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Conflict Asymmetry in Face-to-face and Computer Mediated Teams

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Abstract:

Jehn and colleagues (2010) investigated conflict asymmetry (i.e., different perceptions towards conflict) in a face-to-face context from a multilevel perspective and found that both group and individual levels of conflict asymmetry had negative impacts on performance. In this paper, we conducted a conceptual replication of their work to understand how computer-mediation and time may impact previous findings on conflict asymmetry. At the group-level, we observed a three-way interaction suggesting computer-mediation may reduce the negative consequences of conflict asymmetry early in a teams' lifecycle. At the individual level, we observed a two-way interaction wherein the negative correlation between high task-conflict asymmetry perceptions and satisfaction took time to emerge.

Keywords: Computer-mediated communication (CMC), Multilevel analysis, Conflict asymmetry

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1 Introduction

Much of the previous research on conflict in teams treated conflict as a shared team experience rather than a configural one where there are differences in attitudes or perceptions among individuals working together. Noticing this research gap, Jehn and colleagues investigated conflict asymmetry—the differences among team members' perceptions of conflict—from a multilevel perspective (i.e., individual and group levels) (Jehn, Rispens and Thatcher, 2010). They found that group conflict asymmetry (i.e., the standard deviation among team members' perceived conflict) had a negative impact on group performance and creativity, while individual conflict asymmetry led high/low conflict perceivers (i.e., group members who perceived higher/lower conflict than other group members) to have lower/higher satisfaction with the group and lower/higher individual performance.

What has been conspicuously neglected in both conflict and information systems (IS) literatures is the impact of conflict asymmetry in computer-mediated communication (CMC) teams (Karaca, 2016). Global firms and work groups are increasingly conducting their business solely on technology platforms (e.g., Slack or Cisco WebEx) within and across countries (Ferrazzi, 2014; RW3 CultureWizard, 2016). Employees are increasingly working from home, and many of them do not even meet their group members via video-conferencing (RW3 CultureWizard, 2016) —a trend that will continue and likely be amplified with "millennials" and "Generation Z", who rely heavily on technology for decision-making and communication. Many office employees also work on CMC teams with members in different locations; a survey reveals that 79% of them work always or frequently on geographically dispersed CMC teams (Ferrazzi, 2014). Finally, with the COVID-19 global pandemic, most work arrangements have become computer-supported and there is a likelihood that the "new normal" will include more computer-supported work arrangements. With CMC teams becoming more and more commonplace, it is thus also crucial to understand the nature and impact of conflict asymmetry in CMC teams.

A second important element of team interactions is the passage of time. Teams engage in a lifecycle that alters what members are focused on at any one point (Tuckman and Jensen, 1977; McGrath, 1991; Walther, 2002). Jehn et al. (2010) studied existing organizational work groups at one point in time (that likely was varied across multiple group lifecycles). We extend their study to a longitudinal design, which enables a time-based understanding of the phenomenon.

In our study, we examined the same research question addressed in Jehn et al. (2010) in an attempt to determine the robustness and the generalizability of their findings. However, we made some intentional changes to their design; our data were collected within computer-mediated teams to gain some understanding of whether the previous conflict asymmetry-related findings generalize across different communication contexts. Further, our teams were zero-history student teams, enabling us to study if previous findings are robust to team member experience. In addition, our study utilized a longitudinal design in order to draw some conclusions about the role of time. Finally, our design utilized a different scale to measure conflict. As such, while our study has some elements of a methodological replication, there are likely sufficient differences as to label our study a conceptual replication. Table 1 summarizes the similarities and differences between Jehn et al.'s (2010) study and our replication.

Table 1. Similarities and Differences Between Jehn et al. (2010) and Our Replication Study

Aspects of Study	Jehn et al. (2010)	Current Replication Study
Research Objective	Investigates conflict asymmetry from a multilevel perspective (i.e., individual and group levels).	Replicates the Jehn et al. (2010) study longitudinally in different (F2F vs. CMC) team communication contexts.
Hypotheses	H1: Group conflict asymmetry is negatively associated with outcomes (group performance and creativity), with the mean level of conflict in the group controlled for. That is, the more dispersion around conflict in the group, the lower the level of group outcomes. H2: A member who perceives more conflict than the other members of a group is less effective as a group member (has lower satisfaction and lower reported performance) than a member who perceives less conflict than the rest of the group, regardless of the mean level of conflict in the group.	Examines Jehn et al.'s (2010) H1 and H2 (main effects) *longitudinally* in *F2F vs. CMC contexts*.

	H3: Members' perceptions of group atmosphere (commitment, respect, trust) mediate the effect of individual conflict asymmetry on individual performance and satisfaction. That is, members who perceive higher levels of conflict in a group are less likely to experience a positive group atmosphere and are thus less likely to experience increased performance and satisfaction with the group than members who perceive lower levels of conflict. H4: Experienced social processes (communication, cooperation) mediate the effect of individual conflict asymmetry on individual performance and satisfaction. That is, members of a group who perceive higher levels of conflict in the group are less likely to experience positive social processes, and they are thus less likely to experience increased performance and satisfaction with the group than members who perceive lower levels of conflict.	
Measures	Group conflict asymmetry Individual conflict asymmetry Group atmosphere Social processes Objective group performance Group creativity Satisfaction with team Individual reported performance Control variables (gender diversity, group size, gender, mean levels of task and relationship conflict)	Group conflict asymmetry Individual conflict asymmetry Satisfaction with outcomes Group performance Control variables (gender composition, group mean conflict, group size)
Experimental Design and Sample	Studies existing organizational work groups at one point in time (n = 167, 51 teams).	Studies zero-history student teams utilizing a longitudinal design (n = 215, 44 teams [22 F2F and 22 CMC]).
Analysis Method	Group level: Hierarchical Regression Individual level: Hierarchical Linear Modeling (HLM)	Group level: SAS Proc Mixed Individual level: HLM

2 Theoretical Underpinnings

2.1 Original Hypotheses

Jehn et al. (2010) developed the novel concept of group conflict asymmetry—conceptualized as the degree to which members of a group differ in their perceptions of how much conflict there is in the group. They further argued that this construct has important multi-level implications. They articulated potentially important relationships between asymmetry at the group level and group performance. Likewise, they argued that individual conflict asymmetry (another novel concept)—defined as the extent to which a member perceives more or less conflict than do other group members (Jehn et al., 2010)— if ignored, will exclude the “we-ness” of the group and the cumulative effects of interactions among the members. They ultimately tested two main-effect hypotheses and two mediating-effect hypotheses. We examine only the main effects in the study:

> **Hypothesis 1**: Group conflict asymmetry is negatively associated with outcomes (group performance and creativity), with the mean level of conflict in the group controlled for. That is, the more dispersion around conflict in the group, the lower the level of group outcomes.
>
> **Hypothesis 2:** A member who perceives more conflict than the other members of a group is less effective as a group member (has lower satisfaction and lower reported performance) than a member who perceives less conflict than the rest of the group, regardless of the mean level of conflict in the group.

