134. The conceptualization of time in gesture

Abstract

Humans around the world conceptualize time as space. Such spatial construals surface systematically in co-speech gesture, providing a more vivid picture of time conceptualization than offered by speech alone. Temporal gestures have recently come into sharp empirical focus because of their position at the intersection of questions about the psychological reality of conceptual metaphor, about the embodied nature of abstract reasoning, and about linguistic and cognitive diversity. Across cultures temporal gestures show some widespread patterns – such as the anchoring of "now" to the speaker's location with a point downward from the speaker's gestural space – and some striking particulars – such as locating the past and future, respectively, downhill and uphill or in front and behind. Provocative recent findings notwithstanding, much remains to be learned about temporal gestures, including their variation within and across cultures and their precise relationships to language and cultural practices.

1. Temporal gestures

Humans gesture abundantly when talking about space (Alibali 2005). Whether describing where two grocery stores lie in relation to each other, illustrating the size of an unseen fish, or indicating the direction of a landmark in the distance, such communicative acts are commonly – even characteristically – accompanied by gestures of the hands. Curiously, similar movements can be observed whenever humans talk about time. Though famously ineffable and abstract, the intangibility of time hardly seems to get in the way of its gestural expression. Whether describing when one event happened in relation to another, commenting on the duration of a tedious meeting, or referring to an upcoming event, such communicative acts, too, are commonly accompanied by hand movements. Such movements are often called *temporal gestures*, and they are paradigmatic examples of conceptual metaphor in gesture: they enact a construal of the domain of TIME as though it had properties of the domain of SPACE. Spatial construals of time are the stuff of everyday language and thought and are strikingly widespread around the world, if not universal (Núñez & Cooperrider, 2013). In language after language the *passage* of time is talked about in terms of motion*, duration* is talked about in terms of length or amount, and the concepts of *past, present, and future* and of *earlier* and *later* are talked about in terms of *relative location* (Alverson 1994; Haspelmath 1997). Gestures that embody such construals may prove just as everyday and just as widespread, though empirical work in this area is still in its early stages (for

an earlier review, see Kendon 1993). What forms do temporal gestures take? What relation do they bear to the spatial metaphors found in spoken language? In what ways do temporal gestures differ from one culture to the next and in what ways are they the same? Such questions are certainly of descriptive interest to students of human communicative behavior. But they also have broad ramifications for our understanding of how body, language, and culture together shape one of the most abstract – but also most fundamental – dimensions of human experience.

2. Early observations and emerging theoretical perspectives

Observers of human communication have perhaps noticed from the start that people gesture when talking about time. In a well-known passage in which he marvels that gestures are "almost as expressive as words", Quintilian writes: "Do we not employ them to indicate joy, sorrow, hesitation, confession, penitence, measure, quantity, number, and time?" (Quintilianus 1922, Volume IV, Book 9, Chapter 3, line 86). Among the first scholars to turn concerted attention to the gestural expression of time was Andrea de Jorio ([1832] 2000), in his study of gesture in Naples. He describes how gestural reference is made to past time by iterated thrusts of the hand over a shoulder, to the present moment by directing an extended index finger to the ground, and to future time by extending the hand forward in a semi-circular leap. (The semi-circular "topology" noted here by de Jorio, which he relates to the sun's arc as a source for thinking about temporal progression, is also noted by later authors and we will return to it below.) De Jorio does not dwell on the fact that these three gestures together form a contrast along the front-back axis, reflecting a systematic spatial construal of time.

Outside these early observations, the phenomenon of time-related gestures does not appear to have attracted much further analytic attention until the work of Geneviève Calbris. Across several publications (1985, 1990: 84–93), she has provided a rich semiotic analysis of the temporal gestures produced by French speakers. In addition to the past-behind/ future-front pattern noted by de Jorio, Calbris describes another pattern in which earlier events are located to the left and later events are located to the right. Many of the features of temporal gestures Calbris notes among French speakers – such as the use of both the sagittal front-back and lateral left-right axes – may end up generalizing to speakers of other Western global languages. Others appear to be more restricted in their distribution. Calbris writes, for example, that when producing temporal gestures along the front-back axis, French speakers recruit relative height to express relative distance from the present moment.

