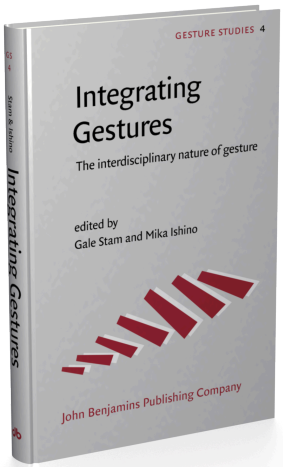
Chapter 21. Gesture and discourse

Stephani Foraker | SUNY College at Buffalo

https://doi.org/10.1075/gs.4.26for



Pages 279–292 of
Integrating Gestures: The interdisciplinary nature of gesture
Edited by Gale Stam and Mika Ishino
[**Gesture Studies**, 4] 2011. viii, 372 pp.

CHAPTER 21

Gesture and discourse

How we use our hands to introduce versus refer back

Stephani Foraker
SUNY College at Buffalo

Do speakers use different gestures when first introducing a referent compared to when referring back to the referent? Four adults narrated a story involving two men and several objects. We coded the speech and gestures produced, focusing on the gestures that accompanied nouns or pronouns used to introduce or refer back to referents. The main finding was that gestures with predominantly redundant information (same identity as the spoken referent) occurred more often when introducing a referent in speech, but that gestures with predominantly additional information (different entity than spoken referent, predicate of a referent) occurred more often when referring back in speech. These findings underscore the idea that speakers' gestures can reflect the difference between new and given information in discourse.

Keywords: discourse, information structure, gesture, anaphora, co-reference

1. Introduction

How do the gestures that speakers produce when they talk vary as a function of discourse? McNeill and colleagues have demonstrated that gestures which accompany speech reflect narrative structure as well as meaning, emphasizing that the gestures accompanying speech are a vital part of discourse (McNeill 1985, 1992, 2005; McNeill & Levy 1993; McNeill, Cassell, & McCullough 1994). We first asked whether speakers use different kinds of gestures when they introduce a referent for the first time compared to when they refer back to a referent. Second, we addressed the relationship between a spoken referent and the meaning of an accompanying gesture and its aspects when introducing compared to referring back to a referent.

Discourse consists of repeated reference to the same discourse referents across a series of subsequent utterances, as well as introducing new referents. Typically, repeated reference in speech is established through the use of anaphoric expressions. Anaphors do not describe mental representations of referents directly, but co-refer to

or link with antecedent representations that have been previously introduced in the discourse. Anaphors that refer back to a previously introduced referent can take several forms, such as a definite noun phrase, NP, (the cat), a proper name (General Grant), a pronoun (he), or a null anaphor. One explanation of why language users employ an anaphor as a "short-cut" to a previously mentioned referent is the notion of *information structure*. Information structure describes utterance form as a function of the mental states of speakers and listeners, including their current representations of the discourse and the speaker's beliefs about the listener's current representation (Lambrecht 1994). Old referents previously mentioned in the discourse are thought to be more accessible, reflected by the fact that they are often referred to with lighter, less contentful lexical forms, such as a pronoun or null anaphor (Ariel 1990, Chafe 1994, Givón 1983). The concept of old, or recoverable, information aligns most closely with the linguistic notion of *topic*, which at the clause or sentence level is defined roughly as what the utterance or proposition is about (Lambrecht 1994: 15, 118). We will use the terms *given* and *refer back* to indicate this discourse function. New referents that are introduced into a discourse are typically referred to with fuller forms of description, such as definite NPs or names (Ariel 1990, Chafe 1994, Givón 1983). New information, which is unshared or not easily derived from the discourse, is often called the *focus* (Gundel, Hedberg, & Zacharski 1993; Lambrecht 1994: 209). We will use the terms *new* and *introduce* to indicate this discourse function.

