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Truth-tellers' and liars' synchrony during attitude-inconsistent conversations

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The recently-proposed strategic synchrony hypothesis holds that deceivers (more than truth-tellers) use nonverbal synchrony as a way to maintain their credibility and the smooth flow of interactions. However, important questions remain as to how an interaction partner's behavior and the topic of interaction qualify the strategic synchrony hypothesis. This study considered whether naïve participants (i.e., truth-tellers and deceivers) synchronize differently to high- and low-involvement partners (i.e., confederates) depending on whether the partners discuss climate change or tuition increases, two salient conversational topics for our participants. Deceivers who discussed climate change with a high-involvement partner were especially likely to subjectively perceive that both they themselves and their partner initiated synchrony during the discussion of climate change. However, objective automated analyses of bodily movement synchrony revealed a different set of findings: Dyads with a truth-teller demonstrated higher increases in synchrony than dyads with a deceiver when moving from a superficial discussion of what they liked about their university to a direct discussion of climate change. Results are discussed in terms of how they advance the strategic synchrony hypothesis.

KEYWORDS

strategic synchrony hypothesis, communication accommodation theory, interpersonal deception theory, interactional synchrony, cross-wavelet transform, motion energy analysis

1. Introduction

Deceptive communication represents a vast area of interdisciplinary research. Alongside other promising approaches, the examination of dyadic synchrony might help illuminate the dynamics of deceptive interactions (Dunbar et al., 2011). *Interactional or nonverbal synchrony* is the rhythmic coordination of behavior over time, with such coordination generally perceived as mutually rewarding (Toma, 2014). For instance, synchronous interactions have been associated with a variety of prosocial outcomes, including increased affiliation, rapport, and prosocial behavior (Bernieri, 1988; Hove and Risen, 2009; Cirelli et al., 2014). Bernieri and Rosenthal (1991) proposed that synchrony is composed of three components: simultaneous movement, rhythm, and the smooth meshing of interaction. Synchrony can target different behaviors (one speaker's hand gestures and another speaker's nodding). Thus, the measurement of synchrony is complex given the plethora of body parts capable of movement and the time-unfolding nature of this movement (Schmidt et al., 2012). Given its emphasis on simultaneous and rhythmic moving between two people, synchrony is a dyadic-level construct. Also, synchrony analysis for countless combinations of body parts would require an unreasonable number of tests. Therefore, in an effort to use synchrony to detect deception, we examine (1) automated spectrum analysis of synchrony in terms of body movement as a whole (i.e., a general and objective assessment of synchrony in head nods, gestures, leg and foot movements, body orientation, and other channels involving body movement; see Issartel et al., 2014) and (2) participants' subjective perceptions

of nonverbal synchrony as a whole. The automated measure is useful to illustrate what the communication was actually like, whereas the subjective measure is helpful to understand how interactants felt about their communication. Both are imperfectly correlated (r = 0.43, Fujiwara et al., 2021) such that they will play a complementary role to understand synchrony.

We were interested in how involvement, the discussion topic, and veracity together predict nonverbal synchrony. *Involvement* refers to the level of responsiveness and engagement that a person shows in an interaction. Given its emphasis on one person's level of responsiveness and engagement, involvement is an individual-level construct. High involvement is characterized by nonverbal behaviors that convey interest, engagement, and close proximity. Low involvement, on the other hand, is characterized by nonverbal behaviors that convey a lack of interest, lack of participation, and greater distance (Burgoon et al., 1999). *Veracity* is the truthfulness or accuracy of a statement. In the sections that follow, we first use communication accommodation theory (e.g., Giles, 2016) to explain how interactional involvement might predict synchrony. We then invoke interpersonal deception theory (e.g., Buller and Burgoon, 1996; Burgoon and Buller, 2015) and the strategic synchrony hypothesis (Dunbar et al., 2020) to show how veracity might predict synchrony. Next, we consider how interactional involvement and veracity might together predict synchrony. Finally, we consider how the topic of discussion (climate change vs. tuition increases) might qualify the role of interactional involvement and veracity in predicting synchrony. Throughout the remainder of the paper, we refer to the naïve participant as the "participant," and we refer to the confederate as the "confederate" or the "partner."

1.1. Interactional involvement as a predictor of synchrony

Communication accommodation theory (CAT; e.g., Giles, 2016) helps explicate why a partner's involvement may predict the extent to which a participant synchronizes with the partner. Convergence manifests in one person's adjustments of their behaviors to become more similar to and synchronous with their partner's behaviors (Dragojevic et al., 2016), which can be studied with respect to how participants adjust a single cue, such as their gestures. Convergence can also be studied as a blend of various cues (e.g., forward leaning, smiling, head nodding, and gesturing; Fujiwara and Daibo, 2016). In this study, the automated analyses focus on how bodily movements *as a whole* synchronize across a variety of channels (e.g., head nods, facial expressions, gestures, forward leans, posture shifts, leg and foot movements), for a composite indicator of synchrony.

In contrast, divergence involves the participant adjusting their behaviors to become more dissimilar to those of the partner (Giles and Wadleigh, 2008; Dragojevic et al., 2016). Meta-analysis has shown such dissimilarity to be associated with lower perceptions of communication quality and other adverse phenomena (Soliz and Bergquist, 2016). Communicative and psychological differences are thus exacerbated during divergent encounters, and divergence can be used to show that the participant does not desire affiliation with the partner (Van Hofwegen, 2015). Maintenance, in which the participant retains their default communicative tendencies without adjusting toward or away from the partner is yet another key pattern. Similar to divergence, maintenance can convey that the participant does not desire affiliation with the partner (Giles et al., 1991, 2013). In contrast to convergence (which would theoretically result in more synchrony), divergence and maintenance would theoretically result in less synchrony. Whereas convergence, divergence, and maintenance can be determined jointly or symmetrically, one interlocutor, known as the *zeitgeber* or time-giver, can asymmetrically set the pace (Burgoon et al., 2014). In CAT terminology, when one person is taking the lead in initiating synchrony without the other person responding in-kind, the person initiating synchrony would be engaging in asymmetrical convergence. Knowing whether one participant is taking the lead or the synchrony is jointly enacted may help understand dominance and also whether the synchrony is strategic or spontaneous (e.g., Wiltermuth, 2012; Hofmans et al., 2019).

When engaging in conversations, participants hold expectations for optimal communication partly grounded in situational and social norms (Burgoon, 1978; Giles and Gasiorek, 2013). During first-time conversations between previously-unacquainted individuals, participants consider the degree of involvement their partners demonstrate in the interaction and the extent to which they can find common ground with their partners (Chen, 2002). Participants also expect initial interactions to involve positivity, attentiveness, affiliation, and discussions of superficial topics (Altman and Taylor, 1973; Tickle-Degnen and Rosenthal, 1990; Honeycutt, 1993). It should be noted that involvement can be negative in some situations, such as being highly involved during a destructive argument with a relational partner. With that said, given this study's context as an initial getting-to-know you conversation in which the two parties discussed what they most liked about their shared university, involvement was likely construed as positive in this study, and partners were trained to enact high involvement in a positive manner. When partners demonstrate high involvement by acting interested in what participants are saying, participants' interactional expectations for positivity and attentiveness may be met or surpassed, and, as a result, participants may synchronize to the high involvement of their partner in an effort to affiliate with the partner. This reasoning is consistent with Principle 4 of CAT, which states that speakers will increasingly accommodate their interaction partner the more that speakers wish to affiliate with the partner or decrease social distance (Dragojevic et al., 2016).

Conversely, when partners demonstrate low involvement by acting uninterested in what participants are saying, participants' interactional expectations may not be met. Hence, participants may engage in divergence or maintenance to signal their dissatisfaction and disaffiliate with the partners, thereby impeding the formation of synchrony. This reasoning is consistent with Principle 6 of CAT, which states that speakers will increasingly non-accommodate to an interaction partner when speakers want to disaffiliate or increase social distance from the partner (Dragojevic et al., 2016). In the context of first-time interactions between strangers, it seems likely that participants would be more inclined to disaffiliate from their partner when the partner is acting uninterested and uninvolved in what participants are saying, compared to when the partner is acting interested and involved. This reasoning suggests the following:

H1: Dyads with a high-involvement partner will demonstrate greater synchrony than dyads with a low-involvement partner.

