ON THE NATURE OF LANGUAGE ACQUISITION

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SUMMARY
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ON THE NATURE OF LANGUAGE ACQUISITION

Language acquisition seems much like the growth of organs generally; it is something that happens to a child, not that a child does. And while the environment plainly matters, the general course of development and the basic features of what emerges are predetermined by the initial state (which is) a common human possession. (Noam Chomsky - New Horizons in the Study of Language, MIT class lecture, 1997)

KEY POINTS:
In this chapter you will learn about:
• the innateness hypothesis
• the role of the linguistic input in the process of acquisition
• the relationship between language acquisition and general cognitive development
• the modularity of mind and language
• the critical period hypothesis

1. Introduction

How does a baby's babbling turn into words? How does a child begin to utter strings of words and then more and more complex sentences? Why do very young children choose to utter words instead of chirping or barking, even when they hear a pet chirp or bark every day? Why are humans the only creatures that possess this skill called language? What does this skill tell us about our mind, about the properties of our brain? Is it one more cognitive skill, similar to all the others? Why can we simply grow up speaking but still have trouble when, later in life, we want to learn a second or a third language?

Linguists, psychologists and neurobiologists have been trying to find an answer – from different perspectives – to these eternally fascinating questions (and to many related ones) in an attempt at gaining a better understanding of the relation(s) between brain-mind-language. In what follows, the focus will be on what linguistic theory can tell us about the acquisition of language, though results from other fields, which can provide support in favour/against the hypotheses put forward by linguistic theory, may be occasionally invoked.

The general perspective will be the one provided by generative linguistics; behaviour and its products will be seen as "data that may provide evidence about the inner mechanisms of mind and the ways these mechanisms operate in executing actions and interpreting experience" (Chomsky 1997, MIT class lecture). Within such a perspective, the goal of the linguist is not only to describe language but also to account for the origin of language knowledge and for the process which leads to knowledge of one particular language; equally important, one has to explain how "different learners converge on similar mental representations on the basis of dissimilar environments"
(Crain 1991:597), i.e. one has to account for the fact that the process of acquisition is fairly uniform across speakers.

Analysis of child speech can help us better understand what is universal and how the system of language is organised.

2. Input and acquisition

2.1 The question

The study of language acquisition reveals that, at a very early age, the child is acquiring words and structures at a very high rate. Markman (1994) reports data from other studies about the speed at which a child can acquire vocabulary. It seems that by the age of six children already know 9,000–14,000 words, which means that they learn approximately 9 words a day from about 18 months on. It is also beyond doubt that the child can create and understand strings of words, which he/she did not hear in the input. By the age of 5, he/she has (almost) adult-like knowledge of the grammar of the target language. Complex sentences and complex structures are used and understood in an adult-like fashion.

The obvious question is how this is possible. The linguistic input which children receive is deficient: it does not always consist of complete grammatical sentences and it is limited. How can human beings who are exposed to an environmental linguistic stimulus, which is "impoverished, unstructured and fairly random" (Hornstein and Lightfoot 1981:13) acquire a rich system of knowledge which is structured and, by all means, non-random? This problem has been known in the literature as the logical problem of language acquisition (Baker and McCarthy 1981, Hornstein and Lightfoot 1981), as the poverty of the stimulus or as Plato's problem¹ (Chomsky 1986, 1988).

Besides this question, there is also the so-called developmental problem (Felix 1984) which is related to the question of "why natural languages are acquired the way they are, i.e. how can the regularities that have been observed in real-time acquisition processes be explained? " (Felix 1984:133).

One classical explanation is that children acquiring language can overgeneralise, use analogy, are good imitators and are constantly corrected by their elders, who provide the right type of input for acquisition to take place.

A different type of explanation is that the child’s linguistic development is fully determined by genetic properties. The claim is that human beings are endowed with the language faculty, one component of the human mind, which consists of innate, genetically determined principles. On this view, the process of language acquisition is constrained by some specific linguistic knowledge.

In what follows these two main hypotheses will be discussed.

¹ In Plato’s *The Meno* Socrates leads, through questions, an uneducated boy to the discovery of theorems of geometry. The assumption is that the boy, who had never been taught any mathematics at all, could discover theorems of geometry because he had some previous knowledge (from an earlier existence) which was reawakened in his mind through the questions Socrates asked. This problem was later rephrased by Bertrand Russell:“How comes it that human beings, whose contacts with the world are brief and personal and limited, are able to know as much as they do know?” One can easily see that the same problem arises in the case of language acquisition. (Chomsky 1988).
2.2 General learning strategies

2.2.1 ... and why they cannot explain it all

One traditional explanation of how children acquire language maintains that the ability to form and interpret novel strings of words is based on domain-general procedures that are at the core of other types of learning. In order to learn how to speak, the child would have to resort to general-domain procedures, such as analogy, abstraction, connection between categories, detection of novelty, which are operative in any other domain of cognition. The process of language development is said to be constrained by the children's inherent cognitive capabilities and/or the social environment. Such a view is rooted in the behaviourist tradition, which defines human behaviour as a mere reaction to present and past stimuli, leaving no room for linguistic knowledge abstracted away from stimulus/response behaviour. The role of social and cognitive factors is emphasised.

One well-known linguist who applied the behaviourist theory to the study of language was Leonard Bloomfield, who argued that "a regular analogy permits a speaker to utter speech-forms which he has not heard" (1933:275).

Though one cannot deny the role of social interaction or of general learning mechanisms in the acquisition of language, one cannot ignore the overwhelming evidence which shows that "language growth", especially syntactic development, cannot reduce to analogy, connections, abstraction or social interaction. The relation which exists between the primary linguistic data (PLD) to which the child is exposed and the output grammar may rely on principles which are not operative in other kinds of learning and which can account for the huge amount of creativity in language development as well as for the speed with which children acquire language. Language is much more than a mere mapping between cognition/social categories and linguistic patterns.

2.2.2 Structure dependence

One main assumption of generative linguistics is that sentences have hierarchical structure and hence syntactic operations are stated in terms of hierarchical operations which are dependent on structure and not on linear ordering, i.e. operations cannot rely on relations such as "first", "second", "closest", etc. This is the so-called Structure-Dependence Constraint, defined as 'an innate schematism applied by the mind to the data of experience' (Chomsky 1971).

An interesting area for investigating whether children rely on structure-independent hypotheses or on deeper principles in the process of language acquisition is the area of YES/NO questions because they seem to be consistent with both structure-dependent and structure-independent rules. Let us consider the following pairs of sentences:

(1)  a. Bob is clever. / Is Bob clever?
     b. You are hungry. / Are you hungry?
     c. You can follow me. / Can you follow me?

At first sight, the examples in (1) above may lead to the conclusion that YES/NO question formation in English relies on linear ordering. In order to create a YES/NO question, one has to apply the rule stated in (2):
(2) Front the first or the leftmost verbal element (is/can/have/etc.) in the sentence.

This will produce the correct interrogative sentence in the case of a-c in (1) above where indeed the first verbal element has been fronted with grammatical results:

(3) Bob is clever.
   You are hungry.
   You can follow me.

However, if one wants to form a YES/NO sentence whose declarative counterpart is (4a) below the structure-independent rule stated in (2) would no longer apply; (4b) is ungrammatical:

(4) a. The boy who is passing by is my brother.
    b.*Is the boy who -- passing by is my brother?

The ungrammaticality of (4b) points to the fact that Subject-Auxiliary Inversion (SAI) is not a structure-independent rule. The subject in (4a) is “the boy who is passing by” and the first verbal element is the auxiliary is in is passing. If rule (2) applies the result is ungrammatical:

(5) The boy who is passing by is my brother.

The ungrammaticality in (4b) shows that if the first verbal element is in a Relative Clause it cannot be fronted. The structure-independent hypothesis cannot yield the desired result; a structure-independent rule cannot apply in complex sentences.

As the hypothesis which relies on linear order is computationally simpler and since questions of the type in (1) are probably more often present in the input which a very young child receives one might imagine that children start with a structure-independent rule. However, from the point of view of learnability, such an assumption cannot account for how children manage to get rid of this rule and come to know that (4b) is incorrect, i.e. it cannot explain how the child gets rid of the structure-independent hypothesis and adopts the structure-dependent one. Chomsky (1971) argues that children always apply structure-dependent hypotheses in the process of language acquisition.

Crain and Nakayama (1987) designed two experiments which tested precisely this claim, pointing out that children do not overgeneralise from cases like the ones illustrated in (1) to cases like the ones illustrated in (4). The first experiment elicited productions of YES/NO questions from 30 children of mean age 4; 7. Each child had to ask a doll named Jabba particular questions about a set of pictures. The experimenter told the child: Ask Jabba if .... For example, Ask Jabba if the boy who is watching Mickey Mouse is happy. 60% of the questions which the children produced were correct, which proves that the children applied the structure-dependent hypothesis.
The second experiment focused on the explanation of the errors made by the children in the first experiment. None of the mistakes the children made was caused by the application of the structure-independent hypothesis. The results lend support to the claim that children use structure-dependent hypotheses in the process of language acquisition.

