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The origin and essence of linguistic reference

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2006

[Link to publication](#)

Citation for published version (APA):

Brinck, I. (2006). *The origin and essence of linguistic reference*. Lund Philosophy Preprints. <http://www.fil.lu.se/>

Total number of authors:

1

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LINGUISTIC REFERENCE: ITS ORIGIN AND ESSENCE

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DRAFT 2006

Abstract.

Reference is described as a property of in its verbal form type expressions and indirectly their tokens, and in its nonverbal form interactive, intersubjective behaviours. Four key properties for assessing and comparing referential expressions are identified. A comparison of verbal and nonverbal reference reveals important similarities, but cannot ascertain whether the reference relations are alike. An analysis of gaze-following and pointing confirms that nonverbal reference is determined in a different way than verbal reference. The referential role of gaze derives from its role for individual attention, and is chiefly sustained by mandatory brain processes for gaze-following, action recognition, and goal attribution. Pointing establishes reference by similar resources to gaze and in addition a heuristics for interpreting instrumental action, while situating the interaction in a first-order, intersubjective framework that allows for exchanging communicative intentions. Thus, the speaker-object relation is encoded in terms of the target in intentional communication, but the speaker's guiding intention in language. Further, verbal reference is ultimately determined by properties of the type expression. Finally, the crucial distinction between type and token expressions can only be grasped by accessing a sign system, which moreover supports the capacity for context-independent action. To conclude, an accurate understanding of reference is intrinsically related to language acquisition and linguistic knowledge.*

1. REFERENCE AND REFERENTIAL BEHAVIOURS

Intentional communication is the nonverbal, spontaneous and purposively produced, social interaction about entities in common space that can be found in human infants and, arguably, the Great apes. It aims to change others' behaviour not directly as by physical action, but indirectly by influencing their attention. In contemporary research on intentional communication it is frequently claimed that behaviours which are typical of intentional communication such as pointing and joint attention are referential. Because intentional communication is considered a precursor to natural language, *the referential claim*, as it will be called, suggests a deep similarity between these behaviours and verbal (linguistic) reference.

Yet, although the research on infant communication is vast, the exact relation between verbal and nonverbal reference remains to be clarified. This matter should be the cause of some concern for the following reasons. First, any claim about an essential similarity between behaviours that superficially appear to be distinct must be substantiated by an explicit account of the basis of the similarity, or else its significance cannot be assessed. In addition, treating behaviours as identical although their similarity may prove to be merely approximate is especially damaging for research that, as in the present case, aspires to explain transition periods and takes an evolutionary perspective.

The present inquiry is concerned with the scope of the referential claim. The claim will be assessed by a comparative analysis of the principal constituents of verbal and nonverbal

* Work on this article was financed by the Swedish Research Council.

reference that takes experimental data about referential behaviour into account. The purpose is to settle in which respects nonverbal reference is similar to verbal reference. Although the inquiry emphasizes nonverbal reference, its result will illuminate the nature of linguistic reference.

Nonverbal reference quite often is characterised in terms of the goal the infant is supposed to have with it, while verbal reference regularly is characterised in terms of either speaker intention (to refer) or semantic properties pertaining to idealised models of natural language. Describing nonverbal and verbal reference from distinct perspectives make them appear fundamentally different, and constitutes an obstacle for comparing them. To circumvent this difficulty, nonverbal and verbal reference will be approached from the perspective of their respective means to refer, namely, referential behaviours and referential terms in natural language. The referential expressions to be dealt with all concern individual objects, which places singular demonstrative reference at the centre of the inquiry. The focus is on those properties of referential expressions, whether linguistic or behavioural, that contribute to determine the reference. Characterisations of the means that might present a difficulty for making comparisons will be avoided.

Below, the term ‘referential’ will be used for any expression that draws the attention to a particular in common space for the benefit of an observer. The term ‘referring’ will be used to express a property of expressions that genuinely refer, the typical case being linguistic utterances. The referring expressions constitute a subset of the set of referential expressions.