Before we empirically examine these two original hypotheses, we discuss the rationale for why the impact of conflict asymmetry on group and individual outcomes might differ between F2F and CMC contexts over time.

2.2 Why Might the Impact of Conflict Asymmetry Differ between F2F and CMC Contexts?

The key reason why the impact of conflict asymmetry might differ between F2F and CMC teams is the technologies CMC teams rely on and utilize. The advantages and disadvantages of CMC can be summarized in terms of process losses and gains (Nunamaker, Dennis, Valacich, Vogel and George, 1991; Pinsonneault, Barki, Gallupe and Hoppen, 1999). Compared to F2F communication, CMC tends to incur more process losses due to social loafing (Chidambaram and Tung, 2005) and the lack of social context cues (Baltes, Dickson, Sherman, Bauer and LaGanke, 2002). On the other hand, CMC can result in process gains by mitigating production blocking (Dennis, Wixom and Vandenberg, 2001), social categorization (Giambatista and Bhappu, 2010), and the immediate salience of surface-level diversity (Carte and Chidambaram, 2004), as well as by weakening communication barriers and thus increasing collaboration (Bhappu, Griffith and Northcraft, 1997).

For example, although Jehn et al. (2010) demonstrate that group conflict asymmetry hurt team performance by decreasing the effectiveness of group processes such as cooperation and idea generation, CMC teams may not suffer from a decrease in group process effectiveness. CMC settings encourage contribution and collaboration between team members (Bhappu et al., 1997) and can improve information exchange and equal participation (Carte and Chidambaram, 2004; Dennis, Fuller and Valacich, 2008). CMC can even encourage members to be more willing than F2F communicators to voice their opinions and contribute ideas, possibly resulting in better outcomes than those of F2F teams (Dennis and Garfield, 2003).

Regarding individual effectiveness, Jehn et al. (2010) found that high-conflict perceivers were indeed less effective team members as evidenced by lower satisfaction and lower perceived individual performance. To make matters worse, the negative impact of conflict asymmetry may be aggravated in the context of CMC. CMC contexts are often characterized by insufficient communication cues, physical distance between members (Hinds and Bailey, 2003), and separate contexts amongst members (Cramton, 2001)—all known to lead to more frustration and withdrawal (Swann, 1999). As a result, higher-conflict perceivers cannot see or listen to the reaction of the other members immediately or properly. Owing to these restrictions, higher-conflict perceivers may still feel that their concerns have not been addressed sufficiently. Further, in the context of CMC, team members tend to rely too much on limited cues, which causes their original meanings to be amplified—a phenomenon known as hyper-personal communication (Walther, 1996) where message receivers engage in over-attribution and, thus, may arrive at conclusions that were not intended (Walther, 1996). All these findings suggest that high-conflict perceivers in CMC teams may have a different satisfaction level than their counterparts in F2F teams.

2.3 Why Might the Impact of Conflict Asymmetry Differ over Time?

As team dynamics change over time, the impact of conflict asymmetry likely will change as well. CMC teams tend to be more task oriented than F2F teams (Bhappu et al., 1997; Walther, 1994; Walther, 2002). Yet, this tendency gradually changes over time; CMC team members slowly begin to exchange social information (Chidambaram, 1996; Walther, 1992). F2F teams, on the other hand, socially start off by exchanging relationship information and establishing rapport (Chang, Bordia and Duck, 2003; Gersick, 1988; Gersick, 1989). However, after the initial interactions, F2F teams begin to focus a great deal more on tasks at hand (Chang et al., 2003; Gersick, 1988; Gersick, 1989). From these findings, we argue that depending on the communication context, the impact of conflict asymmetry on outcomes might be different, particularly over time.

Regarding group effectiveness, as CMC team members interact with each other and adapt to the communication medium, the ambiguity they face dissipates, and their communication improves (Wilson, Straus and McEvily, 2006). In addition, team members tend to use communication technologies more effectively as they gain experience with them (Chidambaram, Bostrom and Wynne, 1990; Fuller and Dennis, 2009). As such, real differences of opinion and/or feelings of emotional conflict will be more accurately interpreted and members' awareness of others' perceptions of conflict will increase. Further, the additional effort needed to communicate these differences will be effort not spent on completing the task.

Regarding individual effectiveness, CMC teams typically communicate more slowly than F2F teams, due to their restriction to a single linguistic channel (Walther, 1995). Research shows that members of CMC teams generally feel more dissatisfied than members of F2F teams during initial interactions (Chidambaram, 1996). Yet, this difference usually dissipates over time (Dennis and Garfield, 2003), because CMC team members adapt to the communication technology and, thus, become more able to leverage it to their advantage

(Chidambaram et al., 1990; Fuller and Dennis, 2009). Additionally, channel expansion theory (Carlson and Zmud, 1999) argues that individuals can harness more functionality and usefulness from collaborative technologies with experience. Furthermore, as parties interact, the hyper-personal communication phenomenon and its negative effects are expected to fade over time (Walther, 1996); team members' tendency towards over-attribution is likely to decrease as they get to know each other. These studies and theories suggest that member satisfaction is likely to vary across time.

