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Space for cognition: gesture and second language learning

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This paper explores the possibility that L2 learners utilize gesture, like speech, for intrapersonal problem solving. Kita (2000) argued that the "default" organization of information when speaking is analytic but that the use of representational gestures, specifically iconic and abstract deictic gestures, can constitute a spatio-motoric mode of thinking, that is, that we deploy "gesturing for thinking". Thus, Kita believes that gestures are *actional* as opposed to representational and form as part of the physical environment in conjunction with the cognitive system. In applying this perspective to second language learning, it is argued in the current study that, because of an inability to fully command discourse in the L2, at times learners utilize this mode of thinking. There is also speculation that the use of gestures in the form of beats in relation to prosodic features, notably intonation and syllable structure, may be a form of *enaction*, that is, internalizing the L2 through embodied processes.

Introduction

In the 1990s, mirror neurons were first discovered in the brains of monkeys. These neurons were found to fire not only when an animal itself engaged in a given hand movement, but also when it watched the same movement of another animal or person (Di Pelegrino et al. 1992). In a more recent study (Rizzolatti and Gallese 1997), human mirror neurons were found to function in the same way. With this and other studies has come a widening sense of the possible importance of gesture as part of our biological, psychological, linguistic, and cultural make up (Rizzolatti and Arbib 1998). In addition, there has been speculation that mirror neurons provide a possible neural basis for imitation, observational learning, and motor imagery (Jeannerod 1997: 115), as well as for empathy and our ability to read the minds of others, or as expressed by Gallese and Goldman (1998: 493): "According to 'simulation theory', other people's mental states are represented by adopting their perspective: by tracking or matching their states with resonant states of one's own."

Long before this discovery, imitation was identified by Vygotsky as a key aspect of learning and development. In fact, according to Newman and Holtzman (1993: 151), he believed that it is "the predominant joint

revolutionary activity" of childhood. Moreover, Vygotsky (1986: 188) argued that imitation is a transformational process, that "[w]hat the child can do in cooperation today he can do alone tomorrow". In relation to gesture, this suggests that, like speech, there may be forms that eventually take on significance at the psychological or intrapersonal plane of development through what Vygotsky termed the process of *internalization*. In relation to this process and the ontogenetic development of language, Vygotsky argued that "the word at first, is a conventional substitute for the gesture" (1986: 65). Thus the overall movement towards semiotic mediation starts with gesture in the form of pointing, a way by which we not only come to indicate but to know objects and the world around us.

In an initial attempt to study the intrapersonal use of gestures and their function in conjunction with the use of *private speech* (speech for the self) for purposes of mediating second language (L2) learning (McCafferty 1998), I found that the two were virtually always co-produced when adult L2 learners of English were engaged in on-line problem solving in the L2. The results of this study also suggested a possible link between gesture and *inner speech* as learners at times nodded their heads during unfilled pauses, as if affirming their own thoughts. Moreover, the study found that participants used gestures associated with American language culture for this purpose as well as those associated with their first language culture.

The present study focuses on the use of gesture and space as a self-organizing form of mediation for L2 learning. The basic assumption is that there exists a strong interconnection between thought, language, and gesture. From a Vygotskian perspective, gesture, like speech, can act as a means of thinking as part of the process of developing one's thoughts; moreover, it can function as a separate, spatio-motoric mode of thinking (Kita 2000). Additionally, I will speculate that gesture is a means through which linguistic elements, and in this case prosody and syllable structure, might, at least partially, be internalized through the process of embodiment.

But before turning to the study, iconic gestures along with abstract deictic gestures are described below because these forms have constituted the major focus, so far, in examining gesture in relation to spatio-motoric thought. Also, because their connection to thought and communication has proven controversial, a review of theories of iconic gesture follows. Finally, because gesture is part of the larger notion of communication and, moreover, is a form of embodied action, there is a brief treatment of the concept of embodiment and the principle of enaction as put forth by Varela, Thompson, and Rosch (1993).

