



The Influence of Age on Second Language Acquisition and Fossilization: A
Review of Previous Studies

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Abstract

The relationship between age and second language acquisition (SLA) has remained one of the most extensively debated topics in applied linguistics. Researchers have long attempted to determine whether age significantly influences learners' ability to acquire a second language and to what extent age contributes to differences in language attainment. Closely related to this issue is the phenomenon of fossilization, which refers to the stabilization of non -native linguistic forms in a learner's interlanguage despite continued exposure to the target language and ongoing instruction. The present study reviews previous research concerning the influence of age on second language acquisition and examines the relationship between age-related factors and fossilization.

The review draws upon major theoretical perspectives and empirical studies in the field of second language acquisition, including research related to the Critical Period Hypothesis, age effects on pronunciation and grammar acquisition, cognitive development, and learner-related variables. Particular attention is given to studies investigating the extent to which younger and older learners differ in their ability to achieve native -like proficiency and the role that fossilization plays in limiting ultimate attainment among adult learners.

The findings of previous studies indicate that age influences various aspects of second language acquisition, particularly pronunciation and phonological development. While younger learners are generally more likely to achieve native -like proficiency, adult learners frequently demonstrate advantages in the initial stages of language learning due to their cognitive maturity and learning strategies. The literature further suggests that fossilization cannot be explained by age alone, as factors such as motivation, language exposure, instructional quality, and opportunities for interaction also contribute significantly to long-term language development.

The study concludes that age remains an important factor in second language acquisition; however, it should be viewed as one element within a broader network of cognitive, social, and environmental influences. Understanding the interaction between age and fossilization contributes to a more comprehensive understanding of language learning processes and may assist educators in developing more effective language teaching practices.

Keywords: Second Language Acquisition, Age, Fossilization, Critical Period Hypothesis, Interlanguage, Language Learning.

1. Introduction Second language acquisition (SLA) has become one of the most significant areas of research in applied linguistics due to the increasing importance of multilingualism in modern societies. As globalization continues to facilitate communication across linguistic and cultural boundaries, understanding the factors that

influence second language learning has become essential for educators, researchers, and policy makers. Among the numerous variables investigated in SLA research, age has consistently received considerable attention because of its potential influence on language learning outcomes.

The question of whether younger learners possess an advantage over older learners has generated extensive debate for several decades. Early research suggested that language acquisition is strongly associated with biological maturation and that there may be an optimal period during which language learning occurs most naturally and efficiently. This view became widely known through the Critical Period Hypothesis, originally proposed by Lenneberg (1967), who argued that language acquisition is linked to neurological development and that the ability to acquire language declines after puberty. Although the hypothesis was initially developed to explain first language acquisition, many researchers later extended its application to second language learning. Subsequent investigations have produced complex and sometimes contradictory findings. Several studies have reported that learners who begin acquiring a second language at an earlier age are more likely to achieve native-like pronunciation and higher levels of ultimate attainment than those who begin learning later in life (Johnson & Newport, 1989; Birdsong, 1999). At the same time, research has demonstrated that adult learners often progress more rapidly during the initial stages of language learning because they possess more advanced cognitive abilities, greater metalinguistic awareness, and more developed learning strategies than children (DeKeyser, 2000). These findings suggest that the relationship between age and second language acquisition is far more complex than a simple comparison between children and adults.

A concept that frequently emerges in discussions of age-related differences is fossilization. First introduced by Selinker (1972), fossilization refers to the persistence of non-native linguistic features in a learner's interlanguage despite continued exposure to the target language and ongoing instruction. Fossilization has often been associated with adult second language learners because many individuals continue to exhibit grammatical, lexical, or phonological deviations from native-speaker norms even after years of language use.

Consequently, fossilization has become a central concept in attempts to explain why some learners fail to attain complete native-like proficiency.

Contemporary SLA research increasingly recognizes that age alone cannot account for all differences in language learning outcomes. Factors such as motivation, quantity and quality of language input, educational background, social interaction, learning environment, and individual learner characteristics have also been shown to influence second language development. As a result, modern perspectives tend to view age as one component within a broader network of interacting variables rather than as the sole determinant of success or failure in second language acquisition.

Given the continuing debate regarding the influence of age and the role of fossilization in second language learning, a comprehensive review of previous studies remains necessary. Examining the findings of earlier research can provide valuable insights into the extent to which age affects language acquisition and help clarify the mechanisms that contribute to fossilization among second language learners. Therefore, this study

reviews major theoretical and empirical contributions related to age and fossilization in order to develop a clearer understanding of their role in second language acquisition.

