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Conceptual Affiliates of Metaphorical Gestures

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Overview

In this talk, I will present two sets of experiments exploring how spontaneous gestures relate to words, thoughts, and meaningless motor actions. In the first half, I will discuss examples of two previously undocumented types of metaphorical co-speech gestures, which are not easily described within existing classification schemes (Cienki, 2005; McNeill, 1992; Müller, 1998). In the second half, I will present experiments showing bidirectional influences between simple repetitive motor actions and talking or thinking about memories with metaphorical content.

Metaphorical Beat Gestures with Lexical and Conceptual Affiliates

The first series of experiments investigated spontaneous co-speech gestures that accompanied stories with literal or metaphorical spatial content. Numerous tokens of a previously undocumented type of metaphorical gesture were observed, which I will call *metaphorical beat gestures*. Some of these appeared to be *lexically affiliated* with co-timed words that shared the same metaphorical source domain, whereas others were only *conceptually affiliated* with the overarching metaphorical spatial schema that structured the story, as a whole.

The form and function of these gestures is difficult to predict or describe based on any available gesture taxonomy or theory of gesture-speech relations. *Prima facie*, the notion of a 'metaphorical beat gesture' may sound like an oxymoron: according to McNeill's (1992) 4-way classification of gestures, Metaphorics are one type, and Beats are another. According to classification systems based on the timing of gesture phases, metaphoric and iconic gestures are generally triphasic, whereas beats are biphasic (Wilson, Bobick, & Cassell, 1996). Function-based classification schemes (Cienki, 2005; Müller, 1998) can, in principle, accommodate the notion of a beat gesture with metaphorical

content, yet the gestures observed here are problematic for these systems, as well. Müller's (1998) and Cienki's (2005) taxonomies place metaphoric gestures among *referential* gestures: they iconically represent and *refer to* a physical object or relationship in the source domain of the metaphorical concept that the gesturer is *expressing* to the recipient, non-verbally. The classification of metaphorical gestures as referential follows from the natural assumption that they are produced for communicative purposes. I will argue that the metaphorical content of many of the gestures described here is *not referential*, and that their metaphoricity is not part of their communicative design. Although the discursive aspect of these gestures (revealed by their timing) appears to be part of a multimodal communicative signal (Clark, 1996), the metaphorical aspect of metaphorical beat gestures (revealed by the direction of their strokes) is more appropriately considered a symptom of constructing or maintaining thoughts with metaphorical content.

Lexically affiliated metaphorical beat gestures

Each story that participants told in these experiments suggested overall motion or extension along a single trajectory (i.e., upward, downward, right, or left). The first analysis focused on clauses that expressed literal or metaphorical motion or extension along this dominant trajectory. Results showed that participants' gestures were overwhelmingly consistent with the spatial schemas implied by their utterances, regardless of whether space was used literally (e.g., the rocket *went up*) or metaphorically (e.g., my grades *went up*). This was true even when abstract ideas were communicated without using any spatial language (e.g., my grades *got better*). Within these clauses, gesture strokes often co-occurred with lexical items implying motion or extension in a congruent direction (e.g., upward stroke during the onset of the word 'up' or 'better'). Gestures were generally biphasic and beat-like in form, unlike standard metaphoric/iconic gestures (Wilson, Bobick, & Cassell, 1996). On a functional interpretation, these gestures appear to play two communicative roles, in parallel. First, the fact that they generally co-occur with prosodic peaks in speech suggests that they serve a discursive function. Second, they serve (or at least appear to serve) a referential function, expressing iconic representations of the metaphorical source domain invoked by their lexical affiliates (Cienki & Müller, 2008; McNeill, 1992). This referential function is attributed based on the assumption that the metaphorical content of these gestures is intended as a communicative signal (an assumption I will revisit below). I will refer to these gestures that co-occur with speech about metaphorically spatialized ideas as *lexically affiliated metaphorical beat gestures*.

