been

modest in previous research. When task uncertainty was high, and task interdependence and collectivism were low, group-efficacy was not related to group effectiveness. Arguably, it is under these circumstances that groups have the most difficulty combining and integrating information about past performance, task constraints, or context. When groups know what is required to perform a task, can actively share information about their group and value it, their beliefs are better aligned with actual effectiveness. Thus, findings provide support for a contingency approach to group-efficacy.

Second, this research illustrates the influence that task characteristics can have on groups. In the field study, task interdependence moderated the relationship between group-efficacy and effectiveness. Next, we need to explore whether changes in the degree of task interdependence produce corresponding changes in levels of group-efficacy and group effectiveness, capturing different components of interdependence (e.g., resource, outcome, and task interdependence) so as not to under represent the domain of this construct. This issue is especially pertinent for organizations that are currently adopting team-oriented approaches to tasks that were previously individually based. Such reorganization often results in an increase in task interdependence. Similarly, it would be interesting to investigate the moderating impact of task uncertainty over time. Even under conditions of high task uncertainty, there may emerge a modest relationship between group-efficacy and group effectiveness because the groups high in efficacy would be more likely to persist in finding a means of achieving success on the uncertain tasks. Or it may be that groups that start out with high group-efficacy, but repeatedly miss their targets, may gradually lower their efficacy (See Note 3). Further research should examine these relationships.

A third contribution of this research is that the field study highlights the potential impact that the

cultural context has on group processes. The impact of the cultural context is important for understanding the intercultural applicability of group-efficacy, which becomes more critical as an increasing number of multinational organizations use teams in areas of the world with contrasting cultures. In addition to collectivism, there may be additional facets of culture associated with national borders that influence group-efficacy and group effectiveness. Important research is currently being conducted investigating cultural characteristics, such as universalism-particularism, that were first identified by anthropologists Kluckhohn and Strodtbeck (1961, cited in Maznevski & DiStefano, 1998). These cultural characteristics may have implications for group-efficacy and should be incorporated into future investigations.

This research also demonstrated the use of a group response format for conceptualizing and measuring group-level constructs. A detailed analysis of group response measures, as compared to the more conventional individual response formats, is currently underway (e.g., Gibson, Randel, & Earley, 1998); however, the findings obtained here concerning the reliability and predictive validity of the group-efficacy construct are promising. Additional research concerning the applicability of the group-response format for the operationalization of other constructs - such as group cohesion, group learning, or group memory - seems warranted.

Although this study provides support for the validity of the group-efficacy construct, issues of measurement warrant further attention. The methods utilized here to measure group-efficacy should be supplemented by additional, less obtrusive measures. For example, normal daily work group conversations could be analyzed in an attempt to trace the development of expectations concerning group effectiveness. Applying techniques from social network analysis would shed additional light on

the patterns of interconnections between members and factors influencing how information is perceived, weighted, and combined in forming an efficacy belief.

Limitations

A key limitation of this research pertains to demonstration of causality. In the simulation, the experimental design permits some confidence in causal relationships involving the manipulated variable (task uncertainty); however, the cultural variables were not manipulated and I cannot make causal statements about relationships with these variables. Furthermore, in the field study, none of the variables were manipulated. Data were collected over an eight-week period; however, results reported here reflect only one assessment of task interdependence and group-efficacy, followed several weeks later by an assessment of group effectiveness. Therefore, this study should be considered cross-sectional as opposed to longitudinal. To advance further the construct of group-efficacy, causality must be better established in the field using a longitudinal design or quasi-experimentation. The latter might involve experimental manipulation of group-efficacy. This will help to control for the potential effect of prior performance.

A second issue is lack of support for the hypotheses concerning field independence. This may have been due to the relatively narrow focus on a particular aspect of the construct. Field independence is one component of a larger cultural characteristic referred to as psychological differentiation (Witkin et. al., 1979). Rather than field independence, it may be other aspects of psychological differentiation that impact group-efficacy. Future research should explore this possibility. A third limitation pertains to the samples in the simulation study. The U.S. sample in the simulation had a high proportion of Asian Americans. Although this helped obtain variance in the cultural variables, it does not reflect the general

U.S. populous. Future research must test the generalizability of the findings for a U.S. sample with broader representation of ethnic groups.

Conclusion

In this research, group-efficacy did predict a significant portion of the variance in group effectiveness. However, contrary to previous research, findings demonstrate that a strong belief within a group regarding group effectiveness is not *always* an asset. The nature of the relationship between group-efficacy and effectiveness was associated with the specific type of tasks that are under consideration and the cultural context in which the group operates. Thus, in contrast to conventional thinking concerning efficacy beliefs, it appears that the factors influencing group processes interact in complex ways.

NOTES

1. It is important to note that the range of the group-efficacy scores lends additional evidence that the groups had sufficient time to develop strong group-efficacy beliefs in the simulation. Across all items on the measure (e.g., for each of the five levels of effectiveness), the magnitude of the certainty scores was typically either very high (e.g., 100%) or very low (e.g., 0%), indicating groups felt reasonably certain about what level of effectiveness they could achieve.
2. Dansereau et al. (1984: 169) provided a test of the practical significance of an E ratio (the ratio of between-group to within-group etas). Since an E ratio is a cotangent of an angle between 0 degrees to 90 degrees, they defined three intervals, 0 degrees, 15 degrees, and 30 degrees, with 30 degrees being the most stringent test. These intervals allow for making a decision about whether an obtained E ratio indicates a group-level construct. To meet the 0 degree test for inferring group-level constructs, the E ratio must simply be greater than 1. To meet the 15 degree test, the E ratio must be greater than 1.303. To meet the 30 degree test, the E ratio must be greater than 1.73.
3. I am indebted to an anonymous reviewer for this suggestion for future research.