2. Statement of the Problem Despite the considerable body of research examining age in second language acquisition, there is still no clear consensus regarding the extent to which age influences language learning outcomes. While many studies have reported that learners who begin acquiring a second language at an earlier age are more likely to attain native-like levels of proficiency, other research has shown that older learners may demonstrate advantages in certain aspects of language learning, particularly during the initial stages of acquisition. These contrasting findings have contributed to ongoing debate concerning the role of age in second language development.

The issue becomes more complex when considered alongside the phenomenon of fossilization. Although fossilization is frequently associated with adult second language learners, researchers differ in their explanations of why it occurs and the extent to which it is related to age. Some studies emphasize biological and maturational constraints, whereas others highlight the influence of cognitive, social, educational, and motivational factors. As a result, the relationship between age and fossilization remains insufficiently understood.

Given these inconsistencies, there is a need to examine and synthesize previous research in order to provide a clearer understanding of how age influences second language acquisition and the role fossilization may play in shaping learners' ultimate attainment. The present study addresses this need through a review of major theoretical and empirical contributions in the field.

3. Research Questions

The present study seeks to answer the following questions:

How does age influence second language acquisition according to previous studies?

What evidence has been presented in support of age-related advantages and disadvantages in second language learning?

What is fossilization, and how is it related to second language acquisition?

To what extent does age contribute to the occurrence of fossilization among second language learners?

What other factors, in addition to age, have been identified as influencing second language acquisition and fossilization?

4. Objectives of the Study

The present study aims to:

Examine the influence of age on second language acquisition through a review of previous research.

Investigate the major theoretical perspectives that explain age-related differences in second language learning.

Explore the concept of fossilization and its role in second language acquisition.

Analyze the relationship between age and fossilization as discussed in previous studies.

Identify additional factors that may influence second language acquisition and contribute to fossilization.

Provide a comprehensive understanding of the interaction between age and other variables affecting second language learning.

5. Significance of the Study The significance of this study stems from the continuing debate surrounding the role of age in second language acquisition and the persistent challenges associated with fossilization. Understanding how age influences language learning may contribute to a more accurate interpretation of learners' strengths and difficulties at different stages of life. Such understanding is particularly important for educators, curriculum designers, and language

learners who seek to maximize the effectiveness of language instruction.

In addition, the study contributes to the existing body of knowledge by synthesizing previous research concerning both age and fossilization. Since these topics remain among the most widely discussed issues in applied linguistics, a review of the relevant literature may help clarify areas of agreement and disagreement among researchers. The study may also assist language teachers in developing instructional approaches that take learners' age-related characteristics into account while addressing factors that may contribute to fossilization.

Furthermore, the findings of this review may encourage future researchers to investigate unresolved questions concerning the relationship between age, language learning success, and fossilization. By highlighting the complexity of these phenomena, the study contributes to a broader understanding of second language acquisition and the factors that shape long-term language development.

6.1 Second Language Acquisition: Definitions and Concepts Second language acquisition (SLA) is a field of study concerned with how individuals

learn a language in addition to their native language. Since its emergence as a distinct area of research during the second half of the twentieth century, SLA has attracted considerable attention from linguists, psychologists, educators, and cognitive scientists seeking to understand the processes involved in language learning. The field examines both the internal mechanisms that enable language acquisition and the external factors that influence learners' success.

Researchers have proposed various definitions of second language acquisition. Ellis (2015) describes SLA as the process through which individuals learn a language other than their first language, whether the learning occurs in natural settings, formal educational environments, or a combination of both. Similarly, Gass, Behney, and Plonsky (2020) explain that SLA investigates how learners develop knowledge of a second language and the factors that affect this development over time. These definitions emphasize that second language acquisition is not limited to classroom instruction but includes all forms of learning that contribute to the development of communicative competence in another language.

One of the fundamental assumptions in SLA research is that language acquisition is a gradual and developmental process. Learners do not acquire all aspects of a language simultaneously; rather, they progress through different stages as their linguistic knowledge expands. During this process, learners construct an evolving linguistic system that reflects elements of both their first language and the target language. Selinker (1972) referred to this evolving system as interlanguage, a concept that has become central to SLA research.

Interlanguage is characterized by systematic patterns that may differ from both the learner's native language and the target language, reflecting the learner's ongoing attempts to make sense of new linguistic information.

