Exploring the Relationship Between Behavior Matching and Interlocutor Perceptions in L2 Interaction

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Highlights

- Behavior matching is the tendency to adopt the behaviors, postures, or mannerisms of a conversational partner.
- English L2 speakers' conversations were analyzed to identify behavior matching.
- They rated their partner's motivation and collaboration immediately after the conversation.
- Hand movement behavior matching positively predicted motivation ratings.

Abstract

Alignment in nonverbal behavior can be understood through reference to behavior matching, which is the tendency to adopt the behaviors, postures, or mannerisms of a conversational partner. Although behavior matching is believed to occur unintentionally and unconsciously, its occurrence is associated with how interlocutors perceive each other. Drawing on corpus data of conversations between English second language (L2) speakers, this study examines the relationship between behavior matching and interlocutor perceptions, which were measured through post-task ratings of partner collaboration and motivation. Conversations (N = 51) between 102 English L2 university students were coded for nonverbal behaviors in five categories (face, head, hand, posture, self-adaption), and each behavior was coded as being matched or not matched by the interlocutor. The proportion of matched behaviors per dyad in each category were correlated with the mean motivation and collaboration partner ratings, and a linear regression model identified hand behavior matching as a significant predictor of partner motivation. Potential implications and avenues for future research about nonverbal alignment are discussed.

Keywords: nonverbal alignment, behavior matching, interlocutor perceptions, L2 conversation

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Introduction

Unlike prior second language (L2) research that has explored the conditions under which interlocutors align in their linguistic expressions during conversation (e.g., Kim et al., 2019; McDonough, 2006; Trofimovich & Kennedy, 2014), this exploratory study examines convergence in nonlinguistic aspects of speech. In their interactive alignment model, Pickering and Garrod (2004) primarily discussed alignment within and across levels of linguistic representation; however, they acknowledged that it also occurs with nonlinguistic aspects of conversation and suggested that it may underlie various forms of social imitation. More recently, Rasenberg et al. (2020) argued that being a natural part of conversation, alignment is inherently multimodal involving speech and a wide range of bodily behaviors. In terms of L2 alignment, Atkinson et al. (2007) argued more explicitly that alignment is fundamentally multidimensional as it involves linguistic and nonlinguistic convergence between interlocutors, including gestures and posture, as well as interlocutor alignment to the conventions of the speech event using all available sociocognitive tools, such as talk organization, turn-taking strategies, and physical objects, including books and digital technology. Furthermore, as pointed out by Jackson (2018), L2 researchers have typically conceptualized of alignment as an automatic, implicit phenomenon without exploring how interlocutor social factors, such as first language (L1) background or L2 proficiency, might affect its occurrence.

To expand the focus of L2 research to include nonverbal alignment with a consideration of social factors, this exploratory study focuses on conversation between L2 university students. More specifically, it examines nonverbal behavioral mimicry, which is the tendency to adopt the behaviors, postures, or mannerisms of interaction partners (Lakin et al., 2003). Also referred to

as nonconscious behavioral mimicry, it is generally considered to be an unintentional way of both communicating and creating rapport between interlocutors. Because synchronization of matching behavior is such a pervasive aspect of naturalistic interaction, it would be difficult to explain how its immediate and widespread occurrence across multimodal channels could be completely intentional or constantly controlled by interlocutors (e.g., Louwerse et al., 2014). Nevertheless, behavior matching can be undertaken intentionally to secure real-world benefits, such as when business students received more points when they mimicked the behavior of an opponent during a negotiation task (Maddux et al., 2008). Therefore, in light of the growing recognition that mimicry can be nonconscious and automatic as well as conscious and intentional (Holler & Wilkin, 2011), we use the more generic term behavior matching as our study was not designed to determine intentionality. This contribution to the special issue on alignment samples L2 English conversations from the Corpus of English as a Lingua Franca (McDonough & Trofimovich, 2019) to explore the relationship between behavior matching and interlocutor perceptions.

