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Journal

Proceedings of the Annual Meeting of the Cognitive Science Society, 43(43)

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Publication Date

2021

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Peer reviewed

Cognitive Linguistics Support for the Evolution of Language from Animal Cognition

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Abstract

This paper explores previous arguments that language evolved not from animal communication, as naturally assumed by most scholars, but instead out of animal cognition. It is proposed here that additional support for this argument comes from Cognitive Linguistics, an interdisciplinary branch of linguistics. Cognitive Linguistics mediates communication and cognition but, as with Cognitive Discourse Analysis, studies language use in terms of what it demonstrates about underlying cognitive processes and concepts. The paper demonstrates key examples of animal cognition's links to language, with Cognitive Linguistics support, as well as the approach's application to animal cognition in terms of domain-general symbolism, beyond verbal language. However, because communication remains a major function of language, the communicative aspect ought to be maintained in the explanation of language evolution.

Keywords: animal cognition; animal communication; Cognitive Linguistics; language evolution; symbols.

Evolution of Language

A paper discussing language, such as this one, will ideally first stipulate what is meant by the term language, given there is actually no agreed-upon definition (Bolhuis et al., 2014). Instead, many authors freely focus on various characteristics of language: e.g. the language modalities, syntax (e.g. Chomsky, 1968), communicative intentionality (Halliday, 1975), or Saussure's (1966) *arbitrariness*. This refers to how a linguistic form like the sound of a word bears no direct relation to its associated meaning. The lack of a unified definition of language is the subject of the first author's ongoing research. This paper, though, seeks to involve a broad range of perspectives on language when exploring how Cognitive Linguistics may support an animal cognition origin of language.

When seeking to describe the evolutionary history of language, at least some degree of comparative study across species is inevitable. Yet, while some scholars (e.g. Chomsky, 2005) are content to accept a distinct qualitative divide between humans and other species regarding language capacity, others favour a continuum (e.g. Bickerton, 1990). This is in line with Darwinian theory (1885) of there being a difference in degree rather than in kind between species in evolution. A continuum perspective often leads to exploring comparisons and shared features

between recognised languages and animal communication. Linguist Hockett's work on language design features is a famous example of this (1959; 1960). Hockett advanced a theoretical list of initially thirteen features that were considered unique to language as compared with communication, specifically animal communication. These features included, for example, *displacement*, and *duality of patterning* where abstract sounds can become words and words then become sentences.

A clear reason for this particular comparison between animal communication and language is the strong communicative function of language within human usage (e.g. Halliday, 1975). Many argue for a communicative origin of language, including Hauser (1997) and Pinker and Jackendoff (2005), who suggest that the human mapping of vocal sounds and meaning rests on the need for conveying a meaning from one person to another.

Communicative efficiency seems to be universal too. Statistical linguistic laws for communicative efficiency, which apply to the world's recognised languages, have been found to be applicable to the communication of other species. According to Menzerath's (1954) law, the larger the size of a construct, like the number of syllables (sound units) in an utterance, the smaller the size of the individual parts, like the syllables themselves. This is exhibited in gelada vocalisations, where longer vocal sequences produced by adult males were associated with shorter individual calls (Gustison et al., 2016). Zipf's (1935; 1949) law of brevity accounts for frequently used words that tend to be shorter, which has been found in vocalisation across species and even chimpanzee gestural communication (Heesen et al., 2019). Both laws are linked to compression, 'the information theoretic principle of minimizing code length' for energy efficiency, as well as linguistic economy, as in formalist Chomsky's Minimalist Program (1995).

Thus, it stands to reason that language ought to relate naturally to animal communication. However, another approach is to explore animal cognition. Animal cognition findings are not only increasingly complex, allowing for greater accessibility into the minds of other species, but these findings show important relationships to cognition that supports language in humans, as will be explored in this article.

Of particular note, this paper focuses on the independent proposals by Ulbaek (1998) and Fitch (2019) that language may have evolved from animal cognition instead of animal communication. These proposals are explored first, before demonstrating how animal cognition may tie in to some fundamental aspects and features of language, particularly through the theoretical scope of Cognitive Linguistics. Yet, the paper ends by noting the enduring prominence of the communicative function of language, certainly for humans, and how, in Cognitive Linguistics, communication is strongly interlinked with cognition. Therefore, communication should not be ignored in favour of investigating language's evolution via animal cognition alone.