Do gestures also participate in the distinction between a referent that is given versus new? Past research by McNeill and Levy (1993; see also McNeill 2000) found that during a narration some gestures were repeated, forming cohesive links across the discourse. Some of these gestures indexed discourse referents, maintaining continuity between gestures by shared location in space, which hand was used, hand shape, or spatial configuration of the two hands. An important aspect of how gestures could encode and track discourse status is McNeill's concept of a catchment: it is "a recurrence of gesture features over a stretch of discourse. It is a kind of thread of consistent visuospatial imagery running through a discourse segment that provides a gesture-based window into discourse cohesion" (McNeill 2000: 316). McNeill (2000) posits that such catchments are based on a contrast between old and new information which helps to drive the discourse forward (i.e., communicative dynamism, Firbas 1992: 7). McNeill and Levy (1993) argued that repeated gestures or repeated aspects of gestures helped the speaker track background information, such as which referents were given.

In another experiment, McNeill, Cassell, and McCullough (1994, McNeill 1992: 135–144) exposed participants to videotaped narrations of a cartoon story where the speech and gestures either matched or mismatched the speech. The mismatching gestures included changing the hand used for a referent (as well as spatial location) without any intervening change of location or shift in referent in the actual story (e.g., the left hand on the speaker's left represented Sylvester [speech = "Sylvester"], followed immediately by the right hand on the speaker's right representing Sylvester [speech = "he"]). The participants then retold the story themselves. The researchers found that

30% of the anaphor mismatches from the stimulus video had an effect on the retelling of the story's events.

So and colleagues also found that the location of a gesture is important for tracking a referent during a narration. So, Coppola, Licciardello, and Goldin-Meadow (2005) compared narrations of speakers when they either narrated a story with speech and gesture or with gestures alone. They found that participants used spatial location in their gestures to refer back to previously introduced referents in both cases, although far less often and less consistently when they were also speaking. Using the same narration task, So, Kita, and Goldin-Meadow (2009) also found that the location of speakers' gestures reliably indicated a referent's identity across repeated references, and that this occurred whether the spoken referent was ambiguous or not.

The research to date, then, indicates that gestures can carry information about a spoken referent's identity when referring back to previously mentioned referents. Gesture aspects that appear to carry the referent's identity include which hand is being used, its spatial location, and its hand shape. These aspects seem to be important for consistency of reference, over repeated co-reference. However, it remains an open question as to how gestures might indicate the difference between new versus given referents in a discourse.

The present study examined the gestures that speakers produced during the narration of a story, comparing those that accompanied introducing a new referent versus referring back to a given referent in speech. We first examined whether the type of gesture varied, comparing the prevalence of iconic, metaphoric, and beat gestures. Since referring back typically entails less specification in speech (e.g., pronoun), perhaps speakers will also produce semantically "lighter" gestures, such as more beats than iconics. Indeed, McNeill (1992: 211) and Levy (1984) have found that when referring back in speech, the frequency and complexity of gestures declines as the spoken form is less complex. They have also pointed out that iconics predominate at the narrative level (describing the events of a story), while metaphorics and beats are more frequent at episode boundaries or during meta-narrative and para-narrative speech (McNeill 1992: 214). To our knowledge, though, a straightforward comparison of the gestures accompanying introducing versus referring back on the narrative level has not been reported.

We then compared the different aspects of gestures and their meaning for introducing versus referring back to a referent. Five gesture aspects were coded and analyzed for their relation to the spoken referent: which hand was used, the hand shape, the palm's orientation, the spatial location of the gesture, and the motion of the gesture. Similar to the pattern found in speech, we predicted that the meaning of the different gesture aspects would be redundant with the spoken referent, providing largely the same, semantically full information in speech and gesture. On the other hand, we predicted that fewer gesture aspects would provide redundant information when referring back to a previously mentioned referent in speech. That is, when the referent's identity was given and more accessible, speakers should have less need to specify a referent as

fully as when introducing it. We also explored what kind of additional information was available in the different aspects of a gesture that accompanied referring back.

2. Method

We collected narrations from four native-English speaking monolingual adults of college age from the Chicago, USA area (a subset of the So et al., 2005 data set). Following informed consent, they were videotaped while narrating a story involving two men and several objects. They first viewed the 12 scenes of the story together, which lasted 26 seconds. Then the experimenter re-played each scene one by one, and the participant narrated the events for each scene, in order. The narration was produced as a monologue with the experimenter listening passively, rather than as an interactive dialogue, although the experimenter did provide some natural backchannel signals, such as head-nodding.

