



Origin of Language: Does Gesture Come First?

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Abstract

Debates on the origins of gestures and language have lasted for a long time. Many scholars have investigated in depth the mechanisms underlying human and non-human primate communication systems, including gestures and vocalisations, which shed light on the origin of language. Critiques argue that language derives from vocal modality, which can be demonstrated in the experiment on children's language development. Since the origin of language is indispensable for the study of language evolution, it is significant for researchers to further study it and unfold the mystery of language origin. This paper reviews dominant theories of the gestural origin of language and illustrates some critiques of them, concluding that gestures indeed play a pivotal role in language evolution, but language starts by no means with only one modality. More importance should be attached to the study of multimodal origin.

Subject Areas

Linguistics, Semantics

Keywords

Gesture, Language Origin, Multimodal Origin, Language Evolution, Vocal Modality

1. Introduction

As the present conditions of the universe result from its initial conditions, the case of language origin is no different than that of the world. Investigations into problems related to languages, such as language evolution and language change, have to trace to its origin. Actually, the question of the origin of language was one of the major psychological problems in the 18th century. In 1789, the topic was firstly addressed by students of language origins. However, the Société Linguistique de Paris (SLP) forbade writing on it in 1866 (Ángel 2006) [1]. Thanks

to the confluence of linguistics, psychology, biology and paleoanthropology, the question of language origin is back on the agenda of language science (Trabant and Ward 2001) [2] as the New York Academy of Sciences reopened the issue in 1976.

1.1. Literature Review

One of the controversies about the origin of language lies in its discussion about gesture and speech, in other words, which modality comes first to form language. The idea that humans are first able to communicate in a symbolic way by gesture, so are able to develop language, has a long history (Hewes 1999) [3]. The gesture first idea was put forward by several prominent thinkers, such as Etienne Bonnot de Condillac in 1746 and Giambattista Vico in 1744, saying that language began as non-spoken gestures and signs. It was further discussed in the nineteenth century by Edward Tylor, Garrick Mallery, and George Romanes. Later, it was Hewe's article published in 1973 that attracted other's attention and considerable commentary. In his article, he cited a series of experiments to bolster the idea of gesture first. Monkeys in laboratory were trained to respond to visual, tactile, and sometimes noise stimuli, such as bells or buzzers by using their finger or hand to manipulate buttons and other devices, finding that they are indifferent to human's vocal commands. Another study mentioned in his article shows that Neanderthal man lacked the full vocal and articulatory range of modern *Homo sapiens* by evaluating their fossil remains. So early hominids may have found it very difficult to acquire protolanguage depending on controlled vocal production (Hewes 1973) [3], proving further evidence for the gesture first idea. Based on his study, the idea was further studied by Armstrong, Stokoe, and Wilcox (1995) [4], holding that the key to the transition from primate vocal and visible gesture systems to language is the introduction of iconic, visible gestures at some point in hominid evolution. Their discussion was still within the category of gesture only. Followed by this, Corballis (2002) [5] brought in significant new evidence to bolster this idea. He went beyond earlier supporters of a gestural theory by suggesting why speech eventually, but not completely, supplanted gesture. Tomasello (2008) [6] also provided us with a full explanation of gesture first hypothesis. One of his main grounds was also comparative. He argued that at least the first two stages of cooperative communication's emergence proceeded in the gestural, not the vocal domain. With more evidence implemented, Arbib (2012) [7] developed his theory about this idea: the mirror system hypothesis (which will be illustrated in detail in the next section), offering insights into the evolutionary importance of the brain's mirror neurons that enable monkeys, chimps and humans to recognize the actions of others. However, only in humans, these evolved to allow the complex imitation, making it possible to develop into language.

Despite the strong supporters of gesture first hypothesis, some find that this idea is fatally wanting in some aspects. It is not compelling enough to account

for why this should be this. For example, Kendon (2016) [8] argued that language must have evolved in the oral-aural and kinesic modalities together, with neither modality taking precedence over the other. Due to these divergences, the origin of language has become one of the most controversial issues in evolutionary psychology research, making researchers study it from various perspectives.

1.2. Research Aim and Structure

This paper will first focus on some major theories of gestural origin in this field, and illustrate the arguments of scholars regarding it, intending to comment on the problems and give potential suggestions for future study. The first section shows the background and significance of this topic. Studies about the gestural-first origin are illustrated as well. In the section part, this paper reviews studies of gestural origin and major theories about it, aiming to lay a foundation for the correlation between gesture and language. The third part demonstrates the dominant theories about gesture-first origin of language. In the next part, critiques of the theories mentioned in the former chapter are shown to point out the problems of them. At last, based on all of it, this paper makes a conclusion about the findings and gives suggestions for further study.

