Language in the Time of COVID: Sensitivity of Linguistic Alignment to Conversation Type and Communication Modality

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Abstract

The present study investigated the degree to which linguistic alignment is affected by communication medium and conversation type. To do so, we took advantage of the pandemic mitigation changes to reduce the spread of COVID-19 by shifting to engage with others over videoconferencing (VC) platforms or to meet face-to-face (FF) with public health constraints. We asked pairs of participants to conduct three conversations in one of three communication media. Here we analyze conversations from 23 dyads: 8 dyads who conversed FF, 8 who conversed in a laboratory VC set-up, and 7 who conversed in a remote VC set-up. Every dyad had an affiliative, an argumentative, and a task-based cooperative conversation. Results showed differences in lexical and syntactic alignment between conversation types. Interestingly, we also found interaction effects. These results point to changes in alignment based on communication constraints and provide support for the interpersonal synergies approach to conversation.

Keywords: conversation dynamics; interpersonal synergies; linguistic alignment; social interaction; videoconference.

Introduction

Following the beginning stages of the COVID-19 pandemic in 2020, much of the world instated lockdown procedures that radically changed our modes of communication. Our usual face-to-face (FF) interactions suddenly needed to include a physical distance of about 6 feet (182 cm), putting us more than an arm's length away from one another, often while also wearing face masks. To mitigate risk of transmission, many of us also moved our communications online through videoconferencing (VC) options, introducing other constraints in conversation by reducing the amount of nonverbal information (since most people show only their faces) and the altering linguistic and paralinguistic dynamics (since audio transmission changes the natural flow of conversation). While these changes were critical pandemic-abatement measures, many people anecdotally reported that communicating in these new ways changed how they felt about the interactions being had (e.g., Gilbert, 2020; Nguyen, 2021).

The current paper is part of a larger project that sought to empirically understand how these different constraints affect different kinds of interactions. Complementing other papers on differences in movement dynamics in these settings (Romero & Paxton, under review), we here focus on how different communication media might affect participants' linguistic similarity when having different types of conversation.

Communication Medium and Interaction

While some research has been done in the business world about the differences between FF and VC communication (e.g., Baltes et al., 2002, Credé et al., 2003; O'Conaill et al., 1993; O'Neill et al., 2016), fairly little research has approached this topic in the context of social conversations. Two prior studies stand out as being particularly relevant.

Sherman and colleagues (2013) compared interaction outcomes across four different kinds of communication media: in-person conversation, video chat, audio chat, and instant messaging. They found that friends' levels of bonding changed depending on the type of media used for the conversation, with the highest bonding for in-person conversation, followed by video chat. These findings point to the impact of communication medium on outcome, but it does not provide any insight into how conversations unfold nor about how medium might impact different kinds of communications.

More recently, Zubeck and colleagues (2022) compared interpersonal motor coordination in FF and remote VC conversations among friends and friendly acquaintances. Interpersonal movement coordination—or similarity of body movement—is an important component to successful social communication, especially during friendly conversations like those analyzed in their study. Zubeck and colleagues found that participants tended to exaggerate their communicative gestures during VC and that the stability of interpersonal coordination decreased in VC compared to FF interactions. Their work suggests that VC leads to distinct dynamics patterns, but as with Sherman et al. (2013), it leaves open questions about how medium might interact with conversation type to impact dynamics.

Linguistic Alignment and Interpersonal Synergies

Linguistic alignment (LA) refers to the idea that—as people hold conversations—their language becomes more similar to each other at multiple levels (Rasenberg et al., 2020). This can happen at the phonetic, lexical, syntactic, and semantic or conceptual levels. This convergence is generally thought to be positive and to facilitate communication among people

In M. Goldwater, F. K. Anggoro, B. K. Hayes, & D. C. Ong (Eds.), *Proceedings of the 45th Annual Conference of the Cognitive Science Society.*

(Branigan & Pickering, 2017).

Despite this fairly straightforward prediction, research to date has indicated that contextual constraints can affect alignment. For example, Dideriksen et al. (2022) found that spontaneously occurring conversations led to a higher rate of syntactic and lexical alignment than task-oriented conversations, but linguistic alignment in task-oriented conversations was higher than in spontaneous conversations. Duran et al. (2019) found differences in alignment during deceptive conversations but no differences when comparing agreement- versus disagreement-based conversations. Individual social factors can also impact alignment, such as being diagnosed with autism spectrum disorder (Stabile & Eigsti, 2022). While these studies suggest that LA is context-sensitive, precisely how that emerges is still unknown, potentially (partly) due to the different ways in which LA can be measured (Duran et al., 2019).