2.1 Materials

Table 1 provides a description of the stimulus story. The referents considered in this analysis were concrete entities: the officer and the worker were the two animate characters, and the inanimate referents were hat, bench, lunchbox (or lunch), barrel, sandwich, jacket, sink, water taps, water, soap, and bubbles. Referents that were mentioned only once by a participant were not included.

2.2 Data coding

Using Praat (Boersma & Weenink 2007), we first transcribed the speech and annotated it for the two categories of NP (semantically fuller) and pronoun (semantically lighter), and the two discourse functions of introduce and refer back. The first mention of a referent in the whole narration was counted as introducing. All other subsequent mentions of that referent were considered to refer back. Note that this criterion is not as strict as research conducted by Gullberg (2003, 2006), who considered only adjacent clauses, focusing on when the preceding clause contained the referent and the following clause contained the referent as the subject. We chose to include both strict maintenance (in either a parallel or non-parallel sentence slot) as well as cases of returning to a discourse referent following intervening material (see also So et al. 2006, 2009). This choice was informed mainly by our interest in gesture aspects over discourse segments larger than adjacent clauses or sentences. It is an interesting question how the synchronization of gestures tracks with clause-to-clause shifts in discourse, but we have not focused on that finer scale here.

Table 1. Description of the scenes in the stimulus story

Scene	Duration (sec)	Description of each scene
1	2	An officer sits down on a bench beside a barrel with his lunchbox.
2	2	A second man enters the scene from the right. He is taking off his jacket.
3	1	The second man (a worker) salutes to the officer.
4	2	The worker turns on the taps above a sink, which is around the corner from the officer, on the other side of the barrel.
5	2	The officer takes a slice of bread out of his lunchbox and puts it on the barrel top.
6	2	The officer takes some cheese out of his lunchbox and puts that on top of the slice of bread.
7	1	The worker at the sink picks up a bar of soap, which is on the barrel top beside the officer's sandwich fixings.
8	3	The worker washes his hands and face with the bar of soap.
9	2	The worker puts the soap back down on the barrel, but on top of the sandwich fixings (by mistake likely, as he does not seem to look at the barrel top). (This scene has a closer camera angle than other scenes.)
10	3	The officer places a second slice of bread on top of his sandwich fixings, picks it up, and takes a bite.
11	2	The officer stops chewing suddenly with a surprised look on his face.
12	4	The officer is chewing and bubbles are coming out of his mouth.

The speech annotations were then imported into ELAN for accompanying annotation of gestures (Technical Group, Max Planck Institute for Psycholinguistics 2005). We focused on the gestures that overlapped with spoken NPs and pronouns, either in whole or in part. For noun phrases, the gesture had to overlap with the head noun (e.g., *man* in *the man in a suit*); gestures that only overlapped with a verb or predicate (e.g., *in a suit*) were excluded (e.g., Gullberg 2006), as were gestures that occurred fully during a pause (silent or filled).

Gestures were identified based on the stroke and any holds (primarily post-stroke holds), and coded for their type and their physical form. The three types coded were iconic, metaphoric, and beat, following McNeill (1992). Gesture types can often be layered, so the predominant type that the gesture exhibited was used to classify a gesture. Only two deictic points were in the data set, contributed by the same participant, so we did not include them in these analyses. Meta- and para-narrative gestures (McNeill 1992) that did not seem to provide referential or other meaning information about the narrative level were not included in analyses either (see Table 3).

Gesture form was coded by annotating five aspects of the gesture's physical form: which hand was used, hand shape, palm orientation, location, and motion. These

aspects were chosen based on past research reviewed in the introduction, as well as an aspect's ability to carry information about a gesture's meaning (McNeill 1992, 2000: 316; Goldin-Meadow 2003; see also Goldin-Meadow, Mylander & Franklin 2007 for these aspects' importance in "home-sign" systems).

