

Misattribution and Attributional Redirection in Distributed Virtual Groups

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Abstract

Virtual distributed groups must adapt to a number of sociotechnical characteristics in order to relate positively and work effectively over distance. Short-term groups, in particular, experience considerable difficulty in making the adaptations to systems and partners in virtual teams. When adaptation failures occur, such group members are prone to make attributional judgments about distant partners rather than to consider their own adjustment difficulties. However, by re-directing participants' attributional attention to situational issues, through experience with local rather than distributed virtual interaction, participants become more effective when they encounter subsequent distributed virtual environments. This report describes the theoretical dynamics and the results of three pilot studies, the data from which, in comparison to one another, begin to substantiate this attributional framework for virtual work groups.

1. Introduction

Virtual teams are becoming increasingly common in dispersed organizations, educational settings, and other ventures. Collaborators, working at different places and connected through electronic information technologies over the Internet, face numerous challenges in addition to those of traditional small group dynamics. A growing body of research indicates a paradoxical cost/benefit payoff from employing such teams. Organizations profit from the diversity and reach such teams can encompass. Yet the costs in making such teams work effectively are borne by the team members themselves, in terms of accommodation to the unexpected but typical problems such teams face, such as adjustment to temporal delays in information exchange, difficulty in maintaining shared context and work-flow, and other anomalies that require greater effort in order to adjust to work in the virtual environment.

Research suggests that over time, members of virtual teams adapt to these circumstances, learn about each other, and form effective and affective accommodations often resulting in “hyperpersonal,” or better-than-normal relations and productivity [25]. However, in short-term

virtual groups, these adjustments are less often made. People tend to work in new electronic settings the ways to which they are accustomed in traditional groups, ways which do not fit well with the sociotechnical requirements of new media and geographic dispersion, and when this occurs they tend to experience sub-optimal performance quality, lower satisfaction, and interpersonal hostility. In other words, the failure to adapt smoothly to the working requirements of virtual, mediated teamwork, or the expenditure of the considerable extra effort required to do so, often result in negative interpersonal attributions among team members rather than an appreciation of the sociotechnical requirements of distributed work. This is a classic instance of mis-attribution, and its communicative consequences create barriers to effective working and learning situations.

The present research explores when and how virtual team members make erroneous attributions about their virtual partners, the consequences of these attributions, and steps that may be taken to re-focus partners' attention to the sociotechnical requirements of virtual collaboration in ways that allow them to become more effective in distributed groups. The comparison of empirical results from three pilot studies suggest that there is a tendency for short-term virtual team members to make out-group, dispositional attributions toward their virtual partners for their own adaptation failures in online collaboration. When individuals precede distributed group work through a virtual but local practice session, outgroup attributions are mitigated, attributions are redirected, and sociotechnical learning is facilitated, leading to more successful and satisfying experiences in subsequent distributed collaboration.

1.1. Time effects in computer-mediated communication

While no precise parameters distinguish between a “long-term” and a “short-term” virtual group, a number of studies indicate that the duration of virtual teams has significant effects on how their members relate to and work with one another. Early studies examining the effects of computer-mediated communication (CMC) in

decision-making and problem-solving groups concluded that such groups exhibit impersonal relations, low rates of consensus, and other impediments compared to parallel face-to-face (FtF) groups. However, meta-analysis has demonstrated that such effects are often limited to short-term groups—at least to groups that are provided a proscribed amount of time—and that unrestricted groups and CMC partners show greater socioemotional behavior [27].

Several factors may underlie these differences. First, as explained by social information processing dynamics [28], CMC exchanges appear to take place at a slower rate than FtF. Since messages are typed rather than spoken, and since all cues—substantive and affective—must be translated into the single channel of verbal behavior, it takes longer for enough messages to accumulate in order for participants to construct mental models of one another, and react to those constructions by managing their relationships through more verbiage. Groups that are afforded extended periods have been shown to establish more positive relationships over time [4], [24] whereas online groups who experience time pressure respond with fewer affective statements, harsher conflict management and poorer argumentation strategies [18], [19].

Second, the extent to which virtual partners expect that they will be interdependent over ongoing projects, rather than a one-shot assignment, seems to trigger different interpersonal orientations, and more strongly than in FtF groups. Anticipated future interaction in CMC groups appears to stimulate interpersonal information-seeking, more and deeper self-disclosure, friendlier relational communication, greater attraction, and more effort than when future interaction is less expected [21], [23], [27].