To help reconcile these differences, researchers have turned to the idea of interpersonal synergies. In this perspective, conversational partners come together to form a new dynamical system (Fusaroli et al., 2014, 2015; Paxton et al., 2016; Riley et al., 2011). The emergent structure of this new system is sensitive to the environment, constraints, and goals of the interaction, and the system flexibly reorganizes over time according to the pressures and goals of the system. Over time, these systems show more variance along task-irrelevant dimensions in order to minimize variance along task-relevant dimensions. In other words, the interpersonal system becomes more variable in dimensions that *don't* impact task performance so as to minimize variability in dimensions that *do* impact task performance.

If we approach conversation as a synergy, there should be a balance of both complementarity and repetition, depending on contextual constraints (Fusaroli & Tylen, 2015; Fusaroli et al., 2014). These constraints would include everything from conversation goals to physical settings. While it may not always be obvious from the outset how these dynamics will emerge, we would expect that—rather than simply becoming more similar over time across all settings—linguistic alignment might change based on how we hold conversations with one another and the goals of those conversations.

Current Study

Here, we take the interpersonal synergies approach to analyzing differences in language similarity based on conversation type and communication medium. To do so, we recruited pairs of participants—mostly strangers—to have different kinds of conversations (i.e., friendly conversations, arguments, and task-driven interactions) in different communication media (i.e., FF versus VC). While no previous work has yet directly tested the interaction between conversation goals and communication medium, we look to previous work for guidance in our hypotheses.

At the outset, it is important to note that this study was conducted during the COVID-19 pandemic, a period of sociocultural upheaval. Given the emergent properties of alignment, it is difficult to disentangle how the experimental constraints might interact with the particular mental and social impacts of the pandemic. For example, while this project includes typical face-to-face interactions, the additional constraints imposed by social distancing and masking. This makes direct comparisons to previous research extraordinarily difficult.

Hypotheses 1-2. We expected the task-oriented cooperative conversation to have the highest levels of syntactic and lexical alignment (H1; Dideriksen et al., 2019). However, we did not expect any differences between the affiliative and argumentative conversations (H2; Duran et al., 2019).

Hypotheses 3-4. No previous research (to our knowledge) has studied LA in VC social interaction. Driven by the audio limitations of VC, then, we expected there to be higher lexical and syntactic alignment in VC conversations than in FF conversations (H3). Given the need to coordinate tasks despite the audio limitations of VC, we expected more syntactic and lexical alignment during cooperative conversations held in VC than FF (H4).

Method

Corpus

This study is an analysis of a subset of data collected for a larger study comparing the impact of visual information about a conversation partner on movement dynamics (Romero & Paxton, 2021). This analysis was conducted with the subset of these data as a preliminary analysis given the time constraints of transcribing the data. Future analyses will include the entire dataset, once transcription is complete.

Due to space limitations, we here outline the overall study but go into detail only about the method that is relevant for the current analysis. More information about the entire study protocol can be found in Romero and Paxton (2021).

Participants

Twenty-three pairs of students enrolled in a small liberal arts college in the United States participated in the study. Age ranged from 18-22 years (M = 19.87, SD = 1.27). Participants were asked to share various demographics. In terms of gender, 68.89% identified as female, 26.67% as male, 2.22% as non-binary/genderfluid/gender non-conforming, and 2.22% as transmasculine. In terms of race and ethnicity, 46.67% identified as White, 26.67% as Asian, 8.89% as Latinx/Hispanic, 4.44% as Black/African-American, 2.22% as Native Hawaiian or Pacific Islander, 2.22% as Middle Eastern, 2.22% as European, and 6.67% as multi-racial.

Participants also individually indicated their prior knowledge of their partner. Of them, 71.11% claimed not to have met their partner before, and 28.88% indicated that they had. Of the participants that had met before, 46.15% indicated being acquaintances, 30.77% being classmates, and 23.10% being friends.