2.2.3 Wanna contraction

Speakers of American English tend to contract want to in ordinary speech. However, the contraction is not permitted in all contexts. As the examples in (6) and (7) illustrate, contraction is licit when the embedded direct object is extracted (6b) but illicit when the embedded subject is extracted (7b):

(6)   a. Who, do you want to see t,?
b. Who, do you wanna see t,?

(7)   a. Who, do you want t, to kiss you?
b.* Who, do you wanna t, kiss you?

Sentences like (7b) are not used in adult language. Their ungrammaticality derives from principles of grammar, which are not transparent in the input. Let us have a look at the representations which result after movement from object position has applied (8)–(9) and after movement from subject position has applied (9)–(10):
(8) 

CP

2

C'

2

C^0

IP

2

DP

I'

you

2

I^0

VP

present tense

2

V'

2

V^0

CP

want

2

C'

2

C^0

IP

2

D

I'

you

2

I^0

VP

to

2

V'

2

V^0

date

5

[+WH]

who

wh-object movement
(9)

```
CP
2

who
2

C
IP
tense
2
do
DP
you
2

I
VP

t
2

V
2

V
CP

intermediate trace  |  want
t
2

C
IP
2

I
2

I
VP

to
2

V
2

V
DP [WH]

see
5
```
(10)  

want 2  

to 2  

who 2  

who 2  

{present} 2  

you 2  

dp 2  

ip 2  

c_o 2  

c_r 2  

c' 2  

ip 2  

c_r 2  

ip 2  

c' 2  

c 2  

cp 2  

c 2  

c 2  

vp 2  

vp 2  

subject movement
In (11) the original trace intervenes between want and to, blocking contraction.

Assuming that the young learners appeal to analogy and that the PLD contain (only) possible pairs of sentences, we would expect a child’s grammar to create subject sentences like (7b). But there is evidence that such sentences do not occur in early speech production.

Crain and Thornton (1991) tested for the early emergence of knowledge of this restriction. They elicited long-distance *wh*-questions (both subject and object extraction questions) from 21 children who ranged in age from 2; 10 to 5; 5. The results clearly pointed out that at very early age children know this restriction: they do not contract when extracting the subject. Children’s production of subject-extraction questions with an illicit contraction was practically insignificant (4% of the time), in spite of their clear preference to contract when asking object *wh*-questions and when they contracted 59% of the time.
2.2.4 Backward anaphora

Crain and Thornton (1998) provide further evidence that children do not apply the usual learning-theoretic strategies in the acquisition of language. This time evidence comes from the area of meaning.

In adult language, a sentence like (12a) can only be interpreted as in (12b); (12c) is deviant:

(12) a. He danced while the Ninja Turtle ate pizza.
    b. Hei danced while the Ninja Turtlei ate pizza.
    c. *Hei danced while the Ninja Turtlei ate pizza.

At first sight, one may reach the conclusion that (12c) is impossible because the pronoun precedes the noun with which it is co-indexed. However, this “linear” explanation cannot account for those cases when the temporal clause precedes the matrix and when the restriction no longer applies. (13a) below is ambiguous: it can be interpreted either as in (13b), where he and the Ninja Turtle refer to different individuals, i.e. they do not have the same referent, or as in (13c), where he and the Ninja Turtle have the same referent.

(13) a. While he danced the Ninja Turtle ate pizza.
    b. While hei danced the Ninja Turtlei ate pizza.
    c. While hei danced the Ninja Turtlei ate pizza.

(Crain and Thornton 1998:25)

This means that in spite of the fact that the pronoun precedes the noun, they can be co-indexed. Linear order is irrelevant. Deeper principles should be looked for. (12c) is impossible because the pronoun c-commands the co-indexed nominal:

(14) CP
    2
    C'
    2
    C
    0
    IP
    2
    Spec
    he
    2
    I'
    2
    I
    0
    VP
    past
    2
    V'
    2
    V
    0
    AdvP
    dance
    5
    while the Ninja Turtle ate pizza

Children have knowledge of binding principles at an early stage; in particular, they know that a pronoun cannot be co-indexed with a noun which it c-commands.

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2 This interpretation represents a violation of what has been called Principle C of Binding Theory: If a pronoun precedes a referential NP (i.e. an R-expression), then they cannot both refer to the same object if the pronoun c-commands the NP. C-command is defined as follows: A c-commands B if the constituent immediately dominating A also dominates B. For a more detailed explanation of Binding Principles, see for example Cornilescu (1995), Haegeman (1991/1997), Cook (1988) or Radford (1988).
In (14) the pronoun he c-commands the nominal the Ninja Turtle because IP, the constituent immediately dominating he, also dominates the Ninja Turtle.

If children relied (only) on general learning mechanisms (such as analogy, overgeneralisation and the like), we would expect them to find both (12a) and (13a) ambiguous, i.e. to believe that (12c) is a possible interpretation of (12a).

Crain and McKee (1985) used the Truth-Value Judgement Task\(^3\) to test 62 children (mean age 4; 2) for knowledge of the restriction which applies in (12) but not in (13). It was found that children rejected interpretations of the type in (12c) (i.e. co-reference between the pronoun and the NP) 84% of the time but they were willing to assign the interpretation in (13c) to (13a) (i.e. the pronoun and the NP can refer to the same "individual" when the pronoun does not c-command the NP).

### 2.2.5 Baker's Paradox\(^4\)

One often-invoked argument against analogy or generalisation comes from the Dative Alternation/Construction in English. Verbs like give, tell, send can enter either the structure in (15a)/(16a)/(17a) or in (15b)/(16b)/(17b) in the pairs of sentences below:

\[
\begin{align*}
(15) & \quad \text{a. John gave a book to Mary.} \\
& \text{b. John gave Mary a book.}
\end{align*}
\]

\[
\begin{align*}
(16) & \quad \text{a. John told a story to Mary.} \\
& \text{b. John told Mary a story.}
\end{align*}
\]

\[
\begin{align*}
(17) & \quad \text{a. John sent a letter to Mary.} \\
& \text{b. John sent Mary a letter.}
\end{align*}
\]

Suppose now that a child receives an input which contains sentence pairs of the type in (15)–(17) above. The generalisation which follows is that any verb with an argument structure of the type: NP\(_1\)–NP\(_2\) to NP\(_3\) (as in the a examples) can also have the argument structure NP\(_1\)–NP\(_3\) NP\(_2\) (as in the b examples). However, there are verbs like donate, whisper or report which, though allowing the former structure, are incompatible with the latter:

\[
\begin{align*}
(18) & \quad \text{a. John donated a book to the library.} \\
& \text{b. *John donated the library a book.}
\end{align*}
\]

\[
\begin{align*}
(19) & \quad \text{a. John reported the incident to Mary.} \\
& \text{b. *John reported Mary the incident.}
\end{align*}
\]

If language acquisition reduced to general learning mechanisms, we would expect children to believe that (18b) and (19b) are possible, generalising the Dative alternation property to these verbs as well. How do children avoid structures like the one in (18b) and in (19b) with verbs such as donate, for example? The question is more intriguing than it might seem at first sight. The analysis of corpora of child English (CHILDES\(^5\),

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\(^3\) The Truth-Value Judgement task is a comprehension technique used to investigate children's understanding of the meaning of sentences. "The Truth Value Judgment task can be used to tell if sentences are ambiguous or unambiguous for children and adults. The distinction between unambiguous and ambiguous sentences proves to be crucial in demonstrating children's adherence to certain linguistic principles, known as constraints." (Thornton and Crain 1998:2)

\(^4\) Baker was the first one to discuss the phenomenon in detail in an influential paper in 1979; hence the label of "Baker's Paradox".

\(^5\) CHILDES = The Child Language Data Exchange System, a database of transcripts, programs for computer analysis of transcripts, methods for linguistic coding, and systems for linking transcripts to digitised audio and video.
MacWhinney and Snow (1985, 1990) reveals that children learn the double object dative several months before they learn the to-construction, i.e., during these months, the child can only use the double object construction which is not possible with the verbs mentioned above (Snyder and Stromswold 1997). However, no mistakes of the type illustrated in 18b or 19b have been found.

One should note, though, that the argument is rather weak. The authors of the study do not mention if in the corpora they have analysed the children did use (in any structure) any of the verbs which are incompatible with double object constructions.

One of the "influential" solutions to the so-called Baker's paradox is the one put forward by Pinker (1989) and by Grimshaw (1989): there are semantic and morphophonemic constraints which apply in the case of the verbs compatible with the double object construction and children seem to be sensitive to these constraints. But if the constraints are semantic, they seem to be primarily linked to lexical learning and hence they may be arrived at via mechanisms which are not necessarily language specific. Moreover, the verbs which cannot undergo Dative Shift are verbs which are acquired rather late. Baker's Paradox does not seem to be a very strong argument against a learning-theoretic account of language acquisition.

Pinker (1989) examines other English constructions which create a similar learning problem and which fall, according to him, under the same paradox. For example, he notices that (20a) below has a passive counterpart, whereas (21a) does not, in spite of the similarity of structure evinced by the a sentences:

(20) a. John touched Fred.
    b. Fred was touched by John.
(21) a. John resembled Fred.
    b. *Fred was resembled by John. (Pinker 1989:8)

These examples, as well as the so-called "causative alternation" (illustrated in 22–24 below) and the "locative alternation" (illustrated in 24–25) point to the fact that analogy cannot always explain linguistic facts.

