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Spontaneous Gestures in L2 Naturalistic Spontaneous Interaction: Effects of Language Proficiency

Abstract: Gestures produced by language learners have a positive impact on interactions; however, few studies have examined natural conversation data focusing on a learner's spoken language proficiency level. This study investigates gesture use among learners of English as a second language with varying language proficiency levels (beginner, intermediate, and advanced) to determine whether gesture use and type (e.g., iconic, deictic, metaphoric, and beat gestures) differ by language proficiency level. This study examined 17 video-recorded dyadic interactions in English consisting of mixed-level and same-level pairs. Quantitative analysis followed by a data-driven approach demonstrated that more advanced learners employed gestures with speech more frequently than other groups. During interactions, iconic gestures were used more often by the beginner group, while deictic gestures were employed more by the advanced group. Moreover, the function of the gestures produced by each group during the interactions appeared to be qualitatively varied. These results indicate that gesture use and type may relate to learners' language proficiency levels. This study has revealed significant differences in gesture use among learners of English as a second language with varying language proficiency levels, providing insights into learners' cognition process during verbal communication.

Keywords: gesture, interaction, multimodality, L2, language proficiency

1. Introduction

Prior research, including Kelly, Özyürek, and Maris, states that gestures appear when we are speaking; by definition, gestures are mostly unconscious. Spontaneous manual movements that accompany speech are referred to as spontaneous gestures (McNeill, *Gesture and Thought* 4), and the realization of spontaneous gestures is not only production/speaker-oriented but also reception/listener-oriented (Kita).

Numerous studies have noted the significance of non-verbal communicative cues supplementing speech in face-to-face communication (e.g., Hostetter; Stam), mostly because the use of such resources in organizing communication increases communication efficiency. This idea suggests the relevance of manual gestures for establishing multimodal expressions. Indeed, gestures used along with speech are ubiquitous in the production and understanding of a target language. Research on language learning reported that language learners' gestures accompanying speech enhanced communication effectiveness for both speakers and listeners (e.g., Gullberg; McCafferty; Sime).

However, many of the related findings backing the relevant use of such resources have, so far, been observed in institutional experimental settings; little evidence exists on the topic during ongoing interaction processes. Additionally, in the field of second or foreign language (L2) learning and gesturing, while much of the research aimed to examine the use of gestures in interaction using a conversation analytic approach, particular gesture types used in naturalistic spontaneous interactions between L2 learners have yet to be investigated. Here, an analysis of interactions in which L2 learners engage in topic negotiations may enable us to more comprehensively understand the gesture–speech relationship across various domains. Accordingly, this study examines the connections between language learners' gestures and proficiency levels in interactions. After collecting data by exposing L2 learners to dyad interactions, I have compared gesture use frequencies to explore gesture type use of learners at varying proficiency levels and examine whether proficiency level relates to gesture type.

2. Literature review

This section begins with a critical review of gesture research in the areas of language development and acquisition, and it summarizes the methodological and theoretical background of the present study.

2.1. Gesture use in understanding and learning L2

Speech and gestures are interconnected temporally and semantically (Kendon, *Gesture*; Kita; McNeill and Duncan). Using interactive perspectives, gesture researchers revealed how gestures encode and decode conceptual and linguistic information related to speech. Through gestures, a speaker can provide a recipient with visual cues or actions that can add meaning, enhance clarity, and allow the recipient to interpret the speaker's intended meaning effectively and quickly (Kendon, *Gesture*; Goldin-Meadow, "Two Faces"; McNeill, *Gesture and Thought*). For example, Hanamoto ("Spatial and Temporal Attention" 184), while endeavouring to represent temporal concepts, reported that speakers produced manual gestures

along the imaginary mental timeline axis, laterally or vertically, to represent the English grammar time concepts of tense and aspect. As such, using gestures during speech facilitates communication and comprehension.