Literature Review

Behavior matching is believed to be activated by the perception–behavior link, which means that just seeing a person's behavior creates the tendency to behave similarly even when interlocutors have no prior relationship or interpersonal goals (Chartrand et al., 2002). This automatic link serves as a form of "social glue" (Chartrand & Bargh, 1999, p. 897) that can produce empathy, understanding, and greater liking between people without intention or effort. Highly automatic behavior matching involves idiosyncratic behaviors like foot tapping, crossed arms, or face touches that do not carry meaning related to the conversation. However, behavior matching is not solely linked to individualistic automatic processes; instead, it can reflect micro-

social interaction characterized by reciprocity and mutual influence (Bavelas, 2007). In other words, a listener's behavior matching can serve as an interpersonal message to communicate awareness and concern that is intended to be seen by the recipient. For example, when engaged with a speaker's narrative, listeners might match the speaker's facial expressions (e.g., surprise or fear) at key points in the story to show their engagement with the speaker's experience (Bavelas et al., 2000).

To identify behavior matching, experimental studies with native speakers have elicited interaction between a naïve participant and a confederate who engages in a specific behavior. In an early study that focused on wincing, Bavelas et al. (1986) had a confederate wear a finger splint and then accidentally bump the finger and wince while placing equipment during the session, either with or without eye gaze to the participant. They analyzed the participant's reaction, specifically whether a matching wince occurred within four seconds of the confederate's behavior. When the confederate engaged in eye gaze, the participants matched the wincing but were less likely to do so in the absence of eye gaze, which provides evidence for behavior matching's communicative function. The confederate in Chartrand and Bargh (1999) engaged in either face rubbing or foot shaking while interacting with participants who then matched those behaviors. In addition to wincing, face rubbing, and foot shaking, additional behaviors that have been matched include side leans (Bavelas et al., 1988), leg crossing (Castelli et al., 2009), facial expressions (Bavelas et al., 2000), gestures (Holler & Wilkin, 2011), and posture (Wells, 2004). In sum, behavior matching can occur in contexts where the listener's copied behavior may carry communicative functions (such as sympathy) as well as in situations where it is unlikely to have any overt message (like foot shaking).

Having demonstrated the occurrence of behavior matching, subsequent studies explored whether it is influenced by interlocutor perceptions, such as likability, friendship, and trust. Focusing on interlocutor likability, McIntosh (2006) manipulated the behavior of a confederate before the session began (i.e., to be either friendly, likable, with similar interests or cold, judgmental, with dissimilar interests). He found that participants engaged in greater cheek behavior matching (i.e., zygomatic muscle movement, such as smiling) when the confederate had been likable. In a second experiment, he found that participants who watched a friend's spontaneous facial expressions engaged in more cheek behavior matching than participants who watched a stranger's reactions to the same stimuli. In a similar vein, research in which participants viewed video recordings of confederates have shown that behavior matching occurred more frequently when participants had been led to believe that they had shared characteristics with the interlocutor, such as being members of the same religious group (Yabar et al., 2006) or having the same first name and academic major (Guéguen & Martin, 2009). Additionally, participants with shared political views engaged in greater behavior matching with then US president Ronald Reagan while watching him in silent videos than participants who did not support him (Bush et al., 1986). This line of research has demonstrated that rapport, which can be understood generally as a harmonious relationship where interlocutors understand each other's feelings and communicate well, facilitated behavior matching.

A related line of research has explored the inverse relationship, namely, whether behavior matching facilitates positive interlocutor perceptions of rapport. For example, Chartrand and Bargh (1999) instructed a confederate to either mimic the participant's behavior or maintain a neutral position while they were taking turns describing photographs. After the interaction, the participants rated the confederate's friendliness and the smoothness of their interaction. The

participants whose behavior was matched gave higher interlocutor friendliness and interactional smoothness ratings than participants whose behavior was not matched. Similarly, Guéguen and Martin (2009), examined the relationship between naïve participants' behavior matching while watching videos of a confederate and their post-viewing ratings of the confederate's likability. They found a high correlation between behavior matching and the likability ratings. In addition to interlocutor friendliness and likability, trust ratings have been shown to be influenced by behavior matching. Maddux et al.'s (2008) study about a negotiation task in which business students took on roles of buyers and sellers found that behavior matching was a significant predictor of buyer trust ratings. Thus, it appears that behavior matching during an interaction is associated with positive ratings of interlocutor rapport including friendliness, likability, and trust.