Table 1: Results of linear mixed-effects model predicting the log of turn-to-turn lexical unigram (left) and bigram (right) alignment with time (in turns), condition, conversation type. Random intercept of dyad. Addition of random slope of conversation type for bigram only.

	Lexical unigram alignment		
Predictors	*Estimates*	*CI*	*p*
Intercept	-1.29	-1.40 – -1.18	**<0.001**
Time	0	-0.00 – 0.00	0.912
VC Remote	0.09	-0.06 – 0.24	0.253
VC Lab	0.01	-0.13 – 0.15	0.912
Arg.	0.18	0.08 – 0.29	**0.001**
Coop.	-0.18	-0.26 – -0.10	**<0.001**
VC Remote x Arg.	-0.02	-0.19 – 0.14	0.787
VC Lab x Arg.	0.22	0.06 – 0.37	**0.006**
VC Remote x Coop.	0.08	-0.05 – 0.22	0.231
VC Lab x Arg.	0.06	-0.07 – 0.18	0.367
Marginal R^2	0.054		
Conditional R^2	0.083		

	Lexical bigram alignment		
Predictors	*Estimates*	*CI*	*p*
Intercept	-2.32	-2.52 – -2.11	**<0.001**
Time	0	-0.00 – 0.00	0.562
VC Remote	-0.09	-0.39 – 0.21	0.558
VC Lab	-0.06	-0.33 – 0.21	0.683
Arg.	-0.09	0.40 – 0.21	0.546
Coop.	0.07	-0.15 – 0.28	0.539
VC Remote x Arg.	0.31	-0.16 – 0.78	0.198
VC Lab x Arg.	0.16	0.27 – 0.59	0.468
VC Remote x Coop.	-0.22	-0.55 – 0.11	0.184
VC Lab x Arg.	0.06	-0.25 – 0.36	0.718
Marginal R^2	0.016		
Conditional R^2	0.108		

Materials and Procedures

The current study was a mixed design, including one between-subjects component (condition) and one within-subjects component (conversation type).

Pre-Interaction Survey. Participants were asked to complete an online questionnaire at least 3 hours prior to the beginning of the study. In this survey, participants rated their position, opinions, and opinion strength on a variety of social and political topics (e.g., death penalty, abortion, ethical responsibilities of celebrities). At the end of the questionnaire, each participant listed their preferences in TV shows, movies, and music.

Conversation Modality (Condition). Each dyad completed the study through one of three conditions: face-to-face laboratory (FF), videoconference remote (VC Remote), and videoconference laboratory (VC Lab). To better allow participants to understand and choose their level of exposure to others during the pandemic, participants signed up for the experiment for the kind of modality (or condition) in which they would be conversing.

FF (*n = *8 dyads). Participants convened at a laboratory space on campus. They were asked to follow CDC and campus-wide pandemic preventative measures, such as wearing face coverings and using hand sanitizer. During their conversations participants were in a large room seated facing each other 6 ft apart (182 cm). A hanging microphone was placed between them to capture the audio of their conversation. Dyads also had access to two separate small rooms where they completed the informed consent process online, as well as interaction surveys between conversations.

***VC Remote (*n = *7 dyads)*.** Once participants signed up to participate in the study, they were emailed the link to the VC call that would be taking place. Once the study time started, a member of the research team started the call. The experimenter turned on their video briefly to introduce the study and answer any initial questions. Then, they sent the survey link to the participants through the chat function on the platform and asked them to complete the informed consent portion of the survey. Once completed, they were directed to come back to the VC call to start the experimental session. From this point, the experimenter provided instructions with no video feed.

***VC Lab (*n = *8 dyads)*.** Participants met at a laboratory space on campus. They were placed in separate rooms with identical setups: a desktop computer (Dell All-in-One with built-in speakers), webcam with a built-in microphone (Microsoft LifeCam Studio), and a projector. After the informed consent process, they sat in a chair in the middle of the room in front of a wall, onto which the VC video feed of their partner was projected. (No self-view was shown.) The projector was placed 295 cm away from the wall creating a projected image 129.5 × 200.6 cm on the wall. The webcam was placed by the wall in front of the participant (109-177 cm away), ensuring that their whole torso was visible in the frame. Once both participants were situated, the experimenter closed the doors to those rooms. The experimenter then sat in a third room from which they provided instructions through the VC call without video. The experimenter then told participants to remove their face-mask if they felt comfortable doing so, since they were in a building with good air circulation and separated from any other person physically. They were allowed to keep them on if they so wished, but all participants chose to take off their face coverings.