A third factor underlying the effects of time on virtual groups is their need to adapt to the peculiarities of the technological systems they employ. Lebie, Rhoades, and McGrath [13] examined the amount and kinds of statements made in synchronous CMC and FtF groups over multiple, time-limited tasks. They found that CMC groups not only made fewer statements across tasks over time, but also that the nature of their comments differed from FtF groups in early projects. Specifically, CMC groups devoted a significantly greater proportion of their comments at first to discussing the use and mechanics of the technology, where FtF groups, unsurprisingly, did not. While this may seem like an obvious point at first glance, it speaks to the issue of accommodations that CMC groups must make, and how these may offset the amount of time they have to address more substantive task or relational issues—at least, when the amount of

time they have is fixed and limited, as was the case in Lebie et al.'s [13] and many other studies. While early prognoses about the promise of CMC suggested that it would help prevent groups from being distracted by interpersonal and non-task issues (e.g. [7], [16]), these findings suggest that CMC groups are distracted, instead, by CMC itself, but that this problem remedies itself as groups grow accustomed to it over time and multiple projects should they be afforded the opportunity to do so.

In order for virtual groups to become more effective, these studies show, accommodations must be made not only in getting to know one's partners, but in order to work effectively with CMC. Other research suggests what the nature of these accommodations may be, and what the consequences are for failing to make them.

1.2. Sociotechnical accommodations and attributions

1.2.1. Accommodations. Several studies indicate that a variety of sociotechnical accommodations are required for effective virtual teamwork. These include (1) frequent communication, more frequent than in unmediated groups; (2) confirming receipt of messages; (3) making sure all members are included on all messages (by e-mail, when a group-based computer conferencing system is not being used); (4) early and continuous work on both organizing and substantive contributions to the team's final project (rather than sequencing organization then substantive efforts); (5) substantially greater explicitness in questions, answers, agreements, and articulating expectations; and (6) earlier deadlines (more working ahead) and greater adherence to them. These "rules for virtual groups" have been suggested by qualitative analyses of global and local virtual teams, e.g. [6], [8], [10], [11], [14], and are associated with a variety of positive group outcomes.

1.2.2. Accommodation failures and attributions. However, especially in the case of groups who have not evolved over time, members have difficulty adapting to the requirements imposed by distance and media, even when they are explicitly informed about them in advance. Initial efforts by such teams, unsurprisingly, often lead to last-minute efforts (handicapped by slower-than-FtF communication systems), anxious waiting for partners' contributions, and sub-optimal performance. When such groups do not successfully accommodate to the demands of virtual collaboration, frustration and dissatisfaction arise [see e.g. 11]. Moreover, when some the partners are geographically distributed with respect to others, frustration is directed at remote colleagues [3],

[6]. Consistent with the literature on the subject, we have observed instances in which partners who are co-located denigrate their remote partners collectively (rhetorically asking “what’s wrong with those people?”), casting aspersions on their personal characteristics such as laziness, irresponsibility, and lack of commitment. Ironically, this kind of cross-blaming has been heard at all of the distributed sites at which distributed partners of a given group reside.

In a recent study, Cramton [6] suggests that the dynamic underlying such perceptions is the psychological principle called the “fundamental attribution error” [20]: the tendency to blame another’s disposition, or personality, for what is actually a situationally-stimulated behavior. This cognitive bias seems especially easy to apply to distant members of a virtual group, since in-group/out-group dynamics are especially potent in CMC, where visual anonymity promotes animosity for out-group members [17]; the composition of distributed virtual teams, by definition, includes some members that by virtue of their geographic dispersion are “outsiders” with respect to other members. In this case, the presence of out-group members of a virtual group offers other participants a heuristic, or a salient and less ego-threatening target on which to blame problems in coordination and action.