Having briefly introduced the phenomenon of behavior matching and key findings about its relationship with interlocutor perceptions of positive attributes associated with rapport, an important question is its relevance to L2 interaction, specifically whether it has potential to shed light on issues of interest to L2 researchers and teachers. First, within L2 evaluation, an important construct is interactional competence, which refers to the knowledge that interlocutors make apparent during interaction (Young, 1999). As summarized by Plough et al. (2018), nonverbal behavior is an important consideration when evaluating interactional competence because it influences the co-construction of dialogue during oral interviews (i.e., interaction between evaluator and test-taker) and paired oral exams (i.e., interaction between test-takers). Assessment studies focusing on rater perceptions have demonstrated that nonverbal behavior plays a role in test-taker evaluation (e.g., Ducasse & Brown, 2009; Jenkins & Parra, 2003; May, 2011), but less is known about how instructors react to nonverbal behavior when evaluating student performance or whether students are sensitive to their peers' nonverbal behavior when

engaging in collaborative tasks. Considering the relationship between behavior matching and interlocutor perceptions, there are potential implications for its strategic deployment to facilitate inclusive and collaborative pair or small group interactions.

Second, as argued by Gullberg (2006), gestures play an important role in L2 learning in that they are part of the target language to be acquired and their use provides insight into the acquisition process. A subset of nonverbal behavior, gestures typically involve the hands and arms and contribute to the verbal message being communicated in ways that more automatic behaviors like foot tapping or face rubbing do not. According to McNeill (2005), deictic, iconic, and metaphoric gestures contribute to construction of meaning when accompanying speech, and they serve as manifestations of the internalization processes as utterances and sentences. Reflecting their importance in communication, gestures have been incorporated into L2 teaching approaches, such as the Accelerative Integrated Method (Arnott, 2011; Cummins, 2014; Mady et al., 2009), which pairs vocabulary items and grammatical markers with gestures as a way to promote internalization. Behavior matching researchers have demonstrated that co-speech gestures are mimicked during referential communication tasks when a speaker presents a depiction of a shape, the listener accepts the depiction, or an interlocutor signals incremental understanding (Holler & Wilkins, 2011). They argued that the mimicked co-speech gestures were more reflective of intentional or conscious mimicry due to their important role in conveying communicative messages. In sum, both co-speech gestures and behavior matched co-speech gestures may play important roles in creating collaborative language use and supporting L2 development.

The Current Study

To sum up, behavior matching appears to be a robust phenomenon in a bidirectional relationship with the interlocutor perceptions of rapport measured in previous studies, including likability, friendliness, trust, shared interest, and smooth interactions. To explore its occurrence in a corpus of non-experimentally manipulated conversations between English L2 university students, we considered whether behavior matching during the conversation had a relationship with immediate post-task ratings of two positive attributes associated with rapport: motivation and collaboration. While motivation (i.e., how motivated my partner was to engage in our conversation) provides insight into the harmony of interlocutor relations, collaboration (i.e., how well my partner worked with me) is an indicator of smoothness. These two attributes were selected from a battery of interlocutor ratings that students completed immediately after the conversation (along with anxiety, fluency, and comprehensibility) as part of the corpus.

Although the ratings were elicited after any potential occurrence of behavior matching, we cannot determine when their perceptions began or how they evolved over the course of the conversation. Nevertheless, the corpus data can provide insight into students' behavior matching and their perceptions of an interlocutor during an initial meeting, which occurs frequently in numerous university settings, such as on the first day of class, in study groups, during hallway and cafeteria conversations, or when introduced to the acquaintances of friends. Finally, by examining non-manipulated conversations, the data help illuminate the extent to which alignment in behavior contributes to the "background hum" of naturalistic interaction (Louwerse et al., 2014, p. 1421). The research question was: Is behavior matching during L2 English speaker conversation related to interlocutor perceptions of partner motivation or collaboration? Based on the findings of previous research, we predicted that there would be a positive

relationship between them, such that greater behavior matching would be associated with higher post-task ratings.