Informed Consent and Introductions. Upon arrival at the experiment, participants read an informed consent form on a computer. They completed this process while being allowed to ask any questions. After informed consent, dyads were instructed to introduce themselves to one another briefly.

Conversations. After introductions, each dyad held three different conversations; each conversation lasted 8-10

min. The order of conversations was counterbalanced in one of six orders and randomly assigned before the experiment started. After each conversation, they were asked to complete an interaction survey on a computer where they rated how they subjectively felt about the interaction; these data are not analyzed here. We describe each conversation type in more detail below.

Affiliative (Aff.). Following previous work (Paxton & Dale, 2013), each dyad was asked to talk about things that they enjoy (e.g., hobbies, movies, music), to find something that they both enjoy, and to discuss why they enjoy it.

Argumentative (Arg.). Following previous research (Paxton & Dale, 2013), each dyad was instructed to discuss a topic and try to convince one another of their opinion. To elicit a truly argumentative conversation, topics were selected from the opinion questions by identifying topics on which the participants in the dyad wrote differing opinions and for which they each indicated feeling strongly about their opinion. If participants stopped talking or came to a resolution before 8 min had elapsed, the experimenter stopped the conversation and assigned the second highest ranking topic as the new prompt for the remainder of the time.

Cooperative Task-Based (Coop.). Participants were instructed to discuss and come to an agreement about a number of objects they would take if they knew they would be stranded on a deserted island. To constrain the conversation, they were told that they would only be allowed to take a shoebox with the items. By the end of the conversation, they had to agree on a list of objects.

Demographics Survey and Debriefing. After the study session, participants answered an online demographics survey and indicated whether they knew their partner prior to the study session. If they said they knew their partner prior to the study, they were asked to indicate the nature of their relationship (e.g., acquaintance, friend). After completing this survey, participants were debriefed and thanked for their participation by a member of the research team.

Data Preparation and Analyses

Each conversation was manually transcribed from the video recordings. These transcripts were then analyzed with ALIGN (Duran et al., 2019) to extract metrics of turn-to-turn cosine similarity in participants' lexical and syntactic patterns. We included measures of unigram and bigram lexical and syntactic alignment. In brief, ALIGN calculates this by creating vectors of the language structures (in one-word and then two-word sequences) for each turn and then calculating the cosine similarity between conversation partners' sequential turns. Additional technical detail is available in Duran et al. (2019). To ensure that our data better fit assumptions of normality, we took the log of the lexical alignment values.

We then created linear mixed effects models to identify differences in multi-level language alignment due to the contextual constraints imposed by the experimental paradigm (Bates et al., 2014; R Core Team, 2020). Categorical variables were contrast-coded, with the FF condition and the affiliative conversation type serving as reference categories. Each model included dyad as a random intercept with the maximal random slope permitted by the data. All code for the project is publicly available on our GitHub repository: https://github.com/a-paxton/multilevel_linguistic_alignment_across_modalities.

Results

For clarity and completeness, we present all results of all analyses run in tables. For our readers, we do not include any test statistics in the text; instead, we point our readers to the appropriate tables for additional detail.

Table 2: Results of linear mixed-effects model predicting the log of turn-to-turn syntactic unigram (left) and bigram (right) alignment with time (in turns), condition, conversation type. Random intercept of dyad. Addition of random slope of conversation type for bigram only.

	Syntactic unigram alignment		
Predictors	*Estimates*	*CI*	*p*
Intercept	0.53	0.49 – 0.58	**<0.001**
Time	0	-0.00 – -0.00	**0.028**
VC Remote	0.03	-0.04 – 0.09	0.443
VC Lab	0.01	-0.05 – 0.07	0.744
Arg.	0.1	0.05 – 0.16	**<0.001**
Coop.	-0.01	-0.05 – 0.04	0.823
VC Remote x Arg.	0	-0.09 – 0.08	0.941
VC Lab x Arg.	0.06	-0.02 – 0.14	0.124
VC Remote x Coop.	0.03	-0.05 – 0.10	0.438
VC Lab x Arg.	0.01	-0.06 – 0.08	0.752
Marginal R^2	0.046		
Conditional R^2	0.099		

