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Interactive Gestures

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Illustrators are hand gestures made during conversation. Following Bavelas, Hagen, Lane, and Lawrie (1989), we propose a new division of illustrators, into *topic* and *interactive* gestures. Interactive gestures refer to the interlocutor rather than to the topic of conversation, and they help maintain the conversation as a social system. They subsume but are not limited to the category previously called *beats* or *batons*. Three tests of this theory are reported here. In Experiment 1, the same narrative task was assigned to both dyads and individuals: Dyads had a higher rate of interactive gestures than did individuals, but the opposite pattern was shown for topic gestures. In Experiment 2, we manipulated visual availability: The rate of interactive gestures was higher for partners interacting face-to-face than for those who could not see each other, but topic gestures were not significantly affected by condition. Thus, in both experiments, interactive and topic gestures responded differently to social variables, which strongly suggests they are functionally distinct groups. A final analysis showed that, in both data sets, interactive gestures were less redundant with the words they accompanied than were topic gestures, which supports our hypothesis that they maintain involvement with the interlocutor without interrupting the verbal flow of discourse.

The most common setting for discourse is face-to-face dialogue. Two characteristics of conversation distinguish it from written discourse: Because it is face-to-face, it includes some nonverbal as well as verbal acts (e.g., facial displays and gestures), and because it is dialogue, it has social as well as semantic and syntactic aspects (Bavelas, 1990; Bavelas & Chovil, 1992). Linking these two, we will report here research testing the proposal (Bavelas, Hagen, Lane, &

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Lawrie, 1989) that there is a subclass of conversational hand gestures, which we called *interactive gestures*, whose function is to aid the maintenance of conversation as a social system.

TOPIC AND INTERACTIVE GESTURES

Bulwer (1644/1974) traced interest in hand gestures at least to Francis Bacon, who in 1605 criticized Aristotle for having neglected their importance in rhetorical speaking. Modern work started with Efron (1941/1972), who not only studied cultural differences in gesturing, but proposed the first functional classification principles. Building on these, Ekman and Friesen (1969) introduced a distinction between *emblems*, which are stereotypic hand signals used in the absence of speech, and *illustrators*, which are improvised during conversation; illustrators are the focus of the research to be reported here. Kendon's (1972, 1975, 1980, 1986, 1987) conceptual and microanalytic contributions have largely shaped contemporary gesture research and have maintained interest during periods when facial displays dominated nonverbal research. Another key contribution was made by Cohen and Harrison (1973) and Cohen (1977), who established the communicative status of illustrators by showing that they decline in frequency when there is no receiver to see them.

McNeill (1985) breathed new life into the study of gestures by reformulating and offering evidence for the suggestion in earlier literature that illustrators are part of the same language process that produces words: They are made predominantly when the person is talking (rather than listening), and they are temporally synchronized with the speaker's verbal syntax—occurring at precisely the same moment as the relevant part of speech. They depict concrete meanings iconically and abstract meanings metaphorically (e.g., "weighing" two choices or indicating the past as "behind" you). They show the same improvisational quality as do words in conversation, seldom appearing in quite the same form or sequence twice. Their functions develop parallel to similar verbal functions in children, and they are selectively affected in aphasia, with gestural loss paralleling verbal loss. (For further details, see McNeill, 1985; McNeill & Levy, 1982; Pedelty, 1987.)

As will be seen in the following, we are explicitly adopting and building on McNeill's assumption that gestures are "manual symbols . . . analyzable as paired signifiers and signifieds" (1985, pp. 351–352). In this view, gestures are not treated as physical movements but rather as referential acts; they convey meaning, depict events, and represent ideas. They specify and often clarify verbal references, and they can denote meanings that may not be in the accompanying words (e.g., when they occur in the pause before the speaker finds the appropriate word). If this is true, then we can explicate or paraphrase the meaning of an illustrator in the context in which it occurs (i.e., the preceding conversation and the co-occurring words, intonation, and facial displays)—*just as we*

do with words. For example, offering a cupped hand to the other person at a moment of disfluency denotes "please supply the right term" just as the words "What's the . . . ?" would do at the same moment. Even words in complete sentences are given specific meaning by their context, which is both verbal and nonverbal in face-to-face interaction.

As this brief review suggests, research on gestures has come a long way from treating them as expendable accompaniments of speech. However, we (Bavelas et al., 1989) noticed that most gestural research was based on monologue data (e.g., an interviewer asks a subject to narrate specified material). Our examination of dialogue data revealed an apparent subclass of illustrators that we understood as making a reference to the interlocutor rather than to the topic of the discourse. Before elaborating on the function these gestures might have in dialogue, it is essential to give the reader a clear idea of what they look like and how they can be identified. As is true for all illustrators, no two interactive gestures are exactly alike, but they do have recognizable common features.