Many studies have reinforced this importance of gesture use as a non-verbal or bodily resource in second or foreign language teaching and learning (e.g., Gullberg; Gullberg and McCafferty; Stam; Tellier), with this being especially true for language learning processes and L2 communication. To be more precise, both native language (L1) and L2 speakers can express information about their thoughts or knowledge through gestures. Therefore, language development and acquisition, particularly within the communication domain, seem to be profoundly multimodal (Mondada 197). In addition, L2 learners produce more speech-related gestures in L2 than in L1 (Gullberg; Sueyoshi and Hardison 666). Previous studies have demonstrated that L2 learners' gesture use increased when they encountered difficulties, such as when they had to compensate for knowledge gaps in L2, when trying to comprehend L2 speech, or when interacting with interlocutors in L2 (Gregersen, Olivares-Cuhat, and Storm; Gullberg; McCafferty; Mori and Hayashi). Therefore, as in L1, gesture use in L2 interactions appears to be a strategic resource that learners employ when taking turns in speaking or negotiating meaning.

Previous research demonstrated that gestures in L2 interactions within the context of language learning serve various functions. For example, examining how and when gestures are produced with speech allows for monitoring learners' thought process during speech production (McNeill, *Gesture and Thought* 7): the ongoing process of gesture production during speech by learners reveals a complete picture of their progress in acquiring a target language (Gullberg; Kendon, *Gesture*; Stam; Tuite). In addition, gestures accompanying speech can facilitate L2 lexical production, particularly in accessing and finding words in the lexicon (Krauss; Krauss and Hadar). Thus, regarding cognitive function, gestures aid speakers in conceptualizing their thoughts and in the process of lexical retrieval.

While gestures have speaker-oriented functions (e.g., encoding information in speech), they can also aid the recipient's understanding by providing visual input and contributing to communication, indicating that gestures have an interactive purpose (Kita). Indeed, studies have shown how language learners' gestures serve interactive functions, such as fostering listening comprehension (e.g., Hostetter), making the meaning explicit for improving comprehension as a repair strategy (e.g., Gullberg; McCafferty), increasing redundancy (e.g., Kellerman), highlighting spatial and temporal concepts (e.g., Hanamoto, "Spatial and Temporal Attention"), taking turns in speaking (e.g., Mondada), achieving interactional alignment between interlocutors (e.g., McNeill, *Gesture and Thought* 12), and maintaining rapport before repair sequences (e.g., Hanamoto, "Gesture Sequences"). Therefore, gestures fulfil multiple functions (Goldin-Meadow, "Beyond Words"), and L2 learners rely on gestures during speech as a means of communicative behaviour to make speech meaningful to a recipient.

2.2. Gesture use and learners' L2 proficiency

The relationship between gesture use and L2 learner proficiency has been investigated within various contexts, such as in L2 listening comprehension (e.g., Dahl and Ludvigsen; Sueyoshi and Hardison), task-based research using printed animated cartoons (e.g., Gullberg; Nicoladis et al.; Stam), oral interviews (e.g., Taranger and Coupier, qtd. in Gullberg), and discourse comprehension (e.g., Kida). Moreover, the literature shows that a language learner's proficiency tends to influence the frequency and type of gestures used in L2 interactions. Taranger and Coupier demonstrated that higher proficiency levels were associated with a greater number of gestures with speech (e.g., iconic, metaphoric, deictic, and beats gestures; each gesture type is separately defined later in this manuscript), which differed depending on speech topics. Further, Kida's contextual analysis of gesture function in discourse comprehension demonstrated that gestures yielded greater benefits for lower-proficiency learners.

According to Gregersen, Olivares-Cuhat, and Storm, when L2 learners engage in speech, language proficiency is an important factor in decision-making regarding the gesture type and function to be used (205). Their study is of importance because it differs from past experimental studies through having collected data from face-to-face interactions: the speaker was asked some questions after a role-play activity. Gregersen, Olivares-Cuhat, and Storm revealed that participants with varying proficiency levels employed gestures in unique ways according to the situation; particularly, learners at the beginning level tended to employ gestures for representing concrete actions or movements of people for filling verbal linguistic gaps, whereas those at more proficient levels tended to use gestures to avoid speech ambiguity or enhance explicitness to improve speech intelligibility (205–06). Therefore, I deem it safe to conclude that learners produce manual gestures in ongoing interactions based on their language proficiency level as well as other factors, such as topics, tasks, and relationships between interactants.