Interest in temporal gestures since Calbris's first writings has largely shared a cognitive orientation to gesture that emerged in the 1980s. It was around this time that the psychologist David McNeill influentially suggested – with the support of his new experimental methods – that

co-speech gestures provide a kind of back-door access to the imagistic dimension of a speaker's thought processes. Viewed in this way, gesture becomes more than just an interesting behavior to describe: it presents a brave new kind of evidence that cognitive scientists can bring to bear on questions about the nature of conceptualization. The emergence of McNeill's cognitive view of gesture coincided with a swell of interest in conceptual metaphors – that is, cognitive mappings from one domain to another that were hypothesized to underlie the myriad metaphorical expressions seen in language. From the very beginning a paradigmatic example for conceptual metaphor theorists was the TIME IS SPACE metaphor (Lakoff 1992) and it remains so today. The TIME IS SPACE metaphor is often characterized as a "primary metaphor" because it is motivated by an experiential correlation between two domains (Grady 1997; Johnson 1999). When walking on a path, for example, the experience of forward motion is coupled to the experience of temporal progression – and indeed the basic experience of walking may give rise to the future-in-front mapping widely seen in both temporal language and temporal gesture.

It was not until the late 1990s that these two areas of inquiry – conceptual metaphor theory and cognitive approaches to gesture – coalesced, motivating systematic empirical work on gestures accompanying metaphorical language in general and, in particular, accompanying metaphorical language about time. The turn to gesture was motivated in part by a pointed criticism of conceptual metaphor theory lodged by Murphy (1996) and others. Murphy objected that if one wants to prove that conceptual metaphors are really about underlying thought and are not just linguistic decoration, proliferating additional linguistic examples is not enough: alternative evidence for their psychological reality is necessary. Enter gesture. Co-speech gestures provide spontaneous and thus ecologically valid four-dimensional insights into the imagistic side of language, metaphorical or otherwise. Several studies have now demonstrated that temporal gestures provide information about time-related imagery that is at once richer and more dynamic, and which in some cases departs from the representations suggested by spoken language.

In a ground-breaking early study in this vein, Cienki (1998) filmed informal interviews with college students in the U.S. and analyzed them for their metaphorical speech and gesture. He made two important observations about how metaphorical gestures depart from speech. The first was that gestures sometimes offered evidence of metaphorical processes at work where the immediately accompanying speech did not. Overtly metaphorical speech, it turned out, was not a necessary precondition for metaphorical gestures. This observation has since been corroborated in a number of studies on temporal gestures. Cienki's second observation was that speakers of English often gestured in a way that was consistent with a left-to-right timeline. Such a mapping does not show up explicitly in time expressions in the English language, where instead expressions involving front-back contrasts (*The weeks ahead look good; They left back in January*) are

pervasive. This observation has been extended more recently to show that English speakers sometimes produce gestures along the left-to-right axis even when overtly using front-back metaphors in concurrent speech (Casasanto and Jasmin 2012). Metaphorical language may be the source of temporal gestures along the front-back axis, but – as suggested by Calbris (1990), Cienki (1998) and others since – cultural practices of literacy and explicit temporal representation (as found in timelines and graphs, for example) likely motivate gestures consistent with the direction of writing. Writing directions exhibit an inherent "forward" direction, be it rightwards or leftwards. It is perhaps only by virtue of this directedness that writing direction is recruited for side-to-side temporal gestures even when co-occurring speech suggests a front-back construal.