For example, a speaker was trying to explain the problems with a hand-written record system in a hospital:

> and of COURSE there were chances that they would, uh, write something WRONG, <u>you know?</u>

At the point indicated by underlining, she flicked her hand outward, toward the listener, with palm facing up and fingers curled, except for the index finger which pointed directly at the listener. We take the meaning of this gesture to be the equivalent of her verbal (and paralinguistic) "you know?" used in the sense of "do you understand what I am saying?" The orientation of the hand and the index finger both refer iconically to "you," the other person. In another example, the speaker was discussing the summer job options that would contribute the most to his career goal; the listener had suggested earlier that working for Canada Customs would be a good idea. The speaker, after listing several other possibilities, added:

> and <u>Customs</u> is DEFINITELY is career or-oriented.

As he said "Customs," the speaker moved his hand up and toward the listener, almost as if tossing something to him, with palm up, fingers slightly curled, and thumb pointing directly at the listener at the peak of movement. We propose that this gesture conveys a meaning akin to "which YOU suggested," that is, the speaker is citing or crediting the listener as the source of the idea. In this example, unlike the first one, there was no parallel verbal reference (e.g., "as you said"). Without the gesture it would appear that the speaker either did not remember or was not acknowledging that the idea came from the other person, so the gesture serves an important social function. Also notice that, in both exam-

ples, the gestures are completely independent of topic; they give no hint of the immediate topic of conversation (writing something wrong or working for Customs). Instead, these gestures refer to issues between the interlocutors (here, ensuring that the listener has understood what was said or acknowledging the other's previous contribution).

Figure 1 (pp. 474–475) shows several typical interactive gestures from our data. It is also possible to find gestures in previous literature that we would call interactive because their signified meaning involves the other person and not the topic of conversation. Efron (1972, pp. 169, 176) and Ekman and Friesen (1972, p. 366) provided a sketch of what they called a "hand shrug emblem," which we have seen used as an illustrator in dialogue (see Figure 1(f)). We also see as interactive McNeill and Levy's (1982) "conduit metaphors," which treat the words or information being conveyed as an object transmitted between the interlocutors. Some conduit metaphors (e.g., McNeill, 1987, p. 230; McNeill & Levy, 1982, p. 290) depict the delivery of information, as in Figure 1(a). Other interesting examples include

> gestures that accompany, for example, "what did you mean/say/think?" The palm is forward and held upright, while the fingers extend and spread out, usually also curling: a metaphor for the question as an object or container into which the listener is supposed to place an answer. (McNeill, 1985, p. 358)

Goodwin and Goodwin (1986) also described gestures used in word searches: a hand opened to receive the word and a vertical or waving palm that forestalls or rejects the possibility of help with the word search. The second gesture was also noticed by Wiener, Devoe, Rubinow, and Geller (1972, p. 211), who described a gesture they paraphrased as meaning "don't interrupt" (see Figure 1(c)).

We propose that interactive gestures supplant the subclass of illustrators previously called batons or beats. As Kendon (1987) pointed out, most researchers have identified two types of illustrators, "those that appear to represent some aspect of the content of what is being said, and those that have a more abstract relationship" (p. 75). The latter of the two types have been called batons (Efron, 1972; Ekman & Friesen, 1969), beats (McNeill & Levy, 1982), or speech-primacy movements (Freedman, 1972). These were typically described as simple strokes and were assumed to emphasize words or to indicate off-propositional (noncontent) linguistic relationships, rather than to advance the topic of the discourse. We now believe that most of these are interactive gestures; they were probably poorly formed or difficult to identify because of the monologic nature of the data examined. However, the two groups are not isomorphic because, as previously noted, we also include gestures such as conduit metaphors, which were not called beats.

Thus, we propose a new division of the illustrator class, into *topic* and

interactive gestures. Topic gestures depict semantic information directly related to the topic of discourse, and interactive gestures (a smaller group) refer instead to some aspect of the process of conversing with another person. Bavelas, Chovil, Coates, and Roe (1992) identified four aspects that are often marked by interactive gestures: (a) *citing* the other's previous contribution; (b) *seeking* agreement, understanding, or help; (c) the *delivery* of new versus shared information; and (d) events around the speaking *turn* (e.g., taking or forestalling the turn). The primary characteristic that unites such an apparently diverse set of gestures is that they refer directly to the interlocutor; they give no information about the topic. A second, related characteristic is their physical form which always includes some kind of iconic reference to the interlocutor. Sometimes the reference is simply by deixis—pointing at the other person with finger(s), thumb, or palm—but in most instances it is more complex. As noted in Figure 1, there is usually additional shape or movement of the hand that combines with the deictic component to produce a specific and often abstract meaning. For example, the conduit and turn metaphors (including "don't interrupt"), and the hand shrug, all go beyond simply pointing at someone who is present. The form of the citation gesture (Figure 1(b)) seems simply to point at the other person, but such a literal interpretation makes no sense in the context in which it occurs. For instance, in the "Customs" example given earlier the "pointing" can only be understood to be referring to what the other person said earlier, and not to the other person directly.