This study focuses on gesture use in dyadic interactions by learners at varying L2 proficiency levels for the following reasons. First, studies have rarely investigated the relationship between language proficiency level and gesture use through experiments using naturalistic spontaneous discourse. Importantly, this is the case despite the wide availability of methods to analyze natural conversations, such as conversation analysis (e.g., Hanamoto, "Gesture Sequences", "Co-Occurring Speech and Gestures", "Spatial and Temporal Attention"; Matsumoto and Canagarajah; Mori and Hayashi) or discourse analysis approaches (e.g., Kida). Moreover, most previous studies compared gesture use between target L1 speakers and L2 learners or looked at L2 thinking for speaking by L2 learners at different proficiency levels, revealing a scarcity of research on gesture interactions between L2 learners only within the field of L2 learning and gesturing. This study, therefore, attempts to clarify the connections between gesture and language proficiency levels in interaction.

2.3. Research questions

The research questions for this study were as follows: (1) Are there differences in gesture use frequency among beginner, intermediate, and advanced learners in interactions between L2 learners only? (2) If so, are there differences among the three groups for a particular gesture type?

3. Materials and methods

This section describes the methodological framework for this study. Specifically, this section outlines the study's data collection method and its analytical framework.

3.1. Participants

The research involved 34 undergraduate university students (30 men, 4 women, mean [M] age = 21.06, standard deviation [SD] = 3.65) studying science and engineering at a private university in Japan. They were informed that participation was voluntary. Their L1 were Japanese ($n = 17$), Cantonese ($n = 5$), Arabic ($n = 2$), Indonesian ($n = 2$), Nepalese ($n = 2$), Vietnamese ($n = 2$), Malay ($n = 1$), Thai ($n = 1$), Turkmen ($n = 1$), and Uyghur ($n = 1$); no participant was a native English speaker.

Study participants were divided into three levels per proficiency in the English language: beginner, intermediate, and advanced; they were assigned to one of the three levels through a TOEIC-based placement test. All students took this test during the first week of the semester at their university. The study population comprised 11 beginners: those with L1 as Japanese ($n = 8$), Cantonese ($n = 2$), and Thai ($n = 1$); 12 intermediate learners: those with L1 as Japanese ($n = 7$), Cantonese ($n = 2$), Nepalese ($n = 2$), and Arabic ($n = 1$); and 11 advanced learners: those with L1 as Indonesian ($n = 2$), Japanese ($n = 2$), Vietnamese ($n = 2$), Arabic ($n = 1$), Cantonese ($n = 1$), Malay ($n = 1$), Turkmen ($n = 1$), and Uyghur ($n = 1$). All participants provided written informed consent before taking part in the study, which included consent to record interactions and use data for research purposes.

3.2. Procedure

All participants were paired up for a natural interaction in English that lasted approximately 15 minutes, and the data analyzed were based on 17 dyad video-recorded interactions. Participants were assigned in a way that ensured no participant knew the peer in the dyad from before the experiment. Then, the dyads were assembled by the participants and the author; they mainly constituted conversational interactions between strangers on first meeting. The dyads comprised mixed-level and same-level proficiency pairs to compare gesture uses between learners. They were informed that their dyad interaction would be video-recorded and that the

recordings would be used to obtain a general view of their conversational behaviour during interactions. To examine more natural conversational data and consider conversations as a free-flowing task (rather than as a task-based or artificial task), the participants in each dyad were asked to start a free conversation; namely, each dyad was asked to negotiate the conversation topic to be able to contribute to the interaction. These experimental instructions led participants to mostly negotiate and develop topics related to common interests and daily issues, such as their major, high school days, travelling experience, or things they want in the near future; their interactions were deemed as being similar to daily conversations.

Data collection took place in the laboratory where the author works. Upon arrival, the participants in the dyad were instructed to sit across the table from each other. While interacting, the speakers in each dyad were simultaneously recorded using two high-performance digital video cameras with an additional microphone, allowing for both the speaker's and the addressee's gesture use during speech to be captured visually. To ensure clarity in the recordings, each participant was asked to attach a pin microphone connected to the first or second camera to their clothes, near the base of their throat. To capture data from different angles, the two cameras were set up on tripods at a small distance from the table: one camera captured an entire and full-frontal view of both interlocutors, and the other was placed above them and covered the entire surface of the table from the top.