Animal Cognition's Evolution to Language

Cognition's Links to Language

The investigation of ties between cognition and language has a long and varied tradition. Following psychological advances in behaviourism in the first part of the last century, Skinner branched into language, with *Verbal Behavior* (1957). Yet, formalist linguist Chomsky (1968) refuted Skinner's attempt to account for language in purely behaviourist terms, and successfully demonstrated instead that language is a cognitive faculty within the mind.

However, the cognitive basis of language arose considerably earlier than this. Radick (2007) shows, in his detailed historiography of the 'animal language debate', how tightly interlinked cognition and language had come to be thought of in the nineteenth century. This thinking developed to the extent that because animals were considered not to be cognitive at the time, they were also thought simply not to be capable of language. The cognitive underpinnings of language were taken up by influential linguist, Saussure, who lectured in the early twentieth century, and whose works were published posthumously (1966). This cognitive aspect has also been adopted in the branch of Cognitive Linguistics, which, amongst other foci, investigates language's links to domain-general cognition. Thus the language-cognition relationship is well-established.

Moreover, language is not proposed by anyone as being identical to communication. Therefore, comparing the features of animal communication and language requires careful attention and consideration (Graham et al., 2019).

Ulbaek and Fitch

Given the links between cognition and language, it is reasonable to move beyond exploring animal communication as the sole precursor for language evolution. Two modern authors have advanced this thinking further, to propose that the story of language actually originates within animal cognition instead.

Ulbaek (1998) proposed that 'Language grew out of cognitive systems already in existence and working: it formed a communicative bridge between already-cognitive

animals', such as 'calculation across symbolic tokens or mental representations' that can be 'wholly in the mind'. Ulbaek notes that other species have been shown to be intelligent enough to use symbols, as in the non-human primate language teaching experiments. For example, chimpanzee Sarah was taught to use plastic symbols to communicate and answer questions. One symbol stood for 'colour of', an inherently abstract and categorical concept. Sarah had to grapple with this concept in order to be able to respond meaningfully about referent objects, in terms of both their colour and the colour relations between objects (Premack and Premack, 1983).

Yet, almost converse to his argument, Ulbaek (1998) holds that the primary function of language is to communicate, unlike Fodor's notion of a language of thought (1975), in which language evolved as a cognitive tool for the purpose of organising thought. Communication is cooperative and there are serious costs to this, not just in terms of neurological requirements, but also in terms of a selfish need for fitness and the potential costs of sharing information. As such, other species may have been 'prevented' from getting language. Conversely, cognition and extracting information from the environment 'can be inherently selfish' (Ulbaek, 1998) and so has distinct evolutionary adaptive advantages. On the human side, this information-sharing cost is outweighed by our learning through cooperation, and reciprocal altruism, which only requires monitoring of cheaters and scroungers. Thus, Ulbaek claims these as special conditions for humans to reach the stage of language in a communicative capacity.

It is important to note in response that, firstly, there are vast differences between species, such as bonobos being far more cooperative than chimpanzees (Hare et al., 2007), so making such statements about all animals may need careful consideration. Additionally, Ulbaek's argument does not consider any of the documented cases of animal cooperative behaviour, including mutualism. This includes mutualism between humans and wild animals, like dolphins helping fishermen to hunt in Brazil and Myanmar (Gregg, 2013), and the African Greater honeyguide birds, which regularly lead human honey-hunters to bee colonies, so that the wax and honey can be consumed respectively (Spottiswoode, Begg, and Begg, 2016). What is more, this latter example instantiates reciprocal and functionally meaningful communication, with both the humans and the birds using their own specific calls to recruit one another, distinct from any other contexts or vocalisations. As a result, three quarters of the hives found by the humans involved these birds. Despite these points, however, Ulbaek's basic argument proposing a more cognitive link to language, across species, is worth exploring.

Fitch (2019) also argues this point, though focusing more on the mental mechanisms that language supports, than any communicative function. Fitch notes that not only can other animals know more than they can 'say', but though 'a defining feature of human language is its ability to flexibly represent and recombine concepts', not all such concepts are

expressed, even within recognised languages used by humans. One example Fitch gives for other species is honeybees, which have excellent colour vision and colour memory for flowers visited, though their waggle dances communicate only the spatial location and distance of the flowers, without apparently expressing colour information.