1.2. Veracity as a predictor of synchrony

Given that synchrony is a natural and expected dynamics of interactions, it is plausible that deceivers and truth-tellers will both use this form of convergence in their communication with a partner—truth-tellers because it comes naturally and deceivers who are trying to "act natural" as they deceive. *Interpersonal deception theory* (IDT; e.g., Buller and Burgoon, 1996; Burgoon and Buller, 2015) holds that both parties actively contribute to the dynamic unfolding of an interaction involving deception. It also assumes that human behavior is strategic as interlocutors attempt to achieve their goals. IDT provides a basis for predicting how synchrony might vary according to the interaction partner's veracity, which suggests that deceivers might strategically use synchrony during a discussion in order to maintain a smooth interaction and appear believable, more than their truthful counterparts (Yu et al., 2015; Dunbar et al., 2020). Consistent with this reasoning, one study found that, compared to truth-tellers, unsanctioned deceivers (i.e., deceivers who were not instructed to lie by the researchers) maintained greater synchrony with professional interrogators during face-to-face interviews when the interrogators were accusing them of cheating on a trivia game (Dunbar et al., 2014). A follow-up study of the same data set found that participants who cheated were more synchronized with interrogators in the minute immediately before their confession (when they were still being dishonest about their wrongdoing) compared to the minute immediately after their confession (when they were presumably telling the truth; Dunbar et al., 2019).

Synthesizing these and other findings, Dunbar and colleagues (2020) recently labeled the phenomenon of deceivers engaging in more synchrony than truth-tellers the *strategic synchrony hypothesis*. They reasoned that deceivers (more than truth-tellers) strategically use synchrony to maintain their credibility and rapport, as well as to enhance the smooth flow of the interaction. These researchers did not assume that deceivers have to consciously intend to engage in synchrony (e.g., "I am going to try and imitate my interaction partner's hand gestures and other movements"). Rather, the researchers allowed for deceivers' mindsets to be more amorphous yet still strategic (e.g., "The interaction is going well, and my partner seems to like me. I do not want them to know that I am lying, so I will put effort into keeping the interaction going well"). However, perceptions of synchrony do not always conform to objective measures of it. By using both self-report data and automated analyses, we explore whether truth-tellers' and deceivers' perceptions of their use of synchrony actually align with a successful, observable achievement of synchrony as determined by objective analysis. Given IDT and the strategic synchrony hypothesis, we proposed the following:

H2: Dyads with a deceiver will demonstrate greater synchrony than dyads with a truth-teller.

It is also worth considering whether the partner's involvement will interact with the participant's veracity to predict synchrony. When partners act uninvolved in conversations, participants interpret these behaviors as conveying detachment, lack of intimacy, dissimilarity, lack of credibility, and other unfavorable themes (Burgoon and Hale, 1988). High involvement on the part of the partner—encapsulated in cues such as forward leaning, nodding, smiling, gesturing, and making eye contact—might give participants many opportunities for synchronizing with the partner by virtue of the variety of nonverbal cues available for coordinating. This might especially be the case for deceptive participants, who may be more motivated than truth-tellers to maintain their credibility and uphold the smooth flow of the interaction (Buller and Burgoon, 1996). In contrast, differences between truth-tellers and deceivers might be less pronounced when interacting with a low-involvement partner because the lack of involvement could restrict the range of cues with which deceivers and truth-tellers can synchronize. Taken together, this reasoning suggests one form that a two-way interaction could take: Dyads in which a deceptive participant interacts with a high-involvement partner will demonstrate greater synchrony than the three other types of dyads.

Examining dyadic conversations about what people liked about their university, Dunbar et al. (2020) found no two-way interactions between the involvement of one partner and the veracity of the other participant in predicting synchrony, either through automated analysis or through self-reported perceptions of the interaction. However, this previous study differed from the current study because the previous study remained focused on what both people liked about their university throughout the entire conversation. People in the previous study did not discuss a political issue such as climate change or tuition increases in the second half of the conversation as we introduced in this study. Further, the partner enacting high or low involvement was not a trained confederate in the previous study, but they were a trained confederate in this study. Given these differences between the previous study and the current study, it would be worthwhile to investigate whether the null two-way interactions between involvement and veracity in predicting synchrony will replicate. We therefore propose the following:

RQ1: Will involvement interact with veracity to predict synchrony?

1.3. Conversational topic as a predictor of synchrony

One risk of testing the aforementioned hypotheses and research question when participants discuss only one topic is the inability to know whether the same results would emerge if a different topic were discussed (see Jackson et al., 1989). Jackson and Jacobs (1983) argued that using single topics to study persuasion in experiments is a serious design flaw. While not everyone agrees that multiple topics must be present in individual experiments (see Allen et al., 1990 for a discussion), even critics of Jackson and Jacobs' position agree that testing multiple messages or topics is preferable to waiting for multiple studies to be conducted, replicating the findings with other topics (Allen et al., 1990). Thus, another contribution of this study involves an examination of findings' generality across two topics: climate change and tuition increases. Climate change and tuition increases were both thought to be relevant to participants. By virtue of the partner (i.e., the confederate) expressing opinions that contradicted the participants' preexisting views, the dyadic discussions were also likely to involve some degree of controversy.

Climate change and tuition increases were selected as two relevant issues for several reasons. Scientists widely agree on the existence of climate change and the role of carbon emissions in

contributing to climate change (Doran and Zimmerman, 2009). At the same time, however, the general public remains more divided than scientists. Recent polling suggests that 86% of Democrats, 70% of Independents, and 52% of Republicans believe climate change is happening (Energy Policy Institute, 2019). Moreover, there exists further disagreement about the cause of climate change. One public opinion poll recently reported that only 48% of U.S. adults believed that climate change was happening due to human activity, 31% of U.S. adults believed that climate change was happening due to natural fluctuations outside of humans' control, and 20% of U.S. adults did not believe that climate change was happening (Pew Research Center, 2016). Among U.S. adults aged 18–34, an estimated 70% have reported being concerned a great deal or a fair amount about climate change (Reinart, 2018).

Tuition increases were included as a second topic due to their relevance to college-aged participants' lives. Recent estimates suggest that the cost of attending a 4-year university is rising almost eight times more quickly than the general rise in wages among the U.S. population (Maldonado, 2018). Maldonado also reported that student loan debt is currently the second-largest source of debt among the general public, second to only home loans and higher than many other sources of debt (e.g., credit card debt, auto loans). In sum, then, both climate change and tuition increases were similarly thought to be relevant and concerning issues to participants, but the tuition topic might seem more personally relevant to the students than the climate change topic which is more societally relevant. We were interested in examining the findings' potential generality across the two topics. Because we had no a-priori basis for speculating on how the topic of discussion might influence synchrony, we asked the following:

RQ2: Will dyads differ in synchrony depending on the topic of discussion (climate change vs. tuition increases)?

RQ3: Will the topic of discussion moderate the role of involvement or veracity in predicting synchrony?

2. Methods

2.1. Participants and procedures

A total of 129 undergraduate students were recruited for a study called "conversations with a partner" from a communication department's online research participation system at a large university in the western United States.[1] Participants read a description of the study as including two components: (1) an online pre-survey that they completed on their own time and (2) an in-person conversation about what they liked about their university completed a few days later with another student. Participants self-selected into the study based on their interest. Participants were male (21.7%) and female (78.3%), with an average age of 19.87 (SD = 1.44). Participants identified as African American (3.1%), Arab American (4.7%), Eastern Asian American (30.2%), European American (30.2%), Indian American (3.9%), Latino/a American (17.1%), Multi-Ethnic (9.3%), and Other (1.6%).