3.3. Transcribing and coding

The present study was data-driven, and the transcription process was used for data analysis. The transcription of speech and the annotation of gestures in each recorded dyad interaction were conducted and coded using ELAN computer annotation software. First, the conversations were transcribed verbatim using standard orthography, including para-linguistic behaviour, such as laughter, filled pauses, and fillers. Within a few days after making the transcriptions, the author asked each dyad to watch the video recording of their interaction. When the transcriptions included unfamiliar expressions, the speakers were asked to explain what they meant to say through the given expression. The transcription sheet in ELAN included transcriptions of the speech of each participant, with the gesture dimensions on separate tiers.

In total, there were 17 dyads, and the manual gestures produced by each speaker were identified from the video recordings and classified as one of four types: iconic (relating to or resembling the concurrently presented referent), deictic (pointing to concrete objects or referents or indicating abstract spatial representation), metaphoric (depicting abstract images or concepts), and beats (along with the rhythm of uttering or bringing attention to speech; non-semantic meaning). This was based

on McNeill's (*Gesture and Thought*) typology, which used the shape of the gesture and the accompanying speech for analysis.

The types of gestures were classified according to both gesture shape and referential content. One example is that gesture form/shape in case of metaphoric and iconic categories may be the same, but what differentiates these types of gestures is the referent-abstract in the case of metaphoric gestures and the concrete in the case of iconic. McNeill pointed out that metaphoric gestures are "more complex" than iconic, because they have an iconic base, and the abstract referent is represented by this iconic base (*Hand and Mind* 80).

For coding, first, all spontaneous manual gestures were segmented into gesture units or phases (Kendon, *Gesture* 112−13), which is a process that serves to analyze what initiated the gestures. From a gestural perspective, a new gesture begins after another gesture ends during meaning construction (McNeill, *Hand and Mind* 131). Therefore, this study focused on specific expressive manual gesture "strokes" (McNeill, *Gesture and Thought* 1), which were considered to convey the most significant and meaningful parts (Kendon, *Gesture* 112; McNeill, *Gesture and Thought* 1). In addition, across the 17 dyad interactions, gestural identification was performed by a second coder. To ensure consistency between coders, the second coder was trained in and familiar with multimodal analysis. After agreement between the two coders was reached, the inter-rater reliability regarding the number of gestures produced by each speaker (Cohen's kappa = .81) and the coding of gesture types was deemed acceptable. Specifically, for gesture types, Cohen's kappa values were as follows: iconic (= .81), deictic (= .80), metaphoric (= .77), and beats (= .82). Based on prior research (Cohen), these Cohen's kappa values revealed a substantial degree of concordance between the two coders for gesture identification.

To address the research questions, I analyzed the distribution of type and frequency for each participant's manual gestures and calculated the frequency of manual gesture types produced by each participant in the interactions.

I used IBM SPSS Statistics 27 for data analysis. Given the nature of the collected data (i.e., extraction from a small sample and considering violation of normality), I performed non-parametric statistical tests, particularly the Kruskal–Wallis test, for comparing gesture use and type among the three groups. I also applied non-parametric correlation analysis, using the Mann–Whitney test, to verify which combinations of groups and gesture types were correlated. I set the level of significance or alpha level for statistical significance at .05; however, lower alpha levels were also noted. To verify effect sizes, I computed the correlation coefficient *r* (cf. Cohen; Field). Additionally, to analyze gesture use in relation to learners' proficiency more precisely, I coded gestures at varying levels for the function of the gestural action. This process followed the organization of turn-construction or turn-taking system in talk (Schegloff), serving as qualitative support for data analysis.

4. Results and discussion

This section addresses the following issues: (1) Are there differences in gesture use frequency among beginner, intermediate, and advanced learners in interactions between L2 learners only? (2) If so, are there differences among the three groups for a particular gesture type?

4.1. Gesture use frequency

I analyzed whether the frequency of gesture use differed among beginner, intermediate, and advanced learners when speaking English, an L2 for them. The total number of manual gestures paired with speech was calculated for each proficiency group. Table 1 shows the M and SD scores for gesture use observed in the 17 interactions.