Iconic gestures

Iconic gestures are usually hand gestures that are concrete representations of physical objects and/or actions. As such, they also have been designated

as *illustrator gestures*, given that they are often found in conversational settings when, for example, a speaker is describing an experience to an interlocutor that includes a dimension of representation that corresponds to what is said but provides elements through imagery not found in speech. For instance, with the utterance *He threw the water out of the plastic tub*, the gesture could represent the size of the tub, where the hands were placed, the weight of the tub, the direction the water was thrown, etc. However, iconic gestures can be formed with other parts of the body besides the hands; indeed, the whole body can be used to represent an object or action as well, for example, swaying back and forth when demonstrating what it was like to be on a ship in high seas.

Also, McNeill (1985: 359) described iconic gestures as "typically large complex movements that are performed relatively slowly and carefully in the central gesture space". However, Beattie and Shovelton (1999b: 443) noted that "occasionally such gestures were found to be small and fast or operating in a restricted space like in the movement of a single finger, but nevertheless still in possession of iconic properties". Moreover, McNeill (1992) observed that there is a high degree of similarity in the use of iconic gestures cross-linguistically, although there is now evidence that such gestures do have language specificity (e.g. Kita 1993, 2000; McNeill and Duncan 2000).

Theoretical accounts of the cognitive/communicative role of iconic gestures

In David McNeill's on-going theorizing, he views thought, speech, and gesture as converging through "dialogical" interaction, eventually presenting a single cognitive representation, with speech providing a linear, sequential structure to thought and gesture supplying synthetic, holistic, and imagistic elements. Moreover, for McNeill speech and gesture arise from what he terms the *growth point* (GP), i.e. from the conception of what is to be communicated (McNeill 2000). In a further elaboration, McNeill and Duncan (2000: 156–7), following Vygotsky, contend that "sign and context are inseparable" and, thus, that the GP is part of both the interpsychic and intrapsychic psychological planes at once. Moreover, McNeill (2002) argued that mirror neurons coordinate with language production in the brain (areas 45 and 44, respectively), so that the "imagery–language dialectic" (GP) may be a function of evolution. This overall conceptual underpinning encompasses not only iconic but also all spontaneous gestures (i.e. those that are not *emblems*, or culturally recognizable gestures – for example, holding your hand up to signal that you want to respond or ask a question as part of a larger group of listeners).

McNeill (1992: 132–3) also characterized iconic gestures as particularly revealing intrapersonally, that they "cannot help but expose the relevant dimensions of the speaker's thought", in that "[t]hey are the closest look at

the ideas of another person that we, the observers can get" (this is a particularly interesting comment in light of mirror neurons and the reading of other's minds; see above). McNeill also links gesture to Vygotsky's concept of the psychological predicate. Vygotsky (1986: 236) wrote that when a bus is late and finally arrives, a person who had been waiting for its arrival might simply say "coming" rather than uttering a complete sentence (e.g. *The bus for which we are waiting is coming*). This is so because the situation is obvious. This reduction of the syntax is termed 'predicativity'. What is not understood, then, becomes salient, or the psychological predicate. McNeill argued that gesture often is discontinuous with the verbal element and as such allows an interlocutor to infer the psychological predicate.

However, Butterworth and Hadar (1989) and Hadar and Butterworth (1997), in opposition to McNeill's assertion of a semantic overlap for speech and gesture, contended that iconic gestures do not provide additional semantic information. They support their view by the finding that in production iconic gestures can precede the verbal component, an asynchrony that leaves open the possibility of a "preplanning" of the verbal element. Therefore, Butterworth and Hadar (1989) put forth the *Lexical Retrieval Hypothesis* which posits that gesturing helps the speaker find sought-after lexical items through "holding" the conceptual properties in mind while the lexical search continues.

Another competing theory like that of Butterworth and Hadar's is the *Image Activation Hypothesis*, which argues that gesturing helps to maintain an image that a speaker wishes to convey, cementing it to the word (Freedman, 1977). In support of this notion, De Ruiter (1995, 1998) found that, under the condition of describing geometric figures from memory, participants used more representational gestures than when the geometric figures were immediately present. His conclusion was that the use of gesture under the memory condition activated the image in the mind of the speaker while verbalizing.

