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Ergative Structure at Sentence and Discourse Levels in a Self-Generated Communication System

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Abstract

Although attested in the world's languages, ergative systems are, in fact, relatively rare. However, ergative patterns appear to be robust in communication systems created *de novo* – deaf children of hearing parents who are inventing their own gesture systems organize their sentences around an ergative pattern. Moreover, DuBois (1987) has suggested that ergativity underlies *all* languages, but at a discourse level. We observed the spontaneous interactions between four deaf children and their hearing mothers to determine whether the children displayed ergative patterns in their gestures, not only at the sentence level, but also at the discourse level, as DuBois might predict. We found that three of the four children did exhibit discourse-level ergative structure, whereas all four exhibited sentence-level ergative structure. Only one of the hearing mothers exhibited ergative structure in her gestures at the discourse level, and none did at the sentence level. Importantly, ergative structure at the sentence level was *not* reducible to discourse-level factors (in particular, to the novelty of a semantic element in discourse), suggesting that ergativity at each of these two levels is a distinct phenomenon.

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1. Ergative Structure in Conventional and Unconventional Languages

All languages distinguish patients from actors in transitive relations. In English, for example, transitive actors precede the verb, patients follow ("Bert hit Ernie"); and transitive actors are replaced by pronouns in the nominative case, patients by pronouns in the accusative case ("he hit him"). However, languages differ in how they treat intransitive actors.

Some languages, English among them, are called accusative languages and mark intransitive actors in the same way as transitive actors. For example, both precede verbs ("*Kermit* ran home, "*Bert* hit Ernie") and take nominative case when replaced by pronouns (e.g., "*he* ran home," "*he* hit Ernie"). Moreover, patients are distinguished from both types of actors – they follow verbs ("Bert hit *Ernie*") and take accusative case when replaced by a pronoun ("Bert hit *him*"). In this way, the initiator properties of the intransitive actor are highlighted (the fact that Kermit initiates the running, as opposed to his being affected by the running).

Other languages, called ergative languages, align intransitive actors with patients rather than transitive actors. If English were ergative, intransitive actors would follow verbs as patients do ("ran *Kermit*") and would be replaced by the same pronoun as patients ("ran *him*"). The ergative pattern highlights the affectee properties of the intransitive actor (the fact that Kermit is affected by the running, as opposed to initiating the running). Thus, there are two categories distinguished from one another in all languages (transitive actors vs. patients), and a third category (intransitive actors) that is aligned with one category in one set of languages (transitive actors in accusative languages) and the other category in the other set of languages (patients in ergative languages) (Dixon, 1979; Silverstein, 1976).

Although attested in the world's languages, ergative systems are, in fact, relatively rare. Interestingly, however, ergative patterns appear to be robust in communication systems created *de novo*. Deaf children of hearing parents who are inventing their own gesture systems organize their sentences around an ergative pattern (Goldin-Meadow & Mylander, 1984; 1998). Equally striking, when asked to describe a series of action vignettes using their hands rather than their mouths, English-speaking adults invent an ergative structure identical to the one developed by the deaf children, rather than following the accusative

pattern found in their spoken language (Goldin-Meadow, Yalabik & Gershkoff-Stowe, 2000).

Why is ergative structure so robust in newly created communication systems? DuBois (1987) has suggested that ergativity underlies *all* languages, including accusative languages, but at a discourse level. Perhaps it is the ergative alignments pervasive at the discourse level that encourage deaf children (and hearing adults) to introduce sentence-level ergative structure into their invented communication systems. To explore this hypothesis, we examined discourse patterns in four profoundly deaf children previously shown to have created gesture systems with ergative structure at the sentence level (Goldin-Meadow & Mylander, 1984; 1998). We coded videotapes of these children interacting with their hearing mothers, focusing on the discourse patterns displayed by both mother and child.

We begin by reviewing evidence for ergative structure at the sentence level in the deaf children's gestures and in the gestures that the children's hearing mothers produced as they talked to their children. We then ask whether the gestures produced by the deaf children and their hearing mothers adhere to an ergative pattern at the discourse level. Finally, we explore the relation between ergative structure at these two levels, showing that ergative structure at the sentence level is *not* reducible to ergative structure at the discourse level.