Fitch argues additionally that animal communication generally is limited in terms of content and form, but notes that animal cognition is highly advanced, and that other animals have concepts, which can be manipulated, remembered, and represented. One such example is meta-cognition, as found in rats (Foote and Crystal, 2007). In a duration-discrimination test, trials were divided into forced and optional, with varying levels of difficulty across both conditions, and context-dependent rewards offered: a large reward for accurate performance, a small but guaranteed reward for opting out of the test, and no reward for inaccuracy. The results showed, for instance, in trials where the rats could decline the test, and where the test was also difficult, the rats opted out and gained a small reward, suggesting they could determine uncertainty of their own knowledge in relation to the task.

Animal Cognition Studies and Cognitive Linguistics Support

Though there is slight variation between these two perspectives of Ulbaek (1998) and Fitch (2019), both proposals make a good case for exploring links to language that go beyond animal communication. It is proposed here that a particular branch of linguistics, developed since the 1970s, Cognitive Linguistics, can add still further support to the proposal that animal cognition holds the key to the origin of language. This interdisciplinary linguistics movement centres on studying not just language structure, but also language's meaning and symbolic quality – holding for grammar (structure) as much as for the lexicon (vocabulary), as well as the communicative use of language, and most importantly emphasising the relation of language to domain-general cognition. In fact, newly systematised methodology, Cognitive Discourse Analysis (Tenbrink, 2020) investigates linguistic patterns to better understand underlying human concepts and cognitive processes.

Cognitive Linguistics' very name points to the cognitive nature of language. Furthermore, its two key commitments (Lakoff, 1990) are cognitively related also. The 'Generalisation Commitment' characterises general structural principles across all of language, rather than the existence of distinct mental modules like syntax separate to phonology, as Chomsky (2005) maintains. The 'Cognitive Commitment' uses information from other cognitive sciences to understand these general principles of language. As such, this branch of linguistics highlights the focus on the language-cognition relationship, and provides theories and methodologies that could be applied to other species' cognition for comparison. This section concerns both general and social cognition, as follows.

From a general cognition standpoint, cognitive scientist Tomasello (2003) considers the cognitive function of pattern-finding to be one of the prerequisite skills for 'understanding...the symbolic dimensions of linguistic communication'. It is key to be able to categorise, for instance, communicative sounds into meaningful segments. This general cognitive function is found in many other species. Seven-Spot Archerfish, with no evolutionary need to do so, can recognise human faces (Newport et al., 2016). Newborn ducklings can acquire the abstract relations of *same* and *different* through experimental manipulation of their natural imprinting, in terms of shape and colour (Martinho and Kacelnik, 2016). Pigeons learned to sort over a hundred photographs of objects – novel and familiar – into sixteen human language categories (Wasserman, Brooks, and McMurray, 2015). Meanwhile, various species of tits avoided dummy sparrowhawks, even when dismantled and rearranged, apparently based on the predator's presence and key features, rather than their mutual spatial arrangement (Nováková, Veselý, and Fuchs, 2017).

A second key example of cognitive links to language, one shared by Cognitive Linguistics, is vocal learning as opposed to accounts of acquiring language or other communicative systems innately. For instance, vocal learning in mice (Arriaga, Zhou, and Jarvis, 2012), and the Egyptian fruit bat (Prat, Taub, and Yovel, 2015), point to a more tabula rasa and cognitive plasticity approach. This learning approach is adopted in Cognitive Linguistics for a usage-based account of language, in which linguistic structure arises from patterns of usage (Geeraerts and Cuyckens, 2010).

In terms of social cognition, there are also strong potential links to the origin of language (e.g. Fitch, Huber, and Bugnyar, 2010; Seyfarth and Cheney, 2014). Cognitive Linguistics, given its focus on language use and meaning, as well as language structure and general cognition, further supports these. Tomasello (2003) has argued that the triadic behaviour of joint attention is a necessary prerequisite for language development, on account of its connection to the reading of communicative intent. In terms of establishing a joint attentional frame with a conspecific, or heterospecific, a growing number of other species have also been shown to follow gaze or other body language cues, like the direction of mobile ears or a human pointed finger, to attend to another's focus of attention. This includes elephants (Smet and Byrne, 2013), penguins (Nawroth, Trincas, and Favaro, 2017), and ringtailed lemurs (Shepherd and Platt, 2008). Cognitive Linguistics takes this up with, for instance, study of demonstratives like English *this* and *that*, or Japanese *sono*, *kono*, and *ano*, and the argument that they form a unique class of linguistic expressions with a fundamental joint focus of attention function within language (Diessel, 2006).