2.4 Time

Most theories in organizational sciences, at least implicitly, require longitudinal examination of the phenomena concerned (Ployhart and Vandenberg, 2010). This is particularly true for group research, as a number of group theories overtly suggest the notion of group dynamics in relation to time—e.g., punctuated equilibrium theory (Gersick, 1988; Gersick, 1989); time-interaction-performance (TIP) theory (McGrath, 1991); adaptive structuration theory (AST) (DeSanctis, 1988); and the integrative model (Wheelan, 1994). Furthermore, longitudinal examination can solidify causal relationships by testing certain associations at several points over time (Ployhart and Vandenberg, 2010). Hence, by examining such phenomena longitudinally, researchers can gain a more precise understanding of group dynamics. Accordingly, we view conflict asymmetry from a longitudinal perspective.

2.5 Group-level Conflict Asymmetry

Unlike F2F teams, CMC teams may not suffer from a decrease in group process effectiveness. CMC settings encourage contribution and collaboration between team members (Bhappu et al., 1997) and can improve information exchange and equal participation (Carte and Chidambaram, 2004; Dennis et al., 2008). CMC can even encourage members to be more willing than F2F communicators to voice their opinions and contribute ideas, possibly resulting in better outcomes than those of F2F teams (Dennis and Garfield, 2003). These factors may mitigate the adverse impact of conflict asymmetry on performance in CMC teams.

2.6 Individual-level Conflict Asymmetry

The impact of individual conflict asymmetry may be aggravated in the context of CMC. CMC contexts are often characterized by insufficient communication cues, physical distance between members (Hinds and Bailey, 2003), and separate contexts amongst members (Cramton, 2001)—all of which are known to lead to more frustration and withdrawal (Swann, 1999). As a result, higher-conflict perceivers cannot see or listen to the reaction of the other members immediately or properly. Owing to these restrictions, higher-conflict perceivers may still feel that their concerns have not been addressed sufficiently. Further, in the context of CMC, team members tend to rely too much on limited cues, which causes their original meanings to be amplified—a phenomenon known as hyper-personal communication (Walther, 1996) where message receivers engage in over-attribution and, thus, may arrive at conclusions that were not intended (Walther, 1996). All these findings suggest that high-conflict perceivers in CMC teams will be more dissatisfied compared to high-conflict perceivers in F2F teams.

3 Methods

We conducted an experiment using 215 undergraduate students enrolled in database courses across three North American universities. The participants worked on a project as part of their course requirements. Students were randomly assigned to 44 five-member teams (22 CMC teams and 22 F2F teams). Much of the current reality for work teams is that F2F versus CMC/virtual is a false dichotomy, with teams falling into a hybrid category with some degree of virtualness (Griffith, Sawyer and Neale, 2003) measured according to temporal, spatial, and configural dimensions (O'Leary and Cummings, 2007). Our teams are not an exception to this reality. Our efforts to manipulate team context resulted in more-virtual teams being composed of students attending different universities (spatially and configurally dispersed) located in slightly different time zones (temporally dispersed), as is typical of modern distributed work teams. We have labeled these teams "CMC" teams. These teams "met" electronically throughout the duration of the study using a commercially available web-based team project and communication tool. All communications were archived and available to group members, and all deliverables were posted online for instructors to evaluate.

The "F2F" teams were geographically co-located (i.e., spatial, configural and temporal dispersion minimized). The F2F teams used the same web-based tool as the CMC teams to post deliverables, but their meeting context was determined by themselves (primarily resulting in F2F meetings with brief

communications between meetings conducted either F2F or via email/text). All teams were largely zero-history, and our data represent conflict asymmetry, and their outcomes for the duration of the teams' lives.

For our experiment, participants completed a database group project that was submitted as four deliverables. That the task was directly relevant to the students' experience and course of the study was consistent with DeSanctis' (1988) suggestion that any concerns about student respondents are lessened if the students are performing relevant tasks within their experience. After each deliverable, an on-line survey was administered to capture conflict (Miranda and Bostrom, 1993) as well as satisfaction with outcomes (Chidambaram, 1996). While participation in the group project was a required element of the course, responding to the surveys was optional. However, students were awarded bonus points for each survey they completed. The average response rates across the four time periods were 75.25% for CMC teams and 74.50% for F2F teams. Participant demographics can be found in Table 2.

Table 2. Participant Demographics

Variables	CMC (n=105) Mean (SD)	F2F (n=105) Mean (SD)
Age (in years)	22.7 (4.60)	22.3 (3.80)
Work experience (in years)	3.98 (4.02)	4.00 (4.00)
Grade point average	3.15 (0.44)	3.03 (0.57)
Gender	Male=81 Female=24	Male=87 Female=18

4 Construct Measurements

Existing measures were used in all cases; however, we used different measures than those used by Jehn et al. (2010). Items are provided in Table 3. Further, we used a measure of satisfaction with team outcomes (performance) rather than team processes. This better aligns with the group and individual level outcome variables.

Confirmatory factor analyses indicated acceptable construct validity. In our analysis, we also controlled for group mean conflict, the inclusion of which acknowledges the multilevel nature of our data and partials out some higher-level effects in the analysis. We also controlled for team size and gender composition. Perceptual constructs demonstrated reasonable reliability over each of the four time periods: conflict (α=0.747, 0.681, 0.829, and 0.739) and satisfaction with outcomes (α=0.917, 0.926, 0.942, and 0.922). Performance was assessed using project deliverable scores assigned by the three course instructors, following a common rubric.

Table 3: Measures

Construct, Source	Number of Items	α
Relational conflict (Miranda and Bostrom, 1993-4)	Group members made negative remarks about other persons in the group Group conflict tended to be interpersonal in nature The conflict expressed by group members was targeted at a particular person(s) in the group Members confronted each other on personal matters	.60
Task-based conflict (Miranda and Bostrom, 1993-4)	Group members disagree over alternative solutions proposed The group tended to disagree over alternatives The differences experienced by the group were task related The conflict experienced by the group was directly related to the task	.75
Satisfaction with outcomes (Chidambaram, 1996)	Overall, I was personally satisfied with my group's performance My group produced valuable results during this phase I think my group's deliverable is good Overall, the quality of my group's output this phase was high	.93

4.1 Conflict Asymmetry Calculations

Group conflict asymmetry (task and relational) was captured using the standard deviation among team members' conflict scores (Harrison and Klein, 2007; Roberson, Sturman and Simons, 2007). Larger scores indicate larger differences in perceptions among group members. Individual conflict asymmetry was calculated using the equation $1/n\ \Sigma(xi - kj)$, where xi is the conflict score of a focal group member, kj is the conflict score of group member j, and n is the number of remaining team members completing surveys. This calculation is consistent with the conflict asymmetry measure used by Jehn et al. (2010). This measure captures the differences between the focal person's perceptions and those of each of the other group members. Figure 1 shows the ranges of group and individual-level conflict asymmetry scores for CMC and

F2F teams across our four time periods (1-4), with TCA denoting Task Conflict Asymmetry and RCA denoting Relational Conflict Asymmetry. Descriptive statistics are in Table 4.