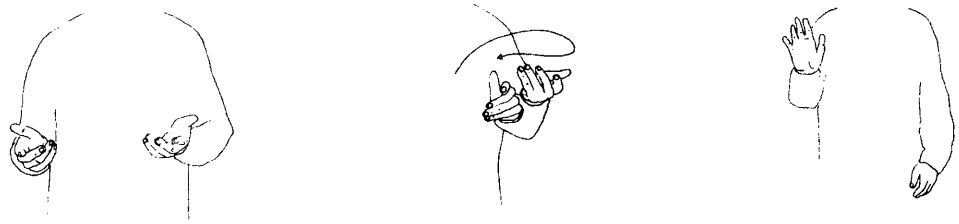
We can distinguish reliably between topic and interactive gestures using a decision procedure based on elimination.[1] The scorer first considers whether it is a topic gesture, looking for some depiction of information related to the topic at hand (e.g., details of the story being told). Failing to find that, the scorer then looks for an interactive meaning. To be an interactive gesture, it must have a paraphrase that is both independent of the topic and addressed to the interlocutor. In addition, the form must be interactive, which means that the finger(s), thumb, or open palm(s) are oriented directly toward the other person at some point, however briefly. (The back of the palm, heel of the hand, or closed hand are negative criteria, i.e., not interactive in form.) Here are two typical scoring examples from our data.

While explaining how to use the library, one person says

then you <u>look up</u> the author or the title

with a gesture of skimming or riffling through a drawer of cards. We interpret this gesture as meaning "by manually going through a drawer of cards in the card catalogue," so this is a topic gesture. Shortly after, the other person summarizes and, upon arriving at this step, says

[1]A description of this procedure is available, with a demonstration tape, from the first author.



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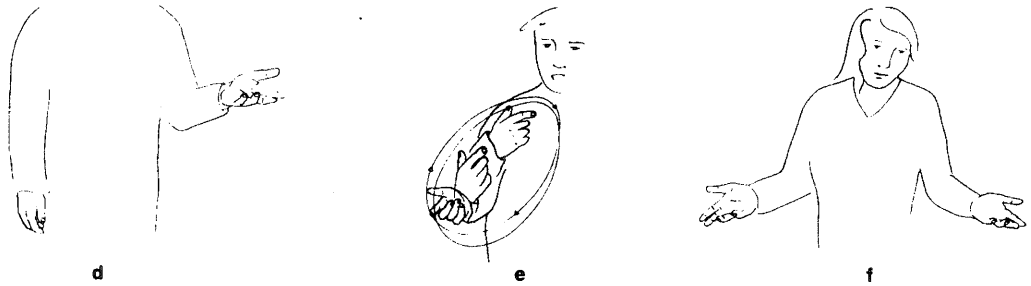

FIGURE 1. Interactive gestures that are typical but not stereotypical (i.e., they are not emblems). The same meaning might be improvised in a variety of ways, even by the same person.
(a) A conduit metaphor in which information is delivered to the other person: "Here's what I'm saying."
(b) (Hand flicks out briefly.) Citing the other person's previous contribution: "As you said, . . ."
(c) (Often a bouncing or pushing movement.) Keeping the turn: "Let me finish, don't interrupt."
(d) Offering the turn: "Do you want to go first?"
(e) (Hand rotates from other to self.) Seeking help with a word search: "Please provide the word I need."
(f) Hand shrug: "What else could I do?"

then look up under the appropriate thing

with a quick movement toward the other person, which we explicate as meaning "you know, what you just said about looking up the author or title." This is an interactive gesture; it does not denote either looking through cards or the concept of "appropriate" but rather denotes that the other person has contributed this information already.

CONVERSATION AS A SOCIAL SYSTEM

Thus far this article has implied that the function of interactive gestures has to do with the nature of dialogue itself, rather than with the specific topic of discourse. We propose that conversation must be seen not as alternating monologues but as a social system (e.g., Bavelas et al., 1989; Clark & Schaefer, 1989; Goodwin, 1981; Rosenfeld, 1987; Scheflen, 1963; Watzlawick, Beavin Bavelas, & Jackson, 1967, Ch. 4). That is, dialogue makes significant social or interpersonal demands as well as semantic and syntactic ones. The interlocutors must, without any formal structure or rules, manage to organize their conversation, coordinate their contributions, and calibrate their meanings as they go along.