2. VERBAL REFERENCE

Linguistic referring expressions are signs. A sign carries perspectival information about entities in the objective, intersubjective world of the sign users (cf. Davidson 1991). The aboutness and representational quality of signs constitute their semiotic function, and result from two operations (Sonesson 1989). First, an expression is made to replace and thereby stand for another entity by *substitution*. Then the expression and the entity that it replaces are told apart by *differentiation*, and their mutual independence is established. An expression that satisfies the substitution and differentiation conditions is a sign, regardless of kind and formal and material properties.

Linguistic expressions are autonomous, or radically context-independent, which is to say that they can be used by any competent speaker at virtually any time or place. From a developmental point of view, autonomy is a consequence of the decontextualisation process, when the child is detaching gestures, behaviours, and words from their ritualised contexts and eventually acquires the ability to both produce and comprehend them.¹ The child then will

¹ As argued by Sinha (1999), the claim that signs are autonomous does not imply the existence of an abstract realm of immaterial meanings.

recognise that linguistic expressions are ‘bidirectional’ and have a constant meaning to which any competent speaker has access (Bates 1976; Tomasello 1998).

There are three fundamental ways of referring. In iconic reference, the substitution relies on a similarity between expression and object, while in indexical and deictic reference, it can be traced back to the causal connectedness and spatiotemporal contiguity of a token expression to its object. In symbolic reference, there is no obvious link between sign and object. Symbolic reference is supported by conventions and may appear more or less arbitrary. Yet conventions are not necessarily constitutive of the relation between symbol and object, but can materialise from stable behaviour patterns that occur naturally. Such conventions control and organise the behaviours from which they once emerged.²

Singular referring expressions are individuated by their function to identify a particular in the context of use. Because any function is independent of its means of realisation, singular reference is not necessarily verbal. Linguistic reference is determined semantically by the meaning of *type expressions*. Their corresponding token expressions establish the reference in the context of use.³ The fact that meaning ultimately is a property of type expressions ensures autonomy. It also forces meaning to be minimal, forming a core which is general enough to fit any context of use. As a consequence of this minimalism, nonsemantic facts about the context of use will in some cases play a part in determining the reference. While meaning identifies reference constitutively, nonlinguistic contextual facts will by giving evidence for reference help speakers identify the referent (Bach 2005). Nonlinguistic facts often contribute to determine the reference of the demonstratives that, much like the nonverbal referential expressions, do not convey precise information about the referent.⁴

Because the linguistic reference relation is one-way, leading from expression to referent, it enables the type expressions to function as tools for directing the hearer’s attention to the speaker’s intended referent. The role of the token expression is to, for the hearer’s benefit, establish the reference by conceptually or ostensively identifying the speaker’s intended referent, and thereby guide the hearer to the referent.

² Constitutive rules create and define a behaviour that would not exist without the rules, while regulative rules reflect natural means-ends relations (Searle 1969). Seen from an ecological and evolutionary perspective, linguistic rules have been formed in the course of human adaptation to the environment, and linguistic facts are grounded in and motivated by facts about human embodied experience (Bühler 1990; Johnson 1987; Johnson & Rohrer in press). In practice linguistic rules are open-ended and only loosely normative (*pace* Searle).

³ Technically speaking, it is expressions-in-context (token expressions) that refer, and not utterances. The limited space does not allow for discussing the reasons for rejecting utterance semantics here, but see Bach (2005), Kaplan (1989), and Salmon (2005). On the present view, the syntactic and semantic properties of the type expression are ultimately responsible for the identification of the referent. That reference is only derivatively a property of token expressions means that the speaker’s idiosyncratic intention to refer plays a secondary role. Type meaning is central to language use in, e.g., ensuring the context-independence of expressions and thereby that competent speakers can verbally agree about their disagreements, making possible deviant uses of language like irony and metaphor, etc. However, focusing on the systematic properties of language is not in principle incompatible with an analysis of token reference in terms of speaker intention as completing the type meaning in contexts of use.

⁴ Whether the role that the context plays for reference determination is semantic or pragmatic is a controversial issue that will not be considered here.