Other researchers have also suggested that there is only a facilitative role for the use of iconic gesture in relation to speech (e.g. Rauscher, Krauss and Chen 1996; Rime and Shiaratura 1991). However, in a review of this perspective, Beattie and Shovelton (1999a) suggested that there is no solid evidence with regard to L1 speakers of a language that iconic gestures induce lexical access. In fact, their own research supports McNeill's central contention that interlocutors pay attention to gestures as an important aspect of communication.

In a first study (Beattie and Shovelton 1999a), the researchers found a significant difference for knowledge concerning the relative size and position of objects as portrayed through iconic gestures for two groups of participants: those exposed to videotaped retellings of three cartoons (audio + visual) as opposed to those who were exposed to an audio-only condition for the same retellings. However, in a second study (Beattie and Shovelton 1999b: 444), they pointed to "serious methodological limitations" with the first study that "might limit the conclusions that can be drawn from it". However, results

for the second study confirmed a significant difference for participants who were exposed to the full visual and audio representation of the story retellings with regard to accuracy in portraying the relative size and position of objects in the story. In addition, the second study included participants exposed to a visual-only presentation of the retellings. This group also gained significantly more information concerning the relative size and position of objects in the retellings over the audio-only group.

Alibali et al. (2001) also investigated different experimental conditions of visibility, although in this case the purpose was to see if the use of iconic gestures changed as a function of being visible to an interlocutor as opposed to when the interlocutor was not visible. They found that college students retelling the story of a cartoon to one another produced a significantly higher rate of representational gestures in face-to-face conditions than when a screen separated the speaker from the hearer. The use of iconic gestures did not, however, disappear entirely in the screen condition. Rather, they were still produced at a "fairly high rate" (p. 182). In addition to other findings, the researchers viewed the study as supporting their *Semantic Information Hypothesis*, which states: "The visibility between speaker and listener should influence speakers' production of gestures that convey semantic information" (p. 182). However, they cautioned that their findings do not answer the question of whether or not there is a communicative function for representational gestures. Nor did they argue, conversely, that the use of representational gestures in the absence of a visible interlocutor supports the process of speech production per se (p. 183). At the same time, however, they contended that such a connection is supported by their result that "speech was more dysfluent when representational gesture production decreased" (pp. 183–4).

In yet another theory, and the one most pertinent to the present study, Kita (2000) argued for a re-conceptualization of the role of iconic and *abstract deictic* gestures (pointing gestures, but not those that refer to concrete objects in the immediate environment but rather to ideas or objects that are at a distant locale), a reformulation that takes as a central tenet McNeill's idea that there is an interconnection between language and gesture in constituting thought. Essentially, Kita argued that the "default" organization of information when speaking is analytic, which he characterizes as comprising hierarchical, decontextualized templates, for example the "English transitive template". Analytic thinking can also be non-linguistic, as with abstract discourse patterns, for instance a script (p. 164). Spatio-motoric thinking, on the other hand, "organizes information with action schemas" and is typical of people's "interaction with an object, locomotion, and imitating somebody else's action" (p. 164). However, he suggested that speech at times can also be spatio-motoric, as when "expressive prosody and imagistically loaded linguistic forms" are deployed (p. 170).

Additionally, Kita contended that with representational gestures, "spatio-motoric thinking can . . . be applied to the virtual environment that

is internally created as imagery", and thus, that "representational gestures are actions in the virtual environment" (Kita 2000: 165). Therefore, the *Information Packaging Hypothesis*, as it is called, views language and gesture as helping to construct thought, i.e. the underlying theory of gesture is *actional* and not representational as expressed by McNeill in his concept of the GP. Furthermore, Kita contended that from an actional point of view, gestures form as part of the physical environment in conjunction with the cognitive system. As an example of this perspective, he cited Goldin-Meadow et al. (1993), who found that when working on math problems, children often solved the procedural aspect of the problem through the use of gestures in coordination with division of space. Kita suggested that this mental operation is basically gesturing-for-thinking. Moreover, he claimed that this happened because "gestures had privileged access to alternative construals of spatially arranged clues that led to the correct solution" (Kita 2000: 176). Also, Kita proposed that all of the theories discussed above can be incorporated under this one theoretical umbrella.