2. Ergative Structure at the Sentence Level

All four deaf children had hearing losses so severe that they were unable to make use of the spoken language input surrounding them. Moreover, their hearing parents had not yet exposed them to conventional sign language. As a result, the children lacked usable input from a conventional language. Nevertheless, all four produced strings of gestures that were structured in language-like ways (Feldman, Goldin-Meadow & Gletiman, 1978; Goldin-Meadow & Feldman, 1977; Goldin-Meadow & Mylander, 1984, 1990).

We determined the boundaries of a gesture sentence on motoric grounds. If the child produced one gesture and then, without pausing or relaxing the hand, produced a second gesture, those two gestures would be considered part of the same sentence. If, however, the two gestures were separated by a pause or relaxation of the hand, they each would be considered a separate unit. We use the term "sentence" loosely and only to suggest that the deaf children's gesture strings share some structural properties with early sentences in child language. We focus here on one such sentence-level property – production probability – the likelihood that a particular semantic element will be gestured in a gesture sentence when it is permissible in that sentence.

When we observed the deaf children, they were in what might be called a "two-gesture" period, akin to a young hearing child's two-word period – a time when the child's utterances for the most part contained at best two gestures. If

such a child wants to communicate an idea with three semantic elements, that child will be forced to leave one of these elements out of the surface structure of two-gesture sentences. For example, if describing a mouse eating cheese, the child cannot produce gestures for the eater (mouse), the action (eating), and the eaten (cheese) in a two-gesture sentence. The child might drop out elements randomly, producing gestures for each element a third of the time (the act is the third possible element). However, this is not the strategy that the deaf children adopted.

The children were quite systematic in the elements they included and excluded from their two-gesture transitive sentences – they produced gestures for patients (the eaten-cheese) and omitted gestures for transitive actors (the eating-mouse). Thus, like all natural languages, the deaf children's gesture systems make a distinction between actors and patients in transitive sentences, a distinction based on patterns of occurrence and non-occurrence.

What about intransitive actors, such as a mouse running to its hole? Figure 1 (top) presents production probability for transitive actors, intransitive actors, and patients in each of the four deaf children. A gesture sentence was included in the data base if it had two elements in surface structure (i.e., if it was a two-gesture sentence) and three in underlying structure (i.e., if a transitive sentence had an underlying structure of actor-act-patient, and if an intransitive sentence had an underlying structure of actor-act-recipient). Note that each of the children

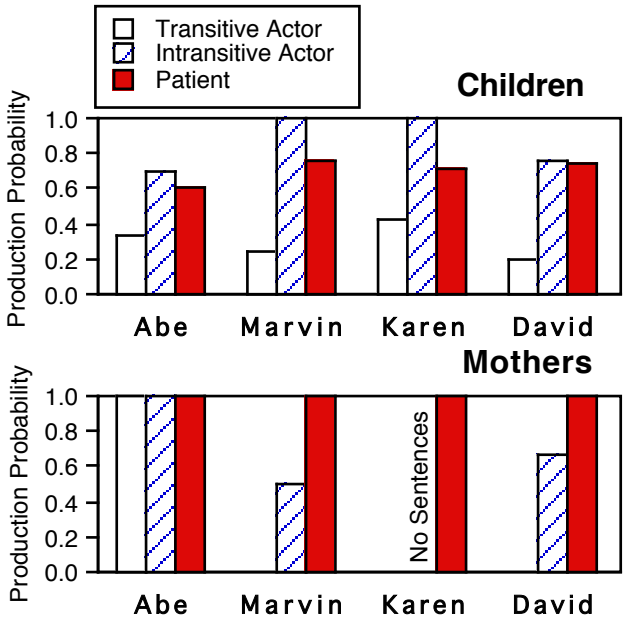

Figure 1. Probability that the deaf children, and their hearing mothers, produced gestures for transitive actors, intransitive actors, or patients in 2-gesture sentences. The children displayed an ergative production probability pattern; the mothers did not. Probabilities were calculated using gesture sentences in which three semantic elements could be gestured but only two actually were gestured.

produced gestures for intransitive actors (the running-mouse) approximately as often as for patients (the eaten-cheese) – and far more often than for transitive actors (the eating-mouse). In this sense, the deaf children's gestures pattern like ergative languages: intransitive actors and patients are treated alike (produced), whereas transitive actors are treated differently (omitted).

