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HUMAN HONEST SIGNALLING AND NONVERBAL COMMUNICATION

The issue of signal reliability ('honesty') is widely recognised in language evolution research as one of the most fundamental problems concerning the evolutionary emergence of protolanguage, i.e. early language-like communication. We propose that nonverbal communication is likely to have played an important but underestimated role in language evolution: not directly in the transfer of message contents, but rather in stabilising the emerging protolanguage. We single out one subset of nonverbal cues - nonvocal nonverbal paralinguistic adaptors (NNPAs) - based on their role as indicators of reliability in present-day communication of humans. We suggest that the relatively involuntary and therefore reliable NNPAs might have served to stabilise more volitionally controlled, and therefore less reliable, verbal communication at the initial, bootstrapping stages of its phylogenetic development.

Key words: communication, language evolution, protolanguage, honest signaling, nonverbal communication, baseline demeanor, signal, cue, ritualization, deception

1. Introduction

It is often stated that the research area of the evolution of language has only relatively recently been rediscovered for serious academic inquiry. Sources (e.g. Christiansen & Kirby, 2003) agree that the origins of this upsurge of interest should be traced back at least to the early 1990s; what is also worth noting is that since then the field has undergone a substantial transformation. Considering that a number of comprehensive overviews have been published recently (e.g. Johansson, 2005; Fitch, 2010), it is not our intention to review this transformation here. However, we would like to begin by pointing to the areas of wide consensus regarding the trends in the evolution of language that may be the key distinctive traits of this research field:

– thoroughgoing interdisciplinarity;

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- the increasing application of quantitative methods, especially computational modelling;
- the increasing role of gesturology and, in general, the appreciation of the importance of the visual channel of communication;
- the relative shift of focus from physiological to cognitive to socio-cognitive preadaptations for the evolving language faculty;
- the shift of focus from speculative scenarios to constraints (whereby certain classes of scenarios are *ruled out*);
- specifically, the growing awareness among non-biologists of the evolutionary dynamics related to the stability of *honest signalling*[1].

Bearing in mind all of the above, we concentrate specifically on the issues of nonverbal communication and the evolutionary stability and honesty of signalling, with a view to unravelling their mutual consequences in the context of the development of early language-like communication. Specifically, we argue that the visual nonverbal layer of communication is likely to have limited the possibilities of deception, thus increasing signal honesty and helping to stabilise the emerging protolanguage.

Our paper is informed by the game-theoretic perspective, in which participants' behaviours – communicative behaviours included – are ultimately reduced to a calculation of gains and losses. As a useful guiding metaphor, we can adopt that developed by Krebs & Dawkins (1984), that is of interplay between *manipulation* and *mindreading*. It is worth remembering that the payoff matrix, under normal circumstances, is set to promote competition rather than cooperation (see section 2.1): the manipulators seek to influence the behaviour of the receivers to their own advantage, which normally works to the disadvantage of the receivers.

It is important to note that such a perspective bears substantial similarities as well as differences relative to the alternative conceptualisations of the communicative process. For example, it shares some of the basic framework of the traditional model of communication (as represented in the works of Claude Shannon & Warren Weaver [1949], Karl Bühler [1934], and Roman Jakobson [1960/1999]), in that separate organisms sequentially exchange "messages", with defined receiver/sender roles. Still, the notion of signals as bearers of information or message lends itself to reinterpretation in terms of *influences* (cf. Owren et al. 2010), i.e. effects on the behaviour of the partner in the communicative interaction. Mentalistic-representational interpretations – under which the communicators update each other's mental models of the world – are possible but by no means necessary, because ultimately what counts is how communication affects behaviour and how those changes alter the payoffs to the participants of the interaction.

Such a perspective, focusing on the organismic level and founded on the concepts of *sender* and *receiver* in a prototypically dyadic interaction, expresses a near-

[1] The problem of honest (reliable) signalling has of course been long recognised as foundational in biologically informed disciplines such as behavioural ecology (e.g. Krebs & Dawkins, 1984), but has more recently been appreciated in wider circles of language evolution studies.

consensus among representatives of various disciplines that share a more or less naturalistic outlook on communication. For example, Marc Hauser (1997) is his study of communication lists compatible definitions from sociobiology (Wilson, 1975), ethology (Hailman, 1977), sensory ecology (Dusenbery, 1992), behavioural ecology (Krebs & Davies, 1993), neuropsychology (Kimura, 1993), cognitive psychology (Johnson-Laird, 1990), and linguistics (Lindblom, 1990) – after Hauser (1997, p. 7).