But can other species engage in the next stage of complexity, that of role reversal imitation, 'to acquire symbolic conventions first used toward them in' joint attentional frames (Tomasello, 2003), as with children's

holophrases? This could be involved in an animal alternating its gaze between another animal and the focus of attention, as kangaroos have just been discovered to do so with human experimenters, during an unsolvable task (McElligott, O’Keeffe, and Green, 2020). Alternatively human-reared dogs exhibited this during the experiment where they were presented with an impossible task of opening a locked box with food inside, and almost immediately resorted to alternating their gaze between the human and the box, in comparison to their wolf counterparts (Miklósi et al., 2003). Another instance might be coral trout and grouper fish regularly pointing out prey hiding in crevices to other local predators, moray eels and wrasse, with vertical distinct headshakes, and even using a horizontal ‘shimmy’ to recruit these other predators for help with hunting (Vail, Manica, and Bshary, 2013). This stage of role reversal imitation links general and social cognition, but also links to the symbolic thesis. This is one of the central tenets of Cognitive Linguistics, as will be explored in the next section in more detail.

Symbolic Cognition

Used communicatively within natural languages, conventional arbitrary form-meaning pairings, or symbolic assemblies as they are known in Cognitive Linguistics (Evans, 2007), are conceptual representations of perceptual information, which can be expressed through numerous modalities as language. This symbolic function, along with the interactive function of language, are central to Cognitive Linguistic theory, even to the extent of a symbolic thesis, in which form is paired with meaning for grammatical units and not just vocabulary.

Symbols are widely acknowledged as a criterion for language (Barón Birchenall, 2016; Deacon, 1997; Hockett, 1960; Saussure, 1966; Tomasello, 2003). However, symbols are approached with differing interpretations by the various scholars who propose them. Planer (2021), for example, posits that symbols are conventional signs that are not dependent on spatio-temporal coincidence with referents. Thus, discussing vervet monkeys, Queiroz and Ribeiro (2002) state that ‘If the alarm call operates in a sign-specific way in the absence of an external referent,’ as with experimental playbacks, ‘then it is a symbol of a specific predator class’, a category of predators rather than a specific individual in the vicinity. Given there is no actual referent at the time of the conventional signal; this could be argued as constituting symbolic communication and so also symbolic cognition.

Taking the generalised Cognitive Linguistics view of symbols as form-meaning pairings, and with their cognitive basis established, it is interesting to find possible symbolic reference used amongst the communication of other species. Gunnison’s prairie dog alarm calls, for instance, encode information like colour and shape labels for their different predators, each predator in turn stimulating their own individual alarm calls (Slobodchikoff, Paseka, and Verdolin, 2009). This range of calls, including at least four predator

labels (Kiriazis and Slobodchikoff, 2006; Slobodchikoff and Placer, 2006), seems to exemplify a symbolic unit, given that reference to colour is arbitrary in any vocal-auditory communication, unless a species has some cross-domain perception of colour; this has not arisen from previous study of this genus (Cain and Carlson, 1968).

More recently, twenty-three horses of various ages and breeds were trained, in two weeks, to approach and touch symbol boards, before choosing freely between a ‘no change’ symbol and the symbol for either ‘blanket on’ or ‘blanket off’, depending on whether the horses already wore blankets (Mejdell et al., 2016). Results were significantly weather dependent, showing equine understanding of the symbols used by the experimenters, although it may have made the results more robust if the horses were allowed free choice from all three symbols at once.

Another more prominent example of animal symbolic cognition relates to two of Cognitive Linguistics’ bedrock propositions: the Cognitive Commitment, reflecting ‘general cognitive principles rather than cognitive principles that are specific to language’ (Evans, 2007), as well as the form-meaning pairings. Currently in Cognitive Linguistics texts, the form-meaning pairing refers only to linguistic, communicated expressions; even a study of conceptual metaphor as a cognitive principle utilises linguistic examples, like “‘She’s a block of ice’” for the ‘affection is warmth’ metaphor (Lakoff and Johnson, 2003). However, in order to substantiate the Cognitive Commitment, an understanding and expression of symbols in non-linguistic non-communicative contexts should be considered too.