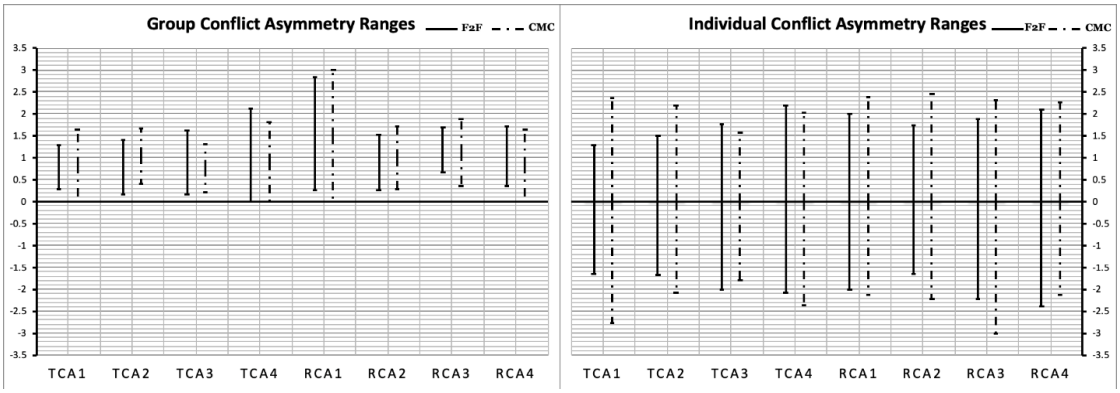

Figure 1. Conflict Asymmetry Ranges

Table 4. Descriptive Statistics

Variable	Mean	Std.	1	2	3	4	5	6	7	8	9	10	11
1. Context	0.495	0.5	1										
2. Time	2.500	1.119	0.000	1									
3. Gender	0.803	0.397	.077*	0.000	1								
4. Individual Task Conflict Asymmetry	0.000	0.786	0.000	0.000	0.041	1							
5. Individual Relational Conflict Asymmetry	0.000	0.921	0.000	0.000	0.000	.280**	1						
6.Satisfaction	5.561	1.334	.141**	-0.018	0.007	-0.021	-.213**	1					
7. Gender Heterogeneity	0.067	0.138	.213**	0.000	-.271**	0.000	0.000	0.008	1				
8. Group Task Conflict Asymmetry	0.819	0.381	.098**	-0.014	0.024	0.000	0.000	-.085*	-0.028	1			
9. Group Relational Conflict Asymmetry	0.988	0.448	.091**	0.042	-0.042	0.000	0.000	-.119**	-.069*	.216**	1		
10. Group Performance	85.798	9.932	0.063	.558**	-0.015	0.000	0.000	.105**	.095**	0.043	.069*	1	
11. Group Average Relational Conflict	2.360	0.523	.398**	0.000	.083*	0.000	0.000	-.157**	0.021	.152**	.241**	0.018	1
12. Group Average Task Conflict	3.796	0.504	-.208**	0.000	-.132**	0.000	0.000	0.014	-.191**	-0.002	.109**	0.055	.178**

5 Data Analysis

Hypotheses testing regarding the relationship between conflict asymmetry and group outcomes utilized multiple observations of both the independent and dependent variables over time. We took into consideration the persistent characteristics of conflict asymmetry and outcomes accounting for the longitudinal nature of our data by modeling the time-based relationships. Our analysis was conducted at the group and individual levels, and it concluded with an assessment of the qualitative data gathered from the CMC teams.

Our sample contained missing values more than is customary because even if an individual team member filled out all surveys, they would still have to be excluded from the analysis if no other members of their team completed the surveys, as there is no way to calculate “asymmetry” in this case. As such, where possible, we calculated averages to substitute for missing data in a single time period for a single individual. The sample size for individual and group level analyses will be provided in the results tables (Tables 5-7) below.

5.1 Group-level Analysis

We conducted repeated measures analysis using SAS Proc Mixed[1]. Results in Table 5 are from the analysis in which time was treated as both continuous and categorical, a recommended way to handle missing data (Littell, Milliken, Stroup and Wolfinger, 2007). For task conflict, we found a significant 3-way interaction (p<.01) and for relational conflict asymmetry our 3-way interaction borders on significance (p=.0571). However, these results cannot be interpreted as supporting H1 without looking at the plots (Figure 2).

Table 5. Longitudinal Analysis using Proc Mixed: Group Level Analyses for Task and Relational Conflict

Dependent Variable	Group Performance	
	Task conflict	Relational conflict
Group Size	-0.6261	-0.5076
Gender Heterogeneity	3.8769	6.03
Time	2.2753***	2.5388***
Mean group conflict	1.4096	-0.7163
Group Conflict Asymmetry	2.3703	-1.0992
Context (F2F=0, CMC=1)	-5.8348*	3.3625
Context* Group Conflict Asymmetry	-13.7211**	-0.8185
Context* Group Conflict Asymmetry*Time	2.9226**	1.7545+

*N=172; + p<0.1, * p < .050, ** p < .010, *** p < .001*

As can be seen from the results, although the negative impact of group task conflict asymmetry on performance is more detrimental for CMC teams than for F2F teams (the significant and negative interaction between context and GCA in Table 5), the impacts vary across time periods. In time 2, our CMC teams performed better with high group task asymmetry than F2F teams did, demonstrating that CMC teams are less adversely affected by task conflict asymmetry than F2F teams. Although this trend changed later. Overall, the significant 3-way interaction (in Table 5 and for task conflict) suggests that the negative impact of group task conflict asymmetry on performance is, overall, less detrimental in CMC teams. . For relational conflict, we noted CMC teams performed better in Time 2 than F2F when there was a lower level of relational conflict asymmetry, indicating that low group relational asymmetry has less detrimental impact on team performance for CMC than for F2F.