A vital element of the consensual understanding of communication advocated by Hauser is that communication does not have to be intentional or volitional. It is of great consequence to our discussion of honest signalling, *sensu* Krebs and Dawkins (1984), where neither honesty nor deception is necessarily intentional or volitional. On this view, honesty stands for "signal reliability", describing a communicative act in which a signal emitted by the sender veridically represents the sender's selected characteristics such as size, future behaviour or ecological conditions, while deceptiveness consists in their misrepresentation. Importantly, "honest" versus "dishonest" signals differentially affect the behaviour of the receiver, which translates into differential payoffs and thus consequences to both those organisms' fitness.

Other traditions exist. On the linguistic ground, probably the most audible challenge to the traditional outlook was issued by Dan Sperber & Deirdre Wilson (1986), who put forward – contra the tradition of Shannon & Weaver, 1949 – the ostensive-inferential model of communication that underscores the role of cooperation between the sender and receiver (*sensu* Grice, 1975/1999) in the communicative process. More recent views within the tradition of embodied and situated cognition stress the interactive, processual and social nature of communication (such as dialogism – see Linell, 2009 – or distributed language movement – Cowley, 2011). We feel that the game theoretic, individualistic, dyadic perspective assumed here, while not inherently superior to the alternatives, affords optimal focus on the problem of honesty as it is typically posed in the evolution of language research; this seems to be particularly pertinent to the stages at which pre-linguistic communication does not yet benefit from the social-motivational cognitive infrastructure (*sensu* Tomasello, 2008) characteristic of contemporary humans.

In a previous paper (Wacewicz & Żywiczyński, 2010), we briefly noted that in the very early (pre-protolanguage) stages of the development of the language faculty, nonverbal communication was likely to be an important factor influencing the evolutionary stability of this emerging communication system. We suggested two versions of this hypothesis. The strong version postulated that the relatively involuntary nonverbal microbehaviours might have been a possible source of signals later co-opted for volitional, symbolic communication[2]; we put it forward as a "conjecture... pointing to a yet unexplored research area" (Wacewicz & Żywiczyński,

[2] More specifically, we observed that in *mimetic* creatures (in the sense of Donald, 1991), the particular microbehaviours functioning as the elements of nonverbal communication had the potential for being individuated as self-contained units to be used in intentional communication. At least in theory, this constituted one candidate path to the emergence of first stable symbolic signs.

2010, p. 516). Still, we also mentioned a weaker version of this hypothesis, in which we propose that elements of nonverbal communication would have exerted a stabilising influence on the co-occurrent intentional signs in emerging protolinguistic communication. The rest of this article spells out the implications of this weaker thesis: we argue that honesty, *qua* high signal reliability, can be assisted at the early, bootstrapping stages of the evolution of language by means of nonverbal communication, specifically "body language". We also hope to show that evidence from nonverbal communication in contemporary language users can be deployed to illuminate phylogenetic questions[3].

2. Evolutionary stability and the "honesty constraint"

As noted above, one laudable outcome of interdisciplinary collaboration in the evolution of language seems to be the fact that the evolutionary principles governing the stability of communication have recently met with increasing recognition from non-biologists (e.g. Green, 2009). In this section, we provide only a very rudimentary review of evolutionary logic, necessary to establish the rest of the argument.

2.1. Evolutionary stability and language

"Signalling" is to be construed in a broadest sense, since any feature of an organism's morphology or behaviour can serve as a signal or cue (Maynard Smith & Harper, 2003). Signalling is reception-driven (Seyfarth & Cheney, 2003) in the sense that what constitutes the selection pressure shaping the production of signals is differential behaviour of the receivers. Signals have the potential to affect the receivers by producing in them internal states – which may be, but do not have to be, construed as mental representations – that result in changes to their course of behaviour, e.g. induce flight, copulation, aggression, etc.