	Syntactic bigram alignment		
Predictors	*Estimates*	*CI*	*p*
Intercept	0.22	0.18 – 0.26	**<0.001**
Time	0	0.00 – -0.00	**<0.001**
VC Remote	0.04	-0.02 – 0.10	0.177
VC Lab	0	-0.05 – 0.05	0.911
Arg.	0.09	0.03 – 0.15	**0.002**
Coop.	-0.03	-0.06 – 0.00	0.076
VC Remote x Arg.	0.01	-0.09 – 0.10	0.901
VC Lab x Arg.	0.1	0.02 – 0.19	**0.015**
VC Remote x Coop.	0.02	-0.02 – 0.07	0.336
VC Lab x Arg.	0.02	-0.02 – 0.06	0.299
Marginal R^2	0.109		
Conditional R^2	0.201		

Lexical Unigram Alignment (Table 1, Fig. 1). Compared with affiliative conversations, arguments showed higher turn-to-turn unigram lexical alignment, and cooperative conversations showed lower unigram lexical alignment. In other words, people tended to re-use individual words from an immediately preceding turn most when having an argument and least when trying to complete a cooperative task. Additionally, compared with FF affiliative conversations, VC lab arguments showed higher unigram lexical alignment. No other main or interaction terms reached statistical significance.

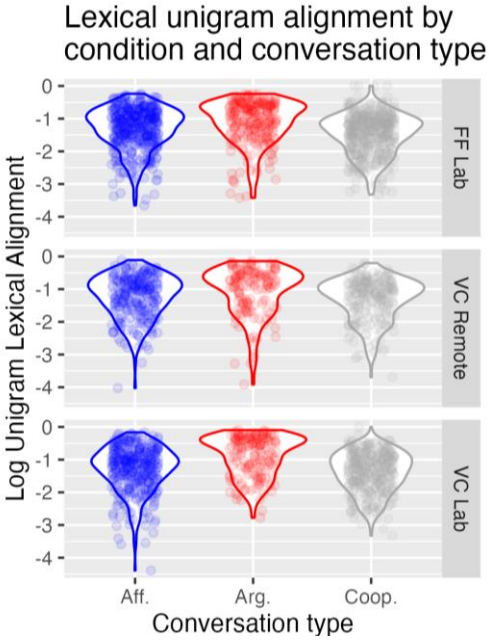

Figure 1: Violin plot of turn-to-turn lexical unigram alignment by condition and conversation type. Individual turn-to-turn values as points.

Lexical Bigram Alignment (Table 1). No effects reached statistical significance.

Syntactic Unigram Alignment (Table 2, Fig. 1b). Across turns, syntactic alignment decreased across all conversations and conditions. Syntactic alignment was higher during argumentative conversations than affiliative conversations.

Syntactic Bigram Alignment (Table 2, Fig. 1c). Main effects for syntactic bigram alignment were consistent with syntactic unigram alignment. Specifically, syntactic alignment decreased over time and increased in the argumentative conversations. Interestingly, we also observed interaction effects consistent with those for analyses of lexical unigram alignment: VC lab argumentative conversations showed significantly higher syntactic alignment than FF affiliative conversations. Additionally, compared with affiliative conversations, cooperative conversations trended toward having lower syntactic bigram alignment, although it did not reach statistical significance.

Discussion

The current study aimed to explore how different contextual demands affect linguistic alignment. To do so, we looked at how communication medium and type of conversation might affect lexical and syntactic alignment. Based on previous research, we predicted that there would be differences in alignment based on type of conversation (H1 & H2), that there would be overall differences that arise due to the communication medium (H3), and that constraints would interact (H4). While we did find that lexical and syntactic alignment unfolded differently depending on conversation type and communication modality, they did not show our hypothesized patterns. Due to the small sample size, these are preliminary results; we will expand these analyses to include the full dataset in the future.