After enrolling in the study, participants completed an online pre-survey that asked them to assess hypothetical scenarios. The scenarios focused on how participants would evaluate cheating (e.g., cheating in a math competition, cheating in a tennis match) differently depending on whether the cheating was framed as interpersonal, intragroup, or intergroup in nature, as well as on whether the rewards for cheating were large or small. Responses to these cheating scenarios are not reported in this study. However, the pre-survey also included questions about participants' opinions on climate change and tuition increases.[2] The purpose of embedding these questions in a longer survey was to deemphasize the focus on climate change and tuition increases. Further, participants completed the pre-survey ∼2, 3, or 4 days before the in-person lab conversation. We reasoned that this multiple-day delay would help further deemphasize the issues of climate change and tuition increases. After receiving the pre-survey responses, we randomly assigned each participant to be a truth-teller or deceiver. We also randomly assigned the confederate (i.e., the participant's conversation partner) to enact high or low involvement, as well as to discuss climate change or tuition increases.

High involvement included nonverbal cues such as leaning forward, acting interested in what the participant was saying, nodding, smiling, making eye contact, and gesturing. It also included verbal behaviors such as asking for more information about what the participant liked about their university during the first half of the conversation. Low involvement included cues such as leaning backward, acting uninterested in what the participant was saying, and reducing how much one nods, smiles, makes eye contact, and gestures. Verbally, low involvement included not asking as many follow-up questions about what participants liked about their

1 The sample size for the self-report analyses was $N = 129$. The demographic information in the Method section pertains to this full sample size of $N = 129$. However, in some analyses, the sample size might be slightly smaller due to missing data. For example, the automated analyses were conducted on a sample of 104 videos. This is because during the debriefing process, participants opted into specific ways in which the researchers could use their data. Some participants did not sign their initials next to the option of allowing the researchers to share their videos with collaborators from other universities. As such, these videos were not shared with one of the authors from another university who conducted the automated analyses. Moreover, some discussions were stopped short of the full 10 min for various practical reasons (e.g., the lab schedule was behind and an RA or the participant had to attend another obligation or the interaction room was needed for another purpose). The automated analyses required the interactions to be as close to 10 min as possible. Therefore, some videos <10 full minutes could not be included in the automated analyses even though the topic of interest was discussed in the second half of the conversation.

2 Questions about climate change included the following: (1) "Climate change is real." (2) "Climate change is an important issue for the government to address." (3) "Climate change is an important issue for people to address in their own personal lives." (4) "Climate change is an issue that does not require human intervention." Questions about tuition increases included the following: (1) "Tuition increases at UCSB are a concerning issue." (2) "University officials should make sure that tuition does not increase for any UCSB student." (3) "Government officials should make sure that tuition does not increase for any UCSB student." (4) "People should go to community colleges before transferring to UCSB or find other ways on their own to make college more affordable rather than advocating for UCSB to lower tuition." The eight items were answered on a 7-point Likert format (i.e., "strongly disagree—strongly agree"). We wrote these items so that responses would provide general information on how important participants thought the issue was, as well as more precise information on who participants believed was responsible for addressing the issue.

university during the first half of the conversation. However, as will be discussed in more detail below, we trained confederates to ask participants to share more details about their views on climate change or tuition increases during the second half of the conversation (regardless of the confederates' assigned involvement) because we thought it was important for all participants to be given ample verbal opportunity to elaborate on their views. However, during the specific discussion of climate change or tuition increases, high- and low-involvement confederates retained their other training on how to behave nonverbally. Before we began recruiting actual participants, we held mock conversations between confederates and RAs. The purpose of these mock conversations was to give confederates thorough training on how to naturally enact their assigned involvement, as well as how to bring up climate change or tuition increases as organically and quickly as possible in the second half of the conversation.

After making the random assignments for a dyad, we emailed the official RAs running the lab session and the RA acting as the confederate. One or two official RAs ran each lab session, and all RAs assisted with this study in exchange for credit hours. Confederates were four female college students and three male college students; approximately the same number of discussions involved female (51.2%) and male (48.8%) confederates. The official RAs running the lab session and the confederate received information about the participant's views on whichever topic the confederate was randomly assigned to discuss, as well as information about whether the confederate was randomly assigned to enact high or low involvement. The confederates also knew that this study was a study about deception, but they did not know whether a given participant with whom they were interacting was randomly assigned to tell the truth or lie. This is because the official RAs received a separate email with the veracity assignment a few days before the lab session, and confederates were not included on this email. Thus, although confederates knew that this study was a study on deception, they were uninformed about whether or not a specific participant was lying.

During the day of the lab conversation, the confederate pretended to be another student participating in the study to earn research participation credit for one of their communication classes. Confederates waited outside the lab's door on a public bench (which is where actual participants often wait for the start of their lab session). We reasoned that waiting outside the lab's door on a public bench would help make the confederate look like a genuine participant. When the confederate and the actual participant had both arrived, the official RAs welcomed both of them into the lab. The official RAs asked both of them their names, introduced both of them to each other, and told both of them that they would be engaging in a 10-min discussion on what they liked about their university. The official RAs then told them that they would first put them in separate rooms so that they could brainstorm at least three topics they like about their university and would be willing to discuss with the other person.

After being separated into a different room than the confederate, the naïve participant was informed about whether they would be a truth-teller or deceiver during the 10-min conversation. Truth-tellers were told that they should be as honest as possible throughout the entire conversation, even if the conversation strayed to topics other than what they liked about their university. Deceivers were told that they should misrepresent their opinions on what they liked about their university and on any other topics that arose during the course of the conversation. The specific ways in which deceivers lied were up to them (e.g., telling complete falsehoods, only giving part of the truth, being overly vague, etc.). Deceivers were also told to sound as believable as possible when lying, and to not inform the partner that they were instructed to lie. The official RAs did not specifically mention climate change or tuition increases when administering the veracity manipulation to the naïve participants.

The official RAs then waited in the hallway while both the confederate and the participant were left in their respective rooms for ∼5 or 10 min. This wait was designed to allow enough time to brainstorm topics they liked about their university. After brainstorming topics, participants rejoined the confederate in order to complete the actual conversation. The actual conversation was videotaped, and the official RAs told both parties that they would check in on them during the halfway point (i.e., after 5 min had elapsed during the 10-min conversation). At the 5-min mark, the official RAs knocked on the door and made sure that everything was going okay. In reality, this knock was a subtle reference to the confederate to switch the subject to climate change or tuition increases as soon as possible.

In the first half of the conversation, confederates were trained to not explicitly bring up climate change or tuition increases. Rather, they were instructed to discuss opinions about their university that could be seen as genuine points of liking. For example, confederates randomly assigned to discuss climate change were trained to consider talking about how nice the weather was at the university, how much they liked the sunshine, and how much they enjoyed doing outdoor activities during the first half of the conversation. Confederates randomly assigned to discuss tuition increases were trained to consider talking about how they liked the new addition to the university's library, the award-winning faculty, or the various on-campus clubs during the first half of the conversation. We reasoned that discussing these plausible (and somewhat superficial) topics during the first half of the conversation would help set the stage for a more serious and direct discussion about climate change or tuition increases during the second half of the conversation. These examples of what to talk about during the first half of the conversation are not exclusive lists of what the confederates could talk about. This is because confederates were also trained to let the conversations unfold as organically as possible while making sure to enact their involvement and topic manipulations. Thus, confederates could embed whichever subtle references to the climate or tuition they thought were most appropriate in the first half of the conversation depending on the organic unfolding of the conversation.

After the door knock at the 5-min mark, confederates switched the topic to climate change or tuition increases as quickly and naturally as possible. For example, during a lull in the conversation, confederates assigned to discuss climate change might say that they wanted to return to the topic of the nice weather at the university. They would then go into a more serious and direct discussion of climate change in a way that contradicted the participant's preexisting opinions [similar to Duran and Fusaroli's (2017) "devil's advocate" paradigm]. For instance, if the participant reported that it was the government's responsibility to address climate change, confederates would talk about how they believed climate change was not real and instead just an excuse for the government to add more employees to agencies such as the Environmental Protection Agency. As another

TABLE 1 Correlations of all dependent variables.