3. Temporal gestures across cultures

The fact that temporal gestures in post-industrial cultures are profoundly shaped by literacy and associated cultural practices makes temporal gestures among more traditional, pre-industrial groups a topic of special interest. Around the time of Cienki's study, Núñez and colleagues (Núñez, von Neumann, and Mamani 1997) began to study the spatial construal of time among the Aymara, an indigenous group of the Andes who lack a writing system and do not have entrenched conventions for representing time graphically. Close examination of Aymara expressions about deictic aspects of time (concerning past, present, and future) suggested a striking TIME IS SPACE metaphor that – in contrast to the pattern found in English and many other languages studied – mapped the past to the *front* and the future to the *back*. On the basis of linguistic evidence alone, however, it was not possible to rule out an alternative, less exotic explanation of this apparently "reversed" mapping: the *fronts* and *backs* invoked in such expressions may not belong to the *ego* but to the fronts and backs of another *temporal event*. (Expressions about sequential aspects of time, which concern only earlier-than, later-than relationships, commonly make metaphorical use of front-back orientation, e.g. *February follows January*.) Núñez and Sweetser (2006) turned to gesture to distinguish between these possibilities. They confirmed that, first, the Aymara past-front/ future-behind linguistic metaphor is cognitively real and, second, it is centered on the ego rather than on some other temporal anchor point. Gestures produced along the front-back axis appear to be inherently deictic – that is, they include the ego's position in a way that gestures produced from side-to-side do not. Additionally, the authors reported that while past-front/ future-behind temporal gestures were widely used by elderly Aymara speakers, they were on the decline among younger speakers with Spanish proficiency, who tended to favor more Spanish-like past-behind/ future-front temporal gestures.

Since Núñez and Sweetser (2006) several papers have sought to explore the range of cross-cultural diversity in time conceptualization by using temporal gestures as a window. Núñez et al.

(2012) studied the spatial construal of time in the Yupno, an indigenous group of the Finisterre Range in Papua New Guinea. Like the Aymara, the Yupno lack a writing system or cultural practices for representing time. Building on the methodology used by Núñez and Sweetser, the researchers used semi-structured field interviews in which participants were asked to explain commonplace temporal expressions. Though not asked to gesture, Yupno participants spontaneously did so – abundantly and systematically – during their explanations. Their gestures reflected an allocentric topographic construal of time in which – regardless of which way the speaker was facing – the past was construed as downhill, the present as co-located with the speaker, and the future as uphill. Perhaps even more remarkably, the construal did not fit the familiar linear "arrow" of time. Instead it exhibited a three-dimensional geometry apparently grounded in the particulars of the local terrain. An interesting point of contrast between the case of Aymara and Yupno is how strongly and regularly the two languages employ metaphorical language to talk about time. In Aymara the front/back terms pervade linguistic expressions about time, whereas in Yupno use of the uphill/downhill contrast for time reference appears to be much more restricted.

Another recent study presents further evidence that time's "arrow" is not universal. Le Guen and Balam (2012) studied the spatial construal of time among the Yucatec Maya, using a combination of linguist analysis, card arrangement tasks, and analysis of co-speech gesture. While the authors do find evidence for spatial construals of time in gesture, these construals appear to be at once more diverse and perhaps less systematic than has been described in previous studies. For instance, it is reported that gestures for past and future contrast with gestures for present – a point downwards from the speaker's gestural space as observed in Naples, France, the United States, and among speakers of Aymara and Yupno – but do not contrast with each other.

Le Guen and Balam (2012) also briefly note another temporal gesture practice in which speakers refer to times of day by indicating locations along the sun's imagined arc through the sky. The arc is absolutely oriented from east to west and is thus anchored to the world rather than to the speaker's body. This practice is apparently widespread among small-scale groups (see, e.g. Haviland 2004: 207; also Kendon 1980, and especially De Vos 2012 for apparently similar practices employed in small-scale sign languages), though it has only very recently attracted systematic attention. Floyd (2008) describes in detail such a celestial gesture system in use by speakers of Nheenghatú, an indigenous language of the Brazilian Amazon. Reference to punctate times of day or extended swaths of time can be made by pointing or sweeping gestures, respectively. Floyd argues that such gestures fulfill a role comparable to spoken words insofar as they provide on-record referential information not found anywhere in speech. Note that, in contrast to the spatial construals of time described earlier, celestial pointing gestures such as

those described by Floyd are not grounded in a conceptual metaphor but rather in a conceptual metonymy by which spatial locations along the east-west arc provide metonymic access to times of day. Little is known about whether such models of the sun's daily course are recruited for understanding time at other scales (*weeks, months, years, cultural history*) or for construing deictic and sequential aspects of time generally.