Based on earlier research (Duran et al., 2019), we did not expect differences in alignment between affiliative and argumentative conversations (H2). However, we found here that alignment was consistently higher in arguments across all levels. Intriguingly, Duran and colleagues observed no difference in lexical or syntactic alignment between argumentative and agreement conversations—again, in contrast to the current findings. This difference may be due to critical differences between the current study and the previous one: In the current work, the affiliative conversation asked participants to identify something that they both enjoyed, while the agreement conversation in the previous study asked participants to discuss a contentious topic that the experimenters had already identified as a point of agreement. It may be, then, that our participants' higher lexical and syntactic alignment in the argumentative conversation reflects their attempts to (as instructed by the experimenter) "stay on topic or closely related topics," while the lower alignment in affiliative conversations reflects their attempts to "search" (both cognitively and linguistically) for similarities. Future work could take a more content-focused approach to test this, identifying what kinds of words and ideas tend to be re-used between these conditions.

The constraints imposed by the conversation condition may also help explain why—again, in contrast to our expectations (H1)—linguistic alignment was lower in cooperative conversations than affiliative ones. We had expected that a higher proportion of on-topic conversation would have led to a higher amount of similar language, especially given that participants were explicitly instructed to *agree* on a specific list of items by the end of their conversation. However—as with the idea of "searching for similarities" noted above—it may be that their lower similarity in lexical items may reflect participants' on-task behavior as they "search" for survival items that would fit in a shoebox. In other words, given a very short period of time, a very unfamiliar scenario, and a very small target space, the constraints of the task may have pushed participants to further explore their conceptual space for possible items. Discussing each of these items—as well as their potential uses and the arguments for their utility—could lead to lower turn-to-turn alignment. Future analyses could test this idea by widening

the window of lexical alignment under consideration: As participants converge on a set of items or compare alternatives, we would expect there to be increasing lexical similarity over time.

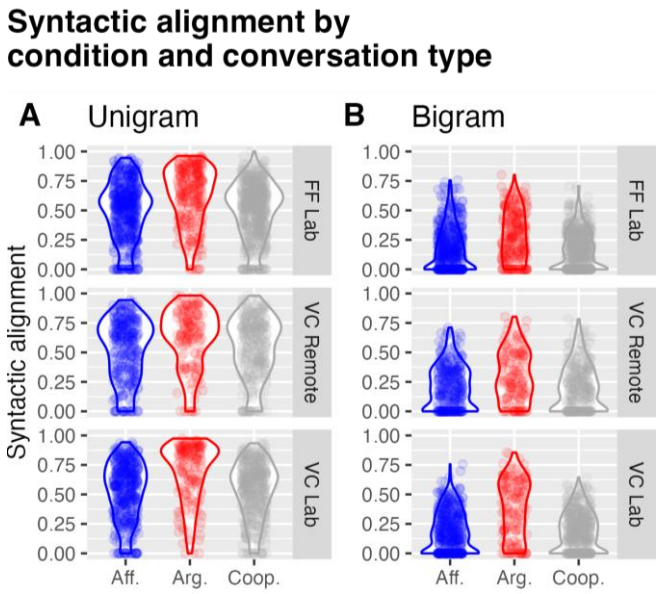

Figure 2: Violin plots of turn-to-turn syntactic alignment by condition and conversation type for both unigrams (A) and bigrams (B). Individual turn-to-turn values as points.

We also expected differences in alignment to appear based on condition, or the communication medium through which conversations unfolded (H3). Without previous research in this area, we hypothesized that—given the constraints imposed by audio in VC—alignment would increase in these situations in order to make up for the reduced visual information about their partner. However, lexical and syntactic alignment overall were unaffected by modality. Another important contextual difference imposed by our experiment was the use of face masks in the FF condition and but not in the VC conditions. This might also lead to a loss of information that is comparable to the loss of visual and audio information in the VC conditions, similar to our findings in analyses of body movement (Romero & Paxton, under review).

This finding could also be explained by shifting our understanding of conversation away from *alignment* and toward a *synergy* (Riley et al. 2011). In the present study, the differences in alignment during communication medium may not have been as task-relevant as we had expected: While there may be differences in phenomenological experience of VC conversations (e.g., Gilbert, 2020; Nguyen, 2021), those differences would not be attributable solely to the medium through which participants held the conversation. This finding aligns with a growing body of literature identifying empirical differences in patterns of alignment across task-relevant versus task-irrelevant domains (e.g., Duran et al., 2019; Paxton & Dale, 2017; Ramenzoni et al., 2011; Romero et al., 2015).