The much discussed uniqueness condition for reference requires that the means of identification select a referent, and select only one referent, in the context of use (Strawson 1950).⁵ The condition is strong, not allowing for the contingencies of everyday conversation, and represents an idealised concept of reference. Because the demonstratives do not express any identifying information about the referent, it may seem as if uniqueness can be discarded. But withdrawing the requirement for identifying the referent in some specific way will admit of multiple identification, which means that more than one object might be identified by one and the same token expression. Evidently, multiple identification is at cross-purposes with singular reference.

This dilemma can be avoided by giving the uniqueness condition a merely regulative role, letting it be enforced pragmatically instead of semantically. In line with this, the present position is that during normal conditions of use an act of demonstrative reference aims to satisfy the uniqueness condition. Success is conditional on the the properties of the actual context and the speaker's goal broadly construed, and so can be approximate only. The amount of effort that a speaker will invest in providing evidence for unique reference depends on the extent to which nonlinguistic factors reasonably can be expected to help the hearer identify the referent, and on how the speaker estimates the hearer's prospects for anticipating the reference.

An analogy may bring out the particular strategy for referring that the uniqueness condition is buttressing. Consider everyday problem-solving (cf. Simon 1955; Tversky & Kahneman 1974). Human beings aim for satisficing instead of the best possible result, because human cognitive resources are bounded. For the most part, people use heuristic strategies to solve their problems, and not rules of logic. Successful heuristics lead to outcomes that are acceptable given the situation at hand. Analogously, the uniqueness condition represents an ideal that speakers aim to satisfy, but are pressed to fulfil just in case uniqueness at that very moment happens to be the most efficient and least costly manner of identifying the referent.

To facilitate distinguishing referring from merely referential expressions four *key properties of reference* will be identified that pertain to different aspects of the referring expression. The properties constitute criteria for (genuine) reference by which verbal and nonverbal reference can be compared. They are as follows:

(R) REFERENCE

- (1) the referential role of the type expression, distinguishing the kind of referent being determined by the expression
- (2) the nature of the reference relation
- (3) the relation between the reference of the type expression and the reference of its token (the expression-in-context)
- (4) the way in which the reference is determined in the context of use

⁵ Strictly speaking, the uniqueness condition applies to Russellian definite descriptions only. These are quantifier phrases that do not refer, but denote.

Applying these criteria to verbal demonstrative reference gives the following result:

(VDR) VERBAL DEMONSTRATIVE REFERENCE

- (i) demonstrative reference identifies a particular in the context of use
- (ii) the reference relation is one-way and leads from expression to referent
- (iii) the reference of a token expression is derived from the reference of its type
- (iv) the token expression directs the hearer's attention to the referent by way of its core meaning

The next section is devoted to nonverbal reference.

3. NONVERBAL REFERENCE

Nonverbal reference is the paradigmatic example of intentional communication. It serves to direct the attention of an observer to a particular in common space without using language or symbols. Nonverbal reference is often defined in terms of its goal. According to a common teleological definition, the function of intentional communication is to influence other agents' mental states and beliefs; according to another it is to share emotions and experiences relative to an object (Tomasello 1999). Functional definitions of this kind implicitly presuppose that certain mental abilities are necessary for achieving the goal, but independent evidence that the abilities in question actually are necessary for intentional communication is rarely provided. Consequently, the possibility of intentional communication in the absence of the presupposed abilities is ruled out by definition.

Furthermore, such definitions cannot be falsified independently of the theory to which they belong, because the goal of intentional communication is inferred from observations of infant-adult interaction that are interpreted against the background of a set of hypotheses about the nature of intentional communication. In view of these shortcomings, an operational definition of intentional communication in terms of objectively verifiable behavioural criteria *prima facie* has an advantage over a definition in terms of function and will be used here (cf. Bard 1992; Leavens, Hopkins & Thomas 2004; Leavens, Russell, & Hopkins 2005). The behaviours that are typical of intentional communication are brought together in the following criteria:

(IC) INTENTIONAL COMMUNICATION

- (DA) behaviours such as vocalisation, touch, or gesture, aimed to draw the attention of the observer to the sender.
- (MG) gaze, vocalisation, manual gestures, or other behaviours used to make manifest the sender's goal to interact and performed relative to the attentional status of the observer.