2. Gestures

2.1. Defining a Gesture

Human gestures are usually very broadly referred to as the ‘manner of carrying the body’ and ‘movements of the body or limbs as an expression of feeling’ (Simpson 1998) [9]. As a non-spoken form of communication, gestures allow us to express a certain meaning with our body, which is different from the ineffective action. One thing to be clear is that gesture and action are not the same thing when we can talk about the origin of language. Although the potential for confusing actions and gestures represents a potential analytic weakness, it can become strength since it tells us something about the origin of gestures (Katia Liebal 2012) [10]. Evidence about the language of infant show that the earliest steps infants take toward language are like those of a gesture-first creature. This language then extinguishes as did the gesture-first language, and is followed in the same children by a second acquisition (McNeill 2014) [11]. The deaf people also use the signed language which are entirely manual and facial, and demonstrate most of the main linguistic properties of spoken language. For adults with different language backgrounds, it is easier for them to speak with gestures complementing the expression of meaning. Gestures are prevalent in the past and present, and in people ranging from young to old. Therefore, the study of gestures is indispensable for us to investigate the origin of language.

2.2. The Origin of Gestures

Hands don’t evolve as a way of communication. Like other parts of animal’s body, hands are organs born with them. However, unlike other animals, gestures

appear merely in primates in the process of moving. These basic movements develop gradually into complex ones, formulating their gesture system. With regard to the issue of gesture's origin, some scholars argue that the development of gestures contributes to the intention of communication, while others hold that it becomes ritualized in the interaction of individuals. The debate unfolds among four major hypotheses: phylogenetic ritualization, ontogenetic ritualization, social learning via imitation and social negotiation. The first two will be explained in detail.

2.2.1. Phylogenetic Ritualization

Phylogenetic ritualization is a process in which communication displays could emerge from body movements lacking a communication function because they are 'borrowed' from other contexts (Liebal & Call 2012) [10]. Animals have certain kinds of ritualized communicative displays to achieve a goal. A case in point is the language of bees. It consists of different dances to show the position of food (Frisch 1973) [12]. This set of system is fixed to some extent so that even if they have no opportunity to interact with others, they are able to acquire this language. In other words, the language is inherited not learned by interaction with others. Therefore, phylogenetic ritualization features a high uniform.

2.2.2. Ontogenetic Ritualization

Ontogenetic ritualization refers to a mechanism that individuals are able to acquire the gestures during their interaction with community members during their lifetimes rather than inheriting them. Unlike the mechanism of phylogenetic ritualization, it features learnability, variation and consistency among communities. The way of imitation enables primates to acquire their language by see how others pose gestures. After acquisition, they may transmit their system to members of the same community, leading to the variation of their basic gestures. However, all of these gestures cannot be understood by members of other communities. This shows how ontogenetic ritualization works.

Based on the illustration, I suggest that the origin of gesture is more likely to result from the ontogenetic ritualization in that the change of gestures in one communication make it possible that basic gestures can develop into complex ones and may combine with vocal system to form the modern language we possess.

2.3. Characteristics of Non-Human Primate's Gesture

2.3.1. Diversity of Types of Gestures

A recent summary of a systematic comparison of the four great apes, siamangs, and Barbary macaques (Call and Tomasello 2007) [13] reported a number of 20 to 35 different gesture types depending on the species: tactile gestures, such as push; auditory gestures such as hand clap, and visual gestures, such as arm waves. Each of them is used in specific conditions for certain aim. For example, tactile gestures, which include some kind of physical contact with another individual were used by all great apes, siamangs and Barbary macaques (Call and

Tomasello, 2007) [13]. Auditory gestures often include the individual's own body used to produce noise. In addition, visual gestures are demonstrated by extending, raising and waving the arms. It is these gestures that formulate the richness of non-verbal communication of non-human primates.

2.3.2. Flexibility of Gesture Use

One way of showing their flexible use of gestures is that apes are able to continue their gestures, when there is no reaction of the recipient, until the receivers give their own response to them. As for the gorillas, they seem to show the flexibility by changing the gestures they use to achieve their specific goals. For instance, chimpanzees can use a given gesture in different functional contexts (e.g. play, aggression, appeasement, food, sex, nursing, and grooming) and a functional context can elicit diverse gestures (Goodall 1968) [14]. In addition, apes take into account the recipients by choosing the most proper gestures to express themselves. For example, they will not use visual gestures as the recipient is not at present. The action of choosing alternative gestures has something in common with our communicative strategies to some extent. In terms of this, the idea of gestural origin of language seems rational.