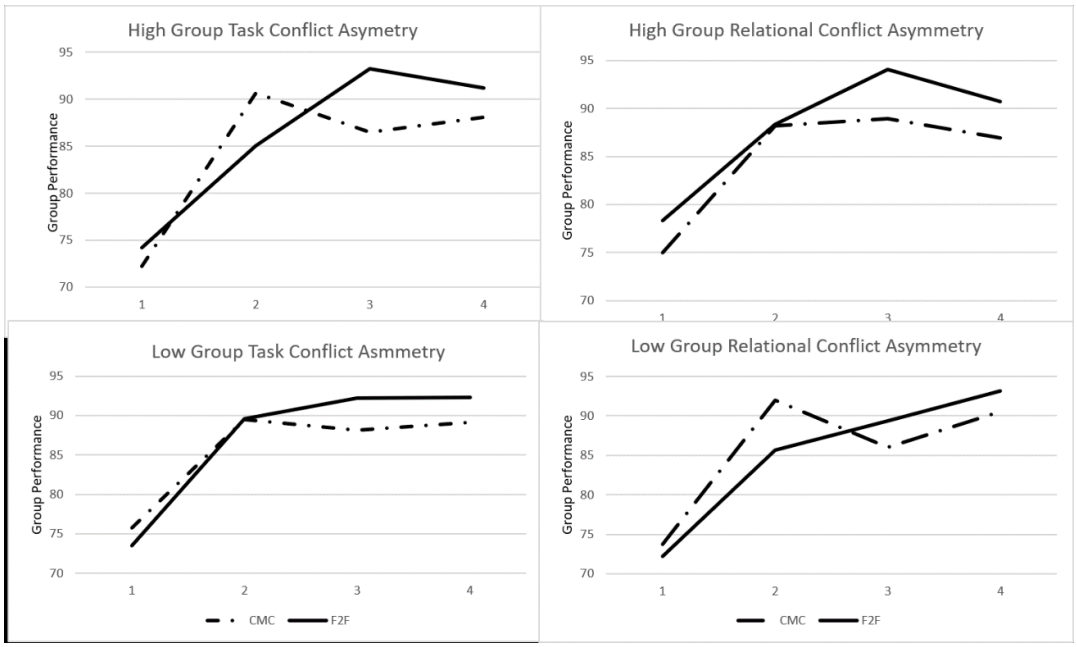

Figure 2. Plots for 3-way interactions of group-level findings

[1] In SAS Proc Mixed, time may be treated as a categorical and/or continuous variable. We repeated the analysis using time as categorical, as continuous, and as both categorical and continuous, and obtained consistent results—there were some differences in the significance level (e.g., P<0.01 vs. P<0.001), but these differences did not affect our hypotheses testing results. In the end, we presented results from the analysis in which time is used as both categorical and continuous, which is better suited when there is lots of missing data.

5.2 Individual-level Analysis

To test H2 we used three-level hierarchical linear modeling (HLM3), in which time was the level 1 variable, individual level variables were the level 2 variables, and group level variables were the level 3 variables. Compared with other techniques, HLM3 provides more complete analysis of repeated measures because it is able to examine systematic individual change patterns over time (Hofmann, Jacobs and Baratta, 1993). HLM also allows for the estimation of both static and longitudinal satisfaction parameters (represented as an intercept and slope term for each individual) and enables the analysis of both within- and between-individual satisfaction change patterns. Also, unlike other techniques, HLM can analyze both categorical and continuous independent variables at each level of analysis (Raudenbush and Bryk, 2002) and uses simultaneous estimation techniques. The simultaneous estimation technique removes concerns about the order in which effects are entered (Rumelt, 1991).

We first specified a null model (model 1), in which there were no independent variables. This enabled us to test whether there was significant variation in satisfaction, a prerequisite for supporting our hypotheses. In model 2, we tested the impact of time by adding a time vector (i.e. linear impact of time) to model 1, assuming that time has a similar impact on all individuals across CMC and F2F contexts. In model 3, we modeled a randomly varying linear trend, in which time may have different impacts across individuals across contexts (i.e., the rate of change differs for individuals and contexts). Because we were not sure whether time had similar impacts on different individuals in different contexts, we included both models 2 and 3 in our analysis. In model 4, we added individual level variables to the intercept, which enabled us to test the relationship between individual level variables and satisfaction. The effects were fixed at level 3, which means that the individual-level impacts on the satisfaction trend over time did not vary by the context (F2F vs. CMC). In model 5, individual-level variables were added to the slope as well, to test the moderating impacts of individual variables on the relationship between longitudinal trend and satisfaction. Similarly, in model 6, group-level variables (i.e. context) were added to the intercept while controlling for group mean conflict. Finally, context was added to the slope in model 7. The equations for all HLM models are in the Appendix.

The method of estimation was full maximum likelihood, and before running the analysis we confirmed that the normality assumption was met, and multicollinearity was not a concern. Using the HLM 7th package, we first analyzed model 1 (i.e., null model). According to Snijders and Bosker (1999), interclass correlation coefficients can be calculated in HLM3 to illustrate potentially unique interpretations about the dependent variable and where the variability exists for each level of analysis. The formula provided by Raudenbush and Bryk (2002) and Snijders and Bosker (1999) was used in our analysis. Results show that 53.88% of the variance was at level 1(i.e. within-individual difference), 28.48% was at level 2 (i.e. between-individual difference), and 17.64 % was at level 3 (i.e. between-group difference). Model comparison and path coefficients (without centering) are provided in Table 6 for task conflict and in Table 7 for relational conflict.