Being able to avoid predators after hearing an alarm call is one example of a situation in which reacting to signals may benefit the receivers in the evolutionary sense, i.e. may increase their (inclusive) Darwinian fitness. If this is the case, the strategy of *reacting* to signals will spread in the population of receivers. The benefit to the receivers does not, however, explain why signals are *produced* in the first place. It is important to realise that the production of signals, in order to spread in the population of signallers, must be backed up by similar evolutionary benefits to the signallers. Such fitness benefits must at least outweigh the costs of signal production such as divulging information, attracting predators, or simply the energetic cost of emitting the signal; otherwise, signalling is outcompeted by

[3] The study of the development of linguistic communication in the visual channel can be illuminated by the ontogenetic perspective (e.g. homesing; Goldin-Meadow, 2003) as well as the glossogenetic perspective (e.g. creolisation in the Nicaraguan Sign Language; Senghas et al., 2004). However, both those perspectives are located in the evolutionary 'present' and to the extent that they presuppose a "social-cognitive, social-motivational infrastructure" (Tomasello, 2008) of modern humans, they fall outside the scope of the current discussion, which focuses on the phylogenetic emergence of cooperative, honest signalling.

the rival strategy of not producing the signal and is gradually removed from the behavioural repertoire of the population.

Both signalling and acting on signals remain *evolutionarily stable* when there is a convergence of interests between the signallers and receivers. Nevertheless, a more prevalent situation is a conflict of interest, such as between predator and prey, males and females in courtship, or members of the same population competing for access to food, mates or shelter (see e.g. Krebs & Dawkins, 1984). In such circumstances, there inevitably arises the issue of trustworthiness as honest signalling ceases to be evolutionarily stable. Signallers are selected not to produce reliable signals, but rather to signal deceptively, inducing behaviours that promote their own fitness rather than the fitness of the receivers. As a result of this inherent risk of deception, acting on signals ceases to be evolutionarily stable: receivers are selected to disregard potentially manipulative messages. In the absence of receivers that would respond to signals, signalling has no effect, but still incurs the costs of signal production, which means that this strategy becomes prone to invasion by the competing strategy of not producing the signal. As a result, communication breaks down.

Several mechanisms have been proposed that have the potential to stabilise communication, i.e. to secure honest signalling as an evolutionarily stable strategy (e.g. Scott-Phillips, 2008). Main ways in which this can be accomplished include *handicaps* (inherently high signal cost), *indexes* (content strictly dependent on form), *kin selection* (messages selectively directed to kin), *reciprocity* (e.g. exchange of mutually honest signals over a history of repeated interactions), or *norms* (e.g. external penalty for signalling deceptively). It is important to realise that none of those mechanisms explains the emergence of language. Linguistic messages do not qualify as indexes in the relevant sense since their content does not automatically follow from their form. On the contrary: as it has often been stressed, the messages in language are conventional-arbitrary, with iconic components ubiquitous, but of marginal importance. They are also cheap to produce, only incurring negligible costs on the signaller, such as the energetic cost of production of speech (but see next paragraph). Kin selection cannot be responsible for the stability of communication in language because this would require that messages be directed selectively to kin, which in language is clearly not the case.

Finally, two candidate mechanisms for stabilising language in its early stages seem to be themselves heavily dependent on linguistic communication being already well established in a given group. Reciprocity is extremely rare in nature (Clutton-Brock, 2009), and in humans it is based on reputational phenomena such as gossip, which are possible without language only to a very limited extent. The existence of social norms against lying has the potential for changing the payoffs by creating an additional, social cost of dishonest signalling, thus increasing the reliability of communication; however, the formation of such norms may also rely heavily on linguistic resources (cf. e.g. Fitch, 2010, pp. 425-430). Thus, the honest nature of signals in language cannot be presupposed, but rather remains the explanatory target.

3. Nonverbal communication

Nonverbal communication has been studied from a variety of theoretical perspectives – e.g. psychological (Ekman & Freisen, 1972), ethological (Eibl-Eibesfeldt, 1989), sociological (Goffman, 1963), or neurological (Feyereisen, 1991), but this term has also grown a wide range of everyday, informal senses. This has led to considerable confusion as to what nonverbal communication refers to (cf. Kendon, 2004). Since in the present article we are concerned with nonverbal signals[4] co-occurring with the use of language, and specifically from the perspective of hominid phylogeny, we follow Laver and Hutcheson (1972), who define nonverbal communication in the context of face-to-face conversational interactions. Accounting for the nature of communication, they adopt two types of distinctions: vocal versus nonvocal and verbal versus nonverbal. Accordingly, vocal behaviours refer to all communicative activities which involve the production of vocalisation, while communicative acts unrelated to the production of vocalisation are defined as nonvocal[5]. With regard to the second distinction, the dividing line between verbal and nonverbal communication is the use of language – verbal communication relies on the medium of linguistic units (phonemes, morphemes, lexemes, etc.); the nonverbal type, on the other hand, includes all these vocal and nonvocal conversational behaviours that employ other than linguistic signals. This leads to the four-fold classification of communicative signals: vocal verbal communication (i.e. utterances constructed by means of linguistic units), vocal nonverbal signals (i.e. vocal signals, such as intonation, stress, rhythm, or voice quality, which are not expressions of linguistic units), nonvocal verbal signals (i.e. expressions of linguistic units which do not involve the production of speech; e.g. written words or signs in a sign language), and finally nonvocal nonverbal signals (i.e. signals which are not expressions of linguistic units and do not involve vocalisation; e.g. non-conventionalised manual gestures, postures, body movements, eye contacts) (Laver & Hutcheson, 1972, p. 12).

