

## **On Negation. What do we need to “say no”?**

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**Abstract** By looking at first-language learning, we can see three broad categories in the acquisition of negation (see DIMROTH 2010 for a review): 1) rejection/refusal; 2) disappearance/ non-existence/unfulfilled expectation; 3) denial. Denial is the most complex form of negation and the last to be acquired. I present the hypothesis that denial relies on false belief understanding. Evidence from normally developed and from Autistic subjects confirms this hypothesis. Competence in linguistic denial is usually acquired by the age of 2 years and a half and 3 years. According to this hypothesis, the attribution of false belief understanding could be lowered to the age of about 2 and a half years. Hence, psycholinguistic studies on linguistic negation add further evidence that shows that the false belief test is not a reliable proof of a complex mindreading ability.

**Keywords:** Linguistic Negation; Mindreading; False Belief Test

### **1. Introduction**

Negation is a universal feature of human language. Every human language includes negation, but to date we do not know of any animal communication system that has negation. What are the cognitive mechanisms underlying negation? What does negation allow us to do?

In many ways, negation makes us species-specific. Most human activities require the linguistic possibility to deny. We could not persuade each other without negation, we could not have public nor private debates without negation, we could not reflect on our past or our future without negation because we could not have counterfactual reasoning. This list could continue on and on.

In this paper I will present the hypothesis that linguistic negation, in its complex form, denial, relies on mindreading and on false belief understanding.

Many studies carried out during these last decades have been looking at the acquisition of negation in first language learning (L. BLOOM 1970; CHOI 1988; DIMROTH 2010; PEA 1980; VOLTERRA & ANTINUCCI 1979). All of them seem to agree on the opinion that the acquisition of linguistic negation is a fundamental step in cognitive development. According to Spitz (1957), the ability “to say no” is the most important achievement of first infancy. In fact, by saying “no” children, for the first time, are symbolically expressing an abstract concept (D’ANIELLO 1989; SPITZ 1957). The use of negation requires complex cognitive abilities. As psycholinguistic research has shown, in order to use negation children need to know the difference between their own mental representations and the external world; they need to know the difference between their own mental representations and the mental

representations of the person they are speaking to; moreover, in complex forms of negation, children cannot entirely rely on a present perceptual scene but instead they need to manage their listeners' beliefs and other epistemic states. Thus, although the expression of negation is acquired very early in infancy (before children learn to talk, in fact prelinguistic infants can reject something by using gestures or by shaking their head), negation is all but cognitively simple. Of course, linguistic negation is far more complex than its non-linguistic expression; still "no" is acquired very early on, being one of the first words in language acquisition.

Psycholinguists have been identifying the different semantic categories of negation that emerge during cognitive and linguistic development. The number of these categories increases or decreases depending on the criteria of classification adopted in each study. However, although there is not a general agreement, we will see that the functions and the order of appearance in these studies are roughly the same.

## **2. Evidence From Normal Development**

By looking at first-language learning in infancy, we can see, following Dimroth's review (2010), three steps in the acquisition of linguistic negation: 1) rejection/refusal; 2) disappearance/ non-existence/unfulfilled expectation; 3) denial.

According to many studies (CHOI 1988; PEA 1980; VOLTERRA 1972; VOLTERRA AND ANTINUCCI 1979), rejection is the first category of negation to be acquired. Children use "no" to express refusal of something existing in their present context. However, we can find examples of rejection in human pre-linguistic gestures and even in animal behaviour. In fact, before the time children start to produce the single word "no" to express rejection, they have already expressed rejection non-linguistically. Rejection, according to Pea (1980) does not require abstract mental representations, while non-existence and denial does require them.

The second category of linguistic negation to arise is non-existence/unfulfilled expectation. At this point, children are able to signal the absence or disappearance of an expected referent in the context of speech or indicate something that violates their expectations, based on previous experience (for instance, malfunctioning toys) .

