



Review article

What is a gesture? A meaning-based approach to defining gestural repertoires



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ABSTRACT

Current systems of categorising ape gestures are typically subjective, relying on human intuition. We have systematised the features on which categorization depends (movement; body part; one/both limbs; use of detached object; rhythmic repetition; contact with recipient), showing that a potential repertoire of over 1000 gestures is physically possible, as large as the lexicon of some languages. In contrast, little more than a tenth of these gestures is used in chimpanzee communication. The striking overlaps in repertoire found between populations and even species of great ape are evidently not a result of a restricted set of possible gestures. Using the reactions of signallers to identify which gestures are intended to be different by the apes themselves, we revised the current classification, making some new distinctions and abolishing others previously considered important, giving a final repertoire of 81. A small number of gestures are used deictically, such that the recipient must pay attention to specific locations to satisfy the signaller; raising the possibility of a stepping-stone to the evolution of reference.

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1. Introduction

All great apes, including humans, employ a rich range of communicative signals that includes facial expressions, body postures,

vocalizations, and gestures. Gestures were described among the first field studies of great apes by Goodall (1968), Schaller (1963), Nishida (1980), and Plooij (1978); but it was more recent work (Tomasello et al., 1985, 1989, 1994; Leavens et al., 1996; Leavens and Hopkins, 1998) that highlighted that, unlike many animal signals, chimpanzee gestures are used intentionally. That is, they are used towards a specific recipient and with a particular goal in the signaller's mind. From these captive studies of chimpanzees, the

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field expanded to include all four non-human ape species (bonobo: Pika et al., 2005; gorilla: Tanner and Byrne, 1996; Pika et al., 2003; Genty et al., 2009; and orang-utan: Liebal et al., 2006; Cartmill and Byrne, 2007), as well as the first studies in the wild of gestural catalogues (chimpanzees: Hobaiter and Byrne, 2011a,b; gorillas: Genty et al., 2009).

But what is a gesture? In the 21-years since Tomasello et al.'s 1985 chimpanzee paper the field has exploded: a Google scholar search returns 273 articles on nonhuman primate gesture published between 1985 and 2016. Some areas of the field remain remarkably consistent: for example, there is broad agreement that a gesture should be a physical movement that is not mechanically effective, and definition should incorporate a measure of the signaller's intention to communicate (Tomasello et al., 1985; Pika et al., 2005; Liebal et al., 2006; Tanner and Byrne, 1996; Genty et al., 2009; Hobaiter and Byrne, 2011a; Roberts et al., 2012, 2014; Frohlich et al., 2016). After that, the consensus starts to crumble. Should gestures be physical movements of the hand and fingers only (Leavens and Hopkins, 1998; Leavens et al., 2010; Pollick and De Waal, 2007; Roberts et al., 2012, 2014); could they include movements of the head (e.g. Tanner and Byrne, 1996), body postures (e.g. Genty et al., 2009), or facial movements (Cartmill and Byrne, 2007). Given their use as communicative signals it is particularly worrying that there is little agreement on how we should discriminate one gesture from another. Even within a narrow definition focused on hand and finger movements, is a *reach* with the palm up the same as a *reach* with the palm down? How do we parse out the variation that results from a change in the signaller's body posture (standing or sitting), or from their environment (e.g. arboreal versus terrestrial), from the variation that results from the ape deliberately encoding differences – perhaps subtly – in information? Frequency of observation may impact a researcher's choice of whether to distinguish a gesture as a specific form, which is problematic, since a gesture may be rare because the context in which it is typically used is rare yet have a distinct meaning that is biologically important (e.g. gestures used in consortship see Hobaiter and Byrne, 2012).

The result of these ambiguities has been a field with a wide range of different gestural repertoires, split to varying levels (c.f. Genty et al., 2009 with Hobaiter and Byrne, 2011a). Typically the approach has been to group by the morphological features that we, as human observers, see as salient. For example: in our 2011 catalogue of chimpanzee gestures (Hobaiter and Byrne, 2011a) we distinguished *arm shake* (small repeated back and forth motion of the arm), *hand shake* (repeated back and forth movement of the hand from the wrist), and *feet shake* (repeated back and forth movement of the feet from the ankles), on the basis of the body parts involved; but we lumped shaking with one arm or shaking with both arms as being part of essentially the same gesture, *arm shake*. Perhaps because humans are themselves great apes, this subjective approach has been quite productive. However, the categorisations remain arbitrary, and the level of splitting has at times been inconsistent (for example: we differentiated *arm shake* and *hand shake*, but described the single gesture *arm raise* as including raise either the arm or the hand; Hobaiter and Byrne, 2011a). Indeed, whether the body part that was employed in performing the movement formed part of a gesture's definition at all was not consistent (for example: *arm shake* was distinguished from *hand shake* and *leg shake* by virtue of the body part, but *hand beckon* was not distinguished from *arm beckon* or even, feasibly, *leg beckon*; instead, *beckon* was defined only by the movement performed, irrespective of body part; Hobaiter and Byrne, 2011a). As a result, on paper, there appeared to be little systematic consistency in how to define a gesture, or to distinguish what might represent a new gesture type, rather than a variant of the same gesture.