In this work, the focus is on nonvocal nonverbal signals but, to fully explicate our argument, a set of finer distinctions must be made. To do so, another division proposed by Laver and Hutcheson (1972) can be appealed to. Commenting on the characteristics of nonverbal communication, they introduce the concepts of paralinguistic and extralinguistic features. Paralanguage, subsuming both vocal and nonvocal signals, encompasses dynamic nonverbal features, i.e. such that are subject

[4] Discussing "non-verbal signals", we use the term "signal" widely, to cover *both signals and cues* as understood in the evolutionary signalling theory (e.g. Maynard Smith & Harper, 2003); but we distinguish between signals and cues later in the text.

[5] Laver and Hutcheson describe vocal activities as involving *speech* production and nonvocal as unrelated to *speech* production. Such a formulation disregards vocal signals which are unrelated to speech production; for example vocalisations termed by J. J. Ohala (1994, p. 2) as corporeals, which express the internal state of the speaker, be it physical or emotional in the form of coughing or throat clearing, intonation and other expressive features of voice. For this reason, the term "speech" was replaced with "vocalization" in our paper.

to change during interaction and which can thus affect its course – vocal paralinguistic features include activities loosely referred to as "tone of voice" phenomena, whereas nonvocal paralanguage is related to communicative behaviours performed by means of the body and hence popularly designated as "body language" (Pease, 1981). In contrast, extralinguistic features include all those signals which are not subject to change during interaction; vocal extralinguistic features are exemplified by the speaker's voice quality, while nonvocal ones include the microecological arrangement of interaction scenes as well as clothing, jewellery, hairstyles, odours, and similar characteristics of interactants' appearance. In this work, our sole concern is with nonvocal nonverbal paralinguistic features, or NNPs.

Finally, it should be noted that among NNPs some are volitional in the sense that they carry interactants' specific communicative intentions, while others are largely subconscious manifestations of interactants' emotional states. Instructive in this respect is Ekman and Friesen's (1969) classification of nonverbal behaviours into emblems, illustrators, affect displays, regulators and adaptors.

- Emblems most closely resemble linguistic signals; they typically have a one-word or two-word translation and are generally known to members of a particular culture. Ekman and Friesen quote the hitchhiker's thumb as a classic example of an emblem; however, it seems that manual gestures which represent actions, concrete objects (i.e. iconic) and abstract concepts (i.e. metaphoric) should also be classified as emblems (cf. McNeill, 1992).
- Similarly to emblems, illustrators are used volitionally but their primary function is to emphasise or deemphasise what is being said; important illustrative signals include beats and deictic gestures (cf. McNeill, 1992).
- Affect displays are almost exclusively related to facial mimicry and refer to expressions of basic emotions, such as anger, disgust, happiness, etc.
- Regulators play an essential role in opening and closing the communication channel, beginning and terminating a topic, and the like.
- Adaptors are non-cognitive and non-volitional signals/cues carrying information about the communicator's psychological attitudes. Ekman and Friesen argue that the developmentally primary function of adaptors is to satisfy certain basic needs related to the well-being of the body, for example, scratching itchy places, grooming dishevelled hair, or wiping tears. In the process of ritualisation, many adaptors are detached from the purely physiological context and become linked to drives and emotions characteristic of contexts in which adaptor behaviours used to be triggered originally (cf. Masip et al., 2004). They are further subdivided into self-adaptors, which involve the manipulation of one's own body (e.g. self-grooming, rubbing, scratching, etc.); alter-adaptors, which involve the manipulation of bodies of others (patting, cuddling, kissing, etc.); and object-adaptors, which involve the manipulation of objects in one's vicinity. (cf. Leathers, [1997] 2007; Masip et al., 2004).

