American Journal of Linguistics 2012, 1(3): 33-39
DOI: 10.5923/j.linguistics.20120103.03

An Overview of Major Biological and Contextual Factors in Language Acquisition

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Abstract This paper gives an overview of the major theoretical perspectives and factors in language acquisition. In the discussion, research findings in African setups are included alongside key American or European findings. Implications for parents and educators are highlighted together with areas requiring more inquiry.

Keywords Biological, Contextual Factors, Language Acquisition

1. Introduction

When we think of how we got to know the languages that we use, we are amazed by this interesting mystery. It is difficult to say just how we got to know the languages that we speak. We mainly believe this is a natural occurrence that is bound to happen unless interfered with. However, there is no consensus on how language acquisition takes place.

Language is defined in different ways. It is mainly defined as a collection of arbitrary symbols and rules used by members of a community to communicate an infinite variety of messages[1-2]. Language is also looked at as a cognitive function that allows humans to learn, produce and understand complex utterances[3]. It is also viewed as a sophisticated biological system that distinguishes humans from other creatures[4].

One is said to know a language if one can carry out a large variety of cognitive and social tasks specific to that particular language. Knowing a language involves having a command of the linguistic system that constitutes the essence of that language[2]. As a system, language comprises of five major components: phonetics (the sound system); Semantics (meanings); morphology (forms); syntax (grammar); pragmatics (language meaning within a context). The capacity to successfully use language requires one to acquire all these linguistic components[5]. At another level, language acquisition also means knowing how to read and write in the language[1]. A major concern in language acquisition is how children pick, master and use linguistic input from the surrounding context.

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Published online at http://journal.sapub.org/linguistics

2. Language Acquisition

Language acquisition is the process by which humans get the capacity to perceive, produce and use words to understand and communicate[6]. This process entails mastery of the full range of grammatical and communicative competence and is influenced by both biology and socialization[6-7].

In this paper, we give an overview of key theories in language acquisition as well as factors that influence language acquisition.

2.1. Theoretical Perspectives on Language Acquisition.

The study of child language acquisition is dominated by different competing perspectives. Each perspective provides fundamental accounts for the core elements of language acquisition. In this section, we give an overview of the major perspectives:

a) Nativist theory.

The nativist theory, also known as the biological theory, holds that language is innately derived from a series of genetically programmed structures. A key assumption of this theory is that children are born with certain innate language acquisition structures[6]. Noam Chomsky is a major theorist in this perspective. According to Chomsky[8], human beings are born with a blueprint for language and the process of learning language consists of developing this endowment into a grammar[9]. Chomsky proposed that all children have an innate language acquisition device[LAD] which enables children to access the basic rules governing all human languages. It is this apparatus which enables them to develop the grammar and vocabulary for the first language they are

exposed to[1]. Studies supporting LAD show that children make overgeneralization errors that arise out of inappropriate use of linguistic rules and not by imitating adults[4, 10]. Researchers have also demonstrated children's ability to create new linguistic forms without modeling or reinforcement[10-11].

The view that language is a unique development of the human brain sets it out as a genetically determined module of human cognition. A module consists of a set of operations that are largely independent of other cognitive processes and are considered to be fast, automatic and without conscious awareness about how decisions are made[12]. The modular view proposes that the knowledge structures that comprise language develop within a single, unified system that shares computational resources and representations[2, 7]. The idea of a language module is compatible with the system being inherited rather than learnt[9].Evidence from language and other genetic disorders lends support for the modular view of language[13-15].

Studies of genetic disorders underscore the view that normal language development involves innate, domain-specific mechanisms. These studies emphasize the neural, psychological and developmental underpinnings of language[13]. For example, developmental dyslexia and SLI appear to have a genetic basis. Epidemiological and familial aggregation studies show that SLI runs in families[14-15]. A large number of SLI children have language-impaired family members pointing to SLI as a heritable disorder[13]. Studies also show that Monozygotic twins are more likely to both suffer from SLI than dizygotic twins[9].

It is important to note that biological theories are not clear in explaining how social factors contribute to children's language acquisition.

b) Learning theories

The learning perspective of the language acquisition process is espoused by the empiricists and associationists.