Extending the attribution framework, we can predict the consequences of out-group/dispositional attributions in the development of virtual groups and their members. Drawing on the cognitive actor-observer bias, virtual team members may maintain different explanations for their own behavior (and for their co-located partners’) than for their distant partners’. When such distortions are present, these perceptions are likely to provide impediments to individual learning and development when participants work in successions of short-term distributed virtual groups. These misattributions might dissipate in long-term groups, as members of such groups are often motivated to seek and provide positive interpersonal information and relational communication. Without such motivation, however, these misattributions may persist, and under such circumstances, individuals deny responsibility for their own need for improvement or corrective action, and thus are unlikely to improve their own adaptation to the situational demands of virtual teamwork..

In sum, a portrait of adaptation problems to distributed CMC can be drawn based on temporal, sociotechnical, and attributional factors. Members of short-term virtual teams do not achieve the depth of interpersonal impressions or levels of relational communication that longer-term virtual teams, or FtF

teams of any duration, achieve. This is due in some part to insufficient opportunity to exchange messages that would lead to such developments, and in some part because knowing that they have limited interdependence deters the search for and provision of the cues on which such development depends. Moreover, while some proportion of virtual groups’ message exchanges seem to be required for adaptation to the sociotechnical environment of CMC, this adaptation may detract from task-related and/or socially-oriented communication in early stages of long-term groups; it is unknown whether it is ever discussed in short-term groups. In either case, these dynamics lead to sub-optimal accommodation, poor performance, and frustration. When this occurs, and when groups are distributed across location with members otherwise unknown to one another, there is a tendency to displace fault for adaptation failures toward dispositional attributions of one’s distant partners, constituting a fundamental attribution error, and precluding learning and subsequent adaptation in other, similar virtual groups.

If cognitive/attributional dynamics provide some basis for the problems of virtual distributed teams, then perhaps intervention, or situations that facilitate re-direction of attributions, may help such participants to realize the situational characteristics of mediated work, and alter their behavior appropriately. If so, then participants in short-term CMC groups may come to achieve the substantive and affective levels previously associated with longer-term virtual groups. In the following, three studies are described which, together, lend credence to this framework, and for the effectiveness of such an intervention. The first study describes how participants in short-term groups failed to accommodate to distributed collaboration despite successive group memberships and projects over time. The second study reports the effects of an intervention on all virtual group participants, with some apparent success. Within neither of these studies was there a control group, so a third study was conducted in order to examine more closely the variation due to an intervention designed to re-direct attributional tendencies away from distant partners and toward CMC’s characteristics and demands.

2. Studies

2.1. Study 1

The first study was conducted employing virtual student teams composed of members from both the University of Kansas ($n = 17$ students) and Rensselaer

Polytechnic Institute in upstate New York ($n = 13$ students), taking the same course on social impacts of the Internet, in parallel. Each class received the identical material, and one instructor led the course, primarily from one location, with a teaching assistant in working closely with the instructor to maximize similarity in the other site. As part of the course, participants were assigned to work on two virtual, online projects in succession, with different partners each time. Each of the two working periods was two weeks in duration. A randomized-blocked procedure was used to assign first round groups consisting of students from both colleges, with further blocking in the second round to insure that partners had not worked together in the first round. Each person worked in teams of 4 people, and each team consisted of students from both universities. Thus, in every group, there were some students working together that had never met before and who worked exclusively on-line. Groups were admonished not to work in local subgroups, but to restrict their communication to the online system (the FirstClass computer conferencing system, featuring threaded asynchronous messaging, and a real-time chat facility). All participants were also thoroughly lectured on the “rules for virtual groups,” discussed above, prior to both the first and second rounds of projects. Projects consisted of writing research review papers on current CMC issues using articles provided by the instructor, although topics were not directly related to the issues of interest to this research.

As part of another research effort researchers took photographs of each student at the beginning of the course, both alone and interacting with another class member; students were told at the time that the images may or may not be used later in the course. In previous research, Walther, Slovacek, and Tidwell [29] found that the presentation of group partners’ photographs mitigated the impersonality of short-term groups (and the intimacy of long-term groups); among other things, this project originally sought to explore whether short-term groups’ members might benefit even more from seeing photographs depicting their partners depicted in social interaction with someone else [based on 1]. In this project, for each of two rounds of group work, groups were assigned via email messages directing each student to a specific Web page describing the respective group. These Web pages reflected, for each group and as evenly matched as possible, either names and no photographs, names and solo photographs of each member, or names and photos of each member depicting each member talking to another person (outside the group).