(GA) behaviours that serve to guide the observer's attention to a distal object, e.g., pointing relative to the observer's attentional status, or visual orienting towards the object followed by gaze alternation between the observer's face and the object and a repeated visual checking of where the observer is looking.

(PB) persistence of behaviour until reward when attempts to communicate fail.

(EB) elaboration of behaviour when repeated attempts to communicate fail.

(DA) subsumes the less specific criterion that intentional communication is used socially. (MG) asserts that the sender has the intention to communicate and wants the observer to attend to this fact. Note that visual attention contact between sender and observer is not necessary for sharing attention to an object (Brinck 2001). (GA) captures the demonstrative nature of intentional communication. (PB) underlines that the sender's behaviour is not incidental, but goal-directed and sensitive to the observer's reactions. (EB) strengthens (PB) by describing what will happen in case the observer does not react as expected. The sender will then adjust her behaviour to the observer's needs and abilities and to the contingent properties of the context. Such flexible behaviour is conditional on the capacity for treating means and goals as mutually independent and understanding the structure of actions.

In the context of intentional communication, intentionality means *goal-directedness*, and consists in the ability to adopt the means to the situation at hand. Communication is tuned to the context in which it takes place. Reaching one and the same goal may require different means on different occasions, and the same means may afford distinct goals. The efficiency of both instrumental and communicative goal-directed behaviour depends on the agent's ability to appreciate the distinctive character of the context, and learn how to deal with new contexts.

Intentional communication is distinguished from instrumental action by its social context, which allows for achieving the goal indirectly, by influencing the behaviour of other agents informationally. Only agents who are sensitive to each others' attentional and emotional states can engage in intentional communication (Bates 1976; Bard 1992; Gómez 1994). As noticed by Bühler, the mutual understanding of communication concerns the agents' perspectival, perceptual experiences (1990:104f.). Hence intentional communication populates the shared world not only with objects and agents, but also with intentional, perspectival states about these objects and agents.

Nevertheless, the shared world will in all its respects remain transparent to its inhabitants, as long as they can read each others' attention. In having both mental and bodily correlates, behaviourally manifest attentional states can convey information about states of mind. Because the attention is grounded in needs, desires, and a willingness to act, it signals an agent's current interest, and equally can signal her next action before it is performed (Brinck 2004; Bühler 1990). *Attention reading* is the general capacity for decoding attention from head orientation, gaze, body posture, intention movements, facial expression, etc., that enables an implicit form of intention reading.

Adjusting communicative behaviour to the needs of another agent as described in (EB) requires *self-other equivalence*, i.e. the ability to recognise that other agents are in relevant respects equal to oneself, specifically by being sensitive to the facts that:

(1a) other agents are causal agents whose behaviour and orientation signal their focus of attention (hence action-readiness), and

(1b) their attention (hence actions) can be manipulated indirectly by attention-getting and attention-directing behaviours.

(2a) other agents are intentional agents who behave spontaneously and purposively, and

(2b) they are able to produce and understand (in the sense of reacting as can be expected given the context) similar communicative gestures as oneself, and moreover do so on similar grounds as oneself.

It is worth observing that the operational definition does not presuppose an active, nor an overt recognition of the self-other equivalence, which would have meant representing oneself and others from a disengaged third-person perspective. Ritualised interactive behaviour patterns, the capacity for attention reading, and associative learning about others' reactions in response to one's own behaviours may be sufficient. Second-person (dyadic) engagement certainly is. Active participation in intentional communication will induce an experience of shared engagement that makes self-other equivalence *perceptually self-presenting*.⁶

Reddy (2003) explains how self-other equivalence can emerge in the dyadic, intersubjective interaction between adult and infant that occurs during the infant's first months in life. Reddy holds that mutual attention between adult and infant evokes affective reactions that entail an implicit self-awareness, consisting in the experience of being attended to. Thus an awareness of both self and other is caused by 'self-other' conscious affects (ibid.: 400).