Behaviorists argued that language acquisition took place through operant conditioning. Skinner[16] suggested that a child would learn that a specific combination of sounds stands for a specific thing through repeated successful associations made between the two. According to Skinner, language use is successful when the child is understood and rewarded with the desired response from another person. The general behaviorist view is that words and phrases are emitted responses that are fixed through social reinforcement. Thus a child learns to respond to words and phrases appropriately through social reinforcement. This view, regards language as a means to certain ends and suggests that individuals respond to language in ways that maximize probability of gratification[5]. This implies that a child will only use those sounds from his/her total repertoire that are socially reinforced[4].

A selectionist view of the acquisition of language competence and complexity is espoused in the relational frame theory (RFT)[17]. Based on behaviorist principles, RFT argues that children acquire language purely through interacting with the environment. RFT theorists introduced the concept of functional contextualism in language learning where focus is on manipulating variables in a child's environment in order to predict and influence language-based psychological events, such as thoughts, feelings, and behaviors. RFT identifies and defines derived relational responding which is an operant learning process that tends to occur only in humans possessing a capacity for language[17]. Different studies support the predictions of RFT and suggest that children learn language via a system of inherent reinforcements[3-4, 10]. RFT basically challenges the view that language acquisition is based upon innate, language-specific cognitive capacities. In sum, the basic determinants of language acquisition in RFT appear to be the type and period of linguistic interaction as well as the psychological events that the child experiences.

Another learning perspective to language acquisition is the social learning theory. Social learning theorists emphasize the role of imitation in language development. It is commonly believed that children acquire their mother tongue through imitation of parents, caregivers, or people in their environment. Imitation consists of memorizing words and sentences and drawing conclusions from them as to what are the grammatical rules of the language[18]. This theory is probably at least partly correct. There are some things (like the meaning of words) which the child learns by imitation, but there are some things that the theory fails to account for. For instance, children's speech is full of errors. In individual cases this is due to the fact that language is complex and a child's first attempt is often not successful[4, 10].

c) Socialization theory

Socialization theory is the oldest and most widely held approach to language acquisition. This perspective focuses on the role of caregivers as sources of social wisdom. Children are viewed as novices who are learning to act like others so that they can communicate their desires. Thus grammar emerges directly from social interaction[19]. The theory emphasizes that for children to expand their vocabularies, they need to hear others speak. In this view, language development is facilitated by corrective feedback from adults[20]. Children who are talked to and corrected learn more vocabulary and do better on the corrected structures than those who are not[21]. This theory emphasizes the importance of tutoring, scaffolding, and corrective feedback as cues that guide the child through every step of linguistic socialization[20]. This view tends to minimize the importance of a priori hypotheses while maximizing the impact of the structure of the sociolinguistic environment. Socialization theory places a great emphasis on the immediate context as the wellspring of grammatical learning[4]. Because it assigns no particular role to memory or off-line hypothesis checking, socialization theory views linguistic input as having a direct and immediate effect on language learning. For the issue of recovery from overgeneralization, the finding that would provide the strongest support for socialization theory is one that shows direct links between parental feedback and recovery from overgeneralization[4].

d) Cognitive theories

Developmental theorists view language as a mental activity whose acquisition is mediated by cognitive maturity. In Vygotsky's view, adults use a variety of cognitive tools to pass modes of thinking and problem solving to their children[22]. Spoken language is the most important tool, but writing, numeracy skills, application of memory strategies and problem-solving also convey information and enable thinking[23]. According to this view of language, a child's ability to use the cognitive tools to accomplish goals is critical in language acquisition. Thus language is a tool influencing thought in important ways and that thought changes once we begin to think in word[23].

Some researchers believe that language is acquired through fast mapping in the brain[24-25]. These theorists argue that it is necessary for the brain to distinguish between the phonemes of a given language in order for a child to differentiate the sounds of that language. This differentiation is accompanied by neurons in the auditory cortex[24]. During the first year of life, when the infant hears the same phonemes repeatedly, a cluster of neurons become wired to respond to that phoneme. Subsequently, any time the ear carries the particular phoneme to the brain, the assigned neuron cluster automatically fires. Therefore, this forms a brain map for the sound of the language or languages spoken in the infants environment[24, 26-27].

e) Neutral approaches

Some approaches to language acquisition are neutral in that they consider the environment and biological influences. For example, the Emergentist theories, such as MacWhinney's[28] competition model, which assert that language acquisition is a cognitive process that emerges from the interaction of biological pressures and the environment explaining that the acquisition process is emergent due to the competition of linguistic forms such as syntactic, lexical, and phonological forms.