2.3.3. Restrictions of Gesture's Function

Considering the function of gestural communication, monkeys and apes use the majority of their gestures to requesting actions like play or mating, expecting an immediate response of their recipients. Evidentially, when communicating with humans, the non-human primates usually point to request things or actions. This type of gesture to obtain something that they want from the human is what we call "imperative gesture". Therefore, based on these studies, we are able to see that non-human primates are limited with the function of using gestures. However, there exist similarities between their gestural language with our human language, providing a foundation for us to investigate the origin and evolution of our language.

3. Gestural Theories of Language Origin

Gesture, a way of communication, started from such a long time ago. It can be identified both in human and animal communication systems. For example, serving in the management of interpersonal relations, ape's gestures are comparable to those of humans, like greeting, beckoning, offering, rejecting and so forth, as shown in **Figure 1**. In addition, experiments also show that all deaf people essentially use the same, primitive gesturing system for communication. This universal system, not a full language, can serve in basic pragmatic communication. Therefore, scholars speculate that the universality of the sign language cannot be an accident. It must have been at the origin of language. Realms of evidence have been given to show that there is certain relationship between gesture and origin of language. They mainly include primate origins, the mirror system and tool-making hypothesis.

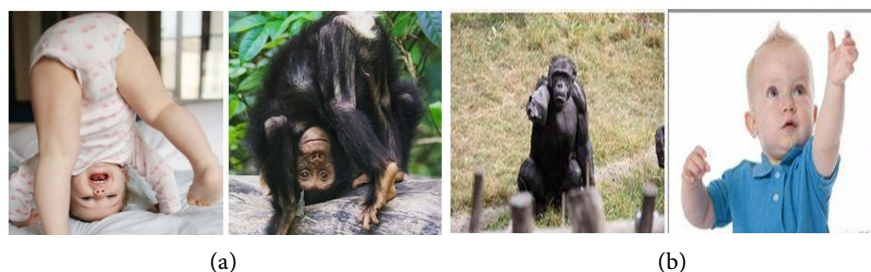


Figure 1. Similar gestures between apes and humans.

3.1. Primate Origin

Studies show that primate gestural communication is more flexible in terms of learning and use than are primate vocalisations (Call and Tomasello 2007) [13]. According to neurophysiological studies, nonhuman primates are hardly able to exert any cortical control over vocalization, which is pivotal to speech. This implies that the ancestor of humans and chimpanzees developed a communication system based on gestures rather than sounds. Gardner and Gardner's experiment of teaching ASL to a chimpanzee offered extra evidence to this. They found that attempts to teach vocal language to great apes have achieved much greater success in communicating in language-like fashion through manual signs than in acquiring anything resembling vocal language (Gardner and Gardner, 1969) [15]. Ploog (2002) [16] documented two neural systems for vocal behavior, one is cingulate pathway and the other is neocortical pathway. In nonhuman primate's vocalization is largely dependent on the cingulate system. The neocortical system is developed for voluntary control of manual movements, and is indispensable for voluntary control. It is only in humans that the neocortical system developed for precise voluntary control of muscles of the vocal cords. Numerous experiments related to apes' gestures and language bolster the idea that language is derived from gestures of primates as we human beings are actually evolved from them.

3.2. The Mirror System

One of the supports for gestural origins is the discovery of neurons in area F5 in the ventral premotor cortex of monkeys. In 1988, Rizzolatti, an Italian neuroscientist, and his team members tried to implant microelectrode into Rhesus monkey's nerve cells in area F5 to record the electronic reaction of the cells when they do any actions. The researchers found that when the monkeys make movements to grasp an object with hand or mouth, these cells are activated. Furthermore, another set of neurons in the ventral premotor cortex of the monkey, called mirror neurons, were activated as well when the monkeys notice other animals making the same movement. That is to say, the mirror neurons allow the actions map into the brain of the viewer, so that they are able to understand and identify these movements. In 1997, Arbib and Rizzolatti proposed the mirror system hypothesis based on the discovery of mirror neurons. They stated that ancestors of human beings can represent their ideas, behaviors, and specific ob-

jects with their hands movement because of the existence of the mirror system, in which the neuro circuits related to hands movements of identification and imitation provide a basic framework for the functional development of language in humans' brains. Recent studies have identified a more general mirror system, involving temporal, parietal, as well as frontal regions, that is specialized for the perception and understanding of biological motion (Rizzolatti *et al.* 2001) [17]. This system has been demonstrated only for grasping movements in monkeys. according to the researchers, F5 area is considered as the homologue of Broca's area in human brain (Rizzolatti and Arbib 1998) [18], and the mirror system is closely corresponding with the cortical circuits that are involved in both spoken and signed language.