	N	1	2	3	4
1. Truthful overall	128	_			
2. Truthful on topic	127	0.66**	_		
3. Involvement overall	128	0.05	−0.002	_	
4. Confederate synchrony on topic	123	−0.11	−0.14	0.30**	_
5. Participant synchrony on topic	123	−0.06	−0.09	0.22*	0.72**

**$p < 0.01$.
*$p < 0.05$.

example, confederates assigned to discuss tuition increases would say that they wanted to return to the topic of the university's new library additions, the university's renowned faculty, or the on-campus clubs. They would then talk about how tuition increases are beneficial because they help fund these resources, even if the tuition increases are sometimes a hardship for individual students. Confederates were also trained to actively solicit participants' thoughts (e.g., "What do you think about climate change?" "Why do you think that?" "Can you tell me more?") so that the interactions would be more balanced in terms of both confederates and participants speaking about the topic at hand.

The official RAs stopped the cameras at the end of the conversation and separated the participant and confederate into different rooms again. The participant then completed the post-interaction survey assessing their perceptions of involvement, veracity, and synchrony. Participants were debriefed about the study's manipulations and purpose after completing the post-interaction survey. They were also asked to not discuss the study with anybody else.

2.2. Measures

2.2.1. Perceptions of partner involvement

Participants answered 20 items that assessed their perceptions of their partner's (i.e., the confederate's) involvement. The items (e.g., "My conversation partner gestured more than most other people," "My conversation partner smiled more than most other people") were completed on a 7-point Likert format (i.e., "strongly disagree—strongly agree"). The 20 items were averaged, with higher scores indicating stronger perceptions that the partner demonstrated involvement ($M = 3.84$, $SD = 0.61$, $\alpha = 0.76$). See correlations with the dependent variables in Table 1.

2.2.2. Perceptions of own veracity

Participants answered one item assessing their perceptions of how truthful they were across the entire interaction (i.e., "What percentage of the time do you think you were truthful during the conversation as a whole?"). This item was answered on a percentage scale ranging from 0 to 100 ($M = 72.90$, $SD = 29.95$). Participants' perceptions of their truthfulness across the entire interaction were not associated with participants' perceptions of the partner's involvement ($r = 0.05$, $p = 0.59$), which was expected given that the random assignments of involvement and veracity were independent of one another.

Participants also answered two items assessing their truthfulness during the specific part of the discussion about climate change or tuition increases (i.e., "How truthful were you during the part of the conversation about climate change or tuition increases in particular?" "How honest were you when discussing your opinions about climate change or tuition increases with your partner?"). Both items were answered on a 7-point unidimensional rating format (i.e., "not at all—entirely"). These two items were averaged, with higher scores indicating stronger perceptions of truthfulness during the discussion of climate change or tuition increases ($M = 4.95$, $SD = 2.08$, $r = 0.91$, $p < 0.001$). Participants' perceptions of their truthfulness during the specific part of the discussion about climate change or tuition increases were not associated with participants' perceptions of the partner's involvement ($r = -0.002$, $p = 0.98$), which was expected given that the random assignments of involvement and veracity were independent of one another. Participants' perceptions of their truthfulness during the entire interaction were strongly and positively correlated with perceptions of their truthfulness during the specific part of the conversation about climate change or tuition increases ($r = 0.66$, $p < 0.001$). This strong and positive correlation provided support that our instructions to participants about continuing to tell the truth or lie even if the conversation moved on to different topics worked as intended.

2.2.3. Partner-initiated synchrony during the discussion about climate change or tuition increases

Participants completed five items that assessed their perceptions of how much *their partner* (i.e., the confederate) initiated synchrony during the specific part of the discussion about climate change or tuition increases. The preface to the items asked participants to reflect on how their partner behaved during the specific part of the conversation about climate change or tuition increases rather than the conversation as a whole. The individual items then asked about beliefs that the participants held (e.g., "the belief that he or she was in synchrony with you," "the belief that he or she was aligning with the way you communicate"). The five items were answered on a 7-point unidimensional rating format (i.e., "not at all—definitely"). The five items were averaged, with higher scores indicating stronger perceptions that the partner initiated synchrony during the discussion of climate change or tuition increases ($M = 4.43$, $SD = 1.37$, $\alpha = 0.93$). This measure was correlated with the other measures as follows: perceptions of partner involvement ($r = 0.30$, $p < 0.001$), perceptions of own truthfulness across the entire interaction ($r = -0.11$, $p = 0.24$), and perceptions of own truthfulness during the specific part of the discussion about climate change or tuition increases ($r = -0.14$, $p = 0.13$).

2.2.4. Participant-initiated synchrony during the discussion about climate change or tuition increases

Participants completed five items that assessed their perceptions of how much *they themselves* initiated synchrony during the specific part of the discussion about climate change or tuition increases. The preface to the items asked participants to reflect on how they

behaved during the specific part of the conversation about climate change or tuition increases. The individual items then asked about beliefs that the participants held (e.g., "the belief that you were in synchrony with him or her," "the belief that you were aligning with the way he or she communicates"). The five items were answered on a 7-point unidimensional rating format (i.e., "not at all—definitely"). The five items were averaged, with higher scores indicating stronger perceptions that the participants themselves initiated synchrony during the discussion of climate change or tuition increases (M = 4.55, SD = 1.35, α = 0.93). This measure was correlated with the other measures as follows: perceptions of partner involvement ($r = 0.22$, $p = 0.02$), perceptions of own truthfulness across the entire interaction ($r = -0.06$, $p = 0.48$), perceptions of own truthfulness during the specific part of the discussion about climate change or tuition increases ($r = -0.09$, $p = 0.32$), and perceptions of partner-initiated synchrony ($r = 0.72$, $p < 0.001$).

2.3. Automated synchrony analysis from interaction videotapes

To capture synchrony from the perspective of rhythmic similarity, this study employed a spectrum analysis that decomposes the complex time-series into rhythmic components, such as 0.5, 1.0, and 2.0 Hz; 0.5 Hz refers to one time per 2 s. As with other methods of automated synchrony analysis (e.g., Cross Recurrence Quantification Analysis, Fusaroli et al., 2014), spectrum analysis can be applied to time-series continuous data in which the time interval between observations (i.e., sampling rate) is constant (Issartel et al., 2014). To generate time-series continuous data, this study employed Motion Energy Analysis (MEA; Ramseyer and Tschacher, 2011), which is an automated technique to measure body movements in a quantitative manner. Users selected a region of interest (ROI) in the video image; then, in the ROI area, the MEA software automatically calculated the pixels change in gray-scale between consecutive video-frames. In this study, the whole bodies of the confederate and participant were separately covered as the ROI, which can be encoded as the confederate's and participant's movement. The sampling rate was 30 Hz, which was equal to the video frame rate.

As a spectrum analysis, wavelet transform was employed because it is suitable for analyzing face-to-face conversation where communicators' rhythms might change, faster or slower, through the interaction (Fujiwara and Daibo, 2016). To evaluate the convergence of rhythm, cross-wavelet coherence (WTC) was calculated (Grinsted et al., 2004). The WTC, a measure of similarity between the two time-series at each component frequency, ranges from 0 to 1. A WTC of 1 reflects a perfect rhythmic similarity between the two movements, and 0 reflects no similarity (see Figure 1). The WTC was calculated using the wavelet toolbox (Grinsted et al., 2004). Referring to a previous study (Dunbar et al., 2020), the parameters for analysis were determined and a coherence value outside the cone of influence was used for analysis. The average coherence <5 Hz (i.e., slower than five times per second) across the time line was standardized using a Fisher-Z transformation before statistical analysis.