1. For *hand used*, we annotated the right and left hands separately, noting symmetrical or asymmetrical for two-handed gestures.
2. For *hand shape*, we noted which American Sign Language hand shape it was the closest to. If the hand shape changed, the beginning and ending shapes were noted.
3. For *palm orientation*, we noted which way the palm faced: up, down, toward or away from the speaker's body, and toward or away from the speaker's vertical center-line. If palm orientation changed, the beginning and ending orientations were noted.
4. For *location*, we annotated two major characteristics. The first was where the gesture occurred in relation to the speaker's body. We used a 9-region matrix, illustrated in Figure 1. The clavicle and hip bones were the horizontal dividers and the two shoulders were the vertical dividers. The center region was also divided into smaller regions for descriptions of locations within this most commonly used region: body landmarks were the sternum (right-left) and the zyphoid process (upper-lower). The matrix was extended into the third dimension with two distances from the body. Near-body was defined as a gesture that fell between touching the body and extending the elbow out to 90°, and far-body was a gesture with the elbow extended past that point. For gestures moving from one region to another, the starting and ending points of the path were noted, as well as any midpoints passed through. The second characteristic of a gesture's location noted was the nature of the location: in neutral space or in a previously defined space. An example of defined space is when a gesture traced the circular outline of a barrel top in neutral space to the speaker's left side, and then a subsequent gesture made use of that outlined region, such as a "put down" movement ending in the barrel top location in space. In such cases, the gestures that shared the (purportedly) defined space had to have a plausible relationship between the meanings of the gestures, tied to the story being narrated.
5. For the *motion* of a gesture, we described the path's shape (e.g., straight, curved), whether it was uni-directional, back-and-forth or in place, the size of the motion, and any descriptive characteristics of the motion's manner (e.g., wavering). For gestures that traced the outline of something, the shape of the outline was noted.

We then interpreted the content or *meaning* provided by each of the gesture aspects. A spoken referent can be accompanied by a gesture that captures information that is *redundant* with the identity of the referent (e.g., *soap* in speech, and a hand shape depicting the shape of a bar of soap in gesture). But a gesture accompanying a referent can, sometimes simultaneously, provide *additional* information which does not simply reinforce the meaning of the spoken referent (e.g., *soap* in speech, and a directional path along which the soap was moved in gesture). For each spoken referent-overlapping

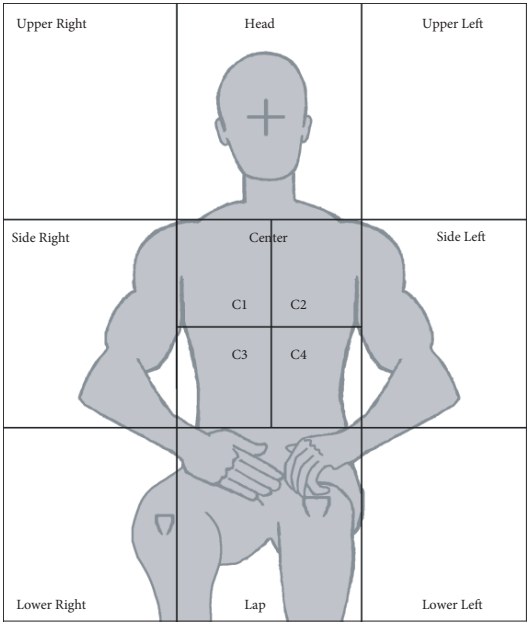
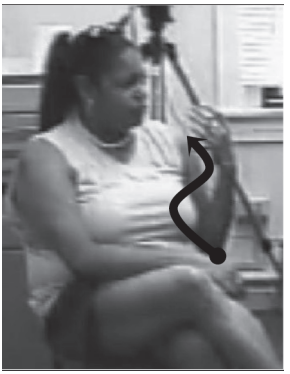


Figure 1. Matrix used to code the location of a gesture. Note that the Right and Left regions extended out as far as the participant reached. Near- and far-body dimensions are not shown; see text for explanation.

gesture pair, we considered whether each of the five physical aspects of a gesture's form (a) provided redundant information about the spoken referent, (b) provided additional information (often about some other referent, but also including a predication of the spoken referent such as an action of or on the spoken referent), or (c) did not appear to provide any information about the spoken referent, other referents, or activity they were involved in. All meta-narrative and para-narrative gestures were excluded for the meaning analyses based on this criterion. Figures 2 and 3 provide examples of this coding scheme. (The fuller spoken context was "There's a guy in some sort of uniform and he's like sitting down to have his lunch. And then, I guess, there's another guy like coming towards him and there's a barrel right next to the police guy.")