The other middle ground theories are Chunking theories,[29-30]. These assume that the child's input is influenced by the surrounding environment and that the learning process is dependent on the acquisition of meaningful chunks of certain constituents such as phonemes, words, syllables, etc. This in turn, stimulates the syntactic and phonological production. These chunks constitute the knowledge the child builds in grammatical and phonological rules[4].

From the foregoing, it is apparent that although each theory provides a specific account of language acquisition, majority of their concepts tend to overlap. It is, therefore, more enriching to take an eclectic view of the process of language acquisition. Frameworks that consider both biological and contextual influences in language development are the latest inclusion in the province of language acquisition and they appear to be gaining ground in pertinent research. In the next section, we give an overview of major factors in language acquisition.

2.2. Major Biological and Contextual Factors in Language Acquisition.

Several biological and environmental factors are important in language acquisition. As already shown in the previous section, the influence of the genetic givens on language acquisition is confounded by environmental factors. This is the age old nature-nurture controversy[9]. Below is an overview of the major factors in language acquisition:

a) Maturation and symbolization

The biological concepts of maturation and symbolization are emphasized by the structuralists in explaining language acquisition. Finnegan,[7] argues that as a system of symbols, language is an arbitrary representation of thoughts, actions, experiences, feelings, and objects. Therefore, in order to acquire language, a child should have the capacity to hold in brain a symbolic realization of something else. It is through such capacity that a child masters language features like displacement and spontaneous usage[9].

b) The critical-age hypothesis

Related to the concept of maturation is the critical-age hypothesis. Chomsky believes that there is a critical age for learning a language as is true for the overall development of the human body[8]. This hypothesis assumes that language is biologically based and that the ability to learn a native language develops within a fixed period, from birth to middle childhood. During this critical period, language acquisition proceeds easily, swiftly, and without external intervention. After this period, the acquisition of grammar is difficult and for most individuals never fully achieved. Language deprivation at this age leads to atypical patterns of brain lateralization[6-7].

This critical age-hypothesis has been tested by analysing the linguistic ability of children reared in environments of social isolation. The case of Genie is used as evidence for the hypothesis. Genie was a child who was not exposed to any language while she was growing up. Genie's parents locked her away for the first 13 years of her life and seldom spoke to her. When she was discovered, she was unable to speak. Deprived of linguistic input in the first few years of life, Genie's capacity for language acquisition had become impaired. Efforts by a linguist to teach her English were mainly unsuccessful[6-7]. In a Kenyan study investigating factors contributing to vocabulary spurt in kikuyu children aged 18-24 months, age was significantly related to vocabulary spurt[31].

Neurological studies show that the brain is most plastic in young children[3, 24, 32]. This plasticity is connected to the critical period during which language is easily learnt[32]. Such studies show that a typically developing child tends to achieve language fluency by the age of 3 years. However, the environment has an influence in how this impacts on language development. For example, fluency may be affected by negative experiences within the first three years[24]. Children who live in an environment characterised by trauma, neglect, stress or abuse may

experience abnormal physical changes in the structure of the brain that interfere with normal language acquisition. High levels of stress hormones cortisol affect the brain and impact on language acquisition[32].

c) Language acquisition schedule

Another age-related factor is the acquisition schedule. Yule[33] argues that all children, regardless of culture, develop language at roughly the same time, along much the same schedule. It has therefore been suggested that language acquisition schedule has the same basis as the biologically determined development of motor skills[7]. This biological schedule is tied to the maturation of the infant's brain and the lateralization process. In fact, as children grow, their vocabulary also grows. Child language researchers back this claim by identifying age-specific milestones in a child's language development[34]. Some of these include: by 6 months, the child engages in "babbling", by 9 months, recognizable patterns of consonant and vowel sounds are produced; by 12-18 months, children produce a variety of single unit utterances (the one-word stage); by two years, the child can combine a variety of words in pairs (the two stage) and the vocabulary goes beyond 50 distinct words. At age 4, the child can combine more than two words at a time. By age 6, children will have acquired fluency in speaking their language. By the time a child goes to school, almost 80 percent of the structures and more than 90 percent of the sound system have been acquired[6-7, 9]. However, this biological schedule influences language acquisition depending on interplay with many social factors in the child's environment.

d) The child's health and language disability

Evidence form studies on language disorders show how a child's health and language disability influence language acquisition. Specific language disorders that adversely affect language acquisition include Williams Syndrome (WS)[35] Specific language impairment (SLI) and dyslexia[36].