In relation to second language learning, Gullberg (1998) found that in a retelling task, many of her L2 participants utilized the gestural space in front of them through the use of deictic pointing, appointing different locations in space for characters and places in the original narrative, which they also referred back to in the course of the retelling. She believed that this helped the speaker/gesturer to maintain coherence in orchestrating the narrative as well as create redundancy.

Gullberg (2003) also examined gestural reference in the form of anaphoric linkage through deictic pointing. She suggested the possibility that use of such forms may be the result of "planning", assigning this use of gesture, intrapersonally, to speech production processes linked to McNeill's GP. Moreover, Gullberg speculated that gestures may "help to reduce learner's cognitive load", an idea that, although attractive from an information processing point of view, does not take into account agentivity, i.e. that the learner is perhaps more concerned with preserving his or her status as a self-regulated person in the task, which, actually, relates to Gullberg's main point: that the overlay of gesture on anaphoric reference allows interlocutors to follow the speaker's discourse, and that this use of gesture builds coherency for interpersonal communication.

In considering the different theories of iconic gestures in relation to communication/cognition outlined above, it is important to keep in mind that most of the studies they are either founded on or supported by are quantitative and experimental in design. Furthermore, only McNeill, Kita, and Gullberg include volitional concerns as an explicit aspect of their theory building, although the physical expression of emotions through gesture is an everyday experience for all of us. Moreover, as Alibali et al. (2001: 186) propose, it is time to "examine how different speakers use gestures in different types of contexts for both speaker-internal and communicative purposes". With regard to the concerns of the present study, this qualification can be

expanded to include how people engage in everyday interactions, that is, with others with whom they share a discursive history and within shared activity systems.

Embodiment

Although it is important to this article to characterize the study of iconic and abstract deictic gestures in relation to both theory and research, there is also a need, I believe, to include a larger frame of reference as well, and I argue that in L2 learning contexts gesture (and speech for that matter) is *embodied action*, a term drawn from Varela, Thompson, and Rosch (1993), who suggest that 'embodied' derives from the notion that

> cognition depends upon the kinds of experiences that come from having a body with various sensorimotor capacities, and second, that these individual sensorimotor capacities are themselves embedded in a more encompassing biological, psychological, and cultural context. (pp. 172–3)

By 'action', the authors argue that "sensory and motor processes, perception and action, are fundamentally inseparable in lived cognition" (p. 173). As an example of embodied action in practice, the authors cite Freeman's (1975) work on the development of olfaction in animals, who concluded, in Varela et al.'s words (p. 175), that "smell is not a passive mapping of external features but a creative form of enacting significance on the basis of the animal's embodied history". Moreover, this position rests on the assumption that mind is an emergent property, that

> knowledge is the result of an ongoing interpretation that emerges from our capacities of understanding. These capacities are rooted in the structures of our biological embodiment but are lived and experienced within a domain of consensual action and cultural history. (Varela et al. 1993: 149)

It is my contention that the process of enaction, as defined above, has much to do with the use of gestures by L2 learners both inter- and intrapersonally. Indeed, in the case of people whose primary exposure to the L2 comes from living within the contexts of the culture, it would not be surprising to find that they come to enact meaning not only through the new language but through gesture as well, and that there is a recognition that, for example, the psychological associations for words and gestures are socioculturally based and can be transformed as a result of exposure to a new language and culture (see McCafferty and Ahmed 2000). Moreover, although this is not the place to pursue the argument in depth, it would appear that the principle of enaction may cohere with Vygotsky's idea of

internalization, and that the former may be an important means by which the later is achieved, particularly as this relates to a materialist framework – a central grounding for Vygotsky from a Marxist perspective.

The study

Purpose

This study derives from a larger research project involving the videotaped interactions of a newly arrived Taiwanese college student to the United States with an American graduate student. In McCafferty (2002), I reported on a marked use of iconic gestures by the Taiwanese ESL student. McNeill and Duncan (2000: 142–3) hold that gesture is typically "co-expressive" with speech, that is, that the two channels "express the same underlying idea unit but do not necessarily express identical aspects of it". On a number of occasions in the data, and at times for quite long stretches of discourse, the L2 participant seemed to make a conscious effort to explicitly match speech and gesture so that the two presented identical content. Because this did not prove to be an idiosyncratic aspect of his gesture use in general, I considered that it may have a specific function in relation to L2 learning, and that he was using the gesture channel in effect to concretize the verbal channel. If, as suggested by Kita, we conceive of the organization of information as taking two pathways – spatio-motoric, and language specific (analytic) – in conjunction with the overall contexts of speaking, then gesturing in an L2 can become at times quite different in function than in the L1, a needed accommodation if indeed thought, language, gesture, and communication operate as a functional system, which, following the ideas of Luria (1973) with regard to cognition as a whole, I propose they do.