An interesting, intrinsic problem in dialogue thus conceived is that, although both partners must remain involved, only one person can talk at once. Whenever a speaker has the floor, there exists the possibility that the conversation could veer off into monologue. One solution to the problem (in formal terms, a homeostatic process) is for the speaker to involve the listener regularly. To a certain extent, the speaker can do this by inserting phrases such as "you know?" or "as you just said," or even "what do you think?" However, the frequent use of such verbal byplay would constantly interrupt the verbal narrative, so nonverbal means of seeking or maintaining listener involvement are well suited to this function. We propose that interactive gestures, for all of their many specific forms and meanings, constitute a class with the common function of *including the listener* and thereby counteracting the beginning of a drift toward monologue that is necessarily created every time one person has the floor. Such gestures, especially when delivered simultaneously with the verbal narrative, can efficiently exert a countervailing force in the direction of dialogue.

EXPERIMENT 1: INDIVIDUALS VERSUS DYADS

The obvious first requirement of our theory is to show that these gestures do indeed refer to the other person in the conversation, rather than having the meanings ascribed in previous literature. Suppose they were really a heterogeneous mixture of beats, batons, conduit metaphors, and depictions of conversational content: They might only appear to us to be directed toward the other person, in passing and fortuitously, depending upon where the video frame is

frozen. Before we begin to modify the work of many previous researchers, we need to demonstrate that these gestures have any relation at all to an interlocutor. Therefore, our first test was to vary the presence or absence of an interlocutor while holding the narrative topic constant; subjects performed the same narrative tasks either alone or in dyads. If these gestures refer to topic, however abstractly or indirectly, then they should not be affected by whether the speaker is alone or in dialogue. If, on the other hand, they are interactive rather than semantic or syntactic, their rate should *decrease* in the absence of a conversational partner. As a corollary, we must also predict that topic gestures should be affected *differently* by these experimental conditions (whether by not changing or increasing). That is, we predicted a functional difference between topic and interactive gestures in response to a social variable.

Straightforward as this manipulation and prediction may appear, subtle difficulties arise when it is acknowledged that topic gestures are also ultimately social (Cohen, 1977; Cohen & Harrison, 1973). Individuals talk and gesture in order to convey information to others, so the absence of another person would be expected to decrease the overall rate of gesturing. If, in the extreme case, no gestures occurred during the alone condition, our main hypothesis would be spuriously confirmed, but we could not show the required difference between interactive and topic gestures. One way of conceptualizing the problem is to imagine conversational systems as forming a continuum: At the asocial extreme is a person in complete isolation, who would have no reason to talk or gesture; at the other extreme is dialogue with all of its systemic demands. The control condition we needed to create was not the first extreme but one in a middle region, which is minimally social in that there is an audience but no interlocutor. We hoped that, in our alone condition, the narrative task and the presence of video cameras would make the setting social enough to elicit illustrators, which we needed to test our hypothesis that a particular subclass would be more frequent when another person was present. For these reasons, we excluded participants in either condition who gestured very little or not at all.

Method

Participants. A total of 50 volunteers (aged approximately 18–50 years old) participated in the study. Most were undergraduates at the University of Victoria, who were asked in their summer-session classes to sign up for what was described as a communication study in which they would be videotaped. Whenever two people could be scheduled at the same time, this was done; people were in the alone condition when only one person could be scheduled for a time slot or when the second person of a dyad did not show up. Thus, although the assignment to condition was not random, it was determined solely by the availability of another, unrelated person and not by any characteristic of the participant. Participants in the alone condition were people who agreed to come and who showed up, as were people in the dyad condition.

Individuals or dyads were replaced if they made fewer than five gestures (of any kind) in each task. Fourteen individuals and two dyads were replaced for this reason, and one dyad was replaced because they did not do the task as instructed; this left the planned numbers of 10 individuals (5 females and 5 males) and 10 same-gender dyads (5 female and 5 male; 20 individuals).

Tasks. Two tasks were used, both intended to be highly visual in order to evoke gesturing. The cartoon task consisted of watching an episode from a "Road Runner" cartoon (in which the coyote attempts to hypnotize the road runner, unsuccessfully of course) and then describing it in detail afterwards. For the other task, the library task, participants were asked to give detailed instructions on how to get a book from the library. The alone condition was therefore like an ordinary memory task; the dyad condition was very similar to Edwards and Middleton's (1986) "joint remembering" task, in which people worked together to reconstruct something. Order of tasks was counterbalanced within condition.

Instructions. Participants came to our Human Interaction Lab, in which four cameras were fully visible. After an overview, dyads were told, in one task order:

> The first task involves giving some instructions out loud. I'd like the two of you together to describe how you get a book out of the library. (It could be the U.Vic. library or any other library that you're familiar with.) So let's say you know the name of the author and the book title. You need to describe such things as how you'd get to the library, how you'd find the book, and how you'd check it out of the library. Any questions?

If there were questions about what doing the task together meant, the experimenter elaborated:

> You should share the telling of it and help each other.