Method

Paired Conversations

Conversations were drawn from the Corpus of English as a Lingua Franca Interaction (McDonough & Trofimovich, 2019), in which L2 English students enrolled in Montreal area universities carried out three, 10-minute communicative tasks in pairs (N = 225): a personal discussion task about problems students encountered when moving to Quebec, a close-call narrative, and a research-based academic discussion task. They interacted with someone from a different L1 background, and there was an equal distribution of pairs with same and different reported genders. This study analyzed the moving to Quebec conversations for two reasons. First, behavior matching has been shown to occur when interlocutors engage with more personal topics and share same-group identification (Guéguen & Martin, 2009; Yabar et al., 2006), and this task required an exchange of personal information related to their same-group experience as international students. Second, more pairs in the corpus did this task first (73%), which ensured that there was no occurrence of behavior matching during previous tasks and no prior interlocutor perception ratings.

Next, any pairs where the interlocutors had an existing relationship (e.g., were friends or partners) or one interlocutor was a research assistant were excluded, which resulted in a potential pool of 136 pairs. Finally, we selected a sample to balance reported gender across male–male, female–female, and male–female pairs and to include a variety of L1 backgrounds. The resulting sample consisted of 51 conversations (38% of the potential sample). The students (N = 102) had a mean age of 24.6 years (SD = 4.1) and had studied English previously for a mean of 13.6 years

(*SD* = 5.3). For students who reported their most recent TOEFL iBT (*n* = 26) or IELTs (*n* = 40) scores, the median scores were 97.1 (*IQR* = 18.0) and 7.0 (*IQR* = 1.0), respectively. They had been living in Canada for a mean of 3.7 years (*SD* = 4.8) and spoke the following L1s: Mandarin (20), Spanish (11), Farsi (10), Arabic (8), Tamil (8), Hindi (7), Bengali (6), French (6), Vietnamese (4), Urdu (4), Cantonese (2), Japanese (3), Punjabi (2), Portuguese (2), Russian (2), Dutch (1), Hebrew (1), Kannada (1), Korean (1), Malagasy (1) Malayalam (1), and Thai (1).

Interlocutor Perceptions

Immediately following the moving to Quebec task, each student completed a short task evaluation in which they rated their interlocutor's motivation and collaboration by putting checkmarks on two, 100-point continuous semantic differential scales, which have been successfully used in the field of cognitive and social psychology since Osgood's (1964) pioneering work. Although Likert scales are most frequently used in applied linguistics research, continuous measurements are also common, including lines anchored by endpoint descriptors (Isaacs et al., 2015) and moving sliders (Saito et al., 2016). As there are few differences in ratings obtained through different scale types of various lengths and resolutions (Isaacs & Thomson, 2013; Munro, 2018; Munro & Derwing, 1998), the scale choice was unlikely to have impacted rating validity in this study. The endpoints for motivation were *my partner was not at all motivated* and *my partner was very motivated*, and the endpoints for collaboration were *my partner didn't work well with me* and *my partner worked well with me*. As part of the corpus creation, the students also rated their partner's fluency, anxiety, and comprehensibility, and Pearson correlation coefficients indicated that the only strong correlation was between the linguistic dimensions of flow and comprehensibility (.67) while all other correlation coefficients

ranged from .14 to .47. The correlation coefficients suggest that students were able to differentiate among various interlocutor attributes when rating.