WS is a rare condition that seems to be caused by deletion of genetic material[9]. Studies of children and adolescents with WS, show that WS might constitute a genetic dissociation in which grammar develops normally but general intelligence is impaired[6, 35, 37]. WS studies show that differences in pragmatics and hyper sociability seem to be relatively influenced by visual and cognitive deficits and moderate retardation[36]. Specific language impairment (SLI) and dyslexia are also viewed as behavioural disorders that primarily impact on structural language information, with subtypes emphasizing difficulties in phonology, semantics, or syntax[35].

In support of the neurological basis of language, Yule[33] observes that all infants make "cooing" and "babbling" noises during the first few months, but congenitally deaf infants stop after six months. This argument implies that in order to speak a language, a child must be able to hear the surrounding language. However, some studies show that merely hearing a language is not a sufficient condition for language acquisition. Children whose main source of speech input is from television, either because their parents are deaf or because they watch cartoons that are in different language, make little or no progress with the language they hear[38]. Severe and prolonged illness has been found to influence variations in speech pattern. For example, during the first 2 years of life, severe illness delays the beginning of speech and the use of sentences by 1 to 2 months[6-7, 33].

e) Exposure to language

Increasing evidence shows that normal brain development depends on early and regular exposure to language[6, 22]. From birth, children are exposed to adult language and this exposure influences their language development. Nyamasyo,[39] carried out a study on the acquisition of syntax by a four year old child. In her conclusions she states that a child will acquire the language it is sufficiently exposed to. Several studies reported in Fromkin and others[9] show that children who do not receive this exposure in their formative years do not achieve native-like grammatical competence. In addition, behavioural tests and brain imaging studies show that late exposure to language alters the fundamental organization of the brain for language[24].

Studies conducted in multilingual settings agree that various contextual factors influence language acquisition. McDonald[40] contrasted various populations in which language acquisition is broadly successful with those in which language acquisition is unsuccessful. Her conclusion was that good representations of speech sounds (phonology) are crucial in predicting eventual successful acquisition. When the individual cannot encode the basic phonological contrasts over which the rules of language operate, prognosis is poor. However, as Morton[41] argues, many cognitive components typically contribute to the successful development of an overall system, and if any one of these is impaired (and no redundancy is present), the system may fail to develop normally. Thus, good phonology may be a necessary but not sufficient requirement for successful language acquisition. In fact, phonology and language mastery emerge as parts of a common language system[42].

Sociolinguists have compared language use in the rural and urban settings and language use among school children and their parents. In such studies, important factors found to affect the language acquisition and use including: verbal contacts, level of education, the socio-economic class cleavage and ethnic group membership.

Gorman,[43] did a study on patterns of language use among Kenyan children in form one and their parents. His primary aim was to find out their pre-school knowledge of English and Kiswahili and the extent of their present use of the languages. He designed a questionnaire to find out the language spoken at home by the children to various members of their families. In summarizing his findings, he argues that ethnic language was used as the only language of communication with decreasing frequency in conversation with grandparents, parents, younger brothers and sisters and older brothers and sisters in that order. He also found out that children preferred to use English in certain special interactions outside their homes like talking to close friends about school and in letter writing.

Another study conducted in Nairobi among children aged 4-9 years aimed at finding out how English, Kiswahili and ethnic languages are used in different environments: at home, at school and among peers[44]. Children from different social economic status communities were observed. The findings show differences in language use in the family, the school and the peer group domains. Among low income groups, ethnic languages were most commonly used at home. In the school domain, Kiswahili was mainly used while among peer group domain Kiswahili and ethnic languages were mainly used. Among the middle-income group, the common language in the family domain was Kiswahili, followed by English and lastly the ethnic language. In school, the most common language among children from this group was Kiswahili while among peers it was Kiswahili and English. In the high-income settings, English was the most popular language in the three domains. English was exclusively used in the school domain while ethnic language and Kiswahili were less extensively used in the home domain. The results of analysis indicate that the cleavage to using English in the home and school environment is significantly related to economic advancement. Among the Nairobi children, English and Kiswahili were the most used while the ethnic languages were the least used in all the three domains. The above findings lend support to the notion that the need to develop linguistic and communicative competence is situationally driven.

f) Family factors in language acquisition

The language behaviour of parents and other significant family members at home determines the language their children would speak[20, 33]. The interaction within the family and the relationships that exist within a home particularly play a vital role in offering a child verbal contacts and the opportunity to use language in meaningful ways. For example, the attitudes and multilingual ability of the family members bear on the child's choice and use of language[45]. Other factors like the type of schools parents take their children to also play a role in their language biases. A child's success in acquiring language is also linked to the child's quest for identity, initially with members of the immediate family then later with members of the larger speech community[20, 33].