(22) a. The ball rolled.
    b. John rolled the ball.
(23) a. The baby cried.
    b. *John cried the baby. (Pinker 1989:8)
(24) a. Irv loaded eggs into the basket.
    b. Irv loaded the basket with eggs.
(25) a. Irv poured water into the glass.
    b. *Irv poured the glass with water. (Pinker 1989:8)

In light of the arguments above we can conclude that the linguistic input is not informative enough with respect to some constraints which encode language knowledge, it is not always transparent with respect to certain rules. It does not provide information that some sentences are ungrammatical or that some interpretations are disallowed. Or, in Hornstein and Lightfoot's (1981:10) terms:

Children are not systematically informed that some hypothetical sentences are in fact ungrammatical, that a given sentence is ambiguous, or that certain sets of sentences are paraphrases of each other, and many legitimate and acceptable sentence-types may never occur in a child's linguistic experience.

However, children come to know facts about language for which there is no clear
The second conclusion we can reach is that the strategy/ies children use when acquiring language on the basis of this deficient input cannot rely (solely) on learning mechanisms which they use in other domains of cognition. A different explanation should be looked for.

2.3 The Innateness Hypothesis

A different explanation arose in the 1950s, in the context of what has been called "the cognitive revolution", when scientists turned their attention to the inner mechanisms which enter into thought and action. The view of language as an independent, unique cognitive system, which involves innate, faculty-specific mechanisms, replaces the view that language is response and stimulus. The idea that there is a mental basis of language is put forward. On such a view, language cannot be accounted for (only) by social or pragmatically based approaches. Within such a general approach, Plato's problem can be solved in a different way, which can explain that, in spite of the deficiency of the PLD to which children are exposed, they are able, in the end, to deal with an infinite range of language structures. If the linguistic input cannot be fully responsible for the acquisition of this skill, it means that children somehow "know", independently of experience, the principles which govern the linguistic constructs, that they have some innate "knowledge" of the constraints (of form and meaning) which are at work. The input which they receive is filtered by a special device, by a special faculty, specific to humans and which can explain the paradox of acquisition:

<table>
<thead>
<tr>
<th>INPUT</th>
<th>DEVICE</th>
<th>OUTPUT</th>
</tr>
</thead>
</table>

The output grammar is the result of the interplay between the PLD and this filtering device called "the language acquisition device" (LAD). Or, in Chomsky’s (1997) terms, ‘each language is the result of the interplay of two factors: the initial state and the course of experience’. We do not have any direct evidence of what exactly is inside this LAD. But we have direct access to the PLD and to the output grammar. Their study can obviously tell us a lot about the mechanisms which are part of the LAD and which allow language acquisition to take place. And, if children have some a priori knowledge of constraints, independent of the input which they receive, it might be the case that some aspects of our knowledge are innate, that they are part of our biological endowment. The child approaches the task of acquisition with a system of assumptions about the structure of language. The process of acquisition reflects a cognitive capacity which is biologically determined. The crucial part of this species-specific property is defined by Chomsky (1980:33-34) as:

Were it not for this highly specific innate endowment, each individual would grow into some kind of amoebic creature, merely reflecting external contingencies, one individual quite unlike another, each utterly impoverished and

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6 For arguments against the domain-specificity of language acquisition, see, for example, Bates & MacWhinney (1987) or MacWhinney and Bates (1989) according to whom: The universal properties of grammar are only indirectly innate, being based on interactions among innate categories and processes that are not specific to language. In other words, we believe in the innateness of language, but we are skeptical about the degree of domain-specificity that is required to account for the structure and acquisition of natural language [...] We suggest that more general principles of pattern detection and distributional learning are sufficient for the task (MacWhinney and Bates 1989:10, 26).
lacking the intricate special structures that make possible a human existence and that differentiate one species from another.

Within a cognitive approach, language has been defined as a psychological faculty, a mental organ, a computational module, an instinct. Pinker (1994), who prefers the term instinct, argues that language is part of our biological birthright, 'an evolutionary adaptation, like the eye, its major parts designed to carry out important functions', a specialised skill 'which develops in the child spontaneously, without conscious effort or formal instruction, is deployed without awareness of its underlying logic, is qualitatively the same for every individual, and is distinct from more general abilities to process information or behave intelligently'7.

That children are biologically preset to acquire language is supported by studies which show that infants can make a distinction between linguistically-relevant and non-linguistic signs (Mehler & Bertoncini 1983), they are able to distinguish their mother tongue from other languages (Mehler et al. 1986), are sensitive to word-boundaries well before they can actually speak (Gleitman et al. 1988), as well as to linguistic stress, vowel duration, rising and falling intonation. As will be shown in the following chapters, the idea that there is a biological programme for language acquisition is also supported by facts about language development: there is an orderly progression of stages, i.e. children acquire structures in a distinct sequence, there is a critical age beyond which our ability to acquire language is significantly impaired or, at least, significantly reduced, it has also been assumed that parameters are subject to maturation. All these facts make language development analogous to other biologically triggered phenomena.

However, one should also be aware that the language faculty is based on properties which are unusual among biological systems, among which the property of discrete infinity. We can construct an infinity of expressions which reflect our thoughts, feelings, etc. from a finite number of sounds; and we somehow "know" that linguistic units are discrete units, that there are three or four word sentences but not three-and-a-half word sentences (Chomsky 1997).

It should be clearly stated at this point that arguing in favour of the view that language is part of our biological endowment does not mean denying the role of the environment nor does it mean that language development is completely independent of cognition in a general sense. The child does extract information from the input and reacts to it in accordance with the constraints provided by the LAD. The child does extract information from the input and reacts to it in accordance with some innate constraints. In this sense, the input is important and there is "learning". However, language development facts suggest that there is more to language acquisition than input and "learning".

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7 As Pinker (1994) acknowledges, the conception of language as a kind of instinct goes back to Darwin who, as early as 1871, in "The Descent of Man" advanced the idea that Language is like an art, like brewing or baking...It certainly is not a true instinct, for every language has to be learned. It differs, however, widely from all ordinary arts, for man has an instinctive tendency to speak, as we see in the babble of our children; while no child has an instinctive tendency to brew, bake or write [...], [it is] an instinctive tendency to acquire an art.'
2.4 The Role of the Linguistic Input

2.4.1 The questions

So far it has been pointed out that language would be extremely difficult if not impossible to acquire if the child were not innately equipped with knowledge of constraints which is part of the LAD, the device that filters a deficient input which does not provide any clue that some sentences are illicit or that some particular interpretations are disallowed, i.e. an input which provides no negative evidence. Such a view raises, however, two questions:

(i) is there indeed no negative evidence, of any type, in the input?
(ii) if language acquisition is defined as a process which relies on some inner mechanisms which exist in the LAD, which is the role of the input, deficient as it might be?

Let us tackle the two questions one by one.

2.4.2 On negative evidence

More often than not, when linguists refer to "negative evidence" they mean that the input which the child receives does not contain any explicit or direct information with respect to ungrammatical forms or illicit interpretations (i.e. the child only receives positive evidence that a particular structure does exist in the language, with one particular interpretation).

A second argument often invoked in favour of the "no negative evidence" hypothesis comes from the area of corrective feedback; parents only rarely provide corrective feedback with respect to ungrammatical forms. Brown and Hanlon (1970), among many others, point out that parents respond to the truth value of their children's sentences but do not correct ungrammatical forms. They examined adults' responses to the utterances of three English-speaking children. The three corpora provide evidence that parents do not react to their children's ill-formed utterances. They are more likely to express disapproval when the sentence is not 'true' and to occasionally correct phonological errors.

Morgan and Travis (1989) also argue that corrective responses do not occur with sufficient frequency or regularity in the input to be considered essential for learning. Very often, correction may not help at all. The literature provides some anecdotal examples of how oblivious to correction children can be:

(26) Child: *Want other one spoon, daddy.*
Father: *You mean, you want the other spoon.*
Child: *Yes, I want other one spoon, please Daddy.*
Father: *Can you say "the other spoon"?*
Child: *other...one... spoon.*
Father: *Say "other".*
Child: *Other.*
Father: *"Spoon".*
Child: *Spoon.*
Father: *"Other spoon".*
Child: *other...spoon. Now give me other one spoon.* (Braine 1971:161)
(27) Child: *Nobody don't like me.*
Mother: No, say "nobody likes me".
Child: *Nobody don't like me.*
...
(eight repetitions of this dialogue)
...
Mother: No, now listen carefully; say "nobody likes me".
Child: Oh! *Nobody don't likes me.*

(McNeill 1966, reported in Jackendoff 1994:22)

Corrective responses do not seem to prevent the child from persisting in making mistakes.\(^8\)

Saxton (1997), on the other hand, provides evidence that the child's immediate responses to negative input are often consistent with its corrective function:

(28) Child: *It's even gooder than anything.* (repeated 4 times)
Adult: Yes, it's better.
Child: Better, yeah.