Since great ape gestures are meaningful, it might be that a more relevant categorisation of signals could be provided by consider-

ing their usage from the signaller's perspective. For example: does any shaking movement, irrespective of the type or number of limbs involved, consistently convey the same intended meaning? We use the term 'meaning' deliberately. Many systems of animal communication involve the transfer of detailed information: for example, primate alarm calls may encode not only the type of predator, but also the level of risk (Schlenker et al., 2016a) or its location (Cäsar et al., 2013; Schlenker et al., 2016b). Assessing the effect of a signal on a recipient is sufficient to assess information transfer. Whether the signaller intends to achieve this effect on signaller behaviour remains unknown, and thought frequently not to be the case (Seyfarth and Cheney, 2003). Great ape gesture is different, because it is intentional. Signallers select their gestures based on a specific recipient and its state of attention; they pause and wait for a response; and – where unsuccessful – persist in signalling until they have achieved the desired change in recipient behaviour. In doing so great apes meet the criteria for 1st order intentional communication (Dennett, 1987). There is evidence for the 1st order intentional (hereafter intentional) use of one or two signal types in a very few non-ape species (e.g. grouper: Vail et al., 2013; macaque: Gupta and Sinha, 2016), but compare this with the extensive body of evidence for the intentional use of a large repertoire of gestures within all ape species in both captivity (chimpanzee: Tomasello et al., 1985, 1989, 1994; Halina et al., 2013; bonobo: Pika et al., 2005; gorilla: Tanner and Byrne, 1996; Pika et al., 2003; Genty et al., 2009; and orang-utan: Liebal et al., 2006; Cartmill and Byrne, 2007) and the wild (chimpanzee: Hobaiter and Byrne, 2011a,b, 2012, 2014; Roberts et al., 2012, 2014; bonobo: Graham et al., 2016). This large data set of intentional non-human signal use provides us with a unique opportunity: we are able to ask what a great ape gesture 'means' in a human language-like sense (Grice, 1957; Hobaiter and Byrne, 2014; Moore, 2016; although c.f. Scott-Phillips, 2015, 2016).

To assess a signaller's intended meaning we must move beyond examining recipient response, and consider signaller behaviour. A signaller's intended meaning is an internal mental state, unavailable to external observers. To overcome this problem, we focus on what behavioural response by the recipient appears to satisfy the signaller. This response must both represent a plausible desire on the part of the signaller (thus, we exclude agonistic behavioural responses from the recipient that targeted the signaller; 'attack me' or 'chase me aggressively' are implausible desires), and lead to the cessation of communication (Cartmill and Byrne, 2010; Hobaiter and Byrne, 2014).

Here we re-examine the gestural repertoire of the wild chimpanzee population of Budongo forest, Uganda, using intended meaning as well as physical form to categorise ape gestural signals. In linguistics 'distinctive features' represent the smallest unit of variation used to describe the structure of phonemes. We adopt a similarly systematic approach, using physical features within dimensions of variation in gesture morphology (for example: the type of movement made, whether it is repeated in a rhythmic fashion, and the body part involved) to define the potential repertoire of gestures (see Forrester, 2008; Roberts et al., 2012 for similar morphological categorisations of gesture, focusing on body posture and limb and hand movements). We compare this with our own research group's existing chimpanzee catalogue, which has been split at both a low level that focused on movements and body areas (St Andrews Catalogue Short List: StAC.SL, based on the level of splitting seen in the 66 gestures identified in Hobaiter and Byrne, 2011a) and at a higher level that distinguishes, for example, hand versus arm use, and one limb (hand) versus two limb (hands) forms of the same gesture types (St Andrews Catalogue Long List: StAC.LL shown in the Sonso specific column of Table 1, Hobaiter and Byrne, 2011a).

We then use evidence from the signaller's intended meaning, to explore which of the potential and actual distinctions have any

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