At the same time, of course, there is the possibility of an interpersonal or communicative function for these gestures to help elucidate meaning for the interlocutor. As reported in McCafferty (2002), the American participant initially established the use of iconic and other forms of gesture as explicit teaching tools, one use of which was to enhance comprehension through illustration of the verbal component. It did not take long before the L2 participant began to imitate these behaviors. However, during the sequences in question, the Taiwanese student's spoken English was quite clear, so it does not appear as though the gestures were necessary to help clarify meaning for his interlocutor.

Therefore, the purpose of this study was essentially to examine further this use of gesture to discover if the L2 learner was utilizing the spatio-motoric channel for purposes of helping acquire the L2. However, because of the possibility that gesture, like speech, can function both inter- and intrapersonally simultaneously, this possibility was explored further as well.

Participants

The single L2 learner in the study, hereafter referred to as B, was in his 20s and had left his country, Taiwan, to come to study English in the United States. At the beginning of the research B had been living in the American southwest for one month. He was attending a large university and had enrolled in two intermediate English as a Second Language courses. The other participant, J hereafter, was an American graduate student and former EFL/ESL teacher. It is important to mention that J thought the research had something to do with the appropriation of abstract gestures on the part of L2 learners, a topic he had not examined. Therefore, he never considered himself to be part of the study, nor, when asked upon completion of the recording, did he recall ever being aware of his own use of gesture. B was never told anything about the purpose of the research beyond the fact that it had to do with L2 learning – gesture was never mentioned.

Videotaping

Originally there were 5 ESL students involved in the project, although all but B had dropped out by the 8th week, and by the 5th week B was able to volunteer only for a time slot when none of the other participants could join him. So, once a week J videotaped both himself and B while they were sitting on benches in a small park-like area not far from B's ESL classroom. The benches formed a "v" shape, and the two participants sat halfway along each side, facing each other and the camera, which was positioned behind the opening of the "v". The camera was on a tripod and took in most of the body of each of the participants (sometimes the lower legs and feet are not seen). An external microphone was used to enhance the quality of the audio recording. In the sessions that included a larger number of participants, J had typically prepared a list of topics for discussion. However, with B the topics were more of mutual devising. Also, J took a much more active pedagogical stance than in the previous sessions.

Initially, it was hoped that B would be involved in the research over a continuous period of time, perhaps lasting a year. However, after arriving in September for the fall semester, he decided to go back to Taiwan by the middle of November. He expected at that time not to return to the United States, but in March of the following year, much to my surprise, I discovered him in the Student Union having a meal and asked him if he would be willing to continue being recorded, to which he readily agreed. Therefore, a second set of recordings were made, although this time they were done in a classroom setting as the weather had grown colder. All told, there were 15 sessions: the first 8 before B went back to Taiwan and the second sequence, lasting 7 weeks, after his return to the U.S. The total duration of the study was close to 8 months.

Analysis and discussion

This study was not meant to be exhaustive but rather an attempt to further explore and understand a particular use of gesture by a specific individual in connection to his efforts at L2 learning. No attempt was made to compile all instances in the data. Instead, an extended excerpt – provided below – served as the basis for the analysis. In addition to the guidelines above, this excerpt was chosen because of the use of abstract deictic gestures on B's part and because J's use of gesture is revealing with regard to his tutorial efforts; moreover, the extent of mutual imitation that the pair engaged in is illustrated as well.

The setting for the recording was a classroom on campus, and the segment is part of a later session, nearing the end of the project. The two participants were engaged in a conversation about use of the Chinese writing system outside of China.