To narrow our research scope even further, in the present work we concentrate on this last type of paralinguistic signals, that is, nonvocal nonverbal paralinguistic adaptors, or NNPA's.

3.1. Nonverbal communication and language.

Equivalents of NNPA's can occur outside the context of linguistic communication. They can be issued even in situations defined by Goffman as "unfocused interaction", when individuals happen to be in the same place and time but do not sustain a single focus of attention (1963, p. 24), as would be the case of self-grooming performed among the crowd at a bus stop. Therefore, it should be stressed that our arguments focus on the paralinguistic uses of nonvocal nonverbal signals, that is, when they co-occur with the use of language, typically in the form of conversation. We contend that in such contexts they primarily perform "indexical function", to use Abercrombie's (1967) term, whereby one communicator reveals information about herself, which allows the interlocutor to "draw inferences about the speaker's identity, attributes and mood" (Laver & Hutcheson, 1972, p. 12).

3.1.1. Baseline demeanour

Among many types of information they convey, NNPA's play a crucial role in indexing the reliability of co-occurring verbal communication. While deception as such is notoriously difficult to identify, and experts emphasise that no unambiguous indicators exist that could be equated with deception, there is empirical evidence that "naive" observers, who lack formal training in detecting lies, nevertheless perform above chance in identifying deception on the part of the speakers (Leathers, [1997] 200, p. 302). In doing so they primarily rely on nonverbal paralinguistic signals (Hale & Stiff, 1990; Knapp & Comandena, 1979; cf. Leathers [1997] 2007, p. 303). It is important to understand that there is no single cue which reliably informs about deception; rather, its uncovering depends on a joint interpretation of groups of signals, or "complexes". Ekman (1985) argues that deceivers tend to exercise extra control over volitional signals, such as facial expression, which creates the effect of auto-presentation – a carefully studied, actor-like way of communicating. At the same time, with regard to the use of more automatic adaptors, there is proliferation of signals indicating tension.

Phenomena related to recognising deception point to the existence of a set of nonverbal signals that index linguistic information as reliable and another set which is indexical of deception. Following David Givens (2012), we will refer to the former as *baseline demeanour*, that is, an inventory of nonverbal signals observed in relaxed social settings which are free of social anxiety or stress. The presence of the baseline complex is open to the interpretation that the accompanying language-like communication is reliable. For the most part, baseline demeanour is constituted of NNPA's, mainly related to postural, proxemic, oculesic, and kinesic cues.

On the postural and proxemic plane, it is characterised by the sociopetal presentation – considering the totality of the communicator's positions and orientations during an interaction, she tends to decrease distance between herself and the interlocutor, typically by leaning towards (Scheflen, 1972, p. 234; see Figure 1) and squaring up with the interlocutor (Hall, 1972, pp. 255-256; see Figure 3). The presentation remains stable during a conversation, with postural and proxemic shifts being usually motivated by the topical organisation of verbal messages (topical changes are commonly indicated by shifts in posture).

With regard eye-contact (EC), baseline demeanour typifies the standard allocation of EC during conversation, with the speaker seeking to establish EC with the hearer at the end of an utterance or a phrase within an utterance (Argyle & Dean, 1972, pp. 301-302). Furthermore, after the communication channel has been opened and the topic of conversation acknowledged by the interlocutors, there is a tendency for the length and frequency EC to decrease (Argyle & Dean, 1972, p. 314).

Finally, the key kinesic feature of baseline demeanour is "sync", to use Birdwhistell's term (1970, pp. 69-71), which indicates the synchronisation of interactants' body movements in space and time.

3.1.2. Deception demeanour

Taken *in toto*, the above NNPA's communicate lack of deception on the speaker's part and as such can be treated as indexes of reliability. Correspondingly, there is a group of NNPA's which are indicative of verbal deception and which hence can be jointly referred as deception demeanour. We have invented this term to mark a contrast with baseline demeanour as most of NNPA's belonging to this behavioural complex are reverses of baseline signals. It should however be admitted that our concept coincides with other accounts of deception, most importantly with the idea of nonverbal profiles of the deceptive communicator (Hocking & Leathers, 1980; Leathers, [1997] 2007).