Examples of a generalised symbolic unit, as defined earlier, might include the offering of collected objects to a potential mate by the male gift-giving spider, nearly three quarters of their food ‘gifts’ being empty and ‘worthless’ (Pandulli-Alonso, Quaglia, and Albo, 2017). Given the lack of function of these ‘gifts’, and the cost-benefit analysis that animal behaviour is regularly subjected to (Ha, 2010), is this a symbolic ‘gesture’, in a similar way to a man buying a woman flowers? Whether these objects are offered intentionally, or as part of evolved adaptation, like representing the individual’s ability to forage, the objects still form part of a social convention within the species and are otherwise useless for the animals, so constitute a natural form-meaning pairing.

Elsewhere, wild chimpanzees have been found to create stone accumulation sites at trees in a very similar form to human cairns at sacred trees in the same area of West Africa (Kühl et al., 2016). As a result of cultural transmission, the primates throw rocks at the trees and their cavities, as well as hitting the trees with the stones, in seemingly ritualistic display behaviour, with no apparent caching of food. The study authors suggest a symbolic element to this behaviour. Also amongst chimpanzees is a much sweeter behaviour: female juveniles carry sticks ‘in a manner suggestive of rudimentary doll play’, carrying them for up to four hours during rest, movement, and feeding times (Kahlenberg and Wrangham, 2010). This behaviour has no obvious function

and has not been reported in other chimpanzee studies, suggesting it is a learned behaviour in this particular troop, while it could also be analysed in terms of a discussion of the relationship between symbolic play and language development (Orr and Geva, 2015; Mitchell, 1997).

Importantly, there is also neuroscientific support for this reasoning about non-linguistic symbolism. Functional MRI study discusses how the anterior and posterior perisylvian areas of the human brain may function as a modality-independent system linking meaning with symbols ‘whether these are words, gestures, images, sounds, or objects’ (Xu et al., 2009). Thus symbolic cognition is a serious prerequisite for language, which can be witnessed across multiple different animal species.

Therefore, all such cognition studies – general, social, and symbolic – seem to support the notion of studying animal cognition for the evolutionary origin of language, and how Cognitive Linguistics supports this viewpoint, as well as showing how animal study can reciprocally inform linguistics.

Complex Animal Communication

Cognition, though, is not the whole story of language. In fact, the functional aspect of cognition’s relationship with language contributes to a serious dichotomy within linguistics: those who hold that language has developed for the purpose of structuring thought (Chomsky, 2005; Fodor, 1975; Kolodny and Edelman, 2018; Reboul, 2015), or for the purpose of communication of thought (Bickerton, 2007; Evans, 2015; Hurford, 2007; Scott-Phillips, 2015). Cognitive Linguistics mediates both positions to a degree.

In Cognitive Linguistics, both the cognitive aspects of language and its communicative capacity need to be reconciled. For instance, there is a conventionality aspect, or tacit social agreement, involved in symbolic reference (Deacon, 1997). There is a proposed co-development of theory of mind – the understanding of other’s minds – with language (Malle, 2002). Negotiating common ground, like shared background knowledge between interactants is important (Clark, 1996). Additionally, the social brain hypothesis (Dunbar, 2009) proposes that complex social lives have led to enlarged brains in at least mammals, due to the extra cognitive processing involved in managing their dynamic social relationships. All of these indicate that the communicative capacity needs to be considered just as much as the more structural and cognitive sides of language. In Cognitive Linguistics, it is thought that language is used as a representation of thought or cognition primarily *in order to communicate*, and that ‘language is the most developed and complex mode of communication’ (Tenbrink, 2020). This is whether such usage involves information exchange or interpersonal expressions of social relations and personal attitudes: ‘transactional’ or ‘interactional’ views respectively (Brown and Yule, 1983).

Therefore, while investigating animal cognition could yield highly worthwhile evidence for the origin of language, and Cognitive Linguistics provides a useful framework in

which to study this, it is also worth considering Hurford’s (2014) point that humans may simply be the first species to evolve language. Or, to put it slightly differently: perhaps humans may simply have been the first species to make use of language in a communicative capacity.

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