The primary way we examined the meaning available in gesture was to classify each gesture as redundant or additional based on the majority of contentful aspects for a particular gesture. Shown in Figures 2 and 3, each physical aspect of a gesture was annotated, and then each aspect's meaning was interpreted in relation to the spoken referent that the gesture overlapped with. Finally, the gesture was classified based on a majority of redundant vs. additional aspects. When there was a tie between the number of aspects, we classified the gesture as additional (this occurred for 5 gestures across the 4 participants).

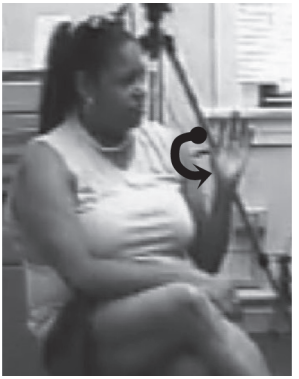
Spoken referent = "another guy" (worker)
Discourse function = introduce the worker
Speech during the gesture = "guy like coming" + pause



Aspect	Form	Meaning	Classify
hand	left	worker	redundant
hand shape	loose 4	n/a	n/a
palm	toward body	n/a	n/a
location	from lap to C2 (through C4), near body, neutral space	worker	redundant
motion	wavering path upward	path of worker entering	additional

Figure 2. Example of the coding scheme for a redundant gesture.

Spoken referent = "him" (officer)
Discourse function = refer back to officer
Speech during the gesture = "towards him"



Aspect	Form	Meaning	Classify
hand	left	worker	additional
hand shape	loose 5	n/a	n/a
palm	toward body rotates to center	(worker) faces officer	redundant
location	C2, near body, defined space	worker	additional
motion	rotation in place	worker turning around	additional

Figure 3. Example of the coding scheme for an additional gesture.

If a particular gesture overlapped with more than one spoken referent, the gesture was classified for each spoken referent separately. Similarly, if more than one gesture overlapped with a particular spoken referent, each gesture was classified separately.

The author annotated and coded all of the speech and gestures of the four narrations. A second coder annotated and coded the speech transcripts, with reliability of 98% for the anaphor form and 99% for discourse function. A third coder annotated gestures for two of the four narrations, coding the gestures for type, physical form, and meaning. Agreement for gesture type was 93% ($n = 83$), for physical form of the gesture aspects 92% ($n = 415$), and for the meaning of gesture aspects 89% ($n = 415$) – redundant aspects were at 95%, with additional and no-information aspects each at 87%.

3. Results

Reported are repeated-measures ANOVAs and paired *t*-tests, $\alpha = .05$, two-tailed, with participants as the random factor. The results reported below are for tests performed on proportions; tests on arcsine-transformed proportions produced similar results.

First, focusing on the lexical spoken forms, we found that speakers used primarily nouns to introduce an entity ($M = 92.5\%$, $SE = 3.8$), while nouns ($M = 51.4\%$, $SE = 6.3$) and pronouns ($M = 48.6\%$, $SE = 6.3$) were used equally often to refer back. Speakers gestured equally often whether they were introducing a referent ($M = 60.2\%$, $SE = 16$), or referring back (NP: $M = 65.5\%$, $SE = 8$, Pro: $M = 48.4\%$, $SE = 11$). Numerically, each participant gestured the least often when referring back with a pronoun, but this pattern was not significantly different compared to NP cases, $p > .27$.

The first factor was the spoken referent's discourse function: introduce vs. refer back. For the introduce condition, we included only NPs. For the refer back condition, we collapsed across NPs and pronouns since there were no differences between them. Proportions reported below were calculated based on the total number of gestures occurring in the introduce condition separately from the refer back condition.

The first analysis included gesture type as the second factor: iconics, metaphorics, or beats. On average, speakers produced more iconics (63.6%) than metaphorics (18.9%) or beats (17.4%). Comparing these gesture types for introducing vs. referring back showed no significant differences, ps $> .33$. Numerically, beats were more common when referring back (23.0%, $SE = 7$) than introducing (10.5%, $SE = 5$), and iconics were more common when introducing (73.6%, $SE = 13$) than referring back (57.2%, $SE = 14$). Metaphorics showed no difference between introducing (15.9%, $SE = 8$) and referring back (19.8%, $SE = 9$).