Accordingly, the deceivers' postural and proxemic behaviour is characterised by the sociofugal presentation – they typically lean back (Figure 2) and angularise away from the interlocutor (Figure 4) during their turns at talking. At the level of microbehaviours, deceivers perform frequent postural shifts unmotivated by the topical organisation of a conversation, which produces an overall effect of presentational instability. A number of researchers have concluded that gaze aversion constitutes one of the most pronounced deception cues – during deceptive communication, EC is perceptible shorter and less frequent than in honest communication (Exeline et al., 1970; Hocking and Leathers, 1980), deceivers tend to shun the gaze of the deceived (Druckman et al., 1982), and they consistently exhibit increased blinking and retinal enlargement (Zuckerman et al., 1981; cf. Leathers, [1997] 2007, p. 310). On the kinesic level, deceivers are often "out-of-sync", that is, it does not come naturally for them to coordinate body movements with those of the interlocutor. Finally, there is a range of adaptor gestures that tends to accompany deceptive

communication. They mainly belong to the class of self-adaptors, specifically self-touches in the form of scratching, rubbing and pinching, which – as argued by Ekman and Friesen – serve to release the deceiver's anxiety caused by the fear of being exposed (Ekman and Friesen, 1972). There is also evidence that deceptive communication heightens the frequency of object-adaptors (Ekman and Friesen, 1972; O'Hair et al., 1981; Cody & O'Hair, 1983; cf. Leathers, [1997] 2007, p. 309; Masip et al., 2004). Leathers notes that a consequence of this increase in deceivers' use of adaptors is a decrease in their use of other nonvocal nonverbal signals, such as emblems or illustrators (Leathers, [1997] 2007, p. 309). This creates the impression that can be described as "restless immobility" – when compared to the standards of honest communication, deceivers on the one hand exhibit an upsurge of nonvocal nonverbal adaptors; on the other, their display of cognitively richer nonvocal nonverbal paralinguistic signals is impoverished.

Concluding this section, it should be stressed again that there is no single nonverbal behaviour that is a stable predictor of either communicative honesty or deception; rather, they are indexed by whole behavioural complexes, here referred to as baseline and deception demeanour. Secondly, the interpretation of particular cues and cue complexes is probabilistic rather than categorical and depends on contextual factors, such as the social and cultural context in which an interaction takes place, the level of arousal, the relation between interlocutors, or idiosyncrasies of their communication styles.

Definitions

Baseline demeanor

The inventory of nonverbal behaviours observed in relaxed social settings which are free of social anxiety or stress. The presence of the baseline complex is open to the interpretation that the accompanying language-like communication is reliable.

Deception demeanor

The inventory of nonverbal behaviours the presence of which is open to the interpretation that the accompanying verbal communication is unreliable.

Indices of reliability

Postural, proxemic, oculic, and kinesic cues which are related to baseline demeanor.

Indices of unreliability

Postural, proxemic, oculic, and kinesic cues which are related to deception demeanor.

Figure 1. Lean forward is an element of the baseline demeanour in face-to-face communication. Exhibited by the listener, it indicates involvement in the ongoing interaction; exhibited by the speaker, it is open to the interpretation as an index of reliability.

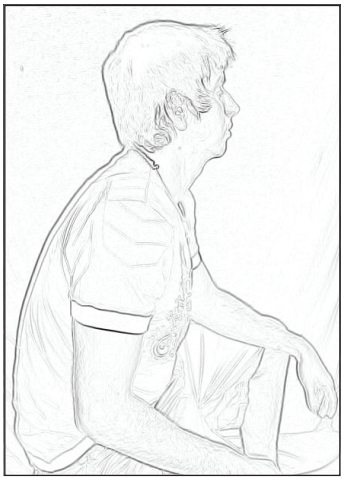


Figure 2. Exhibited by the listener, lean back commonly indicates negative affects, such as boredom and disengagement from the ongoing interaction; exhibited by the speaker, it is open to the interpretation as a deception cue. Verbal transmission of deceptive information is often accompanied by a major postural body shift from the lean forward to the lean back position.

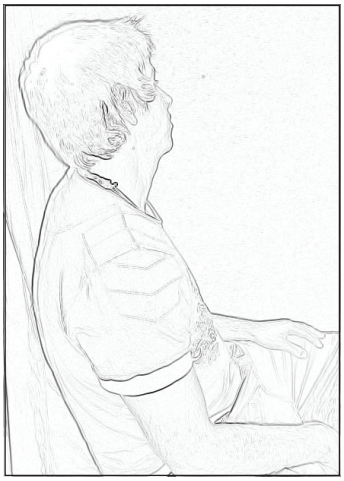


Figure 3. The squaring up alignment (0 degree on the eight-point compass) has a sociopetal character (i.e. it is an orientation that induces friendly interaction) and constitutes an important element of the baseline demeanour in face-to-face communication. Exhibited by the speaker, it is open to the interpretation as an index of reliability.