At the end of each group project, participants completed questionnaires pertaining to their experience

with the project, and with their virtual team members, using measures from previous studies, in order to detect comparative effects. These measures included impression development [22], attributional confidence [5], relational immediacy/affection, social (vs. task) orientation [2], [28], task attraction, social attraction, and physical attraction [15], and individual effort toward the group project [26]. All dependent measures employed 5-interval Likert scales, except for impression development, which employed 4 points of agreement/disagreement and a “Don’t Know” category. Reliability for these measures ranged from the lowest Cronbach alphas of .63 for individual effort, and .75 for social/task orientation, to alphas equal to or greater than .91 for all other measures.

However, the photos made no difference; no significant differences were obtained as a main effect of picture type, picture versus no picture, or even due to experience from project 1 to project 2. An unexpected and uninterpretable 2-way interaction between time and photo/no-photo emerged, but the direction of means were not consistent with expected patterns; the interaction demonstrates that sufficient statistical power was available but that no expected effects obtained. Indeed, despite overt advice about the “rules of virtual groups,” work behaviors were subjectively poor with respect to timing and coordination, and mean ratings of several dimensions of relational communication were relatively low across the board. Subjectively and informally, comments attributing fault to “those people” at the respective other institution, were heard on both sites.

These findings, or the lack thereof, provide no concrete evidence of attributional dynamics, although the anecdotal reports of participants suggest that such dynamics may have been operative. In order to test whether this might indeed have been the case, and whether attributions could be redirected from out-group partners to self and situation, another study was designed and executed.

2.2. Study 2

A second study was conducted employing a deliberate sequence of local/online and distributed/online groups, in order to pilot test a strategy for attributional re-direction of adaptation failures in virtual groups. This study again involved students at two universities: Rensselaer Polytechnic Institute, and the Universität Göttingen in Germany. Twenty-two students at Göttingen and 9 at Rensselaer participated in parallel courses regarding the social and organizational psychological dimensions of computer-mediated

communication. Face-to-face class meetings were held daily at the German site, and thrice weekly at the American site.

Cognizant both of the potential deleterious impacts of attributions in short-term CMC groups, and in order to see if these effects could be offset, two types of teams were formed, for three rounds of projects. Prior to working in distributed virtual groups, participants in each location began the first round by working in groups with co-located partners only, but at different times and using the Internet-based conferencing system that they would later use with their distributed virtual partners. That is, they were assigned to groups with other students from their own site, but admonished to use only the web-based virtual seminar system for all of their communication and collaboration with their co-located partners. It was hypothesized that, by using CMC exclusively, yet with partners whom the students knew, they would come to recognize that the problems associated with virtual teamwork could not be the result of misbehavior by some unknown, outgroup partner(s), but rather, they reflected the needs to adjust to asynchronous interaction, response lags, the time required to type rather than talk, and other facets of communication that CMC generally entail. Facing these requirements, whatever frustrations the subjects encountered could not be attributed to distant partners, but rather, must be attributable to their own trial-and-error approach to CMC.

Participants were lectured on the “rules for virtual groups,” alluded to above and as done with the participants in Study 1. These groups used a virtual communication system hosted on the Web that included both bulletin-board style asynchronous commentary, as well as a synchronous chat facility. Their task was to write a joint paper, based on articles provided to them. Elsewhere on the course web site was the syllabus, reading lists, as well as codes of behavior and suggestions for virtual collaboration. Other aspects of this project and system are described by Jonas, Boos, and Walther [12].

While insufficient sample size and technical problems prohibited analysis of relational communication after this initial period, subjective observation affirmed that partners at each of the sites procrastinated, communicating only sporadically at first, and then worked anxiously close to deadline, with poor quality projects completed. Anecdotal reports by these participants indicated that they had had a difficult and frustrating time using the system to coordinate with each other, and would approach things differently were they to try again. If the hypothesis was correct that, due to the fact that no in-group/outgroup heuristic was available by

which to blame “invisible” partners for their difficulties, the participants should make self- and situational attributions for their difficulties. In so doing, they might better recognize the demands on them and accommodate to the sociotechnical system’s requirements, and internalize their challenges. If so, then their next virtual team projects—in this case with distributed groups—should be significantly more effective.