Speakers in the advanced group scored the highest numerically ($M = 76.27$, $SD = 29.58$), while speakers in the beginner group scored the lowest ($M = 51.82$, $SD = 20.00$). The results of the Kruskal–Wallis test showed significant differences in the distribution of gesture use among the three groups ($\chi^2 (2) = 6.210$, $p = .045$). The results of the Ryan test showed significant pairwise differences in gesture use between intermediate and advanced learners and between beginner and advanced learners (Table 2).

Therefore, gestures were more frequently used in the advanced group than in the intermediate and beginner groups. This observed phenomenon extends previous findings (Gregersen, Olivares-Cuhat, and Storm; Taranger and Coupier), which showed that higher proficiency was correlated with more gestures. Therefore, in naturalistic spontaneous interactions, the number of gestures used appeared to be influenced by proficiency level.

Table 1: Means and standard deviation of gesture use by learners' proficiency level

Level	Mean	SD
Beginner	51.82	20.00
Intermediate	54.50	25.97
Advanced	76.27	29.58

Note: SD = standard deviation.

Table 2: Results of the pairwise correlation analysis of gesture use

Beginner–Intermediate				Intermediate–Advanced				Beginner–Advanced			
U	Z	p	r	U	Z	p	r	U	Z	p	r
n.s.				100.00	2.094	.036	.44	94.00	2.20	.028	.47

Note: n.s. = non-significant.

4.2. Gesture type use

I also analyzed whether differences existed in gesture types among the three groups. Considering that I analyzed the number of gestures used per proficiency level group based on participants' use of particular gesture types, I also classified all gestures produced across the interactions according to McNeill's (*Gesture and Thought*) typology. Nonetheless, before conducting the main analysis, I examined whether the means of gesture use in each group differed reliably per gesture type and group.

Table 3 shows the *M* and *SD* scores of each gesture type per proficiency level group. The Kruskal–Wallis test revealed statistically significant differences among groups in the use of iconic (χ^2 (2) = 6.420, p = .040) and deictic gestures (χ^2 (2) = 10.078, p = .006), but not in the use of metaphoric (χ^2 (2) = 4.251, p = .119), and beat gestures (χ^2 (2) = 4.404, p = .111). To gather a significant combination of groups, I conducted multiple comparisons. Overall, it seemed that beginner learners employed more iconic gestures than the other groups; however, only the difference between beginner and advanced learners was statistically significant for iconic gestures (Table 4). Nevertheless, the quantitative difference was statistically significant (U = 23.50, p = .014), and the effect size was fairly high (r = .52). Therefore, the differences between groups suggested that iconic gestures were used more often in the beginner group than in the advanced groups.

Table 3: Means and standard deviation of gesture use by gesture type and learners' proficiency level

Type	Level		
	Beginner	Intermediate	Advanced
Iconic	10.09 (4.72)	8.00 (3.88)	5.18 (3.37)
Deictic	21.73 (7.42)	23.25 (11.46)	37.82 (13.01)
Metaphoric	13.73 (8.53)	11.67 (6.24)	20.00 (10.37)
Beat	4.91 (3.05)	8.92 (6.89)	9.18 (5.91)

Table 4: Results of the pairwise correlation analysis for iconic gesture use

Beginner–Advanced			
U	*Z*	*p*	*r*
23.50	-2.448	.014	.52

On this topic, previous studies reported that language learners tended to perform iconic gestures when facing lexical retrieval (e.g., Gullberg), aiding language access (e.g., Krauss and Hadar), or co-creating the concepts or linguistic information (e.g., Bub, Masson, and Bukach).

To analyze iconic gesture use in relation to learners' proficiency level more precisely, I coded iconic gestures produced by participants at varying proficiency levels for the function of the gestural action. Table 5 indicates the three main func-

tions of iconic gestures observed in the three proficiency groups. Cohen's kappa inter-rater reliability for function identification of iconic gestures was .79. My results indicated the possibility of differences in gestural function by proficiency level; namely, as the proficiency lowered, speakers produced more iconic gestures when facing difficulties in accessing lexical words. This concurs with prior research (e.g., Gregersen, Olivares-Cuhat, and Storm). Meanwhile, advanced learners produced iconic gestures not for specific attempts, but when they deemed their use appropriate for the situation.