The synergies theoretical framework may similarly help explain why the interaction of condition and conversation type showed a different pattern than expected (H4). Based on our other hypotheses, we expected that task-based conversations over VC would show the most linguistic alignment, but instead, we found the highest alignment in argumentative conversations held over VC when compared to affiliative conversations held FF. Moreover, we found no differences in alignment when comparing affiliative FF conversations and task-based conversations, regardless of communication modality. Coupling our potential explanations about our observed patterns of simple effects of conversation type and condition, it may be that the particular pressures of that particular set of conditions—specifically, trying to weave together a cohesive argument about a personally held opinion over a computer-mediated interaction within a relatively formal and unfamiliar setting—may lead to increased re-use of linguistic and syntactic structures compared to other conditions. It is particularly interesting that—even for arguments—the lab-based VC condition differed from lab-based face-to-face condition but that the remote VC condition did not. Future work should examine whether this might be attributable to ease or comfortability (indexed here through being at a self-chosen location versus being in a lab setting), to individual- or group-level differences in the participants across conditions (since participants signed up for each communication medium on their own, potentially leading to differences by social anxiety or other factors), or to something else entirely (e.g., time on task).

One critical consideration for the current work, however, is the particular sociocultural moment in which these interactions took place. These data were collected across two years of rapid change, spanning multiple phases of a global pandemic that radically altered social dynamics and mental health (e.g., Bland et al., 2022; Xiao et al., 2022). While the COVID-19 pandemic will continue to have long-term effects on individuals and society, some of the differences that we observe here may be due to the particular impacts of social isolation, anxiety, and cultural norms of the pandemic. Future work must continue to investigate these questions to identify the particular constraints that—in a synergies perspective—would cause these interpersonal dynamics to emerge.

Conclusion

Communication dynamics—like the amount of similarity in our language structures—are shaped by our conversation settings and goals. Here, we explored how lexical and syntactic alignment changed during friendly conversations, arguments, and task-focused interactions held face-to-face or over videoconference. We found that conversation goals and medium shaped interpersonal alignment, supporting the *interpersonal synergies* approach (Fusaroli & Tylén, 2015; Riley et al., 2011). Put simply, while similarity may be functional in some contexts, we must better understand the roles that complementarity and novelty play in other contexts.

References

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2014). *Fitting linear mixed-effects models using lme4*. arXiv preprint arXiv:1406.5823.

Baltes, B., Dickson, M. W., & Bauer, C. C. (2002). Computer-mediated communication and group decision making: *Organizational behavior and human decision processes, 87*(1), 156-179. https://doi.org/10.1006/obhd.2001.2961

Bland, A. R., Roiser, J. P., Mehta, M. A., Sahakian, B. J., Robbins, T. W., & Elliott, R. (2022). The impact of COVID-19 social isolation on aspects of emotional and social cognition. *Cognition and Emotion*, 36(1), 49-58.

Branigan, H. P., & Pickering, M. J. (2017). Structural priming and the representation of language. *Behavioral and Brain Sciences, 40*, 1-18.

Credé, M., & Sniezek, J. A. (2003). Group judgment processes and outcomes in videoconferencing versus face-to-face groups. *International Journal of Human-Computer Studies, 59*(6), 875–897. https://doi.org/10.1016/J.IJHCS.2003.07.001

Dideriksen, C., Christiansen, M. H., Tylén, K., Dingemanse, M., & Fusaroli, R. (2022). Quantifying the interplay of conversational devices in building mutual understanding. *Journal of Experimental Psychology: General*. https://doi.org/10.1037/xge0001301

Dale, R., Kirkham, N. Z., & Richardson, D. C. (2011). The dynamics of reference and shared visual attention. *Frontiers in psychology, 2*, 355.

Duran, N. D., Paxton, A., & Fusaroli, R. (2019). ALIGN: Analyzing linguistic interactions with generalizable techNiques—A Python library. *Psychological Methods*, *24*, 419–438. https://doi.org/10.1037/met0000206

Fusaroli, R., Rączaszek-Leonardi, J., & Tylén, K. (2014). Dialog as interpersonal synergy. *New Ideas in Psychology, 32*, 147–157. https://doi.org/10.1016/j.newideapsych.2013.03.005

Fusaroli, R., & Tylén, K. (2015). Investigating conversational dynamics: Interactive alignment, interpersonal synergy, and collective task performance. *Cognitive Science*, 1–27. https://doi.org/10.1111/cogs.12251