(29) Child: *That policeman falled all the way down to the tiger.*
Adult: He fell down.
Child: Yes, he did. He fell down 'caus he likes that tiger.

(Saxton 1997:146)

He reaches the conclusion that 'naturalistic data reveal that children sometimes shift from erroneous to correct versions of particular structures following the intervention of negative evidence' (p.147) and he puts forward a "Contrast Theory of Negative Input" according to which negative evidence is more effective than positive input.

A few remarks are in order here. What Saxton actually means by "negative evidence", or "negative input" is 'any kind of adult response, contingent on child grammatical errors, which embodies information conducive to the realignment of an overgeneralised grammar', i.e. closer to what has been called "implicit negative evidence" than to "negative feedback" or "correction". He explicitly says that negative input may or may not contribute to the process of acquisition. Importantly, providing evidence that children respond positively to "negative evidence" does not automatically provide evidence that the effects of correction are long-term ones.

While it is true that the input only rarely provides direct negative evidence and that, even when it does, the effects of correction are far from relevant for the process of acquisition, one cannot deny that it provides what has been called in the literature "indirect negative evidence", defined as follows:

A not unreasonable acquisition system can be devised with the operative principle that if certain structures or rules fail to be exemplified in relatively simple expressions, where they would be expected to be found, then a (possibly marked) option is selected excluding them in the grammar, so that a kind of "negative evidence" can be available even without corrections, adverse reactions, etc. (Chomsky 1981)

\(^8\) For a different point of view, see Hirsch-Pasek et al. (1984) or O'Grady (1997). The latter shows that a closer look at the data presented by the above authors actually reveal that 'parents are in fact responding inconsistently to well-formedness - sometimes repeating a grammatical sentence and ignoring an ungrammatical sentence, and vice versa.'(p. 257)
One example of the child's resorting to this type of evidence is associated with the acquisition of the null subject parameter which distinguishes between languages like Italian, Romanian, Spanish or Chinese (which allow sentences with null subjects) and languages like English, German or French where the subject must always be overtly expressed. Let us assume that the target language is English, which has the negative value for this parameter. It seems that the child mistakenly hypothesises, during early stages, that the value for this parameter is positive in English and will come up with sentences like the one in (30), which do not exist in adult grammar:

\[(30) \text{Eat apples.}\]

In this case the hypothesised target language contains structures which do not exist in the adult language. But the child will not hear such structures in the input, which will provide indirect evidence that such a structure does not exist in English. On the basis of this indirect evidence, the child will correctly (re)set the parameter and drop null subject sentences out of his/her grammar.

One more distinction which one should take into account when discussing correction is the one between correction which is/is not essential for the acquisition of language and correction which is/is not helpful. The study of Morgan and Travis (1989), where the relation between corrective feedback (to inflectional overgeneralizations, such as 'teached' instead of 'taught', or 'mans' instead of 'men', etc. and to wh-question auxiliary-verb omission errors) and "corrected" output in the sets of transcripts from Adam, Eve and Sarah (the Brown 1973 corpus, CHILDES) is examined, argues that parental responses do not occur with sufficient frequency, are not distinctive enough to be reasonably recognisable and they do not continue to occur as long as the mistakes persist. At the same time, one cannot deny that certain types of feedback may help the learner and may account (to a certain extent) for the different speed with which individuals acquire particular structures or lexical items. What empirical data show is that, while negative correction does exist in the linguistic input to which a child is exposed, its presence/absence is not essential for the process of language acquisition. When present, it might facilitate the learning process, but its absence will not lead to lack of acquisition or to an ever-ungrammatical output. Children who do not receive parental correction will fare through the course of language acquisition just as those who receive negative feedback.

So far it has been shown that the PLD only rarely contain explicit negative evidence. It also seems that even negative feedback is not frequent or distinctive enough to guarantee acquisition. This raises the obvious question: what is the role of the input? What has been said so far may lead to the conclusion that the PLD as such are not relevant in any way in the process of language acquisition. But the question itself is misleading. It is one thing to say that the input does not provide all the necessary information one needs in order to acquire language and that, by all means, the child must have some a priori "knowledge" which should help the child at least to parse the input. The child should be somehow ‘prepared’ to detect certain properties of the strings of sounds:

Preparedness to detect certain aspects of the signal might therefore amount to an internal specification of input to learning[...:] input is not solely external to the learner (‘out there’ in the objectively describable world) but rather part of a complex specification of the internal representation capacities and possible mental states of a learner (Carroll 1999:39).

But it is quite another thing to say that the input is irrelevant in the child's linguistic development. Because one simply cannot deny the role of the input, be it for the mere reason that a child who is exposed to English will speak English, a child who grows up in a
bilingual environment will end up speaking both languages which are present in the PLD to which he/she is exposed. Acquisition of lexical items is extremely sensitive to input. Some restrictions on lexical alternations may be established on the basis of exposure to the PLD. It has also been shown that a certain type of input may speed the acquisition of particular aspects of the lexicon or of grammar (Snow and Ferguson 1977).

2.4.3 Motherese

The idea that input is important in language acquisition has been associated with the concept of motherese. Gleitman, Newport, and Gleitman (1984) discuss the view that ‘the special properties of caregiver speech are required for language acquisition to occur’ (p.45). This claim is rooted in the belief that mothers’ speech (hence the name of ‘motherese’) or caretakers’ speech to children evinces properties which set it apart from the speech to adults or to older children and which facilitate the process of acquisition.\(^9\)

Some of these properties are given in Table 1, taken from O’Grady (1997:250):

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Main Properties of Motherese</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Paralinguistic</strong></td>
<td></td>
</tr>
<tr>
<td>Slower speech with longer pauses between utterances and after content words</td>
<td></td>
</tr>
<tr>
<td>Higher overall pitch; greater pitch range</td>
<td></td>
</tr>
<tr>
<td>Exaggerated intonation and stress</td>
<td></td>
</tr>
<tr>
<td>More varied loudness pattern</td>
<td></td>
</tr>
<tr>
<td>Fewer disfluences (1 disfluency per 1000 words vs. 4.5 per 1000 for adult-to-adult speech)</td>
<td></td>
</tr>
<tr>
<td>Fewer words per minute</td>
<td></td>
</tr>
<tr>
<td><strong>Lexical</strong></td>
<td></td>
</tr>
<tr>
<td>More restricted vocabulary</td>
<td></td>
</tr>
<tr>
<td>Three times as much paraphrasing</td>
<td></td>
</tr>
<tr>
<td>More reference to the here and now</td>
<td></td>
</tr>
<tr>
<td><strong>Semantic</strong></td>
<td></td>
</tr>
<tr>
<td>More limited range of semantic functions</td>
<td></td>
</tr>
<tr>
<td>More contextual support</td>
<td></td>
</tr>
<tr>
<td><strong>Syntactic</strong></td>
<td></td>
</tr>
<tr>
<td>Fewer broken or run-on sentences</td>
<td></td>
</tr>
<tr>
<td>Shorter, less complex utterances (approx. 50% are single words or short declaratives)</td>
<td></td>
</tr>
<tr>
<td>More well-formed and intelligible sentences</td>
<td></td>
</tr>
<tr>
<td>Fewer complex utterances</td>
<td></td>
</tr>
<tr>
<td>More imperatives and questions (approx. 60% of total)</td>
<td></td>
</tr>
<tr>
<td><strong>Conversational</strong></td>
<td></td>
</tr>
<tr>
<td>Fewer utterances per conversation</td>
<td></td>
</tr>
<tr>
<td>More repetitions (approx. 16% of utterances repeated within 3 turns)</td>
<td></td>
</tr>
</tbody>
</table>

The existence of 'motherese', also called baby talk, caretaker speech or parental speech, described as ‘well formed and finely tuned to the child’s psycholinguistic capacity’ (Snow and Ferguson 1977), has been widely taken as an argument against the nativist position; on such a view, children can acquire syntax so fast because of the features of their elders’ speech, and the role of innate language-learning devices should not be emphasised. But it is obvious that the presence of short, clear, high-pitched forms in the input cannot solve the problems raised by the deficiency of the PLD. Nothing in motherese is more informative with respect to which sentence is ungrammatical or which meaning is disallowed. There are often mismatches between early child language and

\(^9\) It has also been noticed that infants seem to prefer motherese to ordinary speech (probably because of the prosodic properties of the former).
their elders’ speech. For example, the latter very often contains more questions and imperatives, while declaratives are used more rarely than in ordinary speech (see Table 1). One would then expect children to use many questions and directives in early speech, which they do not. It seems that there is no correlation in this respect between the existence of motherese and the acquisition process. Studies of patterns of developmental change in children’s use of verbs have also pointed out that these patterns could not be detected in the input provided by the parents.

Moreover, it has been shown that motherese is associated with certain social classes whereas it might be totally absent with others (Pinker 1994a). It may also differ from one ethnic group to another. For example, it has been observed that Japanese mothers and fathers do not change their intonation when they address their little children (de Boysson-Bardies 1999). Since children from all classes and of all nationalities are able to acquire language, regardless of whether they have been exposed to motherese the only conclusion that seems common-sensical is that the use of this special type of linguistic input is not critical to the acquisition process.