Conceptually affiliated metaphorical beat gestures

Participants also produced many biphasic gestures during clauses with no literal or metaphorical spatial content. Not only did these gestures co-occur with words that lacked directional content, they sometimes co-occurred with words that lacked semantic content, altogether (e.g., the disfluency 'umm'). Although at first these gestures appear to be standard beats that give emphasis to stressed words or signal communicative intent, further analysis suggests that their function is not merely discursive. Unexpectedly, the directions of these beat gesture stokes was uncannily congruent with the overall trajectory implied by the story they accompanied. In Example 1, (1a-c), the speaker made a series of upward, biphasic P.U.O.H. (Müller, 2004) gestures, while retelling a story about checking the weather forecast on a hot day (strokes co-occurred with syllables in capital letters):

1a. I was listening to the weather rePORT,

1b. and umm, the FORECASTer said that it was, uh,

1c. he PREDICTed that it would be 99 degrees

The overall metaphorical trajectory of this story is *upward*, and in later clauses the speaker produced lexically affiliated metaphorical beat gestures, co-timed with words like *rising* and *up*. Notably, however, these three gestures (1a-c) preceded the mention of anything implying upward motion or direction in the story, and were affiliated with words, phrases, and clauses without any vertical spatial content. Because these beat-like gestures were often timed with the prosodic peaks and because they were completed and followed by clear rest periods, they do not appear to be errors; that is, their timing argues against the possibility they were simply made erroneously in anticipation of lexical items with directional content that would occur in subsequent clauses.

Although these gestures appear to serve a discursive function, they bear no iconic relationship -- or any other kind of symbolic relationship -- to ideas encoded in the co-occurring speech. In fact, the direction of these metaphorical beat gestures sometimes contrasted with the direction implied by temporally and prosodically-related words and clauses, in cases where utterances implied motion or extent in the direction opposite the overall trajectory implied by the story. Example 2 (2a-c) illustrates such a case. In a story about wanting to buy a used car for the *lowest* price possible, the same speaker who produced the upward metaphorical beat gestures in Example 1 also produced these three downward baton-like biphasic P.U.O.H. gestures accompanying the following utterance:

2a. the STICKer price

2b. on the CAR

2c. that I WANTed was way too expensive

The direction of these gestures is consistent with the downward metaphorical schema associated with wanting to get a cheaper (i.e., lower) price on the car, but it is unrelated to the prosodically/temporally affiliated lexical items in clauses during which the gestures occur, and it is *inconsistent* with the upward metaphorical schema implied by the matrix clause in 2c (i.e., expensive is up). The fact that the direction of these gestures was often unrelated or incongruous with the content of the speech they accompanied argues against the possibility that these examples show standard "mismatches" (Goldin-Meadow, 2003), in which speech and gesture represent complementary aspects of the same object or event: if these gestures communicate complementary information to the speech, it is at the level of the discourse, and not at the level of the word, phrase, or clause.

Like the *lexically affiliated metaphorical beat gestures*, the metaphorical beat gestures in Examples 1 and 2 also appear to serve two distinct functions, in parallel: one discursive and the other metaphorical. In their discursive function, these gestures are linked to lexical items via timing and prosody, but not via iconicity with any metaphorical source domain. In principle, discursive gestures *can* represent metaphorical source domains *in their discursive functions* (e.g., opposing hands can represent contrasting alternatives; points to fingers can represent discourse items as physical objects, etc. (Cienki & Müller, 2008)), but no such relationship between discursive function and any metaphorical source domain obtains in these example. Thus, these gestures differ from the examples presented by Cienki & Müller (2008) insomuch as they do not perform any discursive function by virtue of their iconicity; only by virtue of their timing. Although they are temporally coordinated with co-occurring speech, they are not iconically linked to any lexical, phrasal, or clausal affiliate, in any traditional sense. Rather, they appear to be *conceptually affiliated* with the overarching spatial schema that structures the story, as a whole.

This conceptual affiliation appears to be remarkably strong. Overall, in the two story tokens from which Examples 1 and 2 were drawn, there were a total of 33 gestures. 28 of these were vertical beat-like gestures, and 27 out of the 28 gestures (96%) had strokes in the direction of the overarching metaphorical schema of the story (i.e., upward for the 'weather' story (10 up, 0 down), and downward for the 'car buying' story, (1 up, 17 down); χ^2=30.11, df=1 p=.00001). 64% of these schema-congruent gestures occurred during

clauses with no directional content; thus there were no plausible iconically-related lexical, phrasal, or clausal affiliates for these metaphorical beat gestures.