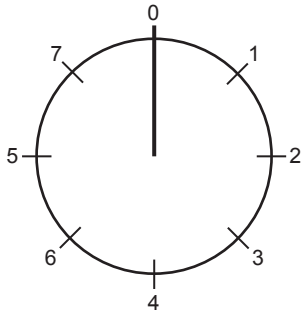
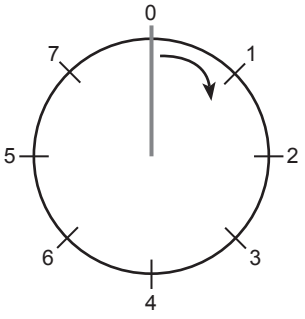


Figure 4. Angularisation (more than 0 degree on the eight-point compass) has a sociofugal character (i.e. it is an orientation that leads to discontinuing friendly interaction). Exhibited by the speaker, it is open to the interpretation as a deception cue.



3.2. Nonverbal communication has high inherent reliability

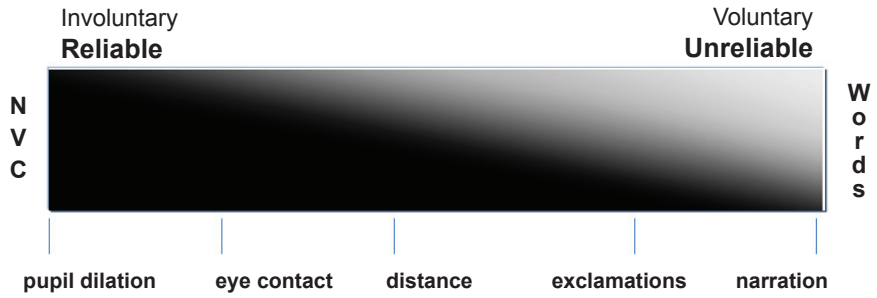
As discussed in 2.1., a situation of conflict of interest between the signallers and receivers inevitably generates selection pressures for deception. Since signallers achieve higher payoffs by deceiving their competition than by refraining from doing it, they are selected to signal dishonestly. As a result, receivers are selected to disregard the dishonest messages, and this removes the motivation for signal production in the first place. Another possibility is the development of a coevolutionary arms race (Krebs & Dawkins, 1984), but this requires that the honesty of signals be backed up by their high production costs.

Still, it is worth noting that the first step in this sequence is taken by the receivers. Organisms monitor their surroundings to gather maximum environmentally important information, and they are selected to utilise any (relatively reliable and cheap to obtain) cues potentially helpful in effectively coordinating their actions. In particular, receivers will extract cues about other individuals' combat potential, mating potential, and especially, the likely course of behaviour in the immediate future. Any aspects of behaviour or morphology that reliably correlate with the above can be "locked on to" as a source of information. Only when a morphological or behavioural trait has started to establish itself as such a source of information to a population of receivers, does there emerge a selection pressure on signallers to exploit it, provided such exploitation is both possible and profitable. Therefore, normally communication is reception-driven (Seyfarth & Cheney, 2003): it does not start with signalling, but with receivers' picking up on "information leakage", or *cues* (e.g. Maynard Smith & Harper, 2003) that have not yet been fashioned by selection specifically for their communicative effect.

The above analysis pertains most directly to inflexible signals that cannot undergo rapid changes without corresponding changes to the organism's genotype, which can only take place on the phylogenetic timescale. Examples include morphological features and certain behavioural traits closely controlled by genetic dispositions, such as reflexes and fixed action patterns. The same logic can be extended to apply to flexible behaviours that can be shaped online, but with a crucial difference[6]. Here, the arms race between the signallers and receivers does not call for genotypes to be changed, so it does not unveil on the evolutionary timescale but rather in real time. As the ability for conscious, volitional production of a given signal increases, so do the possibilities of it being co-opted for deception. A volitionally controlled signal can be produced on demand, in the absence of its correlated "meaning", while it is impossible to similarly appropriate a signal produced outside one's volitional control. As a result, the degree of volitional control of signal production correlates negatively with signal reliability. Thus, signals form a continuum of reliability inversely dependent on the degree of their volitional control. When applied to hu-

[6] The process of "collateral" cues turning into adaptively motivated signals is termed *ritualization*, a concept that dates back to the early ethological tradition in the phylogenetic dimension; the same process developing over an individual's lifetime has been termed *ontogenetic ritualization* (see e.g. Tomasello, 1999).