Gilbert, A. (2020, October 30). Pandemic Grandparenting, Beyond the Dreary Video Calls. *The New York Times.* https://www.nytimes.com/2020/10/30/well/family/pandemic-grandparents-grandchildren-connection.html

Nguyen, V. T. (2021, February 15). Opinion | I Actually Like Teaching on Zoom. *The New York Times.* https://www.nytimes.com/2021/02/15/opinion/zoom-video-school-teaching.html

O'Conaill, B., Whittaker, S., & Wilbur, S. (1993). Conversations Over Video Conferences: An Evaluation of the Spoken Aspects of Video-Mediated Communication. *Human–Computer Interaction, 8*(4), 389–428. https://doi.org/10.1207/s15327051hci0804_4

O'Neill, T. A., Hancock, S. E., Zivkov, K., Larson, N. L., & Law, S. J. (2016). Team decision making in virtual and face-to-face environments. *Group Decision and Negotiation, 25*(5), 995–1020.

Paxton, A., & Dale, R. (2013). Frame-differencing methods for measuring bodily synchrony in conversation. *Behavior Research Methods, 45*(2), 329–343. https://doi.org/10.3758/s13428-012-0249-2

Paxton, A., Dale, R., & Richardson, D. C. (2016). Social coordination of verbal and nonverbal behaviours. In P. Passos, K. Davids, & J. Y. Chow (Eds.), *Interpersonal Coordination and Performance in Social Systems. New York: Routledge.*

Paxton, A., & Dale, R. (2017). Interpersonal movement synchrony responds to high-and low-level conversational constraints. *Frontiers in Psychology*, 8, 1135.

R Core Team. (2020). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing.

Ramenzoni, V. C., Davis, T. J., Riley, M. A., Shockley, K., & Baker, A. A. (2011). Joint action in a cooperative precision task: nested processes of intrapersonal and interpersonal coordination. *Experimental Brain Research*, 211, 447-457.

Rasenberg, M., Özyürek, A., & Dingemanse, M. (2020). Alignment in multimodal interaction: An integrative framework. *Cognitive Science, 44*(11), e12911.

Riley, M. A., Richardson, M. J., Shockley, K., & Ramenzoni, V. C. (2011). Interpersonal Synergies. *Frontiers in Psychology, 2*, 1-7.

Romero, V., Kallen, R., Riley, M. A., & Richardson, M. J. (2015). Can discrete joint action be synergistic? Studying the stabilization of interpersonal hand coordination. *Journal of Experimental Psychology Human Perception and Performance, 41*(5), 1223-1235.

Romero, V. & Paxton A. (2021)**.** Registered Report: Stage 1: Visual Information and Communication Context as Modulators of Interpersonal Coordination in Face-to-Face and Videoconference-Based Interactions. *Acta Psychologica, 221*, 103453. https://doi.org/10.1016/j.actpsy.2021.103453

Romero, V. & Paxton A. (under review)**.** Registered Report: Stage 2: Visual Information and Communication Context as Modulators of Interpersonal Coordination in Face-to-Face and Videoconference-Based Interactions. *Acta Psychologica*

Sherman, L. E., Michikyan, M., & Greenfield, P. M. (2013). The effects of text, audio, video, and in-person communication on bonding between friends. Cyberpsychology: *Journal of Psychosocial Research on Cyberspace, 7*(2), Article 3. https://doi.org/10.5817/CP2013-2-3

Stabile, M., & Eigsti, I.-M. (2022). Lexical Alignment and Communicative Success in Autism Spectrum Disorder. *Journal of Speech, Language, and Hearing Research*, *65*(11), 4300–4305. https://doi.org/10.1044/2022_JSLHR-22-00314

Xiao, Y., Yip, P. S. F., Pathak, J., & Mann, J. J. (2022). Association of social determinants of health and vaccinations with child mental health during the COVID-19 pandemic in the US. *JAMA Psychiatry*, 79(6), 610-621.

Zubek, J., Nagórska, E., Komorowska-Mach, J., Skowrońska, K., Zieliński, K., & Rączaszek-Leonardi, J. (2022). Dynamics of Remote Communication: Movement Coordination in Video-Mediated and Face-to-Face Conversations. *Entropy*, *24*(4), Article 4. https://doi.org/10.3390/e24040559