Table 6. Hierarchical Linear Modeling: Individual-level Analysis Results for Task Conflict

Dependent Variable	Satisfaction						
Variable	Model 1	Model 2	Model 3	Model 4	Model 5	**Model 6** [a]	Model 7
Time		-0.010	-0.010	-0.012	-0.012	**-0.013**	0.005
Individual Conflict Asymmetry (ICA)				-0.348***	-0.348***	**-0.344*** **	-0.350*
Time*ICA				0.127**	0.127**	**0.126** **	0.145*
Gender (M=1, F=0)					0.019	**-0.016**	-0.017
Context (CMC=0, F2F=1)						**0.449** **	0.539*
Mean group conflict (GAVG)						**0.134**	0.134
ICA*context							0.001
Time*context							-0.040
Time*ICA*context							-0.032
Deviance	2018.16	2018.06	1970.39	1954.71	1954.71	1948.67	1947.94
Parameter estimated	4	5	9	11	12	14	17
Model comparison							
Chi-square		0.09	47.66	15.67	0.007	6.03	0.73
DF		1	4	2	1	**2**	3
Model comparison p-value		>.500	<0.001***	<0.001***	>.500	0.047*	>.500

[a] N= 630 at level 1; N= 177 at level 2; N= 44 at level 3; † $p < .100$, * $p < .050$, ** $p < .010$, *** $p < .001$

We found that, for both task and relational conflict asymmetry, model 6 is better than the previous models. Adding the interaction between context and lower-level variables (i.e., context*ICA, context*time, and context*time*ICA) in model 7 did not significantly improve the model. Thus, our hypothesis related to the 3-way interaction of context, time and individual conflict asymmetry perceptions (H2) was not supported.

Table 7. Hierarchical Linear Modeling: Individual-level Analysis Results for Relational Conflict

Dependent Variable	Satisfaction						
Variable	Model 1	Model 2	Model 3	Model 4	Model 5	**Model 6** [a]	Model 7
Time		-0.010	-0.0102	-0.014	-0.014	**-0.015**	0.004
Individual Conflict Asymmetry (ICA)				-0.178	-0.178	**-0.183**	-0.273
Time*ICA				-0.013	-0.013	**-0.012**	0.035
Gender (M=1, F=0)					-0.008	**0.012**	0.013
Context (CMC=0, F2F=1)						**0.675*** **	0.755**
Mean group conflict (GAVG)						**-0.688*** **	-0.687***
ICA*context							0.200
Time*context							-0.039
Time*ICA*context							-0.100
Deviance	2018.16	2018.06	1970.39	1945.70	1945.70	1923.00	1921.03
Parameter estimated	4	5	9	11	12	14	17
Model comparison							
Chi-square		0.095	47.669	24.692	0.001	22.696	1.971
DF		1	4	2	1	**2**	3
Model comparison p-value		>.500	<0.001***	<0.001***	>.500	<0.001***	>.500

[a] N= 630 at level 1; N= 177 at level 2; N= 44 at level 3. † $p < .100$, * $p < .050$, ** $p < .010$, *** $p < .001$

6 Discussion

Jehn et al.'s (2010) results support the hypothesis that group conflict asymmetry is negatively related to group performance, while individual conflict asymmetry is correlated with high-conflict perceivers having lower satisfaction with the group and lower individual performance. Our results support a 3-way interaction at the group-level, while our individual-level results for conflict asymmetry reveal a 2-way interaction. A comparison of the findings of Jehn et al. (2010) and our replication study is provided in Table 8.

Table 8. Findings of Jehn et al. (2010) and Our Replication Study

Findings	Jehn et al. (2010)	Current Replication Study
Group Conflict Asymmetry	Group conflict asymmetry has a negative impact on group performance and creativity.	For CMC teams, high task-conflict asymmetry and low relational-conflict asymmetry early in the teams' interaction can have positive impacts on performance. High relational-conflict asymmetry is detrimental to CMC teams throughout their lifecycle, in comparison to F2F teams.
Individual Conflict Asymmetry	Individual conflict asymmetry leads high/low conflict perceivers to have lower/higher satisfaction with the group and lower/higher individual performance.	The negative correlation between high task-conflict asymmetry perceptions and satisfaction takes time to emerge.

6.1 Mediating Role of Communication Contexts and Time at Group Level

Our group-level analysis of F2F and CMC teams suggest that 1) for teams experiencing *high task-conflict asymmetry*, CMC teams outperformed F2F teams early on, but F2F team performance exceeded CMC teams after the midpoint in the team lifecycle, and 2) for teams experiencing *low relational-conflict asymmetry*, CMC teams outperformed F2F early on, with F2F teams catching up after the midpoint. Essentially, high task-conflict asymmetry and low relational-conflict asymmetry benefitted CMC teams with

higher performance earlier in their lifecycle, compared to F2F teams. As such, our CMC findings add to Jehn and colleagues finding suggesting that CMC may reduce the negative consequences of conflict asymmetry early in a team's lifecycle.

With regards to task-conflict asymmetry, one interpretation of this result is that the reductive capabilities of the collaborative media (Carte and Chidambaram, 2004) allowed teams to experience perceived task conflict asymmetry (i.e., members did not agree on the level of task conflict) without escalation, thereby reaping the positive benefits of task conflict. Further, these teams may have avoided relational conflict, sometimes the result of task conflict escalation (Jehn, 1997), which has generally been linked to poorer performance (De Dreu and Weingart, 2003). We turned our attention to the CMC team comments for additional explanation. In high-performing CMC teams, we observed that even when task conflict was raised, it was effectively addressed before escalating further through raising conflict in a civil manner (e.g., "*I think we should…*"), deferring power (e.g., "*I will change it or you can change it if you think that we should though. I have no problem with that.*"), democratically resolving conflict (e.g., "*Everyone try to get online at a certain time (I think it was 5:00 last time) and everyone vote on what you want to turn in"*), and even admitting to mistakes and apologizing (e.g., "*Sorry about that miscommunication…you were right, I just didn't see what I had.*").

Our observations explain and consolidate the conflicting findings on the linkage between task conflict and performance. Perhaps, when some members of a team perceive task conflict and act on it, the team can better avoid group think and more exploration of the solution space is encouraged, resulting in better team outcomes; whereas in teams where the majority of members disagree on how a task should be accomplished, performance is sacrificed while the team engages in lengthier and less productive conflict resolution efforts.

Conversely, lower levels of perceived relational conflict asymmetry simply meant that the team members were generally in agreement about the relational conflict perceived. Among our CMC teams, the common perception was that little relational conflict was being experienced. Again, the reductive capabilities of the technology could have minimized interpersonal reactions to communication (Carte and Chidambaram, 2004). Among our F2F teams, the emotional response to team communications were likely greater. Alternatively, agreement (or shared perception) about relational conflict may allow teams to assign a level of importance to the conflict resulting in greater efforts to resolve it (Jehn, 1997).