Metaphorical beat gestures (MBGs) appear to serve a communicative function in their discursive role, but in their metaphorical role they may not be designed to serve any communicative function (see Kinsbourne, 2006 for a compatible suggestion). In particular, they do not appear to be *referential*, as theories of metaphorical gestures have generally assumed (Cienki, 2005; McNeill, 1992; Müller, 1998). This is most evident in the case of conceptually affiliated MBGs, but may be true for lexically affiliated MBGs, as well. Consider the gestures in 1a-b: judging from the co-occurring speech, what spatial entity could these downward gestures possibly refer to? Support for this proposal comes from further experiments manipulating the visibility of the speaker and listener, which suggest that metaphorical beat gestures are generally not recipient-designed. Rather, metaphorical beat gestures appear to serve internal cognitive functions for the speaker. Independent of any discursive function they may serve, and setting aside the issue of their potential value for recipients, it is proposed that the strokes of metaphorical beat gestures are produced in schema-congruent directions involuntarily, as a consequence of cognitive processes involved in retrieving or maintaining memories with metaphorical spatial content.

Metaphorical Function of Meaningless Motor Actions

A second series of experiments demonstrates that non-referential, non-communicative manual motor actions can dramatically influence both retelling and silent recollection of autobiographical memories with positive (metaphorically 'up') or negative (metaphorically 'down') emotional content. Studies were conducted in collaboration with Katinka Zwaan-Dijkstra, at the Erasmus University of Rotterdam.

Experiment 1: Marble movements while recounting autobiographical memories

In the first experiment, participants (N=24) retold autobiographical memories while transferring marbles with both hands between cardboard boxes that were stacked on top of each other, and positioned on the right and left of the computer screen in front of them. They moved marbles downward from the top to the bottom boxes on half of the trials, and upward from the bottom to the top boxes on the other half of the trials. Movements were cued by a metronome. Participants were instructed to deposit one marble with each hand into the appropriate box at the instant that they heard a metronome tick (once every 2000 ms), while simultaneously recounting memories with either positive or negative valence.

On half of the trials, participants received 'positive' prompts (e.g., "Tell me about a time you when you felt proud of yourself"), and on the other half they received 'negative' prompts (e.g., "Tell me about a time when you felt ashamed of yourself"). On one block of trials participants moved marbles downward, and on the other block they moved them upward, with block order counterbalanced across subjects. Each block contained an equal number of positive and negative valence prompts. The order of prompts was randomized, and the assignment of prompts to blocks was counterbalanced across subjects. Crucially, on half of the trials marble movements were congruent with the metaphorical spatial schema implied by the memory's valence, and on the other half movements were incongruent with valence.

Two dependent measures were computed, the first to assess the influence recounting positive or negative memories on simple repetitive motor actions, and the second to assess the effect of these irrelevant motor actions on participants' verbal production when recounting emotional memories. Results showed that participants moved marbles between vertically stacked boxes at a higher rate when the direction of movement was congruent with the valence of the memory they retrieved (e.g., upward for positive memories, downward for negative memories) than when direction and valence were incongruent ($t(22)=4.24$, $p<.001$). This was true even though marble movements were carefully timed by a metronome. In addition, valence-congruent movements facilitated access to these memories, resulting in shorter retrieval times ($t(22)=2.43$, $p<.05$). This was true even though marble movements were meaningless, and irrelevant to the task of retrieving and recounting memories.

These effects cannot be attributed to congruity between upward/downward movements and explicitly spatial language in participants' responses, whether literal or metaphorical. Only 11 out of the 576 trials contained any vertical spatial language, and the effects reported here persisted even when these trials were excluded from the analyses. Results demonstrate bidirectional influences between the emotional content of autobiographical memories and the direction of simple, repetitive, irrelevant motor actions.

Experiment 2: Marble movements while retrieving autobiographical memories

The first experiment demonstrated that movement rates and response times could be modulated based on congruity between metaphorical schemas and motor action. The second experiment tested for more ecologically valid effects of meaningless motor actions on the recollection of emotional memories.

A new sample of participants (N=24) were given neutral-valence prompts to retrieve and recount autobiographical memories (e.g., *Tell me about something that happened on your birthday* -- presumably we've all had both positive and negative birthday experiences). For each prompt, participants had 20 seconds to silently retrieve an appropriate memory while moving marbles either upward (for one block of 12 trials) or downward (for the other block of 12 trials). Block order and the assignment of prompts to upward/downward blocks were counterbalanced across subjects. After each block of silent retrieval and marble moving, participants were prompted to recount the memories that they had retrieved aloud, in the same order in which they had retrieved them. After recounting all 24 memories, participants rated their memories as positive, negative, or neutral in valence (ratings were confirmed offline by a rater who was blind to the direction of marble movements that had accompanied the retrieval phase).