The criteria for reference introduced in the preceding section can now be applied to nonverbal reference. One might think that because these criteria presuppose a distinction between type and token expressions, they cannot apply to intentional communication, but this is not the case. Similarly to how linguistic expressions are encoded in a language system, intentionally communicative expressions are encoded in a framework of shared communicative behaviours. Thus a behaviour will constitute a type expression if it has a (core) significance that is stable over contexts of use and independent of any particular agent. Imperative and declarative pointing are in this sense type expressions. The following are criteria for nonverbal reference:

⁶ The term 'self-presenting' does not imply certainty in the present context. That an (inter)action is perceptually self-presenting means that it while being performed simultaneously is causing the conscious experience of being performed.

(NVR) NONVERBAL REFERENCE

- (i) nonverbal reference identifies a particular in the context of use
- (ii) ?
- (iii) the reference of the token expression is derived from the reference of its type
- (iv) the token expression directs the observer's attention to the sender's attended object by manifestly pointing towards it

All the criteria but one, (ii), are appropriate for nonverbal reference. The fourth criterion makes clear that while the reference of a token expression in verbal reference is determined semantically, it is in nonverbal reference determined by iconic and indexical properties. The third criterion about the nature of the reference relation cannot be specified, because the previous discussion of nonverbal reference did not properly expose the relation between the referential expression and its referent on the type level, nor distinguish constitutive expressions from behaviours that contingently support reference determination.

In comparison to communication on an individual basis, a shared, autonomous communication system has the crucial advantage of shifting the responsibility for achieving reference from the individual to the system. This frees cognitive resources that can be recruited for other tasks, such as a flexible use of expressions for a range of different purposes. Because linguistic reference is a property of type expressions, a competent speaker can rely on the expression she is using for securing the reference. She will give nonlinguistic evidence for reference only if the type expression fails to determine the reference of its token. Analogously the hearer will first try to recover the reference from what is said, and take nonlinguistic evidence into account only if prompted to do so. Consequently, a reference relation that has the properties described by the criteria for verbal demonstrative reference has decisive benefits compared to one which determines reference on solely contextual grounds.

To arrive at an understanding of the nonverbal reference relation, the behaviours that play a referential role in intentional communication will be examined in detail. This will settle whether the reference is determined by way of the shared system of type expressions or individually from case to case, and therefore the direction of the relation. Accordingly, the next two sections concern gaze and pointing.

5. REFERENTIAL GAZE

An act of nonverbal reference is achieved when the sender has directed the observer's attention to an object in common space, and sender and observer share attention it. The behaviours that determine reference are gaze and pointing. They usually support each other, but are independent. This section will deal with gaze.

Shared attention relies on perceptual signalling that exploits processing of varying complexity, ranging from automatic attention attraction, or attentional contagion, to full joint attention based in visual attention contact (Brinck 2001, 2004). Achieving full joint attention is

a complicated procedure in which gaze plays several roles within the scope of a single interaction. Attempts at making visual *attention contact* and thereby mutually attend to each others' attention express a general *intention to communicate* (Brinck 2004; Gómez 1994). In gaze-following, the observer tracks what might be called the sender's focusing gaze to an attended object. By gaze alternation between observer and object, the sender guides and monitors the observer's attention. In visual checking, the observer looks back at the sender to see if she is oriented towards the sender's attended object.

Gaze simultaneously indicates the agent's attentional state and its target. It automatically triggers mechanisms of goal- and intention attribution in others, because gaze-processing and goal attribution activate similar brain areas (Calder *et al.* 2002; Emory 2000).

Communicative (social) gaze is directed at other agents with the purpose of evoking a response in them. Emory (2000) asserts that visual attention contact apparently is an emotional stimulus, and therefore may enhance the capacity to use gaze as a source of information about both the external world and states such as emotions, intention, and desires. Gómez (1994:73) submits that first-order eye contact "implies mutual attention to each other's sign of attention". But this claim is true just in case the agent has the capacity to grasp the intentional, goal-directed character of gaze, and moreover recognise that gaze may be used deliberately to signal the sender's current interest. This double implication of attention contact can be picked up immediately from gaze by its simultaneous directedness at its target and the observer who is present to the gaze. Signs of attention, signalling focus of interest, can also be signs of communicative intention.