3.3. Tool-Making Hypothesis

Tool-making hypothesis describes that tool making and use provides motivation for language evolution. According to Fitch (2010) [19], it is necessary to take into consideration of ecological context when trying to explain the phylogenetic generative mechanism of something. So does our language. The most possible ecological context of language is the making and use of tool. Our ancestor didn't rely on language to make and use tool, but their hands or gestures. As they know how to use certain tool, they were eager to impart these skills to other members of their community, or even to their next generation. Therefore, the making and use of tools provides ecological context for language evolution and change. In this process of teaching others, their hands movements related to tool-making connects with communication system so that neural circuit controlling hands movements generates new functions, becoming an area of brain supporting the function of language (Hecht *et al.* 2015) [20]. In addition, when teaching tool-making to others, our ancestors have to separate the whole process into small steps, which have something in common with the characteristics of hierarchical structure and linear structure of our modern language according to linguistics. As their gestures become abstract gradually, the use of gestures gets more prevalent to communicate with others. Therefore, it is reasonable to think that apes' gestures are the foundation or origin of human language.

4. Critiques of Gestural Origin of Language

4.1. Critiques of Primate Origin

So far, although ape gesturing may be comparable to human gestures serving in the management of interpersonal relations—greeting, beckoning, offering, rejecting, and so forth—gestures of a depictive or referential nature have not been reliably observed (Kendon 2016) [8]. Experiments of gestures of human infants show that the earliest steps infants take toward language are like those of a gesture-first creature. But this language then extinguishes and is followed by gesture-speech unity language (Mcneill 2014) [11]. The researcher further argues that the acquisition of true human language occurs at 3 or 4 with a separate evo-

lution of vocal attachment carrying the child up. This may remind us of the idea that human language is evolved with the combination of modalities, with none of them being dominant. Other experiments also give evidence to the objection of gesture first origin of language, which needs to be further studied.

4.2. Critiques of the Mirror System

As we have mentioned in the previous section, the mirror system put forward by Arbib and Rizzolatti provides a clear explanation of how the primate understand each other by monitoring their reaction of neurons in F5 area. They consider the understanding is demonstrated by the activation of neuron in monkeys' brain. However, according to Hickock (2009) [21], it is far from clear whether mirror system play a critical role in this process. He further pointed out that it seems much more likely that these processes would have more to do with the processes involved in an individual's own motor control. (Hickock 2014) [22].

4.3. Critiques of Tool-Making Hypothesis

Tool-making hypothesis states that tool-making and use serves as the ecological contexts for language emergence and evolution as ancestor try to impart the knowledge to other members. Direct evidence, however, displays that language and tool-making are co-evolved. In 2012, Stout and Chaminade published their paper Stone Tools, Language and the Brain in Human Evolution, demonstrating that when the subjects made tools, the more complex the technology they used, the more the brain's active regions overlapped with the language's active regions. This provides another perspective for us to study the origin of language in that gesture does not come before language, less alone acts as the origin of language.

5. Conclusions and Reflections

This paper focuses on the role of gestures in the evolution of human language, and reviews major theories and evidence supporting the gesture first origin of language. Critiques by other scholars of it are also illustrated in this paper. Based on that, some major findings and reflections are made as follows:

5.1. Pivotal Role of Gesture

Each analysis of language origin provides us a new perspective to study it comprehensively. So do the gesture-first theories. Evidence of primates' and infants' experiments do display the pivotal role of gesture in language evolution, for primates and infants all resort to their hands movement to communicate at the beginning of the stage of interaction. Psychological research also shows the correlation between neurons controlling hands and communication. These all strongly bolster the significance of gesture in human language evolution.

5.2. Multimodal Origin of Language

The increasing number of evidence shows that language derives from a combi-

nation of modalities, such as gesture, voice and face. A case in point is apes lip-smacking with gestures when they express a certain idea. Therefore, neither do we ignore the importance of gestures, nor should we overstate their function. Investigation of language origin needs further studies, with interdisciplinary experiments, in that it is the confluence of linguistics, psychology, biology and paleoanthropology that reopens the discussion of language origin.

6. Limitations of the Present Study

While giving a detailed explanation of present theories about language origins from the perspective of gestures, the paper does not include a comparative analysis of the theories from other perspectives. Further studies might incorporate a comprehensive examination of the language origin, so that the myths about language origin can be unveiled easily. Another possible limitation of the present study is that there are not enough experimental explanations for each part because of the time limit. Future studies should explore fully and deeply the topic and give more supporting evidence.

Conflicts of Interest

The author declares no conflicts of interest.

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