The experimenter then went to the control room until they were finished and returned to introduce the next task:

> Okay, the second task you'll be doing involves watching a cartoon. It's very short—it's one episode from a Road Runner cartoon; you've probably seen Road Runner cartoons on TV. You'll be seeing the cartoon twice, the first time just to see generally what it's about, then it will come on again, and the second time I'd like you both to focus on the details. What I want the two of you to do afterwards is to jointly recreate the episode (you don't have to get up and run around or anything!). I want the two of you together to describe and illustrate every detail in the episode. But you shouldn't have any problem remembering it because, as I said, it's very short. Okay, any questions?

In the alone condition, the instructions were modified to suit one person (e.g., "I'd like you to describe . . .").

After the two tasks, participants were taken to the control room, where they were shown their videotape and given a full explanation of the study. Afterwards, they were asked to sign a permission form in which they chose the uses that could be made of the videotape.

Scoring. The participants were filmed both full-face and in profile (a two-way split for individuals, three-way for dyads). The full narratives were scored except for two extremely lengthy descriptions in the library task, which were truncated to the average length of the other narratives for that task. All gestures were scored using the system outlined earlier, that is, using both an explication of what the gesture conveyed and an examination of its form to classify it as a topic or interactive gesture.

The data were scored by one of five scorers, each of whom had achieved at least 90% agreement on a test tape from a different data set. Reliability was also assessed on one alone and one dyad tape. Median pairwise percentage of agreement was 90% for the dyad (range = 75%–100%) and 88% for the alone tape (range = 71%–94%). Obviously, scorers could not be blind to condition, but we were not concerned about scorer bias for several reasons. First, the scorers varied in their knowledge of the hypothesis (two aware, one slightly aware, two unaware). Agreement between the two knowlegeable scorers was 90% for the dyad tape and 88% for the alone tape, both were equal to the median percentages. If their scoring had been biased by knowledge of the hypothesis and condition, their agreement with each other should have been the highest. Second, there were findings that none of the scorers expected. Third, the scoring is both explicit and taxing, with an emphasis on being able to provide reasons in terms of meaning and form for each decision; there were very few cases where bias could be introduced, much less coordinated among independent scorers.

The data for each individual or dyad were then transformed into rates (number of topic or interactive gestures per minute). Because usually only one person talks and gestures at a time, no distinction was made between interlocutors in the dyad condition.

Results and Discussion

The results are summarized in Table 1 (p. 480). The main prediction was supported: There was a significantly higher rate of interactive gestures in the dyad condition than in the alone condition. Topic gestures, on the other hand, occurred at a higher rate in the alone condition. In other words, topic and interactive gestures were functionally distinct in these data.

There are two plausible reasons for the higher rate of topic gestures in the alone condition. Our elimination of people who did not gesture, which happened disproportionately in the alone condition, could have shifted the distribution in

TABLE 1
Experiment 1: Mean Rates per Minute of Gestures by Condition

	Type of Gesture	
Condition	**Interactive**	**Topic**
Alone (n = 10)	1.85 (1.46)	20.13 (10.29)
Dyad (n = 10)	3.28 (1.78)	12.70 (5.32)
df	18	18
t	− 1.97	2.03
p	.03, one-tailed	.057, two-tailed

Note. Standard deviations are given in parentheses.

this condition in the direction of high rates of gesturing. Note that, even if we were effectively "stacking" the alone sample with high gesturers, they had a significantly *lower* rate of interactive gestures. Another possible explanation is that dyads may often use interactive gestures in lieu of topic gestures, for example, citing "what you just said" with an interactive gesture instead of depicting what was said with a topic gesture.

An unexpected but informative finding was a significant task difference in the rate of interactive (but not topic) gestures. We had used two tasks only for conventional reasons of generalizability but found that the library task itself elicited about twice as many interactive gestures as did the cartoon task ($t(19) = 4.38, p < .0001$, two-tailed; there was no task difference for topic gestures; $t(19) = .97$, ns). Given this difference, we can speculate that the two tasks differed in their sociality: In the library task, there was an implied receiver (other than the experimenter), namely, a person who needs the instructions, and indeed our narrators sometimes explicitly addressed an unspecified receiver (e.g., "You'll see a map that shows the floors for each call number").

EXPERIMENT 2: VISUAL AVAILABILITY

The next experiment tested more specifically the role of interactive gestures in face-to-face interaction. If interactive gestures function to involve and include the other person in dialogue, then another person must not only be present but must be able to see the gestures. Therefore, we either placed interlocutors face-to-face across a table (*face-to-face condition*), or blocked their view of each other with a partition (*partition condition*) and then asked them to tell each other a story about a personal "close call." We predicted that interactive gestures would be particularly affected by the loss of visual availability (i.e., fewer in the partition than in the face-to-face condition) because unwitnessed gestures could not serve the function of including and involving the other person in the conversational system.