In the second and third projects, students were assigned to distributed, virtual groups of three to four members, each time, including partners from both Germany and the U.S., to write joint papers together. These projects, based on anecdotal reports and observations, went exceptionally well. Many participants reported enjoying the work—some reporting they had never had so much fun in a group project—and all seemed to adjust to the system and the time constraints effectively.

The same set of dependent measures as described in Study 1 was administered to these groups as well, with similar reliabilities. Statistical analysis was conducted comparing these groups to those from Study 1, where there was no prior local/virtual sensitization. These comparisons demonstrate significantly superior impression development, attributional confidence, social orientation, social attraction, task attraction, and even presumed physical attractiveness ratings, as well as greater individual effort on projects, for the teams in the second study that had had the initial, co-located session compared to those in the previous study who did not (see Table 1).

The results of the first two studies, taken together, tentatively support the attributional redirection hypothesis. While the data from Study 2 alone may be said to reflect a simpler, maturation hypothesis, or Lebie et al.’s finding that time affects communication competency using CMC, the results of the first pilot study make clear that experience with CMC alone is not a sufficient aspect with which to overcome the challenges of effective distributed group interaction. These results begin to demonstrate that the effects of time and inexperience extend beyond mere performance changes; experience and competence with CMC may also be at the heart of the relational dynamics that also accrue over time in CMC. When attributions about remote partners are negative and dispositional, these dynamics will not mature for short-term groups. However, by refocusing the attributions of difficulty to the self and the system a priori, rather than an anonymous outgroup, such problems can be averted, and positive virtual relations may accrue much more quickly.

TABLE 1
MEANS COMPARISON OF VIRTUAL TEAMS WITHOUT (KU/RPI) AND WITH (GÖTTINGEN/RPI)
VIRTUAL/LOCAL PRACTICE

	KU/RPI			Göttingen/RPI			Difference (<i>t</i>) <i>p</i> (1-tailed)
	Mean	<i>SD</i>	<i>n</i>	Mean	<i>SD</i>	<i>n</i>	
Immediacy/ Affection	3.32	0.51	54	3.48	0.49	35	>.05 (n.s.)
Impression Development	8.09	3.06	51	9.63	9.63	35	<.01
Attributional Confidence	24.78	21.37	54	34.71	24.02	35	<.025
Task vs. Social Orientation	3.59	0.57	54	3.16	0.80	35	<.0025
Task Attraction	2.88	0.16	54	3.88	1.02	35	<.000
Social Attraction	3.09	0.27	54	3.77	0.63	35	<.000
Physical Attraction	2.87	0.53	54	3.05	0.43	35	<.05
Project Effort	3.22	1.08	54	3.70	0.92	35	<.025

Despite the promise of these results, the two studies do not, between them, offer the design rigor to definitively address the hypotheses about attribution and attributional re-direction. The samples differed in significant ways. Not only is it prudent to assume that Kansas students and Göttingen students differ, but the Rensselaer students may have differed between studies 1 (in the spring) and 2 (in the summer): The summer course at Rensselaer was predominated by foreign nationals, and it is possible that a certain bond developed among these and the German students, almost all of whom communicated with each other through their second rather than first language. Of greater concern, in neither pilot project were the conditions experimentally crossed (i.e. there was no experimental control condition within each pilot), and these comparisons therefore require additional verification.

2.3. Study 3

A third study was conducted using student teams at Rensselaer. As part of a course on social implications of the Internet, students were assigned to two rounds of four-person, short-term teams, to write brief research papers from provided articles, strictly using a computer-based conferencing system (WebCT, a Web-based system featuring an asynchronous bulletin board and synchronous chat facility). Groups were formed using randomized/blocked procedures. In the first round, in order to simulate co-located and distributed groups, half the teams were each composed of students who all met in one of the six FtF discussion sections of the course twice a week. The other half of the teams were each comprised of individuals from different sections, who had no known FtF contact with one another. For the second round of groups, all teams were composed of

individuals who met in different sections, simulating distributed groups. It was hypothesized that those groups whose members were all in the same FtF discussion section during the first round, would perform better during the second round of papers. Questionnaires were administered after each round using the same dependent measures that were administered in the previous two studies. Completion of these questionnaires was voluntary, for extra credit; some participants did not elect to complete the measures after either round one or two, and only those who completed both could be analyzed; the resulting data set included responses about 86 participants. Manipulation checks were included in the first round post-project questionnaires by which each participant indicated whether each of his/her partners was in the same course section, a different section, or that s/he did not know. Only data from the second-round projects were analyzed, since the research focuses on the effects of the first-round experience on the second-round behaviors. Alpha reliabilities for the dependent measures from this administration ranged from .81 for social/task orientation, to .89 for both immediacy-affection and social attractiveness, to greater than .93 for all other measures.