Interacting with others via the language being acquired has been found to be crucial in language acquisition. The case of Genie is used as evidence to the necessity of others' linguistic input. Another case used to underline the importance of the daily use of the language(s) in meaningful situations, involves deaf parents and their normal hearing son[9]. In this case, the deaf parents gave their normal hearing son ample exposure to TV and radio programs. However, the child did not acquire an ability to speak or understand English. What he did learn very effectively, by age three, was the use of the American Sign Language- the language he used to interact with his parents[9].

The behaviourist stimulus-response hypothesis claimed that children came to use language as a result of being trained by their parents. Although this stance was opposed by Chomsky, it emphasizes the critical role played by the caretaker in enhancing language acquisition in children. The quality of the communication between the caretaker and the child has been suggested to influence language acquisition[46]. Baby talk exposes the child to simple language, linguistic structures and operations. It also indicates rules of language use especially rules of conversation. These interactions provide a framework within which utterances can be situated and acquisition of grammar can take place[7,11].

g) Prior linguistic experience

Prior linguistic experience has also been shown to impact on second language acquisition. It has been suggested that a child's command in mother tongue including whether they are literate affects progress in the second language[47]. Cummins,[47] also developed interdependence hypothesis which predicts that the development of the second school language is partially dependent upon prior level of development of first school language. According to the hypothesis, there is a common underlying proficiency which makes possible the transfer of school skills across the student's two languages.

h) Personal factors in language acquisition

Some personal factors that have been found to influence language acquisition include gender, birth order and nature of birth. Studies show that girls have an advantage over boys in language acquisition[48].

The linguistic environment presented by ordinal birth position also influences acquisition. Several studies have looked at the impact of birth order on language development[49-51]. While they found some interesting differences between first and later-born children's language development, later-born children are not delayed in their language development and first-borns do not have better language skills than their siblings. However, interesting differences in the language skills of first-borns and later-borns are reported. In one study, first-born children were found to reach the 50-word milestone earlier than later-born children. This was attributed to the fact that first-borns spend more time with caregivers than later-borns. However, later-born children do catch up quickly and there are no lasting differences in vocabulary between the two siblings[49]. In another study, the overall language development of second-born children was the same as their first-born siblings, but second born children were more advanced in their use of pronouns (eg. my, mine, you, your)[50]. Earlier research had found that while first-born children were more advanced in vocabulary and grammar, later-born children were more advanced in their conversational skills[51]. Other studies cited in Yule[33] have found good language imitators to be either first born or only. However, firstborns and single children are disadvantaged since they lack the benefits of a siblings' linguistic network. Siblings can have a positive as well as negative effect. In the positive one, siblings learn a great deal from one another as they have a greater number of verbal exchanges and conversations in a day thus offering greater

opportunity for language acquisition. However, in the negative case, one child may dominate the language exchange and stunt the other's development[50]. Singletons have been found to develop language better than twins or triplets[48].

3. Implications for Parents and Educators.

The importance of biological factors in language acquisition cannot be gainsaid. It is a fact that biology lays the foundation for effective language acquisition. However, the acquisition process takes place within a social context where attendant factors interact with the biological givens in ways that either enhance or hinder the acquisition of any language. We further acknowledge that as much as children are responsible for their own language acquisition, their interactions with their family members and broader cultural contexts are quite significant in the process. Parents and educators need to encourage children in their attempts at language use. We also implore parents to embrace interactive activities with their children such as storytelling so as to improve language acquisition. Since language is linked to cognitive development, school activities that encourage children to maximise their ethnic language use should be encouraged. Such school activities can be quite helpful in recognizing and embracing children's linguistic and cultural backgrounds. This would be an important step towards making every child to experience success and feel a valued member of the community.

Research on the effects of biological factors such as language disorders on language acquisition is particularly lacking in African contexts. Such studies ought to be conducted to validate the global applicability of the existing theoretical frameworks to individuals from different linguistic cultures. It would particularly be enriching to see more extensive research work on the acquisition of African ethnic languages. We contend that the province of language acquisition is complex and expansive and a lot of research is needed to unravel the mystery of language acquisition.

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