This design also tests three plausible alternative explanations for the results of the first experiment:

1. Granted that talking with another person somehow elicits more of the gestures we are calling interactive, but it has still not been shown that this increase is because of any relationship to the other person. The effect could be due to some unspecified semantic or syntactic demand that dialogue itself puts on the speaker (e.g., more beats and conduits are used). If this were so, then in this experiment the rate of interactive gestures in dialogue should be unaffected by whether the interlocutor could see them.
2. Or, granted that interactive gestures do indeed indicate the other person, it could still be argued that they are merely deictic, with the speaker occasionally pointing at the other person if there is a person present. If this were so, then the mere presence of another person should be sufficient to elicit these gestures, and it should not matter whether he or she can see the gesture (i.e., people often use deictic gestures toward inanimate objects that cannot see the gesture).
3. If the argument is that these are deictic gestures that are made to convey information to the other person and therefore must be seen, then the same argument should apply to *all* illustrators. That is, this interpretation must predict that both topic and interactive gestures would be affected in the same way by the visual availability of the other person.

Our theory, in contrast, suggests that although the narrator may make topic gestures for the camera or to prompt him- or herself, there is no reason to make interactive gestures that would not be seen by the interlocutor, so these gestures should be more affected by condition than are topic gestures.

The data were gathered as part of a larger study on the use of facial displays in conversation (Chovil, 1991). The entire experiment created four conditions of communicative channel availability; the other two conditions used a telephone and were analyzed for facial displays but not for hand gestures because holding the telephone might interfere with the speaker's freedom to gesture and thus would constitute a plausible alternative explanation (to visual availability) for any decrease in gesturing in these conditions.

Method

Participants. Forty-six female volunteers (23 dyads) participated in the two conditions to be analyzed here. All were University of Victoria undergraduates contacted in classes; most were in their early twenties. The time slots for dyads were randomly assigned to experimental condition. One dyad in the face-to-face condition and two in the partition condition were replaced because of filming problems, to achieve the planned number of 10 dyads per condition. Although

both people told stories, only one narrator per dyad was scored, usually the first narrator. Because of the spontaneous and animated nature of the stories, and because we had focused the cameras as closely as possible to capture facial displays as well, the narrator sometimes gestured so far off to the side that the gestures went out of her half of the screen, in which case the second storyteller was scored. In 5 dyads, this happened with both speakers, so the final number was 15, with 7 dyads in the face-to-face condition and 8 in the partition condition.

Procedure. Participants came to the Human Interaction Lab, where they knew they would be talking to another person and would be videotaped; the cameras were visible as usual. After an overview of the experiment and a first, unrelated task in the same condition, they were instructed as follows:

> I would like both of you, one at a time, to talk about a close-call incident or near-miss incident that you have had. Now I would like you to talk about an incident in which you *almost* got hurt or something bad *almost* happened but in the end everything was okay; or an incident where the injury or outcome was only minor compared to what it could have been. I want you to talk only about something that you feel comfortable in telling. . . . Other people [in the pilot study] have told about skiing accidents, falling off a horse, close calls while playing sports; one person talked about how she almost lost her paper in the computer. You can take a minute or so to think about one you've had. I'd like you to describe the situation in some detail: Make it a story, don't just say it in one or two lines. You can decide which of you goes first.

The experimenter returned after both had told their stories. The postexperimental procedures were the same as in Experiment 1.

Scoring. The videotapes (with each individual filmed face-on, in a two-way split) were scored for interactive versus topic gestures as in Experiment 1, by one of the same five individual scorers, who were blind to condition. Median pairwise reliability was 86% (range = 83%–95%). Rates per minute for each class of gesture were calculated as before.

Results and Discussion

The results are summarized in Table 2. As predicted, there was a significantly lower rate of interactive gestures in the partition condition. There was no significant difference in the rate of topic gestures. Again, and in a different kind of dialogue task, interactive gestures were sensitive to social variables in a way that topic gestures were not, which establishes them as a functionally distinct class.

These results make less plausible the alternative explanations outlined earlier: (1) Any semantic or syntactic demands made on the speaker by dialogue itself were the same in both conditions; (2) interactive gestures are not simply deictic,

TABLE 2
Experiment 2: Mean Rates per Minute of Gestures by Condition

	Type of Gesture	
Condition	**Interactive**	**Topic**
Partition (n = 8)	2.09 (1.86)	18.43 (8.72)
Face-to-face (n = 7)	4.38 (2.38)	20.75 (7.69)
df	13	13
t	−2.29	−.54
p	.03, one-tailed	n.s.

Note. Standard deviations are given in parentheses.

because the existence of another person to point at was not sufficient to maintain their rate; and (3) it mattered whether the other person could *see* the interactive gestures but not the topic gestures. Our storytellers "pointed at" many imaginary objects in the course of their narrations, but they "pointed" less at the person across from them when that person would not be able to see the gesture. We conclude that interactive gestures are made for the other person to see.