Table 5: Comparisons of iconic gesture use by gesture function and learners' proficiency level groups

	Beginner	Intermediate	Advanced
Difficulty accessing word	65 (58.6%)	46 (48.4%)	15 (26.3%)
Lexical encoding process	20 (18.0%)	31 (32.6%)	18 (31.6%)
Capturing attention or requesting clarification	23 (20.7%)	14 (14.8%)	21 (36.8%)
Others	3 (2.7%)	4 (4.2%)	3 (5.3%)
Number of cases	111	95	57

According to Gullberg, in L1 production, iconic gestures were the most frequent and effective gesture type (221). Therefore, my results indicate that, during lexical construction in interactions, beginner language learners may express their communicative intention in L2 using iconic gestures and verbal utterances (in a way similar to how they do in L1) more than learners with higher proficiency levels; this concurs with prior literature (e.g., Nicoladis et al.).

Table 3 also shows that advanced learners produced gestures more frequently compared with the other two groups, with the means for deictic gesture use with speech among beginner, intermediate, and advanced learners being 21.73, 23.25, and 37.82, respectively. For each combination, those more advanced produced greater numbers of deictic gestures. In addition to the Kruskal–Wallis test, I conducted a second comparison to confirm the correlation between proficiency and deictic gesture use. The results revealed significant differences in both advanced learner group combinations. Table 6 presents the results of three pairwise comparisons between two groups and test statistics. There were notable differences between advanced learners and beginners, and between advanced and intermediate learners. I obtained these results using alpha = .01 as the difference level, and the effect size tended to rise with the increase in the difference between proficiency levels. Therefore, it can be inferred that learners with higher proficiency employed more deictic gestures in interactions than did those with lower proficiency; that is, proficiency level appeared to influence gesture use, particularly in deictic gestures.

This leads to the following question: how does the function of deictic gestures relate to increased frequency? To answer this question, the author and the second coder observed the six main functions of deictic gestures (Cohen's kappa = .79). As

shown in Table 7, the proportions of each function among the three groups were almost balanced; notwithstanding, since advanced learners produced deictic gestures more often, quite possibly they may employ deictic gestures more for cognitive and communicative purposes, depending on the context and based on their own considerations.

Table 6: Results of the pairwise correlation analysis for deictic gesture use

Beginner–Intermediate				Intermediate–Advanced				Beginner–Advanced			
U	Z	p	r	U	Z	p	r	U	Z	p	r
n.s.				107.50	2.557	.010	.53	105.00	2.925	.003	.62

Note: n.s. = non-significant.

Table 7: Comparisons regarding deictic gesture use by gesture function and learners' proficiency level groups

	Beginner	Intermediate	Advanced
General reference	39 (16.3%)	27 (9.7%)	33 (7.9%)
Difficulty accessing word	33 (13.8%)	28 (10.0%)	35 (8.4%)
Introduction of new topic or reference	19 (7.9%)	28 (10.0%)	45 (10.8%)
Request for clarification	36 (15.1%)	47 (16.9%)	94 (22.6%)
Acceptance of interlocutor's utterance	65 (27.2%)	88 (31.5%)	115 (27.6%)
Spatial and temporal conception	41 (17.2%)	53 (19.0%)	87 (21.0%)
Others	6 (2.5%)	8 (2.9%)	7 (1.7%)
Number of cases	239	279	416

Prior research demonstrated that lower-proficiency L2 learners use more iconic gestures, and higher-proficiency learners use more deictic gestures (Gullberg); my study corroborates this assumption by showing that advanced learners indeed used more deictic gestures within casual interactions. Therefore, the rationale here is that, as proficiency increases, deictic gesture use frequency also increases.

Further, my research results demonstrated that proficiency correlated more with deictic gesture use than with iconic gesture use. Quantitatively speaking, the findings shown in Tables 4 and 6 (i.e., p-value and effect size differences) support this interpretation. Past research demonstrated that learners were more prone to employ deictic gestures with speech in L2 learning than in L1 learning (e.g., Gullberg; Sherman and Nicoladis). Moreover, a growing body of work suggests that deictic gestures (including pointing gestures) are displayed in various ways during interactional sequences, such as when locating or introducing a reference (e.g., McNeill, *Hand and Mind*), referring to spatial and temporal concepts (e.g., Kendon, "Spatial Organization"), specifying metaphorical timelines and sequencing

events (e.g., Hanamoto, "Spatial and Temporal Attention"), and capturing a recipient's attention or requesting clarification (e.g., Gullberg). Hence, deictic gestures seem to have multiple functions.