The second analysis included gesture meaning as the second factor: redundant vs. additional information. We found evidence that speakers did use their gestures differently in relation to the discourse function of a referent uttered in speech. As shown in Figure 4, when using a noun to introduce a referent, speakers produced gestures that were redundant with the spoken referent 55.4% of the time ($SE = 2.3$) while additional

information gestures occurred 44.6% of the time (*SE* = 2.3). In contrast, when using a noun or pronoun to refer back to the referent, speakers produced redundant gestures 37.5% of the time (*SE* = 5.4) and additional ones 62.5% of the time (*SE* = 5.4), significant interaction, $F(1, 3) = 14.73$, $p = .03$. Paired comparisons for redundant vs. additional gestures were marginally different for introducing, $t(3) = 2.36$, $p = .10$ and for referring back, $t(3) = 2.56$, $p = .08$.

We also considered whether this pattern held for *individual referents* within a narration. Not every referent in each participant's narration showed the pattern, but additional gestures outnumbered redundant gestures when referring back at least 80% of the time, for each participant. Also, the pattern held for the main characters (officer and worker), which were animate entities, but was not as strong for the other, inanimate referents. Table 2 provides an illustrative example for one participant, following the officer character. The officer was introduced with a redundant gesture, and referred back to with 4 additional gestures and 3 redundant gestures, as well as cases of not applicable gesture (meta- or para-narrative) and no gesture.

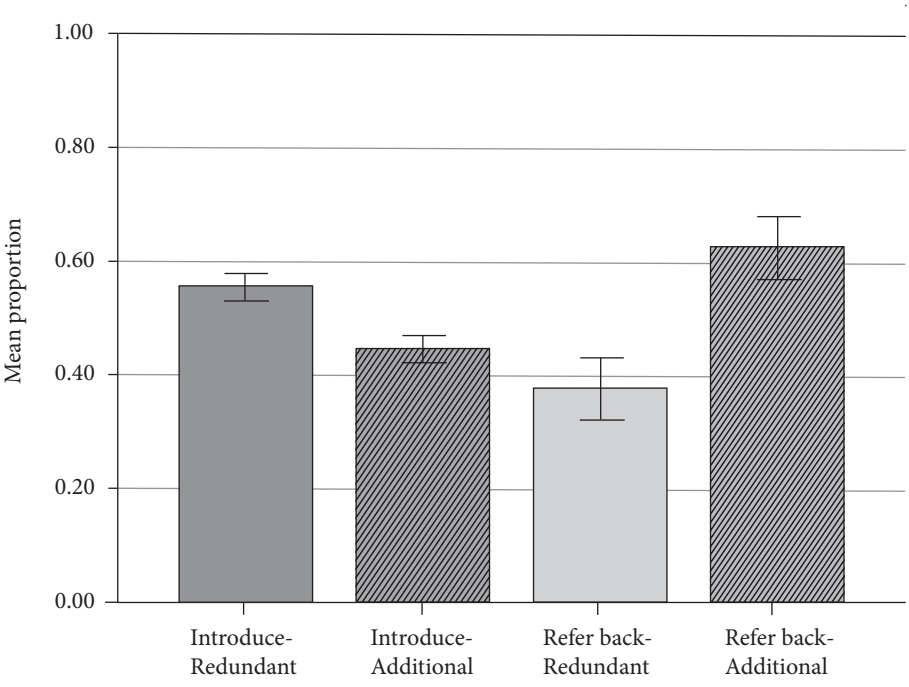


Figure 4. Proportion of redundant (solid bars) vs. additional gestures (striped bars) for introducing (left bars) and referring back (right bars). Error bars represent one standard error of the mean.