Moreover, the change rate of the WTC from the first half of the discussion to the second half of the discussion was calculated to capture the impact of the topic. In this study, the participant and confederate had a casual chat with plain topics during the first half, which should be a baseline of the level of their synchrony. Then, the confederate engaged in a more direct conversation about the specific topic (i.e., climate change or tuition increases) during the second half of the discussion. Thus, a higher change rate of the WTC indicates that synchrony more highly or sharply increased in the second half of the 10-min conversation when the dyad members directly discussed climate change or tuition increases compared to the first half of the 10-min conversation when the dyad members did not directly discuss climate change or tuition increases. This conceptual interpretation of higher change rate of synchrony is relevant when interpreting the automated analyses (reported below).

2.4. Manipulation checks

Participants who were randomly assigned to a high-involvement partner ($M = 4.05$, $SD = 0.65$) perceived their partner as more involved compared to participants randomly assigned to a low-involvement partner ($M = 3.67$, $SD = 0.53$), $t_{(126)} = -3.70$, $p < 0.001$, Cohen's $d = -0.66$. Participants who were randomly assigned to be truth-tellers reported that they were more truthful across the interaction as a whole ($M = 96.24$, $SD = 9.16$) compared to participants who were randomly assigned to be deceivers ($M = 46.45$, $SD = 22.28$), $t_{(126)} = 16.89$, $p < 0.001$, Cohen's $d = 2.92$. Similarly, participants who were randomly assigned to be truth-tellers reported that they were more truthful during the specific part of the discussion about climate change or tuition increases ($M = 6.19$, $SD = 1.41$) compared to participants who were randomly assigned to be deceivers ($M = 3.60$, $SD = 1.85$), $t_{(126)} = 8.93$, $p < 0.001$, Cohen's $d = 1.57$. We therefore concluded that the experiment's manipulations worked as intended.

3. Results

H1 proposed that dyads with a high-involvement partner would demonstrate greater synchrony than dyads with a low-involvement partner. H2 predicted that dyads with a deceiver would demonstrate greater synchrony than dyads with a truth-teller. RQ1 asked whether involvement would interact with veracity to predict synchrony. RQ2 considered whether dyads would differ in synchrony depending on the topic of discussion. RQ3 asked whether the topic of discussion would moderate the role of involvement or veracity in predicting synchrony. We tested these hypotheses and research questions separately for participants' perceptions after engaging in the interaction and for the automated analyses of the interaction videotapes. Doing so allowed us to determine whether the same pattern of results emerged across the two types of data. In the sections that follow, we first report the results for participants' perceptions of synchrony and then report the results for the automated analyses.

3.1. Participants' perceptions of synchrony

To analyze participants' assessments of synchrony, we ran a MANCOVA with involvement, topic, and veracity as the three fixed factors. Covariates included participant sex, age, and ethnicity. Participant sex was dichotomized as 0 = male, 1 = female. Given the equal number of participants who identified as East Asian American

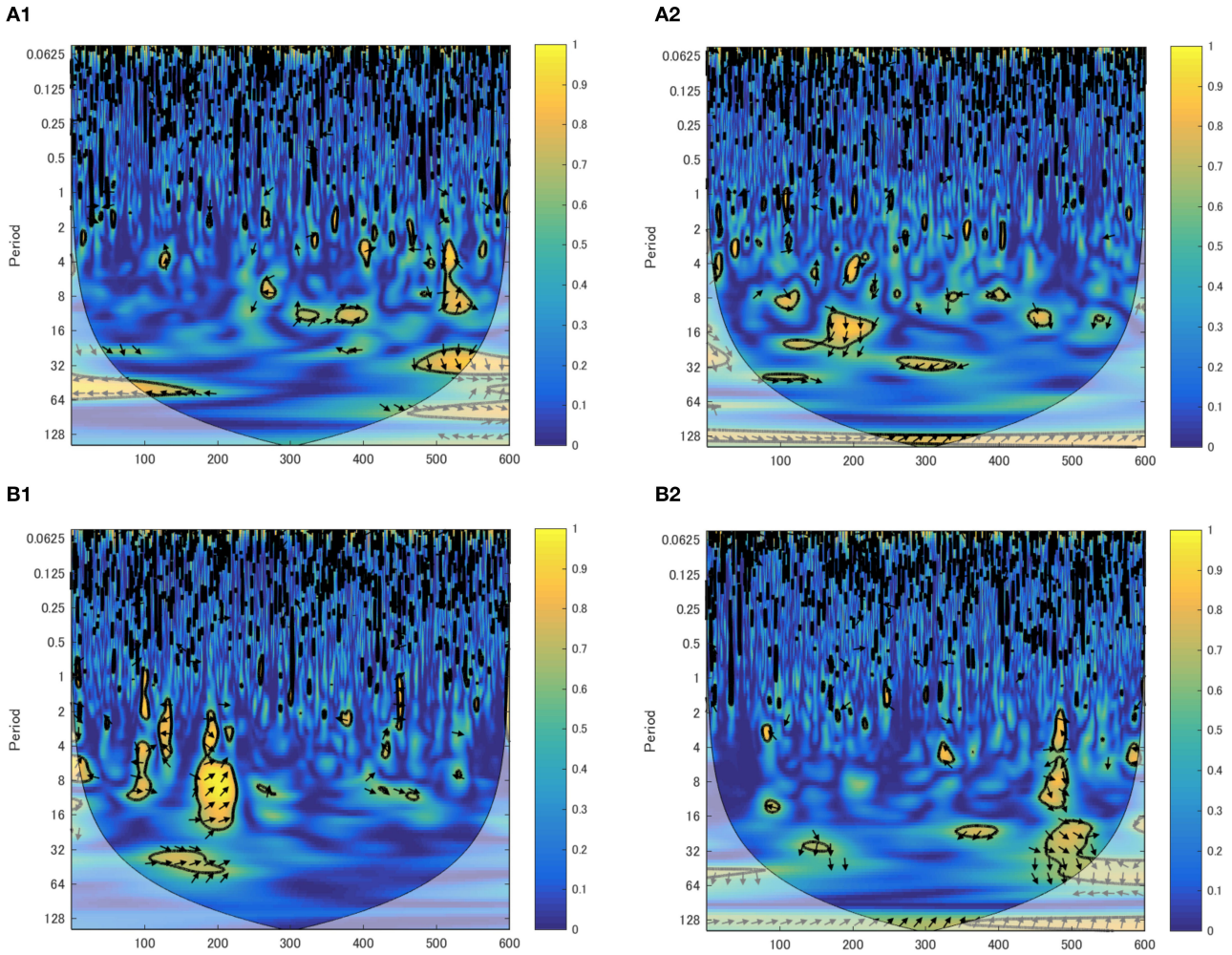

FIGURE 1
Cross-wavelet coherence planes of an example dyad with a truth-teller on **(A1)** climate change and **(A2)** tuition increases and a deceiver on **(B1)** climate change and **(B2)** tuition increases. In each plane, the *x*-axis represents time. The left half of each *x*-axis indicates the first half of the 10-min conversation. The right half of each *x*-axis indicates the second half of the 10-min conversation. The *y*-axis represents each frequency component, as an inverted period (e.g., 0.25 period is 4 Hz), in plane. The magnitude of coherence is represented by color. The color yellow indicates more synchrony than the color blue. The cone of influence (COI) area that is shown as a lighter shade is not included in the analysis since the calculation of coherence can be biased by the edge effect. As the left half of Figure 1 illustrates, a dyad with a truth-teller discussing climate change demonstrated stronger increases in synchrony during the second half of the conversation (top left image) compared to a dyad with a deceiver discussing climate change (bottom left image). Additionally, as the bottom of Figure 1 illustrates, a dyad with a deceiver demonstrates stronger increases in synchrony during the second half of the conversation if they talked about tuition increases (bottom right image) compared to if they talked about climate change (bottom left image).