Two other types of gesture in addition to iconics, abstract deictics, and emblems (explained above) are found in the excerpt: *beats*, as the name implies, are typically sharp up-and-down movements of the hand that, functionally, bring attention to some aspect of the discourse or extra-discursive concerns as well. For example, a beat can signal a contrast to what has been said previously. *Metaphoric* gestures resemble iconics in that they are concrete representations, although in this case they refer to abstractions. For example, an individual's circling of pointed index fingers around one another suggests the turning of a wheel but can be meant to represent the concept of transition.

However, at the same time, it is critical to point out that the classification system used in the study (based on McNeill 1992) is not as distinct as it might appear. The handshapes of gestures can be difficult to slot into one and only one category, and indeed gestures often overlap, for example as in the case of beats with other gesture forms. Also, a particular gesture can be iconic, abstract, and metaphoric at once. Thus, I have not attempted to classify the gestures that appear in the excerpt below (other than beats), although I will continue to refer to the categories established above in the rest of the article.

In the transcription, brackets indicate the gesture phrase (its beginning and end across time), and utterances are subdivided by gesture phases.

J 1:

a) *I'm* [*jealous a little*]
   brings right hand close to heart (palm facing heart), and then palm-up pushes his hand out in front of him

b) [*you know, that you can be from all these different countries . . .*]
   moves right hand out in front of him at chest level, palm down, hand sweeping laterally, designating countries with beats

c) [*and be able to . . .*]
right hand palm down moves in circular motion in front of him, over the "countries" just designated

d) *you know,* [*jealous in a good way*] *not a bad way . . .*
brings right hand close to heart and then quickly out in front of him twice

e) [*and be able to*]
right hand moves laterally from left to right over the "countries" with a series of beats

f) [*write . . . each other's . . . on . . .*]
right hand holding a virtual writing instrument, hand moves across a virtual page from left to right

B 1:

a) *Do you know what? It's because the* [*Japanese and Korea*], *the people*
right hand palm up resting on arm of chair designating the two countries by flipping first the thumb then the forefinger into the palm

b) [*it's from*]
left hand comes off the arm of the chair, up in front of him at chest level with two beats (one for each word)

c) [*China*]
left hand moves left beyond his body, palm up in a beat

d) [*transport to*]
left hand re-traces same path as in c, with palm down, fingers splayed

e) [*Japan and Korea*]
same palm down, fingers-splayed hand position, moves left hand right with beat for *Japan*, then back just a little with second beat for *Korea*

f) *so, so . . .* [*some words*]
both hands close to face, they drop down and come together in "prayer" fashion, although not touching

g) [?] *. . . you know*
hands in same position as above: slides hands back and forth over one another without touching

h) [*it's, but . . . maybe hundred year . . . hundred . . . thousand years ago*]
right hand rises to right side of head and with fingers vertical, palm facing forward, bends hand backwards in a wave that is also a beat, each syllable receiving a beat in this manner

i) [*the peoples from*]
right hand resting on arm of chair waves once in reference to *China* (about to be mentioned) in a beat

j) [*China*]
left hand moves up to position of where *China* was represented previously with palm-down beat on each syllable

k) [*changed to the Korea and Japan*]
retraces earlier movement, arcing the left hand across his body, indicating *Korea*, with a palm-down beat followed by another for *Japan*

l) *so* [*their culture, you know*]
right hand resting on arm of chair, angles thumb to point behind him

m) [*their culture*]
repeats same gesture as above

n) [*some . . . little . . . similar to the*]
right hand rises to chest level, palm down, fingers outstretched and thumb held against forefinger, shaking hand back and forth

o) [*China*]
still shaking, moves left hand to the left to designate *China* with a beat

p) [*like ah Japan is the*]
left hand moves back to the right to the same gestural space designated for *Japan* above

q) [ ]
sits up straight in chair and with both hands, takes hold of his open jacket at chest level and tugs it together

r) [*uh I don't know*]
right hand rises to his head in emblem for thinking

J 2:
[*oh, kimono*]
mirrors B's gesture for kimono but with a slightly different hold on virtual garment

B 2:
[*oh yes, kimono*]
imitates J's gesture exactly, but holds on to jacket (as before)