Another important characteristic of second language acquisition is the existence of substantial variation among learners. Individuals exposed to similar instructional conditions often achieve markedly different outcomes. Some learners attain high levels of proficiency and near-native performance, whereas others continue to experience difficulties even after years of study and exposure. This variation has led researchers to investigate a widerange of factors that may influence language learning success, including age, motivation, aptitude, learning strategies, personality traits, educational background, and opportunities for interaction with native speakers (Lightbown & Spada, 2021).

Throughout the history of SLA research, scholars have proposed numerous theoretical perspectives to explain how second languages are acquired. Behaviorist theories initially viewed language learning as the result of habit formation through repetition and reinforcement. However, later cognitive approaches challenged this view by emphasizing the active role of learners in processing and organizing linguistic input. Krashen's Monitor Model, Long's Interaction Hypothesis, and cognitive-information processing approaches subsequently contributed to a broader understanding of how learners acquire and develop second-language competence. Although these perspectives differ in their assumptions, they collectively highlight the complexity of language acquisition and the interaction of multiple cognitive and environmental influences.

Contemporary SLA research generally recognizes that no single factor can fully explain success in second language learning. Instead, language acquisition is viewed as a multifaceted process shaped by biological, cognitive, psychological, and social influences.

Among these variables, age has remained one of the most extensively investigated because of its potential relationship to ultimate language attainment and the phenomenon of fossilization.

Consequently, understanding the role of age within the broader framework of second language acquisition has become an essential objective of SLA research.

6.2 Age as a Variable in Second Language Acquisition

Age has long been regarded as one of the most influential variables in second language acquisition. Since the development of modern SLA research, scholars have attempted to determine whether the age at which language learning begins affects the rate of acquisition, the learning process itself, and the level of proficiency ultimately achieved. As a result, age has become one of the most extensively investigated individual differences in language learning.

The significance of age in second language acquisition stems largely from the observation that children and adults often demonstrate different patterns of language learning. In many naturalistic settings, children who are exposed to a second language at an early age appear more likely to develop pronunciation and communicative abilities that resemble those of native speakers. These observations led researchers to question whether younger learners possess biological advantages that facilitate language acquisition. Consequently, age became a central variable in studies examining the relationship between maturation and language learning outcomes.

Research findings, however, have not always produced consistent conclusions. Some studies have reported a strong relationship between early exposure and higher levels of

ultimate attainment, particularly in pronunciation and phonological accuracy. Johnson and Newport (1989), for example, found that learners who arrived in the United States at younger ages generally achieved higher levels of grammatical proficiency in English than those who arrived later. Similar findings have been reported by several researchers investigating age effects in different linguistic contexts. These studies have often been interpreted as evidence supporting the view that younger learners possess certain advantages in long-term language acquisition.

At the same time, other researchers have emphasized that older learners frequently demonstrate advantages during the early stages of learning. Adults generally possess more developed cognitive abilities, greater metalinguistic awareness, and a broader range of learning strategies than children. As a result, they are often capable of understanding grammatical explanations, memorizing vocabulary, and applying learning strategies more efficiently in formal instructional settings. DeKeyser (2000) argues that adult learners may initially outperform younger learners, particularly when language instruction involves explicit learning and conscious analysis of linguistic forms.

The distinction between the rate of learning and ultimate attainment has become particularly important in discussions of age effects. While younger learners may eventually achieve higher levels of native-like proficiency after extended exposure, older learners frequently progress more rapidly during the initial phases of acquisition. This distinction has helped explain why studies sometimes produce apparently contradictory findings. Differences in research design, learning environment, length of exposure, and measures of proficiency may all influence the conclusions reached regarding age-related advantages.

Recent scholarship has increasingly questioned the assumption that age alone determines language learning success. Birdsong (2018) notes that age effects often interact with numerous other variables, including motivation, educational opportunities, language input, social integration, and individual aptitude. Consequently, many contemporary researchers view age not as an isolated cause of language learning outcomes but as one factor operating within a complex network of cognitive, social, and environmental influences.

Although disagreement remains concerning the extent and nature of age effects, few researchers dispute that age constitutes a significant factor in second language acquisition.

The challenge lies in determining how age influences different aspects of language learning and identifying the mechanisms through which these effects occur.

This debate has given rise to one of the most influential theories in SLA research: the Critical Period Hypothesis, which attempts to explain the relationship between biological maturation and language learning ability.