Returning to the case of English, recent studies have begun to use more controlled methods to elicit temporal gestures in the laboratory. Cooperrider and Núñez (2009), for instance, sought to delve more deeply into the varieties of temporal gestures produced by English speakers. They used a narrative retelling task in which participants studied from either a graphical or auditory stimulus a brief history of the universe and then recounted it for a naïve participant. The authors described five types of temporal gesture in which time was conceptualized as having spatial properties, each of which reflected a recurring cluster of formal features. Participants produced gestures describing the duration of an event; pointed to or placed events as though they had spatial location; produced gestures highlighting a transition in time or the "spatial" relation between two events; and occasionally produced gestures "personifying" time as an agent with motion of its own. Cooperrider and Núñez noted that an interesting frontier of research on temporal gestures – and indeed on metaphorical gestures more generally – is the granularity at which differences in temporal gestures reflect subtle characteristics of the underlying representations that motivate them.

Casasanto and Jasmin (2012) addressed a puzzling discrepancy between previous linguistic analyses of TIME as SPACE metaphors in English, which suggest the primacy of the front-back axis, and previous analyses of how English speakers gesture about time, which have noted a predominant left-right pattern. In a first study they explicitly elicited temporal gestures about past and future and about sequences by asking people how they would gesture about such notions. They then compared the observed patterns to those seen in spontaneous temporal gestures from a second study and uncovered some differences. English speakers were more likely to use the front-back axis for time in elicited gestures than in spontaneous gestures. Another interesting finding to come out of this study, lending support to speculation voiced elsewhere, is that use of the front-back axis or the left-right axis depends in part on whether *sequential* or *deictic* temporal relationships are being conceptualized. Specifically, the front-back axis was more strongly associated with deictic than with sequential relationships.

4. New directions

The discussion above has suggested a number of fruitful avenues for future inquiry on temporal gestures. For one, there is much potential for further instructive comparison between co-speech temporal gestures and linguistic signs produced to refer to time. Both sign and co-speech gesture exploit the analog richness of the manual-visual modality for communicating subtleties of temporal concepts. A key difference is that the overt spatialization of time is obligatory in signers, while it is only optional in speakers. Where thoroughgoing descriptions of signed temporal reference are available (see Engberg-Pedersen 1999 for a review) interesting parallels are evident. In American Sign Language the left-right and front-back axis are specialized for different kinds of temporal reference, with the former recruited for sequential relationships and the latter for deictic relationships (Emmorey 2002). This pattern is echoed, albeit more faintly, in co-speech gesture as just described above. Further study of both established sign systems and emerging sign systems, particularly in relation to the co-speech temporal gestures used in surrounding communities, could clarify the origins and transmission of spatial construals of time.

Another fruitful avenue for further work concerns the mapping between temporal construal and gestural form. How fine-grained are the correspondences? Studies to date have focused on gross patterns – such as the orientation of the axis used – rather than subtleties. In our studies we have occasionally encountered what look to be morphological features expressing nuances of construal. For example, when producing downward "now" gestures, English speakers often do so with an index finger extended handshape. Yupno speakers, by contrast, often do so with the palm open and flat, oriented parallel with the ground. There is a possibility that these are "frozen" conventions, but they could plausibly reflect a difference between thinking of events as made up of points or slices in a line (in the English case) and thinking of time as positions on a wider field (in the Yupno case). Several authors, including Calbris and de Jorio, have noted temporal gestures that exhibit a (semi-) circular topology. Do these properties reflect underlying construals or, again, "frozen" gestural conventions? Given that gestural form is shaped by a host of factors other than mental imagery, large corpora will likely be needed to discern one-off idiosyncrasies from broader patterns.

Temporal gestures, like co-speech gesture generally, are of two-fold interest. On the one hand they constitute a systematic everyday behavior, one that can be seen in human group after human group, exhibiting in each case a blend of universal and culture-specific features. On the other hand temporal gestures are a cutting-edge tool of contemporary cognitive science. They provide fleeting but vivid glimpses into how the human mind construes experience.

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