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TABLE 1

Correlation Matrix for Simulation Study

Group Level (*n*=60)	*Mean*	*S.D.*	1	2	3	4	5	6
1. Country[a]	.55	.50	1.00					
2. Uncertainty[a]	.50	.50	-.07	1.00				
3. Field independence	11.74	3.21	-.28**	.15	1.00			
4. Collectivism	2.93	.53	-.65***	.04	.20†	1.00		
5. Group-efficacy	85.12	15.98	.35**	-.13	-.11	-.30**	1.00	
6. Effectiveness	6.37	.94	.08	-.32**	.11	-.06	.31**	1.00

†p<.10 *p<.05 **p<.01 ***p<.001

[a]Note these variables are dichotomous; for uncertainty 1=high and 0=low, for country 1=U.S. and 0=Hong Kong. Correlation coefficients for these variables are point biserial.

TABLE 2

Hierarchical Regression Analyses For Group Effectiveness: Simulation Study

(n=60)	Step 1		Step 2		Step 3		Step 4		Step 5	
Variables	*Beta*	*t for beta*	*Beta*	*t for beta*	*Beta*	*t for beta*	*Beta*	*t for beta*	*Beta*	*t for beta*
Country	.08	.64	-.03	-.23	.03	.20	.01	.01	-.76	-.56
Group-efficacy			.33	2.43**	.29	2.25*	1.02	1.16	.20	.11
Uncertainty					-.31	-2.55**	.92	1.20	.92	1.20
Field independence					.19	1.49	.59	.96	.50	.78
Collectivism					.03	.20	.15	.20	-.47	-.35
Group-efficacy x Uncertainty							-1.24	-1.62†	-1.24	-1.61†
Group-efficacy x Field independence							-.43	-.60	-.33	-.45
Group-efficacy x Collectivism							-.16	-.17	.58	.36
Country x Group-efficacy									.79	.56
R^2 *(Adjusted* R^2*)*	.01 (-.01)		. 10 (.07)		.22 (.14)		.26 (.14)		.26 (.13)	
F	.40		3.16*		2.96**		2.19*		1.96†	
df	1, 58		2, 57		5, 54		8, 51		9, 50	
ΔR^2			.09		.12		.04		.00	
ΔF			5.89**		2.64*		.93		.31	

†p<.10 *p<.05 **p<.01 ***p<.001

TABLE 3

Correlation Matrix for Field Study

(*n*=71)	*Mean*	*S.D.*	1	2	3	4	5	6
1. Country[a]	.50	.50	1.00					
2. Interdependence	3.90	.54	.10	1.00				
3. Field independence	13.12	4.37	.90***	.13	1.00			
4. Collectivism	3.02	.71	-.58***	-.11	-.50***	1.00		
5. Group-efficacy	75.23	24.94	.46***	-.06	.54***	-.19*	1.00	
6. Effectiveness	4.16	.48	.39***	-.05	.46***	-.17†	.34**	1.00

†p<.10 *p<.05 **p<.01 ***p<.001

[a]Note that country is a dichotomous variable; 1=U.S. and 0=Indonesia. Correlation coefficients for this variable are point biserial.

TABLE 4

Hierarchical Regression Analyses For Group Effectiveness: Field Study

(n=71)	Step 1		Step 2		Step 3		Step 4		Step 5	
Variables	*Beta*	*t for beta*	*Beta*	*t for beta*	*Beta*	*t for beta*	*Beta*	*t for beta*	*Beta*	*t for beta*
Country	.40	3.58***	.31	2.48*	-.07	-.26	-.20	-.77	-.99	-1.33
Group-efficacy			.20	1.61†	.10	.74	-3.30	-2.43*	-3.31	-2.45*
Interdependence					-.10	-.89	-.79	-2.01*	-.91	-2.24*
Field independence					.51	1.89†	.33	.60	1.13	1.26
Collectivism					.06	.43	-1.10	-1.91†	-1.11	-1.93†
Group-efficacy x Interdependence							1.92	1.82†	2.25	2.06*
Group-efficacy x Field independence							.29	.31	-1.25	- .76
Group-efficacy x Collectivism							1.64	2.06*	1.71	2.14*
Country x Group-efficacy									1.22	1.13
R^2*(Adjusted* R^2*)*	.16 (.14)		.19 (.16)		.24 (.18)		.33 (.25)		.35 (.25)	
F	12.80***		7.84***		4.05**		3.89***		3.61***	
df	1, 69		2, 68		5, 65		8, 62		9, 61	
ΔR^2			.03		.05		.10		.01	
ΔF			2.58†		1.43		2.99*		1.27	

†p<.10 *p<.05 **p<.01 ***p<.001

FIGURE 1
Relationships Tested