Lastly, the third category to be acquired is denial. Denial implies negation of a predication. The referent is usually symbolically expressed. As L. Bloom (1970) argues, to deny, children must have the ability to discern between their own knowledge of the world and the knowledge of their listener. In order to deny a sentence, children have to manage with two propositions, one affirming and one negating the same predication; and they have to ascribe one of them to the person they are speaking to. «To deny the truth of another person's statement entails the understanding that the other person may hold different beliefs, or that language is itself a representation of reality, not reality itself» (TAGER-FLUSBERG1999: 328). Denial is usually acquired by the age of two and a half years.

According to Antinucci and Volterra (1979) categories of negation are acquired according to the complexity of the inferences that they entail. At the beginning, children are only able to make inferences about the present perceptual situation. Thus, at first, children can only negate (rejecting, prohibiting or expressing non-existence) something currently present in the perceptual context of speech or something that just before was present in the speech context. Later on, as children start to express denial, they become able to read their listeners presuppositions. At this time, children rely both on perceptual and pragmatic context.

Choi (1988) in her longitudinal study on English, French and Korean speaking children aged between 1 year and 7 months and 3 years and 4 months went into more depth in the description of semantic categories of negation. She identified 9 functions of negation that usually arise in three different phases.

Phase 1: non-existence, prohibition, rejection, failure.

Phase 2: denial, inability, epistemic negation.

Phase 3: normative negation, inferential negation. (CHOI 1988: 525).

In Phase 3, Choi introduced the category of inferential negation «that indicates the child's inferences about the listener» (CHOI 1988: 524).

Choi (1988) refers to an interesting example of inferential negation:

(Kyle has broken a few crayons. The experimenter has been scolding Kyle for breaking crayons.

Kyle picks up a broken crayon which he did not break and looks at the experimenter)

K: I not broken this. (CHOI 1988: 525).

This example clearly requires false belief understanding. In fact, when Kyle says «I not broken this», he is reasoning with the experimenter's belief. Specifically, Kyle supposes that the experimenter believes that he has broken that crayon while this was not the case (false belief). This example of inferential negation was recorded when Kyle was 2 years and 8 months old.

After the one-word utterance period, when children start to utter their first sentences, according to L. Bloom's study (1970), non-existence is the first category of negative sentences to arise, not rejection. Denial is still the last category to be acquired, despite the fact that the syntactic structure of denial is less complex than non-existence. According to L. Bloom (1970) denial requires more cognitive effort from children.

Hence, according to data we have seen thus far, we can say, following Pea (1980: 165-166) that the expression of negation, from simplex to complex forms, requires underlying cognitive representations of increasing complexity. The first expression of negation does not require internal abstract representation because the rejected object is present in the perceptual scene; later on, with the expression of a disappearance, abstract mental representation is required because the negated object or person is no longer present in the speech event context; finally, when truth-functional negation is used to deny a predication, a second-order abstract representation is required.

Nevertheless, Pea (1980) does not agree with the opinion of Antinucci and Volterra (1979) that, in order to deny, children must attribute a presupposition to their listener. Many times, he argues, children express negation without addressing a person. Moreover, he claims, there is not enough independent experimental evidence supporting Antinucci and Volterra's assertion (1979) that two-year-olds are able to infer other people's mental states.

However, we know that the development of the ability of mindreading begins early. During the second year of life, for example, language acquisition seems to heavily rely on the ability of reading other people's intentions (DE VILLIERS 2000). Furthermore, children start to use mental verbs like "think," "know," etc...in their third year of life ( i.e. before they are able to pass the false belief task). Currently, we

also have evidence showing that even 15-month-old children can understand false beliefs (ONISHI & BAILLARGEON 2005).

Furthermore, it is worth noting that linguistic negation, at least denial, is a metalinguistic operator. Negation cannot be referentially used. Even in a negative descriptive sentence (i.e. “It is not raining”) negation does not have its own referent. Negation never concerns a fact in a real or fictional world, nor an abstract concept like “elegance” or “rationality,” nor an action. Negation is metalinguistic because it implies an operation on a proposition. That is to say, negation is the operation of setting a false value for the proposition it is referring to (and this is the same operation we also make in the more complex linguistic action of lying). Thus, negation, or at least denial, seems to imply a second order mental representation. In fact, by expressing a denial toward a listener, the child is representing a content, negating that content (by setting a false value) and attributing the negated content to the listener.