J's use of gestures

In his first turn, there is clearly a strong illustrative aspect to J's use of gesture in relation to speech. However, it is important to point out that most of his gestures are not identical in content to his speech (as would be expected). In segment 1a, the placing of the palm against the chest is a metaphoric/emblematic gesture signifying emotions (jealousy) as seated in the heart. In the following segments (1b–1e) J designated the *many countries* he referred to in virtual space (abstract deictics) with a beat over each site. It should be pointed out that there was no attempt to refer to any particular countries – not the case with B, as we shall see. In the final utterance of turn one (1f), J illustrated the act of writing with an iconic representation. The

gesture illustrated a Western sense of writing, i.e., he moved his hand from left to right. However, he was talking about writing in Chinese which is a logographic system (a different sense of hand movement), and moreover, the characters are usually written from top to bottom, not left to right. Therefore, although there is a concretizing of the verbal element through the use of gesture, the gestures are rather vague at the same time: perhaps they are only meant to supply enough semantic content to help insure comprehension for his L2 interlocutor.

In turn 2, J was aware that B was searching for a lexical item, not only because B had tried and failed to find the word he was looking for (1r) but also because he had mimed a salient feature of the item: how it is tugged together by the wearer, indicating that it must be a garment (1q). Moreover, the last reference B had made before the gesture was to Japan, giving J a further hint as to what the garment might be. J was able to provide the wanted lexical item, *kimono*, in turn 2, while imitating B's kimono gesture at the same time.

It is my contention that most of J's gestures were meant to illustrate aspects of his discourse to help insure B's comprehension, as described above by Gullberg (2003) for the use of abstract deictic gestures. Moreover, through this high degree of animation, J was indicating involvement in the conversation, and as such, perhaps heightening the level of intersubjectivity between himself and B. With regard to this later point, the discourse was personalized by J to include his feeling *jealous* of B's ability to read in a number of different languages. This use of gesture appears to be a specialized register, and is perhaps analogous to foreigner talk in the verbal channel as both provide elements of redundancy and simplification.

B's use of gestures

Iconic gestures

There are only two iconic gestures in the two turns that B took, and both are of interest to the focus of the study. The first was conjoined with the verb *transport* (1d). B's gesture consisted of the arcing of his left hand as he moved it from left to right, across his body in front of him. It is possible that this use of space was helpful to the process of constructing his thoughts in relation to the verb; however, there was also a different spatial function for the gesture because what was "transported" (the Chinese writing system) originated at a point in space B had previously designated as China, and the movement anticipated the next line (1e) where he designated Korea and Japan in space. Thus, the gesture served as an abstract deictic as well. This second aspect of the gesture is taken up in the next subsection.

The second iconic gesture was an attempt to elicit a lexical item from J. This had become a part of the shared language teaching/learning practice

the two participants had constructed for the pedagogical use of gesture. However, in order to construct this intervention, B had to create through the gestural channel a representation of a traditional Japanese garment. He did so in an imaginative manner, taking an embodied perspective as the wearer, who, when wearing the garment, needs to pull the two sides together, making it very unlike Western clothing, and thus signifying an important attribute to spur J into supplying the word. This use of gesture operated as a form of distributed cognition, or the creation of a Zone of Proximal Development, as I have argued elsewhere (McCafferty 2002).

Abstract deictic gestures

In line 1c, B designated a space to the left of his body as *China*. With this gesture, he started to build a virtual representation of the geographical relationship of China to Korea and Japan in a very accurate portrayal, as if he were reconstructing the locations from a map or globe. However, at the same time, the historical relationship among the countries was also being mapped. As such, B used space and gesture to conceptualize relations in time as well as to designate geographical location. This virtual "organizer" was further constructed in lines 1d and 1e, at which point he completed the representation through adding Japan and Korea. Throughout the rest of the excerpt, he consistently mapped time and space back onto this representation; in fact, there was never a mention of any of the three countries that did not include gestural reference to this virtual representation.

In line 1i, B's gesture anticipated what was to come in the next utterance. As he said *the people from*, he moved his left hand to the space he had designated for China. He then said *China* in the next line (1j) and repeated the same gesture. Then in line 1k, B again moved his hand back to the areas he had indicated for Japan and Korea, although this time he referenced Korea first and then Japan. He once again moved his hand to the space he had designated for China in line 1o, and in line 1p he moved his hand to the space designated for Japan.