On the other hand, one cannot deny that the input is helpful, that it may facilitate the process of language acquisition. For example, there is evidence that the frequent use of YES/NO questions in motherese leads to the early acquisition of auxiliaries (Newport, Gleitman and Gleitman 1977). Also, some properties of the linguistic input clearly facilitate the process of segmentation of the linguistic stream at early stages of development. Shady and Gerken (1995) argue that 2 year olds are sensitive to pitch changes and use prosodic cues to locate linguistic boundaries and to assign linguistic structure. Their conclusion is that ‘both language-internal and caregiver cues appear to be helpful in early sentence comprehension’ (p. 101), and that the existence of one type of cue does not decrease the role of the other.

Input can also provide a "friendly" environment which facilitates communica-tion. But, in spite of its obvious role of facilitator, motherese is not essential for the child's linguistic development. As Newport, Gleitman and Gleitman (1977) put it: ‘the finding that Motherese exists cannot by itself show that it influences language growth, or even that this special style is necessary to acquisition – despite frequent interpretations to this effect that have appeared in the literature. After all, Motherese is as likely an effect on the mother by the child as an effect on the child by the mother’ (p. 112).

One could even question the fact that such a simplified input is really finely tuned to the child's psychological capacity. Even if we assume that parents present the child with finely tuned utterances, they also present them with other utterances, less finely tuned and thus beyond the child's level of comprehension (Pine 1994). As Wexler and Culicover (1980) point out, there is no justification for the claim that a simplified input enhances or speeds language learning. If less is provided by input, more formal constraints will be needed. ‘Limiting input will make a stronger nativist case, rather than a weak one’ (Wexler and Culicover 1980:68).

Studies in second language acquisition may shed new light on the properties of the PLD. Krashen (1985) regards the notion of "comprehensible input" as crucial in second language learning. Though he does not define "comprehensible input" very clearly (it is assumed it is input that is understood by the hearer), it seems somehow clearer what it means in second language learning of lexical items. It is, however, more difficult to see what it means in the case of the learning of functional categories. O'Grady (1997) suggests that we could extend the notion to first language acquisition. In this case, comprehensible input would be an input which expresses 'identifiable meaning, independently determined', which can be inferred by reference to an understanding of
the context in which they are uttered or by resorting to lexical meanings already known. Parents could thus provide support that guides the child in solving a certain task and also in helping him/her to learn how to deal with similar tasks in the future. This is indeed obvious in the learning of word meaning, where parents can provide a finely tuned input and they can help their child to succeed in vocabulary learning. The kind of linguistic input the elders provide may be more important in the acquisition of vocabulary than in the acquisition of grammar.

So far, we have seen that the input does play a part in the linguistic growth of a child. We have also seen that language acquisition would not be possible if the child were not equipped with 'knowledge' of constraints. Does it mean that one of the most important questions to be asked is: 'Which is the important one: environment or innate knowledge?'. Pinker (1994b) points out that trying to establish whether behaviour is caused either by environment or heredity is 'just incoherent' (p. 407). He proposes the following model, which can account for the part both input/ environment and heredity/ innateness can play in the process of language acquisition:

![Language Acquisition Diagram]

It is the Language Acquisition Device, a component of the mind/brain, genetically determined, which, through interaction with the environment, turns our language faculty into an articulated system, into behaviour.

3. Acquisition and general cognitive development

3.1 Preliminary remarks

In this subsection the question of whether language acquisition is a process associated with a cognitive system derived from general human intelligence or whether it is specific to a genetically determined autonomous system, independent of general human intelligence will be addressed. The question is far from trivial and the answer to it should be taken with a grain of salt and with a lot of caution. A proper answer is still a prospect for further inquiry. However, we have reasons to believe that language is something we are endowed with (cases of severe language impairment are obviously excluded): we all end up speaking at least one language. We have also seen that general mechanisms of learning, such as analogy, cannot account for the process of language acquisition, and that, assuming that the input is not helpful enough, the child has some a priori "knowledge" of language constraints. That language faculty is a true species property, which marks the distinction between man and animal, is an idea which
cannot be denied. The fact that the attempts to teach language to other primates failed points out once again that the human brain seems to be suited for the acquisition of language in a way in which no other species is. Such facts could also lead to the idea that language is an index of human intelligence and hence a cognitive system derived from more general human intelligence. However, there is evidence (from neurology, neurobiology, and linguistics) that language or some part of language is independent of general cognitive abilities. Adopting the view that language is a separate "organ", an "autonomous" system does not imply that it does not interact with general cognitive principles.

Let us then address two questions which have a direct bearing on a possible answer to the general question we have set to answer:

(i) is language acquisition dependent on cognitive development ?
(ii) how autonomous is the language faculty?

3.2. Language acquisition and general intelligence

3.2.1 Low IQ and normal mastery of language

Evidence for the dissociation of language from other cognitive abilities comes, on the one hand, from studies of individuals who are intellectually handicapped but still show normal mastery of language and, on the other hand, from studies of individuals whose cognitive abilities are normal but whose speech is impaired.

3.2.1.1 Laura

Yamada (1990) reports of a retarded young woman, named Laura, who cannot count, do easy sums, tell the time, give her age or tie her shoes. Her auditory memory span is limited to three units, she does not know her name or the name of the country in which she lives. Her IQ is in the low 40s, but she can detect and correct grammar mistakes. She can use complex sentences (relative clauses, infinitival complements, headless relatives, complements containing participial forms) with multiple embeddings, she uses tense and agreement markers correctly, has good knowledge of (both full and agentless) passive constructions, of temporal adverbials, modifiers and adjectives and she can use elliptical utterances. But there is a discrepancy between her production and her comprehension. Though she produces a wide range of constructions in spontaneous speech, she fails to respond correctly to the same structures on comprehension tests. In conversation, her answers can be factually incorrect. Her vocabulary, measured on the Peabody Vocabulary Test, is that of a 3; 11 year old. Also, she cannot understand counterfactual questions or hypothetical conditions. Her ability to convey a clear message in conversation is diminished and she fails to use forms in a pragmatically appropriate manner.

Laura's case is interesting not only because it supports the view that language is a specialised human ability driven by principles which cannot be found in other cognitive domains. It also shows that various aspects of language (syntax and morphology, on the one hand, and semantics and pragmatics on the other hand) are separable and that they may relate in different ways to non-linguistic abilities. For example, many of Laura's semantic difficulties/errors reflect her conceptual deficiencies (with number and time, for example). Her case also shows that acquisition of syntax and acquisition of lexical
semantics may be distinct processes and that mastery of one domain does not result in mastery of the other.

The comparison between her syntactic knowledge and her vocabulary knowledge suggests that syntax does not depend upon semantics and that acquisition of the former is not related to the acquisition of the latter. Yamada (1990:119) states the relevance of this case study as follows: ‘Laura’s case is an important addition to the small list of studies that give evidence for the dissociation of language from other cognitive abilities. Her performance provides crucial empirical support for a model of language that acknowledges the multidimensional aspects of language. Aspects of language are tied to non-linguistic systems by tethers of different lengths, and some are perhaps untethered, enjoying an independent status. The data presented here strongly indicate that any viable account of language acquisition must incorporate the notion that language is at least in part governed by principles that are unique to it’.

3.2.1.2 Christopher

Smith and Tsimpli (1995) present an equally interesting case, that of Christopher. At the age of 34 he cannot look after himself (he cannot tie his shoes, cannot button his shirt, cut his fingernails or use a vacuum cleaner) but he is a polyglot. His knowledge of English, his first language, is essentially normal and he also knows some 15 foreign languages (ranging from Danish, Dutch or German to Turkish and Welsh). His ability to learn a new language seems exceptional, in spite of his intellectual deficit.

Christopher's case is very interesting because a close examination of his knowledge of language points, just like in the case of Laura, to its lack of "uniformity". On the one hand, the study of his "second" languages reveals that he has an exceptional talent for the acquisition of lexical items and of morphology, whereas his ability to learn some syntactic structures is somehow reduced. On the other hand, one can notice that his conversation is laconic and repetitive, that he cannot deal with disambiguation, metaphors, jokes or metalinguistic negation, i.e. he cannot deal with those phenomena which require an interpretive use of language and which most probably involve the interaction of his (modular) linguistic faculty with central system operations. While his case clearly provides evidence for the domain-specificity of language, it also raises the question whether language may be only partially autonomous. It may be the case that we have reasons to believe that the language faculty involves a module (in the Fodorian sense, see 3.3.) but that, at the same time, there are also facts which point out that language may also involve aspects of the central system. Or, in Smith and Tsimpli's (1995) terms: ‘the bald alternative of ‘modular/non-modular’ is simplistic, indeed false’ (p.15).

3.2.1.3 Williams Syndrome

Further evidence for a difference between the ability to acquire language and general cognitive development comes from studies of individuals with Turner's Syndrome and Williams Syndrome. They show a certain form of mental retardation but their language skills are relatively good and their language development is normal for their age.