Figure 5. The 'reliability continuum' representing the relation between the degree of voluntary control over a signal and its reliability. The positions assigned to specific means of signalling are approximations.



man communication, this means roughly that nonverbal communication occupies the "reliable" part of the spectrum and verbal signals – the utterances of language – the "unreliable" part.

In sum, verbal communication suffers from the risk of degradation due to the high inherent potential of verbal messages to be used deceptively; this risk would have been exaggerated at the early stages of language evolution due to the lack of language-dependent normative mechanisms enforcing cooperation, which includes honest signalling. The previous sections of this paper point to a possible solution to this problem. Since verbal communication is invariably supplemented by nonverbal signals and cues understood here NNPA's (as defined in section 3) which are themselves characterised by high reliability deriving from their involuntary character, those two forms of signalling could have formed signalling complexes with content conveyed largely via the verbal channel, and reliability assured by the nonverbal component (or *tells*, on the analogy of tells in the game of poker – see Foster & Slayton 2010). In much the same way as in contemporary linguistic communication, nonverbal indices could have been actively used by the receivers to determine the reliability of accompanying language-like (proto-verbal) messages, which is a candidate factor in the development of honest communication.

It is also interesting to note that most primate vocal communication researched so far (but possibly an artefact of data availability, cf. Slocombe et al., 2011) – alarm calls, distress calls, food calls, copulatory calls – is characterised by high signal urgency: the receivers are for the most part required to take instant action. In contrast, language-like communication is based to a very considerable extent on complex compositional messages with mostly *displaced* content, i.e. content independent of here-and-now (Hockett, 1973) that do not call for an immediate choice of the optimal behavioural response. Such low urgency signals may convey highly valuable ecological or social information, e.g. about the sources of food or

history of third-party social interactions (gossip – see Dunbar, 1996). However, in this case the receivers are in a much better position to inspect the signallers for the presence of the indices of unreliability.

4. Summary

In this paper, we have argued that nonverbal communication, in particular NNPA's, is likely to have played an important but underestimated role in language evolution: not directly in the transfer of message contents, but rather in stabilising the emerging protolanguage. Here we summarise the logical steps of our reasoning.

Verbal communication (language) has low inherent reliability because it employs fully volitionally controlled signals that can be easily used deceptively. This problem would have been especially acute at the initial, bootstrapping stages, because at that point language-like (protolinguistic) communication could not have benefited from the stabilising influence of fully fledged norms against deception that are present in contemporary societies but that are themselves dependent of fully blown language. Nonverbal communication necessarily co-occurs with verbal communication, and contemporary evidence shows that it is crucial in evaluating the reliability ("honesty") of this co-occurring verbal communication. For the most part, the reliability of nonverbal communication itself is inherently high as a direct consequence of its largely involuntary character. Therefore, at the early stages, nonverbal communication is likely to have played a role in securing the necessary reliability for the emerging language-like communication at its most labile, initial stages.

4.1. Outstanding questions

As discussed in sections 3.1.1. and 3.1.2, the existence of deception cues – nonvocal nonverbal paralinguistic adaptors (NNPA's) indexing unreliability of co-occurring verbal communication – is an empirical fact. However, their existence and their stability is baffling, at least at first blush. Why is deception possible to detect above chance? Involuntary behaviours may be impossible to use deceptively online, but over evolutionary time, such behaviours could be selected against and removed. *Prima facie*, the evolutionary strategy of feeling anxious when lying should be vulnerable to invasion by mutant strategies in which deception is not correlated with any specific behavioural markers, which predicts the evolution of the inscrutable "poker face" minimising information leakage. A likely explanation could point to the increased cognitive load imposed by lying, which alters the physiological state of the signaler, resulting in a proliferation of cues, some of which will always remain impossible to suppress. But, interestingly, it is possible that the *socially imposed* costs of deception (Lachmann et al., 2001) that characterise contemporary human societies also have a role to play. Further research is called for to establish the factors behind the evolutionary stability of the phenomenon of social anxiety.

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