In the context of attention contact, gaze acquires the functions of in the *imperative mode* announcing the sender's intention to communicate with an observer, and in the *responsive mode* making manifest the observer's recognition of the sender's intention. Accordingly, gaze will in its imperative mode urge the observer to engage in joint attention by following the gaze to its target. Having made attention contact with the observer, the sender will then ostensibly look in a particular direction and alternate gaze between observer and object. In its *referential mode* gaze is made to indicate a target by actively being used to direct another agent's attention (Gómez 1998).

Yet the intersubjective role of gaze is secondary to its role for individual attention and agency. Although gaze is a natural indicator of the agent's attentional focus and inevitably reveals something about her future action, it is not intrinsically referential. A gaze will refer only in the presence of an observer who interprets it as being about a particular object. Conversely, in spite of any efforts made to refer by gaze, there is no guarantee that the gaze will be perceived as communicative rather than merely indicative of focus of attention. Consequently, the role of gaze in social interaction is unstable. Purposively manifest gaze belongs to a vast framework of intersubjective behaviours that underpin, but does not

inherently belong to intentional communication. This conclusion is consistent with research on infant gaze-following as demonstrated by the following brief review of data.

The understanding of gaze as signalling a target of interest develops gradually. By 6 months, infants grasp the goal-directedness of instrumental action, and follow the general orientation of a person towards a direction in space (D'Entremont 2000). Some time after 10 months infants orient not only by the other's body and head direction, but also react to gaze (Brooks & Meltzoff 2005). By 1 year, gaze is followed to a specific target (von Hofsten et al. 2005), but if a distractor object interrupts the line of sight, the infant will fixate on it instead (Butterworth & Jarrett 1991). From 14 months, infants can understand non-biological obstructions such as blindfold (Brooks & Meltzoff 2002), represent the visual perspective of other agents, and follow eye direction to one of multiple targets and to targets outside of their immediate visual field (Déak, Flom & Pick 2000).

Many attempts have been made to conclusively establish whether gaze is referential and can locate an object in common space for an observer, and if so, whether gaze-following alone can fix the observer's attention to the target. Despite this, the research on gaze-following has produced diverging conclusions about the onset and nature of gaze-related skills. This variation has several causes, one being inadequate measuring conditions and differences in the implementation of the procedures (Hofsten et al. 2005), another uncertainty about how to control for and interpret the effects of various accompanying conditions. Factors influencing performance are whether gaze is produced together with other behaviours, and the context contains more than one possible target. Yet another cause is operational disagreements such as whether following head turn, head turn and gaze, gaze alone, or all of them counts as gaze-following, and whether it is appropriate to say that attention is joint when the infant looks in the same direction as the adult, looks to the spatial location of the object, or looks directly at the object. The choice of operationalisation has a decisive impact on the outcome of experiments.

Although it is hard to draw any precise conclusions about the role of gaze for communication from existing data, a few strong tendencies can be observed. To begin, 9-month-olds do not encode gaze to an object in common space as a sender-object relation, and cannot follow the line of sight to its target (Gujardo & Woodward 2004). By 12 months, they seem to encode the relation, but are unable to respond to it alone; they either let the action context, the sender's head and body orientation, or her emotional response to the object serve as cues to the target (Woodward 2003; Moses et al. 2001). Furthermore, the sender's reaching and grasping movements towards the target automatically scaffold gaze-following, because the grip of the hand and, as the object is approached, the shape of the fingers disclose the surface properties of the target to the observer on a subpersonal level (Rizzolatti et al. 2002). This has the negative side-effect that before 14 months, infants cannot readily ignore implausible

manual actions and distractor objects, nor focus their attention exclusively on the sender's gaze. Until 15 months of age, the sender normally is used as a predictive cue for salient events.

These considerations together give reason to believe that there are no specific referential or interpretative strategies for gaze-related behaviour in communication. That gaze-following successfully is driven by any contextual features that happen to support it, shows that it is independent of the capacity to conceive of the sender-object relation as determined by the sender's expression instead of the context.