Data Analysis

To obtain the interlocutor perception ratings, numerical values were assigned to the partner ratings of motivation and collaboration by measuring the distance to the nearest millimeter between the left endpoint and the intersection of the cross or angle point of the checkmark on the 100-millimeter scales. Higher values indicate more positive interlocutor perceptions. After obtaining the values for both partners, they were summed and divided by two to obtain a mean value for each pair, on the assumption that interlocutor perceptions are co-constructed by and co-dependent on both interacting partners, which has been previously shown with partner ratings of comprehensibility, anxiety, and collaboration (Nagle et al., 2022). Mean partner values were also used to complement the use of the conversation, not individual speaker, as the unit of analysis for behavior matching. It is possible that mean values could mask variability in the individual partner scores. For example, the mean score of 50.5 could be obtained from partner ratings of 1 and 100 as well as from partner ratings of 50 and 51. However, descriptive statistics indicated that large gaps between the interlocutors' partner ratings rarely occurred. The mean gap in partner collaboration scores was 4.82 (SD = 6.32), while the mean gap in partner motivation was 10.61 (SD = 9.83). As evidenced by the large standard deviations, there was variation across the pairs in terms of how similar their ratings were.

To identify the occurrence of behavior matching, video recordings that showed both speakers' upper body (face, hand and arms, and torso) while facing each other were analyzed. However, due to the placement of the tables, lower body movements (e.g., leg crossing or foot tapping) were not visible. Informed by the types of behaviors identified in previous research, the

second researcher carried out bottom-up coding of movements of two videos not included in the dataset. After independent coding and discussion with the third and fourth authors, the final coding categories included movements in the following five categories:

1. Face: up or down eyebrow movements, opening the mouth, frowning, smiling, biting or pursing of the lips;
2. Head: side-to-side head tilts, up-and-down head nods;
3. Posture: forward, backward, or side-to-side leans and seated position shifts;
4. Hand: non-iconic movement (a) related to the flow or rate of speech (i.e., beat gestures), (b) representing spatial features or abstract ideas (e.g., metaphor gestures), and (c) pointing or locating objects in space (e.g., deictic gestures);
5. Self-adaption: scratching, touching, or rubbing a body area, touching or twisting hair, crossing arms, tapping fingers, and rubbing hands.

All behaviors that occurred once the interlocutors began the moving to Quebec discussion task were included in the analysis. Any behavior that continued more than a second, such as smiling or touching, was treated as a single unit until the speaker returned to a neutral position or began a different behavior. For the occurrence of behavior matching, each nonverbal behavior was classified as being matched or unmatched based on whether the interlocutor engaged in that same behavior within three to five seconds, which is the typical window used in behavioral mimicry research (Chartrand & Lakin, 2013). Finally, the degree to which each pair matched their nonverbal behaviors was obtained by dividing the number of matched behaviors by the total behaviors in each of the five coding categories. A subset of the data (20%) was independently coded by the fourth author, and interrater reliability assessed using intraclass consistency

coefficients was .78 for face, .97 for head, .88 for posture, .95 for hand, .98 for self-adaption, and .88 for behavior matching across all categories.

Results

Prior to examining the relationship between behavior matching and interlocutor ratings of motivation and collaboration, we first provide the descriptive statistics for the occurrence of movements in the five categories and the proportion of those movements that were matched by the interlocutor. As shown in Table 1, the mean values for head and hand movements were the highest followed by face movements, with all three types occurring in every pair. Self-adaption and posture movements occurred less frequently and in fewer pairs. Turning to the degree to which interlocutors matched those behaviors, the highest proportion of behavior matching (.20) occurred with face movements, followed by hand and head movements. Posture and self-adaption movements were rarely matched.

Table 1

Nonverbal Behavior (Frequency Counts) and Behavior Matching (Proportion) by Category

	Frequency			Behavior matching	
Movement	*k* dyads	*M*	*SD*	*M*	*SD*
Face	51	18.31	10.62	0.20	0.13
Head	51	25.86	16.55	0.02	0.03
Posture	12	0.53	1.12	0.00	0.00
Hand	51	27.49	12.14	0.04	0.05
Self-adaption	46	6.02	5.48	0.01	0.02

Note. *k* dyads refers to the number of dyads out of 51 that had the movement.