Thus, following the considerations of Antinucci and Volterra (1988), we can argue that the complex forms of negation, which are metalinguistic<sup>1</sup> in their nature, regardless of what different names they may be called, entail the ability to understand false beliefs. In what follows, while still considering the different categorisations we have seen above, I will call all of the complex forms of negation “denial.”

### **3. Evidence From Autism**

The next question we are going to address will be: is linguistic negation possible, especially metalinguistic negation, without a complex mindreading ability and false belief understanding? We try to answer this question by looking at the acquisition of linguistic negation in autistic children. Autism is a neurodevelopmental disorder with three characteristic features: social impairments, communicative-linguistic impairments, repetitive and stereotyped behaviours (TAGER-FLUSBERG 1999). At least the first two aspects of autism are usually explained by a “Theory of mind” deficit hypothesis. According to this account, autistic subjects have a specific deficit in understanding other people’s mental states. Thus, as a consequence of this lack of comprehension, autistic subjects have communicative and social deficits. Indeed, the ability of attributing mental states such as intentions, beliefs, desires, etc., to other people is the ground for social behaviours and linguistic communication. Lacking the ability of mindreading, autistic subjects have difficulties in interpreting other people’s communication and behaviour.

Hence, thus far we have made two points. Firstly we have examined cognitive requirements underlying the acquisition of linguistic negation, arguing that, in its complex forms, linguistic negation requires second-order mental representations and the ability of mindreading. Secondly, we have identified a neurodevelopmental disorder, autism, which is supposed to show a specific deficit of Theory of mind. Now, if these two assumptions are correct, autistic subjects should find difficulties with complex forms of linguistic negations. And this seems, in fact, to be the case.

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<sup>1</sup> The definition of negation like metalinguistic operator is different from Horn’s definition of metalinguistic negation (HORN 1985). In Horn’s dichotomy between descriptive and metalinguistic negation, the latter concerns assertability of a proposition while the former concerns description of a negative state of affairs. In my view, negation, at least its complex form, is always metalinguistic, even in descriptive uses, implying an operation on a proposition.

Shapiro and Kapit (1978) looked at the use of linguistic negation in autistic and in normal control children (typically developing 3 and 5-years-olds). Subjects had to follow an experimenter's instructions eliciting comprehension, production or imitation of negative sentences. Findings suggested that autistic children used a different strategy than their controls in accomplishing the tasks. In fact, they performed better than controls in the imitation task but had significantly lower performances in production. All groups performed better in comprehension than in imitation. Still the autistic children's performances in comprehension were lower than the 5-years-olds and even lower than one of the two groups of 3-year-old normally developing controls.

The autistic subjects produce fewer and more rigid negations as well as imitating well, suggesting adequate registration and reply but poor integrative processing of linguistic form for social and communicative use (SHAPIRO AND KAPIT 1978: 349).

Moreover, Tager-Flusberg et al. (1990) looked at language acquisition in autistic and Down syndrome children. Children were visited in their homes and videotaped while playing with their mothers. Conversations were, subsequently, transcribed by the experimenters. Results showed that autistic and Down syndrome children acquired syntactic structure to express negation in the same order as typically developing children. However, autistic children only used syntactic structures of negation to express rejection and non-existence while Down children at later stages also express the function of denial. Significantly, the expression of denial was absent in the linguistic production of autistic children. The authors interpreted these findings as a result of a lack in Theory of mind, under the assumption that denial requires attributing mental states to the listener.

This paucity of denial reflects impairments in Theory of mind. [...] These aspects of mental state understanding are specifically impaired in autism and it is therefore not surprising that this function of language, denial, is almost never used by young children with autism (TAGER-FLUSBERG 1999: 328).

Delayed negation processing was found by Schindele, Lüdtke and Kaup (2008) even in adults diagnosed with high-functioning autism and Asperger's syndrome. Subjects were required to read short stories ending with either a negative or affirmative sentence. Depending on the context, the last sentence could be pragmatically felicitous or infelicitous. Normal controls showed to read slowly negative final sentences only in the pragmatically infelicitous context while the two clinical groups had no context effect showing longer reading times for negative sentences in both conditions.