Following Kita (2000), I believe that because of B's difficulties expressing himself in English, he resorted to the spatio-motoric channel for thinking. That is, because he did not have control over the language, and thus analytic thinking, he mapped out an organizing principle of the discourse – the historical relationship of two of the satellite countries of China – in virtual space, and referred back to this virtual map through gestures. I argue this helped him to orchestrate speech production in the L2 and to actionally structure the discourse. As such, B was gesturing-for-thinking in a way not that unlike what Goldin-Meadow et al. (1993) observed for children, who represented and then solved simple math problems through the spatio-motoric channel, although in this case the "problem" was speaking in an L2.

Beats

Although not anticipated as a focus of the study, the use of beats by B became of interest in exploring the use of space for cognition in connection with both producing emphasis and externalizing syllabic structure. In the excerpt, B produced many beats, mostly in conjunction with significant points in the discourse (lines 1b–1c), and on two occasions in conjunction with syllables. In line 1h, there are seven words, and B used a beat for each syllable of each word, and in 1j he also used a beat for each of the two syllables of *China*. Although he said the word a number of other times in the excerpt, each of those instances received only a single beat, adhering to the notion that these occasions marked emphasis.

In McCafferty (1998) I concluded that beats in the study had a self-regulatory function, that they were mediational in the sense of externalizing the linguistic structure of the L2. I would like to add to that previous speculation by suggesting that B was enacting patterns of the language and its use through gesture in an embodied experience of the L2 with regard to emphasis and syllable structure, although this is clearly an area in need of further research.

Interpersonal dimensions

Although I have concentrated on the use of gesture and space for intrapersonal cognition, this is not meant to diminish the significance of the interpersonal dimension. Indeed, I believe B came to rely on the use of space for thinking, in the case of representational gestures, partly as a result of his interactions with J. Following Vygotsky in relation to the development of private speech (that it emerges from dialogic contexts), I believe that B's use of these gestures transformed from an initial emphasis on interpersonal functions, as in the *kimono* example in the excerpt, to include more intrapersonal functions. However, this is not to suggest that this was the first development of this process; rather, I argue that it re-emerged as a form of mediation in connection to learning the new language. Moreover, it seems likely that in many instances both interpersonal and intrapersonal functions were present at once. Certainly, this is in line with Vygotskian thinking, which does not view inter- and intrapersonal dynamics as dualistic.

Conclusion

This study provides evidence that representational gestures carry communicative functions. It would be difficult to imagine that, for example, B would have engaged in the lexical search in turn 2, i.e., without verbal accompaniment, had he not anticipated a possible response from J. Moreover, the high

degree of imitation of each other's nonverbal forms by both participants further attests the salience of these features in their interaction. The importance of gesture interpersonally also lends credence, from a Vygotskian perspective, to the claim that some of these practices, and in particular the mirroring of the verbal component through gesture, could also have become a form of intrapersonal mediation for B.

In this regard, it is particularly important to point out that, as mentioned above, J's gestures that mirrored his speech conveyed only vague representations and were co-expressive with speech in the manner suggested by McNeill and Duncun (2000), but B's gestures of this ilk were very precise representations and identical to speech. Indeed, it would seem that with the shift to a spatio-motoric mode of thought, the gestures were transformed (internalized) in the sense of providing a greater degree of spatial exactness (as of course one might expect for this modality of thought). Thus, it would not be surprising that in these instances, gesture was leading speech, i.e., helping to structure the verbal channel both at the local level, and as suggested by Gullberg (2003) in relation to L2 learners' use of gesture for anaphoric reference, at the discourse level as well.

Additionally, with further study, the process of enactment leading to embodiment through the use of beats as this relates to the acquisition/internalization of emphasis and syllabic structure may prove to be an especially interesting intrapersonal function of gesture. Furthermore, this perspective adds a dimension to Kita's (2000) construct of representational gestures as *actional*, suggesting that action may be a central underlying aspect of human cognition and not just a modality for thought, as indeed is suggested by the study of mirror neurons.

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