Results showed the direction in which participants moved marbles during retrieval significantly influenced the valence of the memories they retrieved. In response to the neutral prompts, participants retrieved more positive-valence memories during upward marble movements, and more negative-valence memories during downward movements, consistent with the spatialization of valance suggested by linguistic metaphors ($F(1, 21)=10.36$, $p<.05$). This was true even though participants did not use metaphorical language (or, indeed, any overt language) during the silent retrieval phase. Beyond influencing measures that are relevant only in the laboratory, these task-irrelevant motor actions influenced the content of what participants chose to remember.

Conclusions

The gesture experiments revealed a previously undocumented gesture type, the *metaphorical beat gesture*, which has both discursive and metaphorical aspects. Whereas the discursive aspect appears to be communicative, the metaphorical aspect may reflect primarily speaker-internal cognitive processes. At least some of these MBGs do not bear an iconic relationship with any lexical item in the concurrent speech; rather, they are affiliated with the dominant metaphorical schema of the discourse, as a whole.

MBGs were astonishingly prevalent in participants' spontaneous speech (e.g., in the two examples analyzed here, they occurred at a rate of approximately 23 MBG strokes per minute). The presence of such beat gestures has surely been noticed previously, but their metaphorical significance has gone unnoticed; indeed, the metaphoricity of these discursive gestures can be established with confidence at present only because the data set

was designed to contain examples of the same participants in the same sessions telling stories structured by spatial metaphors with opposite directionalities.

Functional taxonomies of gesture (e.g., Cienki, 2005; Müller, 1998) originally distinguished referential (i.e., representational) gestures from discursive gestures, placing metaphorical gestures in the 'referential' category. Recently, Cienki & Müller (2008) have noted that some gestures can be both discursive and metaphorical, and have described gestures that serve their discursive roles by virtue of their iconicity with a metaphorical source domain (see above). The examples presented in the present study illustrate another type of gesture that has both discursive and metaphorical aspects; unlike those described previously, MBGs do not serve their discursive function by virtue of their iconicity with a metaphorical source domain. Rather, their metaphoricity (which depends on their direction) is, in principle, independent of their discursive function (which depends on their timing).

Although the timing of these MBGs appears to serve a communicative function, the direction of the strokes for at least some MBGs does not appear to be designed as part of the communicative signal; rather, it is a byproduct of formulating thoughts with metaphorical spatial content. The marble moving experiments provide a demonstration that simple, non-referential, non-communicative motor actions can interact – bidirectionally – with the process of formulating thoughts with metaphorically spatialized content, and with packaging them into words (Alibali, Kita, & Young, 2000).

References

Alibali, M., Kita, S., & Young, A. (2000). Gesture and the process of speech production: We think, therefore we gesture. *Language and Cognitive Processes, 15*, 593-613.

Cienki, A. (2005). Image schemas and gesture. In B. Hampe (Ed.), *From perception to meaning: Image schemas in cognitive linguistics* (Vol. 29). Berlin: Mouton de Gruyter.

Cienki, A. & Müller, C. (2008). Metaphor, gesture, and thought. In R.W. Gibbs, Jr. (Ed.), *The Cambridge Handbook of Metaphor and Thought*. Cambridge: Cambridge University Press.

Clark, H. H. (1996). *Using Language*. Cambridge: Cambridge University Press.

Kinsbourne, M. (2006). Gestures as embodied cognition: A neurodevelopmental interpretation. *Gesture*, 6(2), 205-214.

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

McNeill, D. (1992). *Hand and Mind: What Gestures Reveal about Thought*. Chicago: University of Chicago Press.

Müller, Cornelia (1998). *Redegebegleitende Gesten: Kulturgeschichte-Theorie-Sprachvergleich*. Arno Spitz Verlag.

Müller, Cornelia (2004) Forms and uses of the Palm Up Open Hand: A case of gesture family? In: C. Müller & R. Posner (Eds.) *The semantics and pragmatics of everyday gestures*. Berlin: Weidler Verlag.

Wilson, A.D., Bobick, A.F., Cassell, J. (1996) Recovering the Temporal Structure of Natural Gesture. *IEEE Conference Proceedings*, 66-71.