6.2 Moderating Role of Communication Contexts and Time at Individual Level

Consistent with previous findings (Chidambaram, 1996), our results indicate a significant relationship between context and satisfaction; our CMC team members were less satisfied with their groups than F2F members were. Further, for task conflict asymmetry perceptions, we found a significant two-way interaction between conflict asymmetry and time (plotted in Figure 3). Interestingly, our low-conflict perceivers were more satisfied early on than high-conflict perceivers. After the midpoint (Time 3), the high-conflict perceivers were more satisfied. Jehn et al. (2010) linked higher levels of individual task-conflict asymmetry to lower satisfaction using cross sectional data from in-tact teams. Our results, again using a measure of satisfaction with the outcome rather than the process, indicate that the negative correlation between high task-conflict asymmetry perceptions and satisfaction is consistent across measures. Our results also demonstrated a level of time sensitivity, providing an important insight for members and managers of virtual work groups.

Higher conflict perceivers, as it has been argued, are likely to devote more energy to discussing, resolving or ignoring the conflict they are feeling (Jehn, 1995) rather than working on the task, resulting in feelings of frustration (Swann, 1999) and stress over the future relationship with the team (Campbell, Simpson, Boldry and Kashy, 2005). This argument implies that as conflict escalates, it may become more personalized (Amason, 1996). While our findings do not negate these previous conclusions, they do offer an additional, temporal understanding of conflict; Individual perceptions of task-conflict that are asymmetric to the rest of the team are not problematic unless they persist over time. Our qualitative data further support this conclusion; as members felt persistently ignored, comments became more emphatic. For example, one member in a high conflict asymmetry team solicited inputs from two inactive members several times and sent the following message, addressing the other active member, after being ignored repeatedly:

"It looks like it's just me and you in this project. I just want to say that from here on out, I will give 0 points to other members in this group unless they give some input or actually do something… I think it is ridiculous that they haven't done one thing."

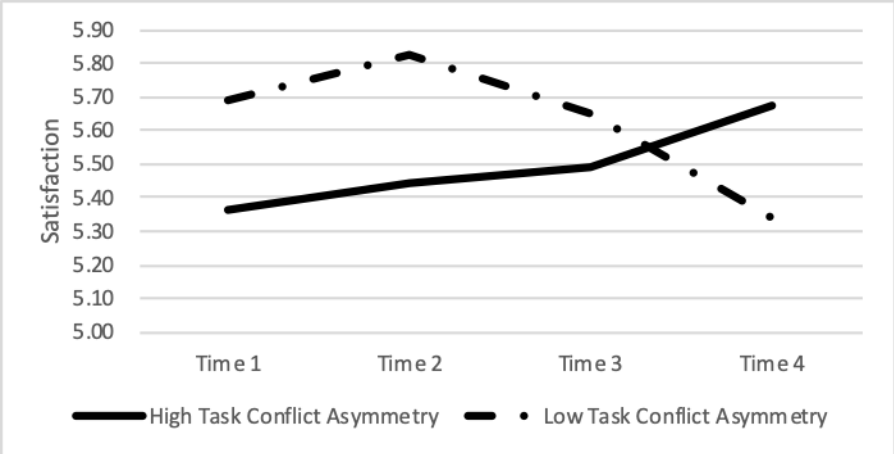

Figure 3. Task Conflict * Time Interaction

Our teams were students with minimal expectations of future interactions. As such, the specter of the "shadow of the future" likely had little impact on our participant's perceptions (Bouas and Arrow, 1996). Saunders and Ahuja (2006) argued that temporary distributed teams likely suppress relational conflict issues to stay focused on completing the assigned task (thus concluding their team-based interactions), whereas on-going teams need to address relational conflict to maintain healthy relationships going forward. We noticed several instances of such suppression in our qualitative analysis. For instance, after not hearing back from other members, one team member stated:

"I didn't know if either one of you were going to sign on again, so I put the report into the grade debriefing file. I will check back later this afternoon and delete it if any of you add a new report into the file."

Our findings provide some interesting temporal insights: First, they suggest that for CMC teams, high task-conflict asymmetry and low relational-conflict asymmetry early in the teams' interaction can have less of a negative impact on performance. Additionally, high relational-conflict asymmetry was detrimental to our CMC teams throughout their lifecycle (in comparison to F2F teams). This might best be interpreted through the hyper-personal model (Walther, 1996); our CMC team members over-relied on, and amplified, the limited cues available about their teammates. As such, early perceptions of animosity, personality differences, or annoyance were amplified, resulting in lower team performance compared to similar feelings among members of our F2F teams, who had more social cues. Further, individual perceptions of conflict may have been made even more salient to individuals as the less-personal communication channel may have made it seem that their teammates were not "listening."

7 Limitations and Future Research

In replicating Jehn et al.'s (2010) study, our work sheds light on the temporal and context-driven aspects of conflict asymmetry. In comparing our results to Jehn et al. (2010), we expected that in CMC contexts (compared to F2F contexts), asymmetry in conflict perceptions at the group-level may be *less* harmful for individuals within the teams, but those who perceive higher levels of conflict than their teammates may be *more* harmed compared to individuals who perceive less conflict than their teammates. Our results generally bore this out at the group-level; however, our individual-level results were less compelling. We recommend researchers to further investigate the differences in the group-level impacts of conflict asymmetry using larger samples. It is important to note here that we used an individual-level outcome measure for satisfaction with group outcomes rather than satisfaction with group process. This may have impacted the consistency of our results with Jehn et al.'s.

Further, while Jehn et al. (2010) studied existing organizational work groups, our sample consisted of zero-history student teams. Even though we believe that our sample was appropriate, and that our findings are generalizable to organizational teams working in computer-mediated contexts, future work utilizing field-based teams would be valuable. Finally, we examined the two main-effect hypotheses of Jehn et al. (2010), confining our focus to the outcomes of conflict asymmetry, to isolate and study the impacts of time and communication context. Future studies expanding on our work to include the antecedents and mediators of conflict asymmetry may provide useful insights to researchers and practitioners alike.