(30.2%) and European American (30.2%), we created two dummy variables to capture ethnicity. The first dummy variable was East Asian American (0 = no, 1 = yes), and the second dummy variable was European American (0 = no, 1 = yes). Given the two dummy variables for ethnicity, there were a total of four covariates in the model.[3] The two outcomes consisted of participants' perceptions of how much (1) their partner (i.e., the confederate) and (2) they themselves initiated synchrony during the specific discussion about climate change or tuition increases. The multivariate omnibus test revealed no main effect for involvement, topic, or veracity, $\Lambda s > 0.97$, $Fs_{(2,106)} < 1.35$, $ps > 0.26$ (demonstrating a lack of support for H1 or H2). The omnibus test also revealed no significant two-way interactions, $\Lambda s > 0.96$, $Fs_{(2,106)} < 1.50$, $ps > 0.22$. However, the three-way interaction was significant in the omnibus test, $\Lambda = 0.95$, $F_{(2,106)} = 3.09$, $p = 0.050$.

Both univariate follow-up tests for the three-way interaction were significant. The three independent variables were implicated in a three-way interaction predicting the participants' perceptions of how much *their partner* initiated synchrony during the discussion about climate change or tuition increases, $F_{(1,107)} = 5.04$, $p = 0.03$, $\eta_p^2 = 0.05$. Table 2 displays the cell means for this three-way interaction. As Table 2 illustrates, the starkest contrast involved truth-tellers who discussed tuition increases with a low-involvement partner ($M = 3.87$, $SD = 1.08$) and deceivers who discussed climate change with a high-involvement partner ($M = 5.22$, $SD = 1.08$). To answer RQ3, then, the conversation topic moderated the role of involvement and veracity in predicting synchrony. Participants were especially

3 Covariate results are not reported in-text for the sake of space but both none of the covariates were significant (Sex: $p = 0.478$, Age: $p = 0.058$, EurAm: $p = 0.440$, AsianAm: $p = 0.692$).

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TABLE 2 Means and standard deviations for the three-way interaction among involvement, topic, and veracity in predicting participants' perceptions of how much their partner initiated synchrony during the specific discussion of climate change or tuition increases.

		Topic											
		Climate change						Tuition increases					
		Veracity						Veracity					
		Truth-teller			Deceiver			Truth-teller			Deceiver		
		N	*M*	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*
Involvement	High	15	4.15	1.88	13	5.22	1.08	14	4.54	1.18	13	4.38	1.36
	Low	18	4.33	1.30	16	4.34	1.15	15	3.87	1.08	15	4.76	1.60

TABLE 3 Means and standard deviations for the three-way interaction among involvement, topic, and veracity in predicting participants' perceptions of how much they themselves initiated synchrony during the specific discussion of climate change or tuition increases.

		Topic											
		Climate change						Tuition increases					
		Veracity						Veracity					
		Truth-teller			Deceiver			Truth-teller			Deceiver		
		N	*M*	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*
Involvement	High	15	4.32	1.64	13	5.29	1.40	14	4.49	1.17	13	4.49	1.62
	Low	18	4.72	1.23	16	4.08	0.93	15	4.39	1.24	15	4.95	1.17

TABLE 4 Means and standard deviations for the change rate of synchrony.

		Topic											
		Climate change						Tuition increases					
		Veracity						Veracity					
		Truth-teller			Deceiver			Truth-teller			Deceiver		
		N	*M*	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*
Involvement	High	10	1.04	0.13	12	0.97	0.23	14	1.03	0.16	10	1.05	0.13
	Low	14	1.07	0.11	13	0.96	0.17	14	0.97	0.13	17	1.05	0.13

A higher change rate of synchrony indicates that synchrony increased more sharply when moving from the first half of the conversation (when a discussion of what the participant and the partner liked about their university occurred) to the second half of the conversation (when a direct discussion of climate change or tuition increases occurred).

unlikely to perceive that the confederate initiated synchrony when participants were telling the truth and confederates were enacting low involvement during the discussion about tuition increases. Participants were especially likely to perceive that the confederate initiated synchrony when participants were being deceptive and confederates were enacting high involvement during the discussion about climate change.

Similarly, the three independent variables were implicated in a three-way interaction predicting the participants' perceptions of how much *they themselves* initiated synchrony during the discussion of climate change or tuition increases, $F_{(1,107)} = 5.57$, $p = 0.02$, $\eta_p^2 = 0.05$ (see Table 3). As Table 3 illustrates, the starkest contrast involved deceivers who discussed climate change with a low-involvement partner ($M = 4.08$, $SD = 0.93$) and deceivers who discussed climate change with a high-involvement partner ($M = 5.29$, $SD = 1.40$). The differences or contrasts between cells were reduced for participants discussing tuition increases. To answer RQ3, then, the conversation topic moderated the role of involvement and veracity in predicting synchrony. Participants were especially unlikely to perceive that they themselves initiated synchrony when participants were being deceptive and confederates were enacting low involvement during the discussion of climate change. Participants were especially likely to perceive that they themselves initiated synchrony when participants were being deceptive and confederates were enacting high involvement during the discussion of climate change.

Both three-way interactions in this section are similar in that participants were most likely to perceive that *their partner* and *they themselves* initiated synchrony when participants were deceptive and partners were enacting high involvement when discussing climate change.

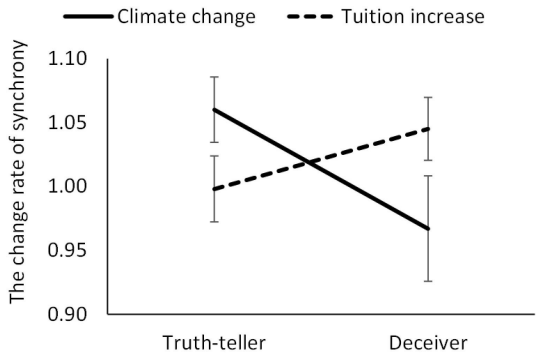

FIGURE 2
Interaction effect between topic and veracity condition for the change rate of synchrony. A higher change rate of synchrony indicates that synchrony increased more sharply when moving from the first half of the conversation (when a discussion of what the participant and the partner liked about their university occurred) to the second half of the conversation (when a direct discussion of climate change or tuition increases occurred).

3.2. Automated analyses

The extent of synchrony (i.e., the WTC under 5 Hz) in the whole conversation was analyzed in a 2 (involvement) × 2 (topic) × 2 (veracity) between-subjects ANOVA. The results of this first test showed that there were no significant main effects, two-way interactions, and three-way interaction, $Fs_{(1,96)} < 0.47$, $ps > 0.50$, $\eta_p^2 < 0.005$. These results indicate that involvement, veracity, and topic did not predict synchrony across the interaction as a whole, either at the main-effects level or in interaction with one another.

However, a more nuanced analysis of synchrony would account for the change in topic after the official RAs knocked on the door at the 5-min mark (i.e., going from a superficial discussion of what the dyad members liked about their university in the first half of the conversation to a direct discussion of climate change or tuition increases in the second half of the conversation). Thus, the change rate of the WTC within the second and first half of the conversation was set as a dependent variable, which was analyzed in a 2 (involvement) × 2 (topic) × 2 (veracity) between-subjects ANOVA. To reiterate what was discussed previously, a higher WTC change rate indicates that synchrony increased more sharply during the second half of the conversation compared to the first half of the conversation. The results showed that there were no significant main effects, $Fs_{(1,96)} < 0.36$, $ps > 0.55$, $\eta_p^2 < 0.004$. However, there was a significant two-way interaction between topic and veracity, $F_{(1,96)} = 5.35$, $p = 0.02$, $\eta_p^2 = 0.05$. Both of the other two-way interactions were not significant, $Fs_{(1,96)} < 0.34$, $ps > 0.56$, $\eta_p^2 < 0.004$. The three-way interaction was also not significant, $F_{(1,96)} = 0.59$, $p = 0.44$, $\eta_p^2 = 0.006$ (see Table 4).