Therefore, as a mechanism in speech ontogeny (Butcher and Goldin-Meadow), which states that pointing deictic gestures develop before iconic gestures, quite possibly deictic gestures are produced more easily than iconic gestures, and more for cognitive and communicative purposes. This suggests that language learners express referential contents or meaning both verbally and through deictic gestures, although some referents occurred in combination with iconic gestures (e.g., Gullberg). Therefore, one can argue that, as documented by Krauss and Hadar, iconic gestures were produced primarily for eliciting lexical encoding support cognitively, while deictic gestures had communicative functions, such as creating cohesion or improving comprehension.

5. Conclusion

This study aimed to determine whether gestural production differed among L2 learners with varying language proficiency levels: beginner, intermediate, and advanced. To achieve this, I examined video-recorded interactional data of mixed-level and same-level pairs and utilized a data-driven approach to capture language learners' gesturing behaviour in ongoing casual interactions.

Regarding the first research question, my preliminary quantitative analysis revealed notable distribution differences for gesture use among the three proficiency level groups. In addition, a multiple comparison test showed significant pairwise combinations between advanced learners and beginners, and between advanced and intermediate learners. That is, even during casual interactions, gesture use may relate to the learner's proficiency level—a finding that aligns with previous studies in various other contexts.

I used McNeill's (*Gesture and Thought*) typology to respond to the second research question, with my findings demonstrating that the distribution of iconic gesture use differed significantly between beginner and advanced learner groups. In addition, I observed reliable quantitative differences in deictic gesture use between intermediate and advanced learners, and between beginner and advanced learner groups; that is, learner proficiency influenced particular gesture type use in ongoing casual interactions. Additionally, the function of iconic gesture produced by each group during the interactions appeared to be qualitatively varied; specifically, compared with participants in advanced-proficiency groups, those in lower-proficiency groups tended to make more use of iconic gestures to solve gaps in lexical knowledge. Regarding deictic gestures, the proportions of each function among the three groups were almost balanced.

This study has some limitations. Although it demonstrated the potential connection between proficiency level and gesture use—primarily based on statistical effect sizes and correlations—I suggest that these quantitative data be put into perspective with more qualitative data to more comprehensively understand the relationship between spontaneous gesture use and learners' proficiency. Hence, future in-depth qualitative research is warranted. For instance, the reliability of my analysis cannot be secured unless retrospective or introspective measures are also considered. In addition, I see the need to acknowledge the small sample size of this research, which denotes that a power analysis would establish the size of the sample needed to establish significant results. Moreover, in this study, I tried to explore various conversation domains by developing and implementing an experiment wherein participants could engage in ongoing interactions with uncontrolled discussion topics. This means that the topic choice, the interaction partner, the proficiency of the interaction partner, and also the strategy of that partner may have influenced gesture frequency. Hence, I believe that future research should try to address this issue by having participants partake in multiple sessions of casual interactions with partners of different proficiency levels.

Despite these limitations, the findings of this study suggest that, in casual interactions, language learners at all proficiency levels tend to convey their intentions visibly through gestures. The study provides valuable insights into L2 learners' non-verbal communication, indicating that gesture is an integral part of communication. In summary, my study showed that as the L2 learner's proficiency level increases, (a) the frequency of use of all gesture types increases, (b) that of iconic gestures decreases, and (c) that of deictic gestures increases. These findings strongly support the argument that looking at only one side of the resource, namely at either the verbal or at the non-verbal aspect of communication, is inadequate for holistically understanding L2 interactions. Speech and gesture are "two sides of the same coin" (Kelly, Özyürek, and Maris 266). Future research should integrate the gestural features of interactions when analyzing the interactions between L2 learners, as well as investigate the cognition process contributing to the development of face-to-face interactions in general.

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