We also examined the spontaneous gestures that the deaf children's hearing mothers produced as they talked to their children. We used precisely the same techniques for determining gesture sentences and the semantic elements contained within those sentences as we used for the deaf children. In other words, we viewed the mothers' videotapes with the sound off, as though they too were deaf (Figure 1, bottom). The first point to note is that there was no uniformity across the mothers – it is difficult to abstract a single pattern from these sets of gestures. However, three of the four mothers did produce more gestures for patients than for transitive actors, thus distinguishing between the two, as did their children. But it is where *intransitive actors* are situated relative to transitive actors and patients that determines the typology of a language, and here mothers strayed from the ergative pattern and thus differed from their children: Abe's mother did not distinguish among the three elements; Marvin's mother produced gestures for intransitive actors at a rate half-way between her production rates for transitive actors and patients; Karen's mother produced no gesture sentences in which intransitive actors were permissible. Only David's mother showed a slight bias toward producing gestures for intransitive actors as often as she produced gestures for patients; however, in other samples, David's mother very clearly did *not* exhibit an ergative pattern whereas David did (Goldin-Meadow & Mylander, 1984:83).

Thus, we see an ergative pattern at the sentence level in the deaf children's gestures, but not in the hearing mothers' gestures. We now turn to discourse to determine whether ergative structure appears at this level in either the children's or their mothers' gestures.

3. Ergative Structure at the Discourse Level

In conducting our discourse analyses, we coded approximately 250 gesture strings for each mother-child dyad. We focused on referents playing the role of transitive actor, intransitive actor, or patient, whether those referents were explicitly gestured or not. In other words, we included in our data base all referents that were part of the predicate frame of the verb even if those referents were not gestured, e.g., if the child asked her mother to open a jar but produced gestures only for the jar and the twisting action, we included in our analysis

mother (as transitive actor), as well as jar (as patient), ignoring the fact that one was gestured and the other was not. Following DuBois (1987), Clancy (in press), and Allen and Schröder (in press), we noted whether the object or person referred to was previously established or new to the discourse. For example, in an utterance whose underlying structure contained four elements – "mother give toy to me" – we focused on the transitive actor (mother) and patient (toy), and considered each in relation to the previous discourse to determine whether it was newly introduced in this utterance or previously established. We followed Clancy (in press) and classified as new any referent, whether explicitly or implicitly mentioned, that had not appeared in the previous discourse.

Figure 2 (top) presents the proportion of transitive actors, intransitive actors, and patients that were new in each of the four deaf children's gesture sentences. Note that, as DuBois (1987) might predict, three of the four children tended to introduce new elements into the conversation as patients or intransitive actors and rarely as transitive actors, thus exhibiting an ergative pattern. David was the exception; he referred to relatively few objects or persons that were new to the discourse and, when he did refer to a new object or person, he was no more likely to introduce it in an intransitive actor or patient role than in a transitive actor role.

We looked also at the proportion of transitive actors, intransitive actors, and patients that were new in each of the hearing mother's gesture sentences (Figure 2, bottom). Relative to their children, mothers were less likely to refer to objects or persons that were new to the discourse. Moreover, only Marvin's mother displayed an ergative pattern at the discourse level. Note, of course, that we are looking here at the mothers' *gestures*, not their speech; in speech, we would