Williams Syndrome (a neuro-developmental disorder) individuals have an IQ of approximately 50, they cannot tie their shoes, they have difficulties finding their way or telling right from left, they can only acquire rudimentary skills in arithmetic, reading or
writing, and their drawing skills are often impaired, but they are very good conversationalists. They are more fluent than normal children of the same age and have a propensity towards low-frequency words and phrases. For example, Bellugi et al. (1993) mention the appropriate use of words such as surrender, non-toxic, brochure, husk, hoisting, cornea, abrasive, tranquil, syringe. The words are not used echoic, the children can define them spontaneously. For example, when asked what commentate means, one Williams Syndrome child replies: 'I wouldn't want to wrestle. I would like to commentate it. It means that... like all the sportscasters do... they tell who's doing what.' (Bellugi et al. 1993:182). They can understand complex sentences, they can use and understand full passives, conditionals, relative clauses and sentences with multiple embeddings. There is no doubt that their linguistic knowledge outstrips their cognitive abilities in other areas, proving that language and cognitive functions can be dissociated. Interestingly, recent studies show that English speaking Williams Syndrome children have difficulties with irregular inflection. This dissociation between different areas of linguistic knowledge (in particular of morphological and syntactic knowledge) supports the distinction between a computational system and an associative memory system for language10.

3.2.2 Normal cognitive abilities and speech impairment

The literature also offers examples of individuals whose cognitive abilities are normal but who suffer from SLI11 (Specific Language Impairment). They show age-appropriate scores on non-verbal tests of intelligence (performance IQ of 85 or higher), are not neurologically impaired, have no hearing problems, but show a severe deficit in language ability. Very often, the impairment was detected within families (Gopnik 1990, Tallal, Ross, & Curtiss 1989, Tomblin 1989), which points to the possibility that it might have a genetic basis. The linguist Myrna Gopnik and her associates studied a family of 30 members (over three generations) of whom 16 have been diagnosed as specifically language impaired.

The accepted profile of linguistic behaviour associated with this disorder is rather wide: the degree of impairment may differ from one individual to another. But one can notice that in spite of the fact that the degree of impairment varies from one individual to another, all specifically-impaired individuals seem to show a somewhat uniform pattern of impairment: they begin to speak later than normal children (the average age for their first words is approximately 23 months, Leonard 1998:43) and they stop to correct themselves more often than normal children do; more often than not, when they try to correct themselves, the result is a less grammatical utterance. They have problems with morphophonemic rules (Clahsen 1989, 1991, Gopnik 1990) which means that their grammatical profile differs according to the language being learned. For example, SLI children whose target language is English show a deficit in the use of both freestanding morphology and in the use of inflections. Past tense morphemes seem to be absent in their speech12 (31), they have difficulty in using the -s for the 3rd person singular (32), their use of pronouns is incorrect (33), they have difficulty in using the plural morpheme –s (34) and grammatical aspect is not always used correctly (35):

10 See the chapter dealing with Morphological Development.
11 Other clinical names used to describe the same phenomenon are developmental dysphasia or developmental aphasia. One should also point out that the term has been extended to language impaired individuals outside the family that Gopnik has been studying and that the term of SLI does not describe a perfectly uniform impairment.
12 See Rice & Wexler (1997) where SLI is reduced to lack of tense specification.
a. Last time we arrive.  
b. Last time I bring one box of doughnuts. (Gopnik 1990: 154)

(32) a. The ambulance arrive.  
b. One machine clean all the two arena. (Gopnik 1990: 154)

b. Jimmy starting eat his breakfast. HE don't like it. Now THEY drop the bowl on the floor. (Gopnik 1990: 149)

(34) a. three Christmas tree  
b. a cups  
c. You make one points. (Gopnik 1990: 147-148)

(35) All the girls sing and they are dancing. (Gopnik 1990: 154)

The SLI children acquiring Italian, a language with rich inflectional morphology, have a deficit only in the area of free-standing morphemes (Leonard, Bartolini, Caselli, McGregor, and Sabbadini 1992, Leonard 1994, 1995) such as free-standing articles.

There is, however, controversy in the literature whether SLI represents a mere delay in acquisition or a deficit which persists through life in spite of the intensive language therapy which the children undergo. Gopnik (1990) and van der Lely (1997) describe SLI as being a syntactic deficit, which persists through life. Rice and Wexler (1997) analyse it as a result of syntactic delay. According to their studies, SLI individuals can catch up; they only acquire language at a slower pace than normal children do. The idea that the impairment does not persist through life is also advanced by those who describe SLI as a processing delay (Leonard 1998). SLI children are assumed to have reduced processing speed, which leads to difficulty with unstressed final sounds.

However, there is general agreement that children with SLI show normal functioning in the intellectual domain; their language impairment is dissociated from their cognitive general abilities, as well as from their social-emotional or auditory behaviour.

It is worth noticing that SLI individuals show a deficit exactly in the area where Christopher seems to be strong: morphophonology (and, obviously rules which match morphological rules into the syntax) and that their deficit does not affect all parts of their language faculty. Their knowledge of thematic relations, for example, is unimpaired (Gopnik 1990). This fact might represent evidence in favour of the view that thematic relations are different from syntactic features (Chomsky 1988, Pinker 1989). The cases presented above represent evidence in favour of the view that the process of language acquisition does not rely only on general intelligence. Part of our ability to acquire language is linked to a specific faculty of our mind or maybe to specific genetic factors (Jackendoff 1994a, Pinker 1994b). As Jackendoff (1994a) argues, ‘the issue ought to be how the two factors balance each other’ (p. 112).

3.3 On modularity

The so-called Modularity Thesis is associated mainly with the name of Jerry Fodor and his 1983 book "The Modularity of Mind". 13 Cognitive processes are argued to fall into two main groups:

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13 Actually, the idea goes back in time to Franz Joseph Gall (who lived at the end of the 18th c- the beginning of the 19th c) who was the first one to argue that the brain is the organ of the mind and that it consists of distinct anatomical areas, specified for different functions.
domain specific processes (sight, hearing, touch, taste, smell), also called input systems (because their role is to turn representations into more accessible information to the central processors) and

(ii) general cognitive processes (thought, problem-solving, and the like).

The most important difference between the two groups is related to ‘autonomy’. According to this hypothesis, the human mind consists of a general-purpose central processing system (related to memory, reasoning, belief, etc.) and a set of domain-specific, pre-specified "modules" which function largely independent from one another. They represent information-processing units that encapsulate a certain type of knowledge and computations on it, i.e. autonomous components that evince distinctive functional properties. Each modular system is hence domain-specific and informationally encapsulated, i.e. the central processing system(s) cannot have access within these modules (but its outputs are sent to the central processing system where the human belief system is built up) and contains genetically determined information.

Language is one of these modules, i.e. a genetically determined independent system. Let us see now in what way one can argue that language has the properties associated with domain-specific processes. When one hears a sentence (in one’s native language), the language module will automatically process it. The sentence acts like a linguistic signal, which will trigger its computation like an automatic reflex. The language module can thus be defined as an information-processing unit. Fodor further argues that the computations performed by sentence recognisers are tuned to a complex of stimulus properties, which is specific to sentences. This domain-specificity is closely linked to the property of being informationally encapsulated. Linguistic computation relies only on what is internal to the language module. Information which does not belong to this system is unavailable to the process of input analysis:

[...] I know of no convincing evidence that syntactic parsing is ever guided by the subjects' appreciation of semantic context or 'real world' background. Perhaps this is not surprising; there are, in general, so many syntactically different ways of saying the same thing that even if context allowed you to estimate the context of what is about to be said, that information wouldn't much increase your ability to predict its form (p. 78).

Encapsulation implies impenetrability of the input system. Fodor suggests that much of what is associated with identification of sentence type, i.e. with linguistic form, cannot be related to other cognitive processes. Encyclopaedic knowledge, context, wishes, etc. cannot penetrate the linguistic computation of form. However, linguistic computation is argued to stop where interpretation, i.e. content, begins to play a part. Content can be derived from processes outside the language module. The implication is that what we usually associate with semantics is linked to the central processes where interpretation occurs.

The rapidity of the operations of such encapsulated modules is accounted for by hypothesising the existence of specific neural structures.

Such a view is in line with the innateness hypothesis, which assumes that language is a separate organ, but differs from the theory of Piaget, according to which

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14 For a different point of view, according to which the modules are the product of development, see Karmiloff-Smith (1992).
15 Egyptian surgeons (1700 BC) had already noted that loss of language was not associated with other cognitive functions (Fromkin 1997).
language is linked to cognitive development. The ontogeny of language cannot be explained by resorting to processes in the central processors.

One important prediction of the Modularity Hypothesis would be that language could break down when other cognitive abilities are in place or, the other way round, that some cognitive ability may break down leaving the language faculty intact. The case studies discussed in 3.2 prove that this prediction is borne out to a certain point. Further evidence that Fodor's view might be correct comes from studies of focal injuries to different parts of the brain.

Research in the domain of aphasia brought in evidence that lesions which affect different parts of the brain trigger different types of speech impairment. In 1861, Paul Broca, a French doctor, showed that a lesion localised on the left hemisphere triggered the loss of the ability to speak whereas lesions on the right part did not result in loss of speech. The speech of the individuals affected by what is now known as Broca's aphasia\(^{16}\) is characterised by loss of grammatical morphemes. Word order is often incorrect and the impaired speakers have difficulties finding their words, they speak slowly and with effort. Sometimes, even comprehension seems to be impaired.