Given the crucial role of gaze for individual attention and goal-directed action, it is not surprising that gaze-following primarily exploits contextual cues. Although gaze naturally indicates the target of action, it cannot be unambiguously used to refer, because it merely indirectly can concern the shared context. To conclude, the way in which gaze determines nonverbal reference is very different from how linguistic expressions determine verbal reference in virtue of meaning. The referential role of gaze is derivative of its role for individual attention and shaped by contingent contextual features. Next the referential role of pointing will be examined.

6. REFERENTIAL POINTING

Human infants start to point around 12 months of age. *Imperative pointing* is produced to obtain an object by way of the observer, while *declarative pointing* is produced to direct the observer's attention to an object for the further purpose of, say, sharing emotions and interest with the observer, requesting information as in social referencing, or exchanging evaluations of the object (Bates, Camaioni, & Volterra, 1975; Bates, 1976; Brinck 2003).⁷ Reaching, giving, and showing constitute ritualised acts that gain their meaning from being constituents of dyadic interactions integrating proximal objects into routines. While imperative pointing ('reach-to-signal') is intended to signal the reach to an observer, instrumental reach ('reach-for-real') is intended to get the object (Bruner 1978). A manual gesture is communicative when it is used to *signal*, and does not constitute, a behaviour. The gesture then functions as a tool that enables the infant to influence other agents' behaviour by their attention. With the emergence of declarative pointing, the object gains independence from fixed action contexts. Declarative pointing aims to establish an object of common interest, thereby replacing the act of physically bringing an object and showing it for the adult (or conversely bringing the adult to the object).

⁷ Liszkowski et al. (in press) report the discovery of 'informative' pointing (to provide information for others) that allegedly is of a different nature than declarative pointing. However, since both the infant's behaviour during the interaction and the gesture's causal (functional) role are similar in declarative as in 'informative' contexts, more than one kind of pointing cannot be distinguished by observation. The claim about 'informative' pointing is comprehensible only given a definition in terms of goal that individuates the gesture by its design (teleological) function. But such definitions cannot be evaluated independently of the theory they belong to, and so the truth of the claim cannot be objectively justified. For this reason and those presented in Brinck (2003), it is likely that informing is yet another use of declarative pointing in its capacity of drawing attention to an object in common space.

Declarative pointing satisfies the substitution and differentiation conditions, and so is a sign and not a signal. Yet it has been questioned that a pointing gesture in any meaningful sense can substitute for an object of attention, because the gesture co-occurs with the object in the context (cf. Leavens 2004). This query results from a misunderstanding of how substitution works in demonstrative contexts. A pointing gesture stands for its object by being causally connected and spatiotemporally contiguous to it. If gesture and object did *not* co-occur, pointing could not have a referential function. Hence co-occurrence does not violate the substitution condition, but on the contrary establishes the substitution.

Camaioni et al. (2004) argue that while imperative pointing relies on the expectancy that the observer is an autonomous causal agent, and therefore is used as a social tool, declarative pointing relies on an early understanding of the mind presupposing that others have intentional and attentional relations to the world that can be shared. It is hard to contest the claim that imperative and declarative pointing are different, since this is evidenced by differences in behaviour. However, several observations suggest that this account of the difference, although quite common, is unjustified.

To begin, that imperative pointing is directed at others merely in their capacity as causal agents does not square with the fact that imperative pointing often is produced together with intersubjective behaviours such as gaze alternation. It would mean that these behaviours are meaningless in contexts of imperative pointing and so would appear randomly, but that is not the case. Moreover, these behaviours are ostensibly used to influence the observer's attention and modulated in response to her reactions, something that usually is taken as evidence for intentional understanding.⁸

Camaioni et al. (2004) maintain that because infants first point imperatively, and because declarative pointing emerges later, at about the same time as the capacity to reproduce complete actions from seeing failed attempts, imperative and declarative pointing entail different sociocognitive capacities. But this line of reasoning merely establishes a connection in time between the emergence of the latter abilities. Their co-emergence may equally well be caused by the emergence of a third, general capacity, or be a pure coincidence. Likewise the fact that imperative pointing emerges first can result from a number of factors.