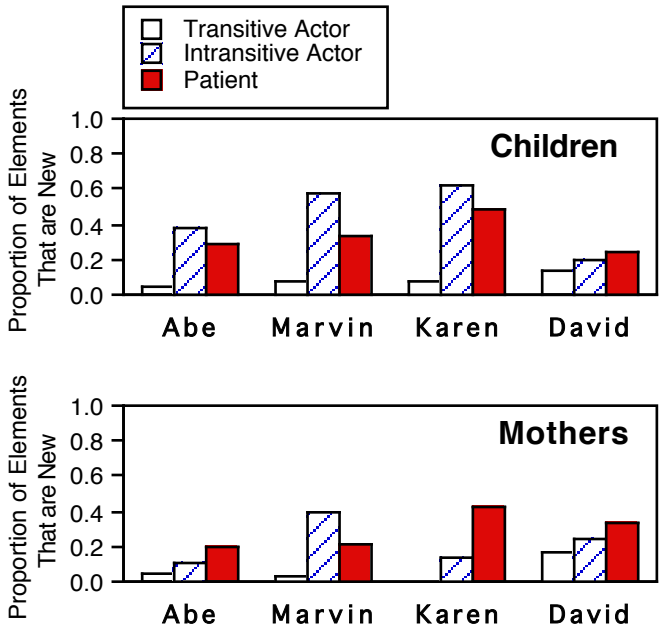

Figure 2. Proportion of transitive actors, intransitive actors, and patients that were new to the discourse. Three of the four deaf children, and one hearing mother, displayed an ergative pattern in their discourse. The denominator for each type of element is the total number of times the children, or their mothers, referred (either implicitly or explicitly) to that type of element.

expect the mothers to exhibit the discourse-level ergative patterns that DuBois (1987) has described for English-speakers.

Thus, we find ergative structure at the discourse level in three of the four deaf children. However, we find ergative structure in all four of the children at the sentence level, suggesting that the two levels of structure are not inevitably linked even in a newly created communication system. It is possible, of course, that ergative structure at the discourse level provided a stepping stone toward ergative structure at the sentence level (or vice versa) for Abe, Marvin and Karen. But for David, who did not exhibit a clear ergative pattern at the discourse level, this developmental progression clearly did *not* occur. In terms of the gesture models that the hearing mothers offered their deaf children, only Marvin's mother exhibited a discourse-level ergative pattern in her gestures. Although she may have offered her deaf child a gestural model for ergative structure at the discourse level, Abe's and Karen's mothers did not.

4. Sentence-Level Ergative Structure is *not* Reducible to Discourse-Level Ergative Structure

Our final task is to consider the relation between ergative structure at the sentence level and discourse level. One very sensible possibility is that the deaf children produce gestures for intransitive actors and patients more often than for transitive actors because, as we have just shown, intransitive actors and patients tend to be new to the discourse more often than transitive actors. In other words, the production probability patterns that we find at the sentence level may be an outgrowth of a semantic element's status as new or old in the discourse.

To explore this hypothesis, we reanalyzed the data that we had coded for discourse, looking now at production probability within each sentence. Because our discourse sample was small, it contained relatively few relevant gesture sentences for each child (as mentioned in section 2, the data base for the production probability analysis includes sentences with two elements in surface structure, and three in underlying structure – actor-act-patient for transitive sentences, and actor-act-recipient for intransitive sentences). We therefore collapsed the data across all four children and examined how often the children as a group produced gestures for transitive actors, intransitive actors, and patients. We divided the semantic elements into those that were new to the discourse and those that were old. We then calculated production probability for new and old elements separately, thus holding novelty in the discourse constant. If the novelty of a semantic element is responsible for how often that element is gestured, we would expect production probability to be high for all new

elements (regardless of role) and low for all old elements (again, regardless of role). If, however, the novelty of a semantic element is *not* related to how often that element is gestured, we would expect to find an ergative production probability pattern for both new and old elements. Figure 3 presents the data, with production probabilities displayed in the right graph for new elements and in the left graph for old elements.

Note, first, that in this data base, there were *no* sentences that introduced a new object or person in the role of transitive actor – just as DuBois (1987) would predict. However, again as DuBois would predict, there were a number of sentences in which a new object or person was introduced in the role of either intransitive actor or patient. The children produced gestures referring to new objects or persons in both roles at a high rate (Figure 3, right). The telling data, however, are the old elements. Here we find sentences with previously established objects or persons in all three roles (transitive actors, intransitive actors, and patients). If novelty were dictating how often the children produced gestures for semantic elements, production probability should be low for all three elements – but it was not (Figure 3, left). Production probability was equal and high for intransitive actors and patients, and low for transitive actors. In other words, the children displayed an ergative pattern even when the novelty of the semantic element was held constant. The ergative patterns that we find at the sentence level cannot be explained by novelty in the discourse.