Preliminary analysis of the results revealed a design flaw in the experiment. Due to the randomization procedure, very few second-round groups were comprised of people all of whom had been in same-section groups during the first round. The mixture of individuals who had hypothetically learned virtual team adaptations, with those who had not, was suspected to have undermined the expected dynamics. That is, while an individual member of a second-round group may have learned more effective virtual behavior as a result of his or her round-one, co-located experience, the group as a whole (comprised of people who had and had not

learned), could not have been expected to reflect this. Indeed, analysis of variance performed at the groups level revealed no significant effects on the basis of whether any of its members had been assigned to a co-located versus a distributed group in round 1.

Since the group seemed to dilute the effects of any individual's round-one experience, data were re-analyzed at the individual participant level, using partner ratings of group members as data about specific individuals rather than to compute an average among all members of a group. The first analysis was conducted based on round-one assignments, on the basis of whether an individual had been assigned to a co-located or distributed group in the first round, and applied as the independent variable in an ANOVA examining each person's round-two behavior. Only one outcome was significantly affected in this analysis: immediacy/affection (see Table 2, first column).

partners was in the same section, (2) knew two of the three partners were in the same section, to (3) knew that all three partners were in the same section. The other new variable, "any known partners," was a binary interpretation of the previous: Did the participant recognize that any of the round one group partners had been in the same class as him or herself? While their perceptions on these variables were sometimes incorrect in comparison to the actual assignments that had been made, they may not have actually had a FtF interaction with their round 1 partners in class, and their perceptual recollections are, in a serious sense, more important impressions of the degree of co-location than is the experimental manipulation.

Using the "any known" variable representing the estimate that they had had some or none of the members of their round 1 group in the same class as themselves, as the independent variable, analysis of variance was

TABLE 2
EFFECTS OF ACTUAL AND PERCEIVED KNOWLEDGE OF ROUND 1 PARTNERS ON PERCEPTIONS OF ROUND 2 (DISTRIBUTED) VIRTUAL BEHAVIOR

	Actual Condition (Round 1 same or different)		Perceived Known (Known vs None)	
	<i>F</i> (1,84)	<i>p</i>	<i>F</i> (1,84)	<i>p</i>
Immediacy/ Affection	6.28	.01	10.17	.00
Attributional Confidence	1.05	.39	4.52	.04
Task vs. Social Orientation	1.02	.31	5.86	.02
Task Attraction	2.31	.13	5.13	.03
Social Attraction	3.76	.06	5.28	.02
Physical Attraction	1.51	.22	2.09	.15

It was reasoned that the actual assignment to the co-location versus distributed condition might matter less than the participant's perception of co-location or distributedness. If the participant did not perceive that the round-one partners were members of the same FtF class as him or herself, the cognitive attributional dynamic hypothesized to have been triggered by the actual manipulation should not be expected to have obtained. Therefore, drawing on the manipulation checks from round one, two new variables were computed. Since participants only sometimes recognized that all of his or her round one partners were in the same class, a "number of known partners" index was computed indicating the number of round-one group partners that the subject believed to have been in the same class (i.e. co-located) as him- or herself, a continuous score ranging from (0) did not know that any group members were from one's same section, (1) knew one of the three

conducted on the second-round dependent measures again. Analyses revealed that the self-reported familiarity with any others from round 1 significantly affected participants' behavior in round two in the directions predicted, as rated by other group members, with respect to their immediacy/affection, attributional confidence, social (vs. task) orientation, task attraction, and social attraction; only physical attractiveness showed no effect (see Table 2, right column).