Table 2. Gestures that overlap with spoken mention of the officer character produced by one participant, classified as redundant, additional, or not applicable

Order of Mention	Lexical Form	Discourse Function	Gesture No.	Gesture Classification
1	NP	introduce	g1	redundant
2	Pro	refer back		no gesture
3	Pro	refer back	g4	additional
4	NP	refer back	g6	additional
			g7	redundant
5	NP	refer back	g11	not applicable
			g12	redundant
6	NP	refer back	g14	not applicable
			g15	redundant
			g16	not applicable
			g17	additional
7	Pro	refer back		no gesture
8	NP	refer back	g23	not applicable
9	Pro	refer back		no gesture
10	NP	refer back	g32	additional
11	NP	refer back		no gesture
12	Pro	refer back		no gesture
13	Pro	refer back		no gesture
14	NP	refer back		no gesture
15	Pro	refer back		no gesture

When we looked at what kind of additional information was being provided by gesture aspects, we found that the location of another referent or the path of motion (either of the spoken referent or some other referent) provided the most additional information (9% when introducing vs. 28% when referring back), as well as the action of (or on) another referent (12% vs. 17%), followed by a hand shape or outlining indicating another referent (2% vs. 16%). We also found that there were more gesture aspects that did not carry any meaning (redundant or additional) for referring back, particularly when accompanying pronouns (22%) compared to referring back with a NP (9%), or when introducing with a NP (4%).

4. Discussion

The present study found that the type of gestures that speakers produced did not vary when introducing versus referring back to a referent. Iconics were numerically more common when introducing, and beats were more common when referring back, but

the differences were not significant. On the other hand, we did find evidence that the gestures speakers produce vary as a function of discourse. When a referent was new, gestures were predominantly redundant with the spoken referent rather than providing additional information beyond the identity of the referent. When a referent was already given, accompanying co-speech gestures provided less redundant information than when introducing – instead, they primarily provided additional information, often about other entities in the discourse, as well as actions of or on the uttered referent. These findings underscore the idea that co-speech gesture is sensitive to co-reference operations and information structure in discourse.

Kita's interface hypothesis (Kita & Özyürek 2003), that gesture and speech generally express the same information, is related to these findings. McNeill (1985, 1992, 2000), too, has stressed the tight synchronization of speech and gesture based on shared meaning. Whether co-expressivity could completely explain the present results is an empirical question for future work. One possibility is that the redundant vs. additional gestures pattern found here might be driven by the propositional content of the speech rather than the given-new status of a referent. For example, it may not be particularly surprising if the gestures that accompanied pronouns were short, not very complex, and less contentful, which could partially account for our results. However, we found that additional information occurred more not only for pronouns that referred back, but also for the more complex NP forms, as well – there were no differences between gestures accompanying pronouns vs. NPs when referring back.

One way to investigate the co-expressivity concern would be to compare the speech segment that a gesture extends over in relation to the proposition that the referent is part of, in speech, and assess whether the kinds of information we found for the motion aspect (including path) would be accounted for. Similarly, if some referent other than the spoken one was indicated by the co-occurring gesture, one would want to know whether that other referent was uttered during the gesture's full extent.

This study is a first step in addressing the question of whether gestures reliably indicate the given-new distinction, as the number of participants reported on in this chapter was rather small, and it would be preferable to examine other stimulus stories with a variety of animate and inanimate referents, and of same and different genders. For example, So et al. (2009) found that when two animate referents were of the same gender, speakers sometimes did not fully specify in speech which character they were referring to (e.g., *he* was ambiguous for referring to one of two males). Interestingly, they found that in such cases, the location of a speaker's gesture did not add any disambiguating information, leaving the spoken referent underspecified in gesture, as well as speech. Since So et al. (2009) focused on the location of a gesture, it would be interesting to know whether the other aspects of a gesture that we have examined in this present study also show no sensitivity to ambiguous reference, or whether it might take multiple aspects of a gesture to add additional, potentially disambiguating information to help specify an ambiguous referent in speech more fully.

Finally, the present results show that speakers' gestures reflect the given-new distinction made in speech, but whether listeners use the information about discourse status that is available in a speaker's gestures is a question that remains to be explored. Because co-speech gestures also play a role in the listener's comprehension, and to some extent are also designed for the listener (Driskell & Radtke 2003, Jacobs & Garnham 2006, Kendon 1994, Özyürek 2002), they may also have the potential to provide listeners with on-line cues about the given-new status of a referent.

References

Ariel, M. 1990. *Accessing Noun-Phrase Antecedents.* London: Routledge.

Boersma, P. and Weenink, D. 2005. *Praat: Doing Phonetics By Computer* (Version 4.5.16) [Computer program]. Retrieved January, 2005, from http://www.praat.org.

Chafe, W. 1994. *Discourse, Consciousness, and Time.* Chicago, IL: University of Chicago Press.