For the topic × veracity interaction, the simple main effect analysis revealed that dyads with a truth-teller discussing climate change demonstrated higher increases in synchrony during the second half of the conversation ($M = 1.056$, $SD = 0.118$) compared to dyads with a deceiver discussing climate change ($M = 0.965$, $SD = 0.198$), $F_{(1,96)} = 4.05$, $p = 0.047$, $\eta_p^2 = 0.04$, whereas such a difference was not significant when they discussed tuition increases, $F_{(1,96)} = 1.54$, $p = 0.218$, $\eta_p^2 = 0.02$. Furthermore, dyads with deceivers increased the extent of synchrony during the second half of the conversation when they talked about tuition increases ($M = 1.050$, $SD = 0.130$) more than when they talked about climate change, which was marginally significant, $F_{(1,96)} = 3.79$, $p = 0.055$, $\eta_p^2 = 0.04$, whereas, in dyads with a truth teller, there was no significant difference between tuition increase ($M = 0.997$, $SD = 0.145$) and climate change $F_{(1,96)} = 1.75$, $p = 0.190$, $\eta_p^2 = 0.02$ (see Figure 2). These results for the automated analyses did not support H1 or H2. They also did not lend any significant findings for RQ1 or RQ2. However, the results did lend significant findings for RQ3, in that the discussion topic moderated the role of veracity in predicting synchrony.

4. Discussion

In this paper, we examined evidence for the strategic synchrony hypothesis, which posits that deceivers (more than truth-tellers) attempt to synchronize their behavior with their conversational partner in order to build rapport, enhance credibility, and evade detection (Dunbar et al., 2020). The true test of the strategic synchrony hypothesis is whether deceivers synchronize their behavior more than truth-tellers. This experiment demonstrates that the answer to this question is not straightforward. Neither self-report experiences nor automated analyses confirm that deceivers synchronize more than truth-tellers in terms of a main effect. This is similar to Duran and Fusaroli's (2017) finding that agreement with the partner rather than veracity affected synchrony. Instead, the topic of conversation and the partner's involvement appear to moderate this relationship. There were three-way interactions among involvement, topic, and veracity in predicting participants' perceptions of synchrony. Decomposing the three-way interactions revealed that participants were most likely to perceive that both (1) their partner (i.e., the confederate) and (2) they themselves initiated synchrony when participants were being deceptive and partners were enacting high involvement during discussions of climate change. On the other hand, the automated findings contrast with the self-report findings; dyads with a deceiver discussing climate change were especially unlikely to objectively exhibit increases in synchrony during the second half of the conversation.

4.1. Implications for the strategic synchrony hypothesis

4.1.1. Self-report analyses

As for the self-report experience of synchrony, there seemed to be the special combination of the three independent variables (deception, climate change, high involvement) that resulted in the highest perceptions of synchrony. One potential explanation for this finding is that compared to tuition increases, climate change might have sparked more partisan and uncomfortable thoughts.[4]

4 Consistent with this explanation, we ran two paired samples *t*-tests with the pre-survey data. Participants believed that climate change was real ($M = 6.51$, $SD = 0.88$) more strongly than they believed that tuition increases were a concerning issue ($M = 6.25$, $SD = 1.07$), $t_{(160)} = 2.48$, $p = .01$, Cohen's $d = 0.20$. Similarly, participants believed that government officials should address climate change ($M = 6.37$, $SD = 0.95$) more strongly than they believed that government officials should address tuition increases ($M = 5.88$, $SD = 1.21$),

The random assignment to be a deceiver and to interact with a high-involvement partner might be two facilitating conditions that additionally kick into gear participants' focus on synchrony. If climate change was in fact a more uncomfortable and partisan topic than tuition increases, the stakes might have been higher when discussing climate change, and deceivers might have therefore been especially motivated to attempt to establish synchrony. This is consistent with recent work by Van Der Zee et al. (2021), who found that the difficulty of the lie task affected the nonverbal coordination of the interactants. Future researchers can more directly test the extent to which this reasoning has merit by including measures about discomfort, motivation, and perceived issue importance in their post-interaction surveys.

In doing so, they can also include non-political topics such as sexual relations in college for comparison, and topics that might be even more partisan and uncomfortable (e.g., discussions of specific presidents' job performances, discussions of immigration policy) to examine whether perceptions of synchrony further spike when deceivers interact with high-involvement partners about these new topics. Conversely, perceptions of synchrony might spike for topics (e.g., climate change) that moderately evoke partisan and uncomfortable thoughts, but perceptions of synchrony might begin to decline for topics that strongly evoke partisan and uncomfortable thoughts. In this way, the strategic synchrony hypothesis might manifest curvilinear effects.

Although the two self-report measures of synchrony were consistent in terms of the specific condition under which participants perceived that they themselves and their partner were most initiating synchrony, the measures differed in terms of when participants perceived that they themselves and their partner initiated the least synchrony. This suggests the merit of examining synchrony separately depending on whom participants perceive as initiating the synchrony. Such examinations are also consistent with CAT's discussion of asymmetrical convergence and divergence, in which one person might be adapting their communication to be more like (or unlike) their interaction partner's communication, more than what their interaction partner is adapting the interaction partner's communication (see Dragojevic et al., 2016).

More specifically, participants perceived that their partner initiated the least synchrony when participants were truthfully discussing tuition increases with a low-involvement partner. In contrast, participants perceived that they themselves initiated the least synchrony when participants were deceptively discussing climate change with a low-involvement partner. Footnote 4 showed that participants agreed that government officials should intervene to address climate change more strongly than they agreed that government officials should intervene to address tuition increases. Thus, climate change might have been a more urgent and macro issue for participants that tapped into their deeply held values. When their low-involvement partner began discussing climate change, participants might not have wanted to betray their deeply-held values by misrepresenting their opinions on an issue with relevance to society and humankind. As a result, participants might have thought that they were going to put minimal effort into the conversation and "just get through it," which could have manifested as the perception that they were not initiating synchrony with their partner.

In contrast, when participants were assigned to truthfully discuss tuition increases with a low-involvement partner, participants might have interpreted their low-involvement partner's statements about tuition increases (e.g., a statement about tuition increases being a positive development to help fund university resources and salaries, even if the tuition increases present a hardship to some students) as lacking empathy toward the participants or other students struggling to pay tuition. This could involve thinking that the partner was insensitive to participants' or their peers' concrete struggles on a more individual level, compared to the climate change condition. Thus, participants might have thought that their partner was doing little to align the partner's communication with that of the participant when the partner was discussing tuition increases with low involvement. Further, by participants telling the truth in these encounters (and, thereby, explicitly contradicting their partner's stated opinions), participants might have caused another uncomfortable rift, which they might have perceived their partner as not appreciating. This might have further reduced participants' perceptions of the extent to which their partner was aligning the partner's communication with the participant.

4.1.2. Automated analyses

The results of the automated synchrony analysis, similar to the self-reported measures, did not support H1 and H2. In Dunbar et al. (2020), which employed a measure of the automated synchrony, the manipulation of involvement produced significant differences in the level of automated synchrony. In this study, unlike Dunbar et al. (2020), trained confederates who manipulated their behavior were employed, which means that the degree of automated synchrony should increase or decrease depending on the behavior of the participants. Given that, the lack of a significant main effect of involvement and veracity (H1 and H2, respectively) but significant two-way interaction between topic and veracity (RQ3) implies that talking about a controversial topic had a substantial influence to the participant.

Indeed, the automated findings might be consistent with the speculation that climate change was a more partisan and uncomfortable topic than tuition increases. These possible characteristics of climate change might have made deceivers especially motivated to *want* to establish synchrony when interacting with a high-involvement partner (and, by extension, to *perceive* that they actually were establishing synchrony), but to make deceivers objectively unable to establish synchrony. Relatedly, deceivers discussing climate change might have experienced greater cognitive load than deceivers discussing tuition increases and truth-tellers discussing climate change (see Vrij et al., 2006). This higher cognitive load might have made deceivers less effective in their monitoring of the partner's behavior and their ability to objectively establish synchrony when discussing climate change. For this concern, it may be beneficial to investigate synchrony of a particular body part that is relatively easy for speakers to control (such as facial expressions which Ekman and Friesen, 1969, argued were the most controllable). Indeed, convergence (and divergence) can occur with a range of different behaviors, and less synchrony in one part may not mean less synchrony in another part as well. Even though it might be difficult to achieve synchrony in bodily movement under deceptive

$t_{(160)} = 4.28$, $p < 0.001$, Cohen's $d = 0.34$. These *post-hoc* findings suggest that climate change might have been a more polarizing issue for participants.

communication situations with the greater cognitive load, it may still be possible to indicate increased synchrony in facial expressions (Riehle et al., 2017) or nodding (Hale et al., 2020).