In order to assess more precisely the direction of this effect, the "number known" variable—the number of round 1 partners participants recognized as having been in the same classes as themselves—was used to generate the means for each level of familiarity with round-one partners (from 0 to 3). The means indicated a linear increase on every outcome variable for each level of familiarity, with exceptions in only two cases (among six sets of four means). The overall linearity was tested via

correlational analyses, which demonstrated that the effects indeed obtained in the directions consistent with the hypothesis: Significant one-tailed correlations were obtained in each case but physical attraction, between the round-one partner familiarity scores and the round-two behavioral assessments, as shown in Table 3.

TABLE 3
ONE-TAILED CORRELATIONS BETWEEN NUMBER OF PARTNERS KNOWN IN ROUND 1 AND OUTCOME MEASURES IN ROUND 2 ($N = 86$) OF STUDY 3

Measure	<i>r</i>	<i>p</i>
Immediacy/Affection	.32	.001
Attributional Confidence	.21	.025
Task Orientation	-.28	.004
Task Attraction	.26	.009
Social Attraction	.28	.004
Physical Attraction	.15	.092

3. Discussion

3.1 Interpretations

These three studies, together, comprise complementary data and in whole suggest that the hypothesized dynamics of outgroup attribution in distributed virtual teams does occur, consistent with suggestions by Cramton [6]. As previous research has demonstrated, members of short term, distributed, virtual teams are not particularly motivated to get to know their online partners. Without gaining such knowledge or experiencing the commonality that accompanies it, when such groups fail to adapt to the relatively unique demands of virtual work, members turn their frustration not to their own adaptation failures, but instead, toward the dispositional attributes of their distributed partners. Such patterns are consistent with the fundamental attribution error. Extending this framework, these patterns can be overcome by attributional re-direction strategies that take place when partners have an on-line experience with people whom they know by face. This redirection allows them to internalize the adaptations that virtual work requires, and stimulates these adaptations in subsequent virtual, distributed groups, leading to more positive relational behavior, as perceived by their new partners.

Such an interpretation can potentially redirect our theorizing and pragmatic guidance about the management of virtual teams. It accounts for others' observations from field studies [e.g. 9] that distributed

virtual teams need at least one FtF meeting in order to be successful, but for as-yet-unknown theoretical reasons; the value of a FtF meeting remains, theoretically, a "black box" at present. However, the potential of gaining familiarity with partners that may be acquired FtF may not be valuable because one learns about one's immediate group *per se*. It may function to trigger participants' realization that the problems of online interaction are not the fault of some unseen, unknown entity. The present framework suggests that, while a FtF meeting may be valuable for people who work together on-line, it need not be among the immediate distributed team members but rather, may involve preparatory local, electronic teams.

3.2. Future Research

Despite the suggestive nature of these three studies, they remain as a set imperfect and rough-edged. While the third study addressed in part the lack of direct experimental/control conditions that the first two studies lacked, it, too, lacked certain qualities that would validate the hypotheses more directly. Namely, the third study did not approach the level of perceived outgroup heterogeneity that is expected to be apparent when virtual team members from different sites must coordinate. The groups' composition using members from same or different sections of a course only minimally approached the local/distributed variable that was hypothesized to be active. Further tests using groups across meaningfully distant locations, institutions, geographic regions, and time zones would add a critical level of scientific and practical validity to this research.

Future research must also attend to the potential but as yet untested relationships of mediated interpersonal outcomes to decision-making, productivity, and output quality effects. In the third study herein we were unable to examine the effects of attributional re-direction on individuals' efforts toward the group project (which had been assessed in studies 1 and 2), since analysis issues required that we utilize observer ratings rather than self-assessments. Most prior research has treated these two issues—relational and effort issues-- as independent. There is a strong likelihood, however, that they are intricately linked (see e.g. Weisband & Atwater, 1999). For instance, if speakers' similarity and credibility moderate the weight we attach to their arguments, then interpersonal judgments portend greatly for quality group decision-making, and the concern over CMC in enhancing decision-making makes more important our interest in virtual groups' interpersonal behavior.

Finally, future research should examine whether long-term CMC group members also internalize the attributional patterns and behavioral tactics similar to those that short-term teams gain through re-direction. Previous research has shown that long-term groups often iron these issues out ad hoc, over time, despite impersonal beginnings. Research has not examined whether the hyperpersonality that long-term virtual groups sometimes show provide cognitive/behavioral transfer to subsequent virtual groups; extremely long-term research designs will be needed to see if this likelihood is indeed the case.

4. References

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