Turning to the interlocutor perception measures, which were mean partner ratings for each pair, the interlocutors generally had positive views of each other's collaboration and motivation, with mean scores above 80 on a 100-point scale for both attributes. The collaboration (M = 87.20, SD = 7.81) were slightly higher than the motivation ratings (M = 81.10, SD = 11.01). To explore the relationships between behavior matching and interlocutor perceptions, Pearson correlation coefficients were obtained. Because posture behaviors rarely occurred (in only 12 dyads), they were excluded from the correlation analyses. The correlation coefficients and 95% confidence intervals are provided in Table 2. Based on applied linguistics benchmarks (Plonsky & Oswald, 2014), hand movements had a small positive relationship with collaboration (r = .28). There were no other relationships of note between behavior matching and collaboration or motivation,[1] and the correlation between collaboration and motivation was .43 (95% CI = [.17, .63]).

Table 2

Correlations for Behavior Matching by Type

	Collaboration			Motivation		
Movement	*r*	95% *CI*		*r*	95% *CI*	
Face	.01	–.27	.28	.06	–.22	.33
Head	.05	–.23	.33	.08	–.20	.35
Hand	.16	–.12	.42	.28	.01	.52
Self-adaption	.09	–.20	.37	.07	–.23	.35

Based on the correlation results, a simple linear regression model was obtained with motivation ratings as the outcome variable and hand behavior matching as the predictor variable.

The model was statistically significant, $F(1, 49) = 4.13$, $p = .045$, and accounted for a total of 8% of the variance ($R^2 = .08$) in motivation ratings. In terms of assumptions and model fit, analysis of residuals indicated good model fit (only 2% of the cases had standardized residuals greater than ± 2) and only one case with potential undue influence on the model (i.e., Cook's distance was greater than one).[2] As the only variable in the model, hand behavior matching significantly predicted motivation ratings, $B = 57.60$, $SEB = 28.05$, $Exp(B) = .28$, $t = 2.05$, $p = .045$.

To illustrate the positive relationship between behavior matching and interlocutor perceptions, Example 1 is part of the conversation between two female students who were L1 speakers of Russian and Hindi. In terms of behavior matching, their proportion scores were .35 for facial movements, .18 for hand movements, and .07 for head movements, which were all higher than the mean values (see Table 1). Although hand behavior matching was the only significant predictor of motivation ratings, we highlighted all the instances of followed movements in the excerpt. In this segment, they were discussing how the weather in QC poses a challenge to international students who are not accustomed to extreme winter conditions.

Example 1

P295: I feel like the first one is definitely the winter (*smile*)

P296: yes (*smile followed*)

P295: Because uh when I moved here okay so because I lived in Dubai for a couple of years

P296: okay

P295: and it was like extremely hot and everything so I had nothing for winter wear like %nothing% (*side-to-side head movement*)

P296: %nothing% (*side-to-side head movement followed*)

P295: so yeah it's just looking around the store and then like you know you find these winter coats that look like there is a great price on them it's a great deal but then you find out that they don't do anything for you like it's like umm investing into a great winter wear is like one of the major things because you will end up wearing it for like nine months (*head nod*)

P296: yes, yes (*head nod followed*) I completely agree with that but since it is like my first year (*smile/laughter*)

P295: Yeah (*smile/laughter followed*)

296: I've heard stories about this and which are true like uh yeah I have–I'm so anxious like in India also no atmosphere as such as this like normal weather (*up-down hand movement*)

P295: yeah exactly (*hand movement followed*) it's like all pretty steady like rainfall and everything

P296: exactly like nothing is extreme

P295: exactly

As illustrated in this excerpt, both interlocutors initiated movements and followed their partner's movements. At the beginning, P295 smiled, moved her head sideways and nodded, all of which were followed by her partner. Later toward the end of the excerpt, P296 smiled/laughed and used a beat gesture, both of which were followed by her partner. Although it was beyond the scope of the current study to explore alignment across linguistic and nonverbal levels, the excerpt contains segments where the interlocutors use each other's lexical items during the behavior matching (i.e., *nothing* and *exactly*). At the end of the conversation, these students gave each other a joint collaboration rating of 93, which was higher than the mean rating across all pairs (81.1).