#### **4. Discussion**

Taken together, these findings suggest that, in order to linguistically deny, children need to understand other people's mental states, as well as their false beliefs. Competence in linguistic denial is usually acquired between the age of 2 and a half years and 3 years. Hence, according to this hypothesis, the attribution of complex mindreading and false belief understanding is lowered to at least the age of about three years. While, according to the false belief test, children do not have these abilities until they are four years olds (WELLMAN, CROSS, WATSON 2001).

However, according to P. Bloom and German (2000), this task does not only require complex mindreading but many other abilities as well. Hence, difficulties in passing the false belief task cannot be only a problem of reasoning about false beliefs. Children younger than 4 years might not have enough memory abilities or processing capacities to solve the task (GERMAN AND LESLIE 2000), even though they understand that beliefs can be false (BLOOM AND GERMAN 2000).

Moreover, following Bloom and German (2000, 28), it should be noted that even if normally developing children younger than 4-years-old showed that they did not understand false beliefs, this would not be a proof that they are not able to reason about other people's mental states. Indeed many studies (CSIBRA, GERGELY, BIRÓ, KOÓS, BROCKBANK 1999; LESLIE 1994; O'NEILL 1996) have been showing that children even younger than two-years-old are capable of attributing mental states to other people. Thus, failure in this test might be due to the major complexity of the task given. Indeed, as Bloom and German (2000) note, the linguistic and communicative skills of normal 3-year-olds cannot be compared to that of older autistic children. Communicative, linguistic and social abilities of normal 3-year-old children are different and far superior to those of older autistic children, even if normal 3-year-olds are not passing the false belief test.

Besides, lately, further researches have been showing that even before their third birthday normal children can pass a false belief test if, following Bloom and German's (2000) suggestion, cognitive demands on the task are significantly reduced. Clements and Perner (1994), using an anticipatory looking paradigm, showed false beliefs understanding in 2 years and 11 month-old children; in Southgate, Senju and Csibra (2007), using the same experimental paradigm, the age of false beliefs understanding was lowered to 25 months. Recently Buttelman, Carpenter and Tomasello (2009) carried out a study using an active helping paradigm. This study showed false belief understanding in 18 month-old infants.

## **5. Conclusions**

In conclusion, we can say that the use of linguistic negation in its complex form entails the ability of understanding false beliefs. Children acquire this form of negation by the age of 2 and a half years. Hence, linguistic negation is a proof that young children understand other people's representational mental states. Children understand that other people have mental states representing the world before their third birthday, and before their third birthday they understand that these representations might be false, not exactly matching the world itself. Indeed, the ability of mindreading shows a gradual development. It is possible to identify different levels of mindreading. The first entails the ability to implicitly attribute mental states and intentions, mainly motor intentions, to others. The second level implies the capacity to explicitly reason about other people mental states (desires, beliefs, intentions, etc...). A third level implies the ability to reason about other people mental states concerning, in their turn, again other people mental states (eg. "I know/believe/predict that John knows that Mary knows"). Accordingly, different kinds of the false-belief test, are usually run. As we have seen, Clements and Perner (1994), Southgate, Senju and Csibra (2007), and Buttelman, Carpenter and Tomasello (2009) showed false belief understanding in very young infants. In these studies, children are not requested to explicitly and verbally reason about other people's intentions. Their helping behaviours and their eye gaze directions seem to suggest false belief understanding.

False-belief task can also be explicit and verbal and it can test first and second order mental representations. Indeed, in the “Anne and Sally” test (WIMMER AND PERNER 1983) the experimenter can ask children about Anne (false) belief or he can ask about what Sally knows that Anne knows. The former is a first-order mental representation test and it is passed by children around the age of 4 years; the latter is a second-order mental representation test and only children after their 4 years of age are usually able to pass the test. The use of denial seems to suggest the ability to attribute first-order mental states and to understand false beliefs even though children are not yet able to pass the “Anne and Sally” test.

Thus, psycholinguistic studies on linguistic negation add further evidence about the reliability of the false belief test as a proof of Theory of mind. By passing this test, children certainly show that they have a complex mindreading ability. On the other hand, not passing the test is not a proof that children cannot understand other people’s mental states.

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