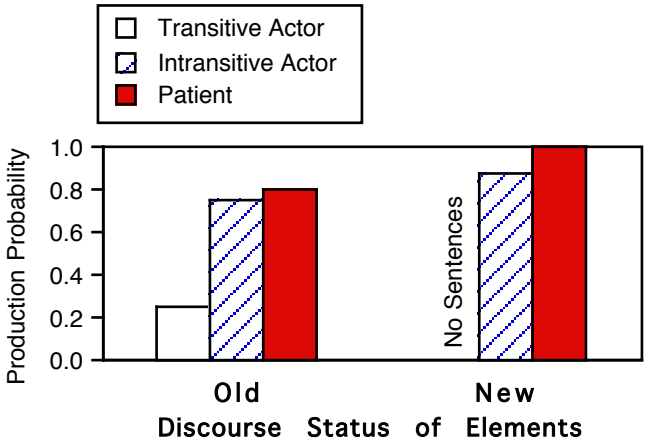

Figure 3. Probability that the deaf children produced gestures for transitive actors, intransitive actors, or patients when those elements were old (left) or new (right) to the discourse. The ergative pattern is evident in both graphs (where data are available), suggesting that ergative structure at the sentence level is independent of the newness of the elements in discourse. Probabilities were calculated for all four deaf children combined and using sentences in which three semantic elements could be gestured but only two actually were gestured.

5. Conclusion

Ergative languages are relatively rare. Interestingly, however, ergative structure appears to be as viable as accusative structure in early child language. Children across the globe have no difficulty learning an ergative language (Ochs, 1982; Slobin, 1985). Even more striking, children who are learning accusative languages often display ergative patterns at the earliest stages of language-learning. For example, English-learning children tend to produce words for intransitive actors and for patients at the same rate, and both at a higher rate than for transitive actors – an ergative alignment (Goldin-Meadow & Mylander, 1984:62-64). Similarly, children learning Korean, an accusative language, go through a period during which their transitive verbs typically occur with a single argument, the patient, and intransitive verbs occur with the actor – again, an ergative alignment (Choi, 1999; Clancy, 1993).

Further evidence for the robustness of ergative structure comes from the deaf children we have studied, children who are *inventing* their own communication systems. All four of the deaf children exhibited ergative structure in their gestures at the sentence level, and three of the four did so at the discourse level as well. Importantly, we have found that ergative structure at each of these two levels is a distinct phenomenon – one is not reducible to the other. However, it is possible that, having introduced ergative structure at one level, the children are then more likely to also introduce it at the other level, presumably to preserve the coherence of the system. In other words, ergative structure at one level may make it more likely that there will also be ergative structure at the other.

In contrast to their deaf children, the hearing mothers do not consistently display ergative patterns in their gestures at either the sentence or discourse level. This finding may not be all that surprising given that the mothers produced all of their gestures while talking. The spontaneous gestures that speakers produce when they talk have been found to form an integrated system with that talk (Goldin-Meadow, Alibali & Church, 1993; McNeill, 1992). The mothers' gestures are thus not "free" to pattern in the same ways as their deaf children's gestures do (Goldin-Meadow, McNeill & Singleton, 1996). Whatever the reasons for the differences between the deaf children's gestures and their hearing mothers', it is clear that the mothers' gestures did not provide the impetus for the ergative structure found in the children's gestures. Ergative structure appears to be the child's own invention.

But ergative structure is not unique to child language-creators. When asked to describe a series of action vignettes using their hands rather than words, English-speaking adults invent gestures adhering to an ergative pattern rather than the accusative pattern found in their spoken language (Goldin-Meadow et al., 2000). Thus, ergative structure does not reflect a child-like way of organizing information for communication. Rather, the ergative pattern may

represent a robust solution to the problem of communicating information from one mind to another, a solution that finds its way into the structure of language at both sentence and discourse levels.

Endnotes

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