Discussion

To summarize the main findings, these conversations between English L2 university students contained numerous nonverbal behaviors involving head, hand, and face movements but fewer movements related to posture or self-adaption. While the proportion of matched behaviors was quite low across behavior categories (.00 to .20), hand behavior matching was a significant predictor of interlocutor perceptions of motivation. In contrast with experimental studies with native speakers, which tested whether naïve participants would match a confederate's specific behaviors, such as wincing (Bavelas et al., 1986), leg crossing (Castelli et al., 2009), facial expressions (Bavelas et al., 2000), and gestures (Holler & Wilkin, 2011), our analysis focused on the proportion of matched behaviors in non-experimentally manipulated L2 conversations. Since task conditions did not elicit strategic deployment of mimicry, it was unsurprising that the proportion of behavior matching was relatively low. Nevertheless, the findings extend those of prior studies that established an association between behavior matching and positive interlocutor perceptions of likability, friendliness, and trust (e.g., Chartrand & Bargh, 1999; Guéguen & Martin, 2009; Maddux et al., 2008).

Hand gestures analyzed in this study were co-speech gestures (i.e., beat, metaphor, and deictic) which are considered to be more reflective of intentional or conscious mimicry (Holler & Wilkins, 2011). Co-speech gestures prevail in L2 conversations especially because speakers compensate for linguistic difficulty and resolve communication breakdowns in face-to-face interactions by using hand movements strategically (Goldin-Meadow, 2003; Gullberg, 2006; McNeill, 2005). Thus, it is possible that the L2 speakers in this study deployed hand behavior matching intentionally to facilitate mutual understanding (Bavelas, 2007; Holler & Wilkins, 2011). Because prior research has identified variation in gesture use based on a speaker's

linguistic and cultural background (Nicoladis et al., 2018; Pika et al., 2006; So, 2010), we carried out a post-hoc analysis to explore whether there were any background similarities across the 11 pairs that had the highest rates of hand behavior matching (10–18%). These 22 students spoke nine different L1s, which suggests that the higher rates of behavior matching were not associated with a particular linguistic or cultural background. There was also no evidence that higher rates of head, face, or self-adaption behavior matching could be attributed to L1 background. Interestingly, eight of the 11 dyads involved interaction between students with the same reported gender (three male–male and five female–female dyads), which suggests an avenue for future research to identify the types of behaviors matched in same versus different gender pairings or groups.

Apart from the positive relationships between hand behavior matching and motivation, no other correlations reached the benchmark for a small relationship. One possible explanation for minimal relationships between behavior matching and interlocutor perceptions is that our analysis casts a wide net by including any type of movement. For example, in their study of behavior matching in unscripted conversation, Bavelas et al. (2000) excluded meaningful listener movements, such as head nods and smiles, to limit their scope to behaviors that have less communicative function. In the present exploratory study, all possible nonverbal behaviors were included, a decision which may have made it more difficult to detect meaningful data patterns. Future studies should work toward identifying whether behaviors that serve overtly communicative purposes are more likely to be matched.

In light of these findings, there are a few tentative implications for L2 research and teaching. L2 interactional competence is frequently assessed during oral interviews and paired oral exams for placement and achievement purposes at language schools or universities (Brooks,

2009; Winke, 2013). Previous rater perception research reported a positive relationship between paired oral exam performance and test-takers' use of nonverbal behaviors, including facial expressions, head nods, and hand gestures (Ducasse, 2013; Ducasse & Brown, 2009; May, 2011). Due to its positive relationship with rapport, behavior matching may contribute positively to rater evaluation of interactional competence. Future research should focus on behavior matching in higher-stakes interactions, such as conversations between examiners and test-takers on the IELTS speaking test, to identify whether test-taker behavior matching (or lack of behavior matching) relates to their scores. Similarly, when the assessment of paired oral tests includes criteria for collaboration or interactional competence, it may be useful to explore whether behavior matching plays a role in those ratings.