Driskell, J. E. and Radtke, P. H. 2003. "The effect of gesture on speech production and comprehension." *Human Factors* 45: 445–454.

Firbas, J. 1992. *Functional Sentence Perspective in Written and Spoken Communication.* New York, NY: Cambridge University Press.

Givón, T. 1983. "Topic continuity in spoken English." In *Topic Continuity in Discourse: A Quantitative Cross-Language Study*, T. Givón (ed), 343–364. Amsterdam: John Benjamins.

Goldin-Meadow, S. 2003. *Hearing Gestures: How Our Hands Help Us Think.* Cambridge, MA: Harvard University Press.

Gullberg, M. 2003. "Gestures, referents, and anaphoric linkage in learner varieties." In *Information Structure, Linguistic Structure and Dynamics of Language Acquisition*, C. Dimroth and M. Starren (eds), 311–328. Amsterdam: John Benjamins.

Gullberg, M. 2006. "Handling discourse: Gestures, reference tracking, and communication strategies in early L2." *Language Learning* 56: 156–196.

Gundel, J., Hedberg, N. and Zacharski, R. 1993. "Cognitive status and the form of referring expressions in discourse." *Language* 69: 274–307.

Jacobs, N. and Garnham, A. 2007. "The role of conversational hand gestures in a narrative task." *Journal of Memory and Language* 56: 291–303.

Kendon, A. 1994. "Do gestures communicate? A review." *Research on Language and Social Interaction* 27: 175–200.

Kita, S. 2000. "How representational gestures help speaking." In *Language and Gesture*, D. McNeill (ed), 162–185. Cambridge, UK: Cambridge University Press.

Kita, S. and Özyürek, A. 2003. "What does cross-linguistic variation in semantic coordination of speech and gesture reveal? Evidence for an interface representation of spatial thinking and speaking." *Journal of Memory and Language* 48: 16–32.

Lambrecht, K. 1994. *Information Structure and Sentence Form: Topic, Focus, and The Mental Representations of Discourse Referents*. Cambridge, UK: Cambridge University Press.

Levy, E. T. 1984. *Communicating Thematic Structure in Narrative Discourse: The Use of Referring Terms and Gestures*. Ph.D. dissertation, Department of Behavioral Sciences, University of Chicago.

McNeill, D. 1985. "So you think gestures are nonverbal?" *Psychological Review* 92 (3): 350–371.

McNeill, D. 1992. *Hand and Mind: What the Hands Reveal About Thought*. Chicago, IL: University of Chicago Press.

McNeill, D. 2000. "Catchments and contexts: Nonmodular factors in speech and gesture production." In *Language and Gesture*, D. McNeill (ed), 312–328. Cambridge, UK: Cambridge University Press.

McNeill, D. 2005. *Gesture and Thought.* Chicago, IL: University of Chicago Press.

McNeill, D. and Levy, E. 1993. "Cohesion and gesture." *Discourse Processes* 16: 363–387.

Özyürek, A. (2002). Do speakers design their co-speech gestures for their addressees? The effects of addressee location on representational gestures. *Journal of Memory and Language, 46,* 688–704.

So, W. C., Coppola, M., Licciardello, V., and Goldin-Meadow, S. (2005). The seeds of spatial grammar in the manual modality. *Cognitive Science,* 29*,* 1029–1043.

So, W. C., Kita, S., and Goldin-Meadow, S. 2009. Using the hands to identify who does what to whom: Gesture and speech go hand-in-hand. *Cognitive Science,* 33*,* 115–125.

Technical Group, Max Planck Institute for Psycholinguistics, Nijmegen, The Netherlands. ELAN – Linguistic Annotator (Version 2.6.3, and later) [Computer program]. First retrieved April, 2006, from http://www.lat-mpi.eu/tools/elan/

Acknowledgments

For helpful comments, I thank attendees of the International Society for Gesture Studies conference in 2007, the gesture community at The University of Chicago, and the editors. I thank Krystal Simms and Rhudwan Nihlawi for their assistance in data annotation. This research was supported by NIH fellowship HD049247 to S. Foraker. Data collection was supported by R01 DC00491 from NIH-NIDCD to S. Goldin-Meadow.