The reader may have noticed in Tables 1 and 2 that the ratio of interactive to topic gestures is roughly the same in both experiments, with interactive gestures making up about 10% to 20% of illustrators for these kinds of tasks. We should also point out that our scoring system classifies all gestures as topic or interactive, and we have not needed a miscellaneous or unscorable option. In other words, the category previously called batons, beats, or speech-primacy movements has not appeared since we identified interactive gestures.

REDUNDANCY ANALYSIS

There is another testable derivation from our theory of interactive gestures, one that brings us closer to how these gestures function in conversation. We agree with McNeill (1985) that words and topic gestures work together to convey semantic information in a highly integrated manner. We go on to propose that, because interactive gestures can be used in place of interactive words, they are particularly suited for solving the speaker's problem of involving the listener without disrupting the topical verbal narrative. That is, interactive gestures are specialized to serve their function efficiently *without* requiring words. If so, then it should be the case that interactive gestures frequently occur without any corresponding verbal reference to the other person.

To test this, we devised a scoring system to assess the degree of redundancy between the information conveyed by an illustrator and the information conveyed

by the accompanying words.[2] For each gesture, the meaning of the gesture and the meaning of the accompanying words were fully itemized and then rated for overlap on a scale of 0 to 3. A score of 0 meant that the gesture supplied virtually no different, additional information (or gave even less information) than the words did. For example, a speaker said

a small square box

while making a small box-shape with the hands. The gesture did not add any new information or details. It was completely redundant with the words that were said at the same time, and therefore was a topic gesture with a score of 0. Or, as in our first example in the introduction, the speaker said

you know?

while flicking her finger at the other person. The gesture, like the words, referred to the other person, so it was an interactive gesture with a score of 0. This example also makes clear that "verbal" does not equal "topic" (which would make the scoring system tautological): Both words and gestures could convey topic meanings, and both words and gestures could convey interactive meanings.

Gestures that were given scores of 1 or 2 provided some or a good deal of extra information, respectively, but the general category of information also appeared in the words. For example, if "walking" appeared in the words, then a gesture depicting a specific style of walking merely provided additional information about the verbally established category, walking.

To be scored as 3, the gesture had to provide a category of information that was not in the words at all. For example, a speaker said

He goes dut, dut, dut

while illustrating a comical form of walking with her fingers. The words "he goes" did not convey in any way that the action referred to was "walking." This category of information was entirely in the gesture, which also depicted a specific kind of walking. Therefore, this was a topic gesture with a score of 3. An interactive example was given earlier, in which the speaker said

then look up under the appropriate thing

while flicking his hand at the other person. The words did not refer to the other person at all; there was no verbal indication that "appropriate" meant what the other person had said earlier. This category of information was exclusively in the gesture, so this was an interactive gesture with a score of 3.

[2]A complete description and instructions are available from the first author.

Operationally, the relevant accompanying words were deemed to be the phonemic clause (e.g., Dittman & Llewellyn, 1967) during which the gesture occurred. The information being conveyed verbally was limited to the words in the phonemic clause, without any paralinguistic or nonverbal aspects (e.g., intonation, nonlexical vocalizations, or facial displays); these were not considered because our purpose here was solely to compare the gestures with the words. Any pronominal form, whether verbal or gestural, was given its previous meaning as long as the usage was unambiguous.

Two scorers applied this system to the data from Experiments 1 and 2. All of the interactive gestures were scored. Because of the much larger number of topic gestures, a random one-sixth were sampled for scoring. The two scorers prepared and scored the data from Experiment 1 together, then divided the Experiment 2 data into halves which they scored separately with two reliability checks ($r = .93$ and .95). To prepare the data for scoring separately, they first agreed together on the phonemic clause and on the global meaning of the gesture (e.g., "something to do with a card catalogue"). This was done because, although the first two steps are not part of the judgement about redundancy, they are necessary preconditions for the reliability of this judgement.

Two of the dyads, both in the partition condition of Experiment 2, were excluded from analysis because there were no interactive gestures at all. Each remaining dyad or individual was assigned (a) the average redundancy score for all of their interactive gestures and (b) the average redundancy score for the sampled one-sixth of their topic gestures. These averages were compared by correlated t tests for each experiment, and the results (shown in Table 3), strongly confirmed our hypothesis that interactive gestures are significantly less redundant with words than are topic gestures.