Exclusively focusing on the differences between imperative and declarative pointing obscures an important similarity between them. The research on mirror neurons reveals that manual actions are recognised by a mapping of the observed action onto a motor representation of it in the observer's brain. Seeing another agent perform an action will activate the same neural circuits in the observer as in the agent and provokes similar experiences and emotions as if the observer had performed the action herself (Gallese, Keysers & Rizzolatti 2004; Rizzolatti et

⁸ It may be true that the infant in rudimentary forms of imperative pointing (not directly addressing the adult, but waiting for the adult to notice her need and then act accordingly) considers the adult's causal powers only. However, such behaviour is a mere precursor of intentional communication. Thinking of it as representative of imperative pointing would, in conflict with available data, yield the counterintuitive conclusion that attempts at influencing attention is atypical for imperative pointing.

al. 2002). This process is mandatory no matter what gesture is produced as long as it is goal-directed, which suggests that the understanding of pointing gestures begins with subpersonal processing of the action's physical properties relative to contextual cues. By 12 months of age, this is combined with a teleological heuristics that interprets instrumental action by evaluating its efficiency and relevance as functions of contextual and target constraints (Csibra & Gergely 2003; cf. Carpenter, Call & Tomasello 1995).

A functioning reading of communicative gestures that relies on subpersonal processing and implicit heuristics makes it superfluous to take the sender's intention to refer into account. Therefore a recognition of the intention to refer cannot be necessary to understand pointing. In contrast, a recognition of the sender's general intention to communicate is necessary.

This conclusion gains support from a series of experiments on infants' understanding of gaze, point, and reach. Sodian & Thoermer (2001, 2004) show that around 12 months, infants exploit physical-functional action properties and contextual cues to understand gaze, point, and reach alike. Sodian & Thoermer link the understanding of sender intention to language acquisition. By 1 year, children have well-established expectations about action goals as signalled by gaze-direction, movement, and reach/grasp, while a consistent use of pointing to redirect and share attention develops during the second year in learning about the function of conventionalised gestures (2004:313). Hence, a use of pointing as a referential gesture determined by speaker intention develops in parallel with an understanding of how linguistic expressions refer. Before that infants exploit the same kind of information to read pointing as for instrumental action and gaze.

7. CONCLUDING REMARKS

Nonverbal reference shares several properties with verbal reference. However, there is one important difference. In nonverbal reference, a token expression is related to its object by contingent properties of sender, gesture, and context. In verbal reference, the relation of a token expression to its object is constrained before use by properties of the type expression. This permits verbal reference to have additional extralinguistic effects to referring. In this, declarative pointing approaches verbal reference, because it serves to draw attention to an object in common space for a range of further purposes, similarly to how acts of verbal reference serve to identify an object in the context of use for unlimited purposes.

In referring, the context is typically determined by the speaker's attention, but in infant pointing the context determines attention. The contrastive teleological and intentional ways of retrieving a target of action have their counterparts in *goal-directed* and *guiding intentions* respectively. Intention-guided, as opposed to goal-directed, action is controlled by the agent, who produces the action in order to make the context fit her needs. To avoid encoding the sender-object relation in teleological terms, the infant must be able to conceive of actions as guided by the agent's intention and not the target. This ability is linked to the onset of language

acquisition. Language constitutes the most powerful tool available to break away from contextual dependencies and take control over one's actions.

However, linguistic reference does not in the first instance depend on the intentions of individual speakers, but is at bottom a property of the language system. The guiding intention of a speech act is constrained by linguistic properties. Therefore the ability to encode the sender-object relation as intention-guided is not sufficient for understanding the reference relation. The distinction between type and token expressions must also be recognised, and specifically the role that type expressions play for reference determination.

Declarative pointing comes close to achieve context- and user-independence and so satisfies the substitution and differentiation conditions for signs. But the full extent of decontextualisation cannot be grasped unless the gesture is related to other expressions of similar independence. Although the gestures used in intentional communication form a system, their individual forms are not exact enough for them to be mutually contrastive in a systematic fashion. Therefore the reference relation will not be understood until the child has gained some insight into the structure of language. The significance of the referential claim presented at the outset of the inquiry should be clear by now. To conclude, referential and referring acts are distinct.

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