Considering the importance of nonverbal behavior in L2 interaction, it may be useful to raise students' awareness about the relationship between behavior matching and rapport. By drawing their attention to behavior matching, instructors can help students develop the ability to deploy it for strategic purposes during speech events, such as interviews, oral exams, and group projects. Teachers may find it useful to consider behavior matching when monitoring pair and small group interactions to determine if students are collaborating successfully or if it would be useful to intervene, as noted by Wells (2014) in his study of group work in math classes. Behavior matching—and the matching of hand gestures in particular—could generally complement the existing stock of pedagogical resources used by teachers. Considering that gesture use in L2 classrooms is beneficial for language development, for example, in terms of drawing students' attention to problematic utterances (e.g., Davies, 2006; Wang & Loewen, 2016) or helping them internalize vocabulary (e.g., Macedonia & Klimesch, 2014; Tellier, 2008),

a focus on the social and rapport-building functions of gestures might provide additional learning benefits for students.

Although there was a small positive relationship between relatively low rates of hand behavior matching and rapport, the findings require replication through additional analysis of spontaneous talk as well as more tightly controlled experimental studies. Also, this exploratory study has several limitations that impact its generalizability. First, because interlocutor perceptions and behavior matching have a reciprocal relationship (Chartrand & Bargh, 1999; Maddux et al., 2008), it was not possible to determine directionality or causality of the obtained association between behavior matching and motivation. It is unknown whether the occurrence of hand behavior matching facilitated higher motivation ratings, or if a student's perception of interlocutor motivation during the conversation resulted in the behavior matching. Future research should adopt more dynamic measures of interlocutor perceptions to identify how they evolve with behavior matching throughout a conversation. Second, as noted in the introduction, a variety of interlocutor perceptions (e.g., likability, trust, friendliness, smoothness of interaction) have been tested in previous research, and the current study has identified collaboration as another attribute associated with behavior matching. Collaboration, which was defined here as how well the interlocutors worked with each other, is most similar to the smoothness of interaction measured in prior research (Chartrand & Bargh, 1999), but future research is needed to replicate the findings for interlocutor attributes tested previously and identify new attributes relevant in different communicative settings. Furthermore, there have been a variety of scales used to elicit interlocutor perceptions, ranging from 5-point Likert scales to the 100-point scales used here. This variation in target attributes and their measurement makes it difficult to generalize the findings, so future L2 replication studies are needed.

Third, our analysis examined alignment as behavior matching between speakers only. Researchers have reported that self-alignment (i.e., repeatedly producing the same behavior) of iconic gestures occurred more frequently during conversation than between-speaker alignment (Bergman & Kopp, 2012). Finally, although nonverbal behavior was the main focus of the analysis, this study did not consider how both verbal and nonverbal information are integrated during conversation. Example 1 provided some insight into the co-occurrence of behavior matching and lexical expressions, but future research adopting a more micro-analytic approach could provide greater insight into their relationship. To conclude, this contribution to the special issue about alignment in L2 interaction has identified the occurrence of hand behavior matching in L2 conversation and an association with perceived interlocutor motivation. As an exploratory study, we hope that the findings pave the way for future investigations of alignment that consider a wider range of social factors to identify the conditions under which behavior matching facilitates L2 learning.

Notes

1. Our focus is on the relationship between behavior matching and interlocutor perceptions. However, it is possible that the total frequency of various behaviors, as opposed to the proportion of matched behaviors, may be associated with interlocutor perceptions. Examination of the correlation coefficients between behavior frequency counts and the interlocutor perception ratings revealed Pearson correlation values ranging from .08 to .24 for collaboration and from –.04 to .33 (hand movements) for motivation. Thus, the correlation analysis did not indicate any strong relationships between total behaviors and interlocutor ratings.

2. Due to the presence of one case with potential undue influence on the model, we ran a bootstrapped linear regression with bias corrected accelerated confidence intervals, and there was no change in the model or the predictor variable. The BCa 95% confidence interval for hand behavior matching was 5.45 to 106.57.

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