A few years later, in 1874, Carl Wernicke showed that a lesion in the posterior part of the left temporal lobe leads to language impairment of a different nature. This time comprehension is the one that is affected and the impaired individuals (who are affected by Wernicke's aphasia\(^{17}\)) often use made-up words or the wrong words (they may use 'glass' for 'cup' for example). One can notice that different areas of the brain seem to be associated with different sub-compartments of language.

The first linguist who described aphasia from a linguistic point of view was Roman Jakobson, in his 1941 book "Child Language, Aphasia, and Phonological Universals". He noticed that there is a parallel between child language acquisition and the type of loss of language knowledge in aphasia. In his view, Broca's aphasics lose knowledge of grammatical formatives and thus their syntactic relations are also affected. They tend to use verb infinitives and unmarked Nominative case nouns, phenomena which also characterise the so-called \textit{optional infinitive stage} in child language. Another important insight was that marked elements are the ones which are acquired last but which get lost first in aphasia.

Obviously, we are far from knowing with precision which area of the brain is responsible for which function and probably we should not expect to find a perfect mapping one area – one function. Still, data from studies of aphasics reinforce the view that the brain is the organ of the mind, made up of different discrete areas and that the language faculty may be one of them.

4. On the ‘mixed’ nature of language acquisition

Since the process of acquisition implies not only syntactic development but also the acquisition of word meaning, of the vocabulary of the target language, if we are to fully understand the acquisition process as a whole we must understand how the two processes develop and interact. The relation between the two is neither simple nor unidirectional, nor can it be reduced to stating “which comes first: syntax or semantics?”. When linguists define language acquisition, when they discuss the role of input or the relation between language development and cognition, they often provide a

\[\text{footnote}{16}\] Broca's aphasia is also called expressive aphasia, agrammatic aphasia, non-fluent aphasia or syntagmatic aphasia.

\[\text{footnote}{17}\] Wernicke's aphasia is also called receptive aphasia, fluent aphasia or paradigmatic aphasia.
biased answer, addressing the issue either from the perspective of syntax or from the perspective of lexical development. Syntacticians focus exclusively on the learning of the computational system, whereas most of those concerned with the acquisition of word meaning focus on the part which cognition may play in the process. This dissociation seems to have played an important part in the famous debate between Jean Piaget and Noam Chomsky (constructivism vs. nativism). Jackendoff (1994a: 129) reduces the debate to a misunderstanding, which he describes in very clear terms:

"After all, Piaget and Chomsky have a great deal in common. Both believe in complex unconscious mental processing. Both believe that the structure of the world we experience is in large determined by the internal mental constructs of potentially great abstraction.

As far as I can determine, the major difference between the Piagetian and Chomskian traditions concerns what it takes to learn. Not a small part of the problem in the debate was that Chomsky’s argument focused almost exclusively on complex details of the learning of syntax, about which Piaget had virtually nothing to say; likewise, Piaget’s ground for argument was conceptual learning, about which Chomsky had virtually nothing to say. So, the debate was not carried on in common territory, which led to a certain amount of the mutual misunderstanding and rancor.

It is worth pointing out that, on the one hand, Chomsky (1993:24) argues that both the acquisition of syntax and that of vocabulary are subject to the poverty of the stimulus problem:

"[..] the pervasive problem of ‘poverty of the stimulus’ is striking even in the case of simple lexical items. Their semantic properties are highly articulate and intricate and known in detail that vastly transcends any relevant experience.

But, on the other hand, in previous studies, Chomsky (1988, 1995) advances the view that acquisition of syntax and the learning of word meaning may represent two different types of developmental change:

... what we call knowledge of language is not a unitary phenomenon, but it must be resolved into several interacting but distinct components. One involves the computational aspects of language [...] A second component involves the system of object-reference and also such relations as “agent”, “goal”, “instrument”, and the like; what are sometimes called thematic relations [...] for want of a better term let us call the latter a “conceptual system”. We might discover that the computational aspect of language and the conceptual system are quite differently represented in the mind and brain, and perhaps that the latter should not strictly speaking be assigned to the language faculty at all.

The implication is that the acquisition of word meaning may not be entirely part of the language faculty and hence this process would be different from the acquisition of syntax. This is in line with what data from linguistic development have proved so far. In spite of the fact that both the acquisition of syntax and lexical development take place at high speed, suggesting that both processes are guided by some innate constraints, we are actually faced with two types of developmental processes. First, the acquisition of syntax is (almost) complete by approximately age 5, when it reaches a relatively steady state, whereas the acquisition of vocabulary, though slowing down with age, continues through life. The active vocabulary of a normal 5-year-old child has been estimated at approximately 3,000 words. A normal adult’s active vocabulary is ten times greater, while the passive vocabulary of an educated adult can contain over 100,000 words (Aitchison 1988)."
Second, one can talk about uniformity of final attainment only in terms of syntactic knowledge. Knowledge of vocabulary can hardly be described as uniform across individuals. It is dependent on social factors, world knowledge, and general cognitive predispositions. Development in the area of vocabulary requires more than input and an innate device responsible for language development; it is dependent on the existence of an appropriate conceptual structure or the appropriate type of extralinguistic knowledge, requiring probably an incorporation of conceptual universals and language-specific conventions.

The principles which have been postulated as guiding the two processes are also of a different nature: the principles which constrain syntactic development are language-internal, part of I(nternal)-language, while the constraints which guide the acquisition of word meaning also include semantic or pragmatic principles, i.e. which belong to E(xternal)-language. This suggests that UG may not be able to account for all aspects of acquisition, in particular lexical development may have to rely on mechanisms which are not (only) language specific. Bloom (2000:15) states this fact in clear terms:

In fact, word learning is the clearest case of learning one can imagine. Nobody was born knowing the meaning of the English word rabbit. Everyone who knows the word has heard rabbit used in a context in which its meaning could be recoverable from the environment using a rational process; that is, everyone who knows the meaning of rabbit has learned it. If you can stomach the terminology, I suspect this might be the least controversial claim in the study of language development.

Evidence that knowledge of syntax and knowledge of vocabulary could be (up to a point) dissociated comes from studies of mentally retarded individuals whose knowledge of language is almost normal, as well as those of language impaired individuals. Let us take Laura’s case, for example (presented in 3.2). Her knowledge of morphology and syntax is not impaired, but she has difficulties in the area of semantics and pragmatics. Her vocabulary is that of a 3-year-old and she cannot use her language knowledge in a pragmatically appropriate manner. She cannot make use of her knowledge of language (i.e. her competence) to adequately express her thoughts or to interpret what she hears. Her language deficit is associated with her performance system and her language problems seem to reflect her conceptual deficit.

Also, individuals with SLI show a discrepancy between knowledge of morphosyntax and knowledge of thematic relations. Such cases suggest that the acquisition of syntax does not rely on general cognitive abilities whereas the acquisition of word meaning or of discourse rules is associated to conceptual development and/or knowledge of the world. Also, studies of abnormal language acquisition with impaired grammar but good knowledge of vocabulary and discourse strategies suggest the same thing: that the mechanisms involved in the acquisition of grammar are language-specific whereas those responsible for the acquisition of vocabulary or of pragmatic competence are independent (Curtiss 1988).

We have reasons to believe that language, conceptual system and pragmatic competence interact but, at the same time, they can be developmentally dissociated: they may have different origins and rely on distinct representational systems. But do they follow independent tracks or do they interact? Vygotsky (1962) proposes that originally, language and conceptual development (thought) follow independent tracks. But, at the age of approximately 2 years, the two tracks begin to interact. Hirsh-Pasek and Michnick Golinkoff (1996) argue that mental models (whose construction is closely related to the process of cognitive development) play an important part in the child’s ability to use language. Language comprehension, in its turn, may help children to construct primary representations. On such a view, language and conceptual development interact.

There is a “critical period” for language acquisition; if people are not exposed to language during this period they may never acquire language with the same results as those individuals who were exposed to linguistic input during this critical period.

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18 For example, Clark’s conventionality assumption or Markman’s whole object assumption.
Maybe the real issue of language acquisition studies ought to be how these factors interact, within an epistemology that embraces constructivism and innate predispositions. Or, in Lila Gleitman’s (1993) words:

[...] this is the problem of modern linguistics: how much does a child have to learn and how much is built in?

5. The Critical Period Hypothesis

5.1 Definition

Language evinces one more property which qualifies it as a biologically programmed ability and which brings support in favour of the view that there is a distinct language faculty: it seems that there is a certain age beyond which our ability to acquire language is reduced. Although linguists and psychologists have not reached an agreement as to what this critical age is or to what its causes might be, there is a common belief that, at a certain point (maybe in their early teens) people lose the ability to learn language without conscious effort.