However, like all research, our study is not without limitations. First, our group-level sample was relatively small (44 teams) yet not much smaller than that (55 teams) of Jehn et al. (2010). Even though we expanded on the work of Jehn et al. (2010) by studying the temporal aspects of conflict asymmetry over 15 weeks, future studies could further improve our understanding of conflict asymmetry through the use of larger samples and/or longer duration studies. In addition, the longitudinal nature of our study introduced task variety that may need to be examined as an additional moderator.

Finally, given that our student teams had some flexibility about their meeting context (especially the "F2F" teams), there may be some noise in the data due to variance among our F2F teams, in the degree to which they met face-to-face versus used communication technology. These teams may be better considered as geographically collocated rather than strictly F2F.

8 Conclusion and Contributions

We make two key, cross-disciplinary contributions. First, our findings extend the literature on conflict asymmetry. In today's workplaces, and especially in this COVID-19 era, many projects are increasingly conducted in pure CMC settings. This trend will continue and grow as the technologically savvy generations constitute the majority of the workforce. Our paper also brought attention into the increasingly common fact that CMC teams are not confined to just one meeting; in fact, CMC teams often last a long period of time. By incorporating communication context and time in our study, we thus show that the impact of conflict asymmetry on individual and group outcomes is more complex and nuanced than was previously explored.

Second, we add to the technology impact and CMC literatures. Given the prevalence of technology and its increasing embeddedness in the communications and important fabrics of organizations and society, we highlighted yet another way in which technology impacts the way teams collaborate. We still, however, have a long way to go to fully understand the implications of technology. In this paper, we have demonstrated how technology, over time, moderates the impact of an important and inevitable aspect of work groups: conflict asymmetry.

For practitioners, understanding the differential impacts of conflict asymmetry between F2F and CMC teams and over time will enrich their managerial tools for conflict management. Managers first need to understand that not just conflict, but also conflict *asymmetry,* matters; conflict asymmetry is little discussed among practitioners, as evidenced by a lack of attention in practitioner publications (e.g., Brett and Goldberg 2017). More importantly, the effects of conflict asymmetry are nowhere close to uniform across different types of teams or across time. Managers should bear this fact in mind, and implement appropriate strategies and tactics, to mitigate the negative impacts of conflict asymmetry on collaboration.

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Appendix: Equations for All HLM Models

Model 1 (Null model):

$SATISfACTION_{tij} = \pi_{0ij} + e_{tij}$

$\pi_{0ij} = \beta_{00j} + r_{0ij}$

$\beta_{00j} = \gamma_{000} + u_{00j}$

Model 2:

$SATISfACTION_{tij} = \pi_{0ij} + \pi_{1ij}*(TIME_{tij}) + e_{tij}$

$\pi_{0ij} = \beta_{00j} + r_{0ij}$
$\pi_{1ij} = \beta_{10j}$

$\beta_{00j} = \gamma_{000} + u_{00j}$
$\beta_{10j} = \gamma_{100}$

Model 3:

$SATISfACTION_{tij} = \pi_{0ij} + \pi_{1ij}*(TIME_{tij}) + e_{tij}$

$\pi_{0ij} = \beta_{00j} + r_{0ij}$
$\pi_{1ij} = \beta_{10j} + r_{1ij}$

$\beta_{00j} = \gamma_{000} + u_{00j}$
$\beta_{10j} = \gamma_{100} + u_{10j}$

Model 4:

$SATISfACTION_{tij} = \pi_{0ij} + \pi_{1ij}*(TIME_{tij}) + e_{tij}$

$\pi_{0ij} = \beta_{00j} + \beta_{01j}*(ICA_{ij}) + r_{0ij}$
$\pi_{1ij} = \beta_{10j} + r_{1ij}$

$\beta_{00j} = \gamma_{000} + u_{00j}$
$\beta_{01j} = \gamma_{010}$
$\beta_{10j} = \gamma_{100} + u_{10j}$

Model 5:

$SATISfACTION_{tij} = \pi_{0ij} + \pi_{1ij}*(TIME_{tij}) + e_{tij}$

$\pi_{0ij} = \beta_{00j} + \beta_{01j}*(ICA_{ij}) + r_{0ij}$
$\pi_{1ij} = \beta_{10j} + \beta_{11j}*(ICA_{ij}) + r_{1ij}$

$\beta_{00j} = \gamma_{000} + u_{00j}$
$\beta_{01j} = \gamma_{010}$
$\beta_{10j} = \gamma_{100} + u_{10j}$
$\beta_{11j} = \gamma_{110}$

Model 6:

$$SATISfACTION_{tij} = \pi_{0ij} + \pi_{1ij}*(TIME_{tij}) + e_{tij}$$

$$\pi_{0ij} = \beta_{00j} + \beta_{01j}*(ICA_{ij}) + r_{0ij}$$
$$\pi_{1ij} = \beta_{10j} + \beta_{11j}*(ICA_{ij}) + r_{1ij}$$

$$\beta_{00j} = \gamma_{000} + \gamma_{001}(CONTEXT) + \gamma_{002}(MEAN_j) + u_{00j}$$
$$\beta_{01j} = \gamma_{010}$$
$$\beta_{10j} = \gamma_{100} + u_{10j}$$
$$\beta_{11j} = \gamma_{110}$$

Model 7:

$$SATISfACTION_{tij} = \pi_{0ij} + \pi_{1ij}*(TIME_{tij}) + e_{tij}$$

$$\pi_{0ij} = \beta_{00j} + \beta_{01j}*(ICA_{ij}) + r_{0ij}$$
$$\pi_{1ij} = \beta_{10j} + \beta_{11j}*(ICA_{ij}) + r_{1ij}$$

$$\beta_{00j} = \gamma_{000} + \gamma_{001}(CONTEXT_j) + \gamma_{002}(MEAN_j) + u_{00j}$$
$$\beta_{01j} = \gamma_{010} + \gamma_{011}(CONTEXT_j)$$
$$\beta_{10j} = \gamma_{100} + \gamma_{101}(CONTEXT_j) + u_{10j}$$
$$\beta_{11j} = \gamma_{110} + \gamma_{111}(CONTEXT_j)$$

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