4.2. Limitations and additional opportunities for future research

Using confederates in an experiment has advantages and disadvantages. Because we wanted to manipulate the involvement of the conversational partner in order to give truth-tellers and deceivers someone to match their behavior with, we used confederates whose behavior was scripted. We also wanted to create an uncomfortable discussion topic in order to explore the influence of topic on the use of synchrony, and we needed to have conversations that were characterized by political disagreement on specific issues. We therefore trained confederates to manipulate their involvement and disagree with the participant on the specific topic they were discussing. The fact that confederates were expressing an opinion about climate change or tuition increases that contradicted the participant's preexisting opinion also means that this study was examining synchrony under a special context, namely one in which the confederate was engaging in a disaffiliative move when discussing the assigned topic. Other patterns of findings may be observed if the confederate had instead been trained to express agreement with the participant's preexisting opinion about climate change or tuition increases.

Kuhlen and Brennan (2013) argued that experimental procedures might create a somewhat artificial environment that gives confederates a knowledge advantage because the confederates know more about the experiment and the ensuing discussion than the naïve participants. This is arguably an unavoidable limitation in experimental communication studies where the goal is to test theory under varying and tightly controlled conditions. However, this drawback is arguably mitigated by the random assignment of participants to conditions and the fact that confederates were blind to the truth or deception condition of the participant. Another limitation is the use of young adult college students as participants. Future researchers should explore some of the same questions examined in this study with other groups of U.S. adults to determine whether similar results emerge among other participants who vary on the extent to which they are politically engaged with political issues such as climate change.

Relatedly, participants who were randomly assigned to be deceptive might have been suspicious that their interaction partner was also given a set of instructions for manipulating their behavior. These participants might have thought that their interaction partner was also instructed to lie or otherwise change their behavior from what they would normally do in a first-time conversation. In contrast, participants who were randomly assigned to tell the truth might not have been as suspicious that their interaction partner was given a set of instructions for changing their behavior. This consideration may have impacted the findings. For example, participants randomly assigned to be deceptive might have thought that their high-involvement interaction partner discussing climate change was also asked to be deceptive, and that this high-involvement partner was simply trying to "make the best" out of an awkward situation. This mindset may have contributed to these specific participants' high perceptions of synchrony. Also, participants may have been suspicious about the topic of conversation that their interaction partner raised (i.e., climate change or tuition increases), given that participants completed items about their personal views on these subjects in the pre-survey. We took several steps to mitigate this concern. These steps included not scheduling the laboratory sessions on the same day that participants completed the pre-survey, training confederates to embed subtle references to the topic in the first half of the conversation (e.g., talking about how they liked the sunny and warm weather as a prelude to discussing climate change), and training confederates to only bring up their assigned topic directly in the second half of the conversation. Nevertheless, some participants may have been thinking about how their laboratory visit was related to the pre-survey, so they may have been primed to think about climate change or tuition increases throughout their laboratory visit.

Also, since both the confederate and participant were college students, they may have both believed in the need to address climate change. We did not gather data on confederates' actual beliefs about climate change or tuition increases. Rather, we trained confederates to contradict participants' beliefs. This means that most of the conversations could have involved deception to some extent: when the participant was randomly assigned to be a deceiver, the participant would have been stating beliefs about climate change or tuition increases that did not match the participant's genuinely held beliefs. When the participant was randomly assigned to be a truth-teller, the confederate may have been stating beliefs about climate change or tuition increases that did not match the confederate's genuinely held beliefs. This consideration may have impacted the findings, but it is potentially mitigated by the confederate also being randomly assigned to enact high or low involvement. Because the confederate's behaviors also followed the involvement manipulation, it is plausible that whether the confederate was lying or telling the truth did not unduly affect the confederate's behavior. This issue deserves additional attention in future research.

Another methodological limitation is that the words "synchrony" and "alignment" were not defined for participants when they were completing the synchrony measures. Future researchers should define these terms for participants in an easily accessible manner so that participants' impressions of these terms match researchers' impressions. With that said, the synchrony measures were both highly reliable (αs = 0.93), and the other items in the synchrony measures were arguably written in a more easily accessible language (e.g., "the feeling that he/she was matching your way of communicating?"). For these reasons, we thought that it was warranted to keep the synchrony measures intact.

As another limitation, the sample size in this study should be noted. Since there are 3 between-subject conditions, each cell size was not overly large: an average of 16 people per cell for subjective measures, and 13 for objective analyses. However, the sample size is still comparable with previous studies investigating face-to-face communication in deception contexts (e.g., Levine et al., 2010; Dunbar et al., 2014). As for an effect size, $\eta_p^2 = 0.05$ is small but not negligible given Cohen's f, calculated as $f = \sqrt{\frac{\eta_p^2}{1-\eta_p^2}}$, $= 0.25$ indicates a medium effect ($f = 0.10$ indicates a small effect); $\eta_p^2 = 0.05$ is $f = 0.23$. Besides, the high reliability of our automated measure may

be emphasized. In general, lower reliability (or higher measurement error) of dependent variables increases the chance of obtaining a non-significant result when a significant result is correct (e.g., Charter, 1997). For this concern, there is little doubt about the high reliability of the automated measure because it contains almost no human (observational) errors. In addition, previous studies have shown that the automated coding of nonverbal behavior, compared to observers' manual coding, had a better performance to account for participants' self-reported measures (Fujiwara and Daibo, 2014; Fujiwara et al., 2020). Thus, even though the small sample size in this study should be noted as a possible limitation, the current study's findings should be reliable.

5. Conclusions

This study considered whether truth-tellers and deceivers synchronize differently to high- and low-involvement partners depending on whether the partners discuss climate change or tuition increases. Three-way interactions suggested that deceivers who discussed climate change with a high-involvement partner were especially likely to *believe* that both they themselves and their partner initiated synchrony during the discussion of climate change. However, automated analyses revealed that dyads with a truth-teller indicated higher increases in synchrony than dyads with a deceiver in the climate change condition when moving from the first half to the second half of the conversation. Furthermore, dyads with deceivers demonstrated higher increases in synchrony when they talked about tuition increases compared to when they talked about climate change when moving from the first half to the second half of the conversation. Given that the primary results were related to the RQ and the hypotheses were not supported, it seems fair to note that the results in this study are not conclusive. However, it should not be underestimated that the different types of measure (i.e., self-report, automated measure of synchrony) collectively qualify the strategic synchrony hypothesis because the partner's behavior and the topic of conversation are important factors to consider when determining whether deceivers synchronize more than truth-tellers (Fujiwara et al., 2021).

The findings also underscore the importance of data triangulation when studying deception because participants' perceptions may provide a different picture than automated analyses. The differences between objective measurement (as seen in the automated analyses) and perceptual measurements (found in the self-reports) suggest that the experience of synchrony, or the lack thereof, differs from the behavioral enactment of it. People might feel in sync with their partner but in a way that is undetectable objectively (see Dunbar et al., 2020 for more discussion on this point). Future investigations should explore three or more topics to probe whether the strategic synchrony hypothesis manifests curvilinear trends, with perceptions of synchrony being highest for moderately partisan and controversial topics, while dropping for very superficial and very divisive topics. Relatedly, future investigations should also examine a potential role of cognitive load in qualifying when deceivers are able to objectively establish synchrony. These investigations offer additional potential to further delineate the boundary conditions of the strategic synchrony hypothesis.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Human Subjects Committee at UC Santa Barbara. The patients/participants provided their written informed consent to participate in this study.

Author contributions

ND and QB designed the study, collected the data, and wrote the literature review. KF conducted the analyses. ND wrote the discussion. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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