The so-called Critical Period Hypothesis (or the sensitive period) is associated with the name of the neurolinguist Eric Lenneberg, the first one to argue that there is a critical period for language acquisition, which extends from approximately the age of 2 to the onset of puberty, i.e. between ages 2–13, when functional and biological linguistic development needs to be activated. This period coincides with the specialisation of language to one cerebral hemisphere, normally the left (Lenneberg 1967). If language acquisition does not occur before the onset of puberty language can no longer develop fully. If people are not exposed to language during this period, they might never be able to acquire language in the same way or with the same results as individuals who were exposed to linguistic input during the critical period.

There is, however, evidence that multiple critical periods exist for language: there are different sensitive periods for different components of language. Almost everybody seems to agree that the sensitive period for phonology ends at around age 5 or 6 (which could explain why second language acquisition which begins later may never attain native or near native like accent) whereas the critical period for morphology and syntax declines later, probably at the onset of puberty (Long 1990). The ability of discriminating between phonetic contrasts which are not relevant for the target language is lost at a very early stage. At the age of two, Japanese children can no longer distinguish between /r/ and /l/, a distinction which is not relevant in Japanese (de Boysson-Bardies 1999).

Interestingly, studies of brain lesions which result in speech impairment show that the age when the lesion occurs is extremely important. Seliger (1978) discusses aphasia types which differ according to age group, in spite of the fact that the lesion is in the same area of the brain. A lesion in Wernicke’s area can produce jargon aphasia in old age, motor aphasia in a child and conduction aphasia in youth and middle age. Such case studies lead to the hypothesis that ‘there is a continuous long-term process of interhemispheric and intrahemispheric localisation of function […]’. Since different aspects of language are affected at different stages in this process, it is hypothesised that there are multiple critical periods which correlate with localisation and the gradual loss of plasticity’ (Seliger 1978:15).

19 Competence reaches its peak during a “critical period” and then declines in most behavioral domains (Johnson and Newport 1993).
For obvious reasons, it is impossible to test what happens to a child who is not exposed to language during the relevant period.²⁰ That is why most experiments were carried on second language learners and most of the criticism of the critical period hypothesis came, actually, from studies of second language learning. In a nutshell, the core of the criticism was based on the idea that adults can be superior to children in learning a second language or that at least adults are not inferior to children in the process of learning²¹ a foreign language.

There are two problems with such a critical approach. Firstly, Lenneberg (1967) did not hypothesise that an adult cannot learn a foreign language:

> Most individuals of average intelligence are able to learn a second language after the beginning of their second decade [...]. A person can learn to communicate in a foreign language at the age of forty. This does not trouble our basic hypothesis on age limitations because we may assume that the cerebral organisation for language learning as such has taken place during childhood, and since natural languages tend to resemble one another in many fundamental aspects the matrix for language skills is present. (p. 176)

What Lenneberg assumes with respect to second language learning is that the process may be different from first language acquisition:

> "...automatic acquisition from mere exposure to a given language seems to disappear after this age [i.e. the end of the critical period] and foreign languages have to be taught and learned through a conscious and elaborated effort. Foreign accents cannot be overcome easily after puberty." (p. 176).

If this is the case, (and the above quotations are relevant enough), testing for the existence/absence of the critical period effects on second language learners somehow departs from the nature of the hypothesis under discussion. Arguing that adults can be good second language learners does not contradict Lenneberg’s theory in any way. Similarly, as Hurford (1991) points out, ‘one cannot reason quite so easily from second language learning results to a critical period for first language acquisition’ (p. 163).

Also, one should not neglect that, if one assumes the view that language is a modular cognitive system, analogy with the development of other systems, such as the system of vision, suggests that there are changes in brain systems and their learning capacity throughout development. The classical example is the study on the development of vision in cats (Hubel and Wiesel 1962, 1970). The neurons of the visual cortex of cats are preset to respond to specific stimuli. When a kitten is deprived of some of these stimuli during the sensitive period for vision, those neurons preset to respond to the stimuli which are absent from the input will become inactive and, finally, they will degenerate. The development of vision in humans seems to have the same specificity. By analogy, the hypothesis is that the language faculty, a modular cognitive system on a par with vision, should display the same developmental requirement: exposure to the appropriate stimuli during the appropriate developmental period.

²⁰ However, it seems that there have been cases of such “forbidden experiments”. The story says that the Pharaoh Psnatik I of Egypt attempted to isolate young children, giving orders that no one speak to them. He wanted to test whether in the absence of linguistic input children begin to speak the “original” language of mankind.

²¹ On the other hand, there are studies in second language learning which clearly show that individuals who begin learning a foreign language in childhood can reach higher levels of proficiency in the end than those who begin learning a foreign language as adults, in spite of the fact that the latter may initially perform better.
5.2 Evidence in favour of the critical period hypothesis

Evidence in favour of the critical period hypothesis comes from cases of children deprived of language during their first years of life, be they "normal" children or children who were exposed to American Sign Language (ASL) at a later stage. Their later linguistic development proves that there is a critical period for language acquisition and that there is something special about the maturational state of the child's brain.

A well-known case is that of Genie, a girl who was discovered in 1970 at the age of thirteen. She had been isolated from the world and deprived of language or any other type of social interaction. After her discovery, her cognitive abilities improved but her language ability, though remarkably fast in the beginning, remained, after seven years of rehabilitation, at the level of a two and a half year old child. Her lack of linguistic knowledge, especially in the area of syntax, supports the critical period hypothesis. However, Genie's case must be taken with a grain of salt. Some of the researchers on the team that worked to rehabilitate her questioned whether her lack of linguistic competence was merely a consequence of the lack of linguistic input during her early childhood.

Another well-known case is that of Isabelle, who was discovered in the 1940s, at the age of six, i.e. during the critical period. At the time she was discovered she could not speak and her cognitive development was at the level of a two year old child. But she could speak within a year.

One more case of a severely isolated child is that of Kaspar Hauser (Londen 1999) who is said to have appeared in Nuremberg in 1828, at the age of approximately 16. The story says that he had been kept in captivity, isolated from other people, between the age of approximately 4 and 16. When he was discovered, his speech had all the characteristics of a normal 4 year old child who acquires German (lack of conjunctions, particles and verbal auxiliaries, use of subjectless sentences, misuse of articles with the plural, misuse of personal pronouns, the verbs are mainly used in the infinitive, lack of embedded sentences, etc.) but it seems he "regained" language very fast. His story, if true, points to the fact that language, if acquired, up to a certain degree, during the critical period, can be "reawakened" and further developed beyond this period.

Studies of language acquisition in the congenitally deaf also point to the fact that the later a language is learned the less its use is native (Newport 1990). One such study is the one of Newport and Supalla (reported in Newport and Johnson 1993). They separated subjects (in a residential school for the deaf) into three groups, by their age of exposure:

(a) native learners (exposed to ASL from birth)
(b) early learners (exposed to ASL between the age of 4-6)
(c) late learners (exposed to ASL at age 12 or later, i.e. after the critical period).

The results show a decline in performance (both production and comprehension) with increasing age of exposure. The later the first exposure, the more incomplete the ultimate attainment. These results suggest that the age of the first exposure to language plays an important part in linguistic development.
SUMMARY

In this chapter a general framework for the study of language acquisition has been presented. Language acquisition has been defined as the rapid, effortless process, which turns a deficient and limited input into correct output grammar. The final state which children achieve is uniform.

Though the PLD do play an important part in acquisition (the innate component can become part of our biological potential only when interacting with the environment), the deficiency of the linguistic input points to the fact that the child has to resort to something else in the process of acquisition. The idea that the child must have some a priori knowledge of the constraints of language has been advanced.

It has also been hypothesised that the acquisition of language is not a unitary phenomenon: the acquisition of syntax can be (partly) dissociated from general cognitive development, representing a process distinct from general learning principles, whereas the acquisition of word meaning may rely both on language specific and on general learning mechanisms, world knowledge, and social factors.

Language has been defined as a cognitive module, and its development has been assumed to be constrained, just like the development of other cognitive systems, by certain critical periods, when the relevant stimuli for the development of the module must be present in the input. Their absence may render the faculty inactive or, at least, deficient.

So far, the following general schema for language acquisition has been assumed:

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INPUT                  OUTPUT
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The LAD has been defined as a mental organ which develops as part of the child’s biologically determined maturation. It is the locus of the principles which govern the linguistic constructs, the locus of constraints, a system of innately specified assumptions about the structure of language. It is, in essence, the initial state of the language faculty. It is "a function that maps presented data into a steady state of knowledge attained" (Chomsky 1987: 61).

It has also been said that we do not have direct access to the LAD, that we have to hypothesise about its nature on the basis of our analysis of the input and of the output grammar. Which means that the hypotheses we construct are dependent on the theory of language adopted. In the next chapter the evolution of these hypotheses within generative linguistics will be presented.

Further reading


General+advanced: If you are ready for more, read Chomsky (1986) and Chomsky (2000).
Focussed: For linguistic arguments that the acquisition of syntax relies on more than input, read Crain (1991). The reader keen on finding out about pros and cons will also enjoy the Open Peer Commentary section at the end of the paper. Fromkin (1997) summarises the approaches to the neural basis of language and modularity, with evidence from SLI, aphasia and linguistic ‘savants’. If you find Fromkin too general and want to find out more about speech impairment, Leonard (1998) provides a recent comprehensive review of the literature dealing with SLI in children.