Moreover, as the means for interactive gestures suggest, their modal score was 3, a score that could be given only when the word "you" or its equivalent *did not occur at all* in the accompanying phonemic clause. Thus, although the means for topic gestures indicate that they were tightly interwoven with the

TABLE 3
Experiments 1 and 2: Mean Redundancy Scores by Gesture Type

	Type of Gesture				
	Topic	**Interactive**	t	df	p **(one-tailed)**
Experiment 1 (n = 20)	0.75 (0.49)	2.68 (0.30)	15.60	19	<.001
Experiment 2 (n = 13)	0.57 (0.47)	2.74 (0.56)	10.77	12	<.001

Note. 0 = the gesture is completely redundant with the words, that is, gives no additional information; 3 = the gesture is completely independent of the words, that is, gives entirely different information. Standard deviations are given in parentheses.

words they accompanied, interactive gestures usually occurred without any corresponding verbal counterpart—just as our model predicted.

The absolute values of the means also eliminate two other possible alternative explanations. First, it becomes even less likely that interactive gestures are merely deictic. There is no reason that a particular kind of deictic gesture would consistently occur without the word "you" whereas other gestures were consistently accompanied by a corresponding word. Second, the mean values answer potential questions about scoring bias. Recall that the redundancy score was based on the scorer's itemization of the meaning of the gesture and the phonemic clause. If, in the case of interactive gestures, the scorers often underinterpreted the words and overinterpreted the gesture (e.g., paraphrased an interactive gesture as "what you just said" instead of only "you"), then the scores would be biased toward nonredundancy. However, because no verbal equivalent of "you" even appeared in the accompanying clause, the words and interactive gesture were clearly nonredundant, no matter how the gesture was specifically interpreted.

IMPLICATIONS

Taken together, the results confirm the major points of our original theory of interactive gestures (Bavelas et al., 1989). That is, the data establish that there exists a separate class of conversational gestures sensitive to the visual presence of an interlocutor and that these gestures have properties consistent with the role we propose they play in maintaining conversation as a social system. We have recently completed further studies showing, first, that alternating monologues by face-to-face dyads produce significantly fewer interactive gestures than does dialogue by the same dyad and, second, that interactive gestures elicit predictable responses from the interlocutor (Bavelas, Chovil, Coates, & Roe, 1992).

This pattern of results leads to a highly speculative but striking alternative interpretation of certain findings in aphasia. It has been suggested that one characteristic of Broca's aphasia is that beats (but not other gestures) decrease markedly; the opposite is true for Wernicke's aphasia, where mostly beats are retained (McNeill, 1985; Pedelty, 1987). If, as we suspect, interactive gestures subsume beats, then one of the losses in Broca's (and not in Wernicke's) is interactive or social, which implies that the social as well as semantic and syntactic aspects of language are "hard-wired." This is consistent with Rosenthal's (1982) finding that newborns coordinate their vocalizations with their mothers'—again implying that the social aspects of language are not developmentally secondary but are co-equal with the cognitive aspects.

Finally, we would like to reiterate that, in our theory, the systemic, interactive functions of conversation are not served solely by the speaker's interactive gestures; we simply discovered them here first. Our own and other researchers' observations have identified several verbal and nonverbal "topic-free" acts that,

we propose, can serve the complex interactive demands of conversation. For example, speakers can use *sociocentric sequences* (Bernstein, 1962; Duncan, 1972), which are terminal phrases such as "y'know?" or "eh?" Bernstein (1962) originally called these by a quaint but suggestive name, "sympathetic circularity sequences," and he speculated on a meaning very similar to our interpretation of certain interactive gestures:

> The speaker requires reassurance that the message has been received, and the listener requires an opportunity to indicate the contrary. It is as if the speaker is saying "Check—are we together on this?" (p. 235)

We think that the same function is served by rising intonation on a declarative sentence, sometimes called a "try-marker" (Clark & Wilkes-Gibbs, 1986; Sacks & Schegloff, 1979). Other topic-independent tools at the speaker's disposal are *discourse markers* (Polanyi & Scha, 1983; Schiffrin, 1988) or *framing statements* (Edwards & Middleton, 1986), which permit the speaker to orient the listener to the macrostructure of their discourse (e.g., "Well, this is an aside, but . . ." and, later, "So, anyway . . .").

The listener also plays an active part in maintaining the conversation by interactive acts called *back channels* (Yngve, 1970) or *listener responses* (Dittman & Llewellyn, 1967), such as "mhm" and heads nods. We have seen *interactive facial displays* (Chovil, 1991/92) such as inquiring or puzzled looks and would now speculate that *motor mimicry* (e.g., wincing at another's pain; Bavelas, Black, Chovil, Lemery, & Mullett, 1988; Bavelas, Black, Lemery, & Mullett, 1986) serves in conversation to indicate comprehension, as do verbal mimicries such as echoing or anticipating the speaker's words. Goodwin (1981) and Clark and Schaefer (1989) have described several ways in which speakers modify their talk in response to vocal and nonvocal acts by the listener that we would call interactive. Our current experiments are aimed at examining all of the means, verbal and nonverbal, that interlocutors use to maintain the systemic aspects of their conversation.

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