6.3 The Critical Period Hypothesis The Critical Period Hypothesis (CPH) remains one of the most influential and extensively debated theories in second language acquisition (SLA). It proposes that language learning is affected by biological maturation and that there is a period during which language acquisition occurs with greater ease and efficiency. According to this view, age-related changes in the brain gradually reduce the capacity for language learning, resulting in differences between younger and older learners. Although originally developed to explain first language acquisition, the

hypothesis has been widely applied to second language learning and continues to shape discussions concerning age-related differences in SLA.

The theory is most commonly associated with Lenneberg (1967), who argued that language acquisition is linked to neurological development. He suggested that the lateralization of language functions becomes largely complete around puberty, after which the brain loses some of the flexibility that characterizes childhood learning. From this perspective, younger learners are expected to possess advantages that facilitate language acquisition and increase the likelihood of achieving native-like proficiency. A substantial body of research has examined whether empirical evidence supports the predictions of the Critical Period Hypothesis. Findings reported by Patkowski (1980), Johnson and Newport (1989), and Long (1990) collectively suggest that earlier exposure is associated with higher levels of ultimate attainment, particularly in syntax and pronunciation.

Learners who begin acquiring a second language during childhood generally appear more likely to achieve native-like proficiency than those who start learning later in life. Such findings have frequently been interpreted as evidence that age-related constraints influence certain aspects of second language acquisition, especially phonological development.

Despite its considerable influence, the Critical Period Hypothesis has not been universally accepted. Critics argue that the available evidence does not demonstrate the existence of a strict biological cutoff point after which successful language learning becomes impossible. Birdsong (1999) contends that the relationship between age and language attainment is more gradual and variable than early formulations of the hypothesis suggest.

Research has shown that some adult learners are capable of achieving exceptionally high levels of proficiency, including near-native performance in particular linguistic domains, indicating that age alone cannot fully account for language learning outcomes.

Further criticism has focused on the role of non-biological factors. Bialystok and Hakuta (1999) argue that differences between younger and older learners may be influenced by factors such as educational opportunities, motivation, quality of language input, social interaction, and patterns of language use. From this perspective, age effects cannot be examined independently of the broader learning environment in which acquisition takes place.

Researchers have also questioned whether age affects all aspects of language equally. Evidence suggests that pronunciation and phonology are generally more sensitive to age-related influences than vocabulary acquisition or certain aspects of grammar.

Consequently, some scholars have proposed that different language abilities may be associated with different developmental periods rather than a single critical period governing language acquisition as a whole.

Contemporary SLA research generally acknowledges that age plays a significant role in second language acquisition, but disagreement remains regarding the nature and extent of its influence. Rather than viewing the Critical Period Hypothesis as a definitive explanation of language learning outcomes, many researchers regard it as a useful framework for investigating how biological maturation interacts with cognitive, social, and environmental factors.

6.4 Fossilization and Interlanguage Fossilization is one of the most influential concepts in second language acquisition (SLA) research because it addresses a fundamental question: why do many learners fail to attain native-like proficiency despite years of exposure to the target language? The concept is closely connected to interlanguage, a term used to describe the evolving linguistic system that learners develop as they progress toward mastery of a second language. Together, interlanguage and fossilization provide an important framework for understanding long-term patterns of second language development and the limitations that some learners encounter during the acquisition process.

The notion of interlanguage was introduced by Selinker (1972), who argued that second language learners construct a linguistic system that is neither identical to their first language nor fully equivalent to the target language. Rather, interlanguage represents an independent and dynamic system that develops as learners receive new input, test hypotheses about language, and modify their linguistic knowledge over time. Because interlanguage is constantly evolving, it serves as the foundation for understanding both language development and persistent learning difficulties.

Within this framework, Selinker (1972) proposed the concept of fossilization to explain the tendency for certain linguistic features to become resistant to change. Fossilized forms may persist even after extensive exposure to the target language, continued instruction, and frequent opportunities for communication. As a result, learners may continue to display non-native patterns in their language use despite achieving advanced levels of proficiency.

Research has documented fossilization across multiple linguistic domains, including pronunciation, grammar, and vocabulary. Persistent foreign accents, recurring grammatical inaccuracies, and long-term lexical errors have all been identified as potential manifestations of fossilization. The presence of these features among learners from diverse linguistic and cultural backgrounds has led many researchers to regard fossilization as a widespread phenomenon rather than a problem limited to specific languages or learning contexts.

Although fossilization is widely recognized within SLA research, there is considerable disagreement regarding its underlying causes. One line of research associates fossilization with age-related factors and biological limitations on language learning. From this perspective, learners who begin acquiring a second language after childhood may encounter neurological constraints that reduce the likelihood of achieving native-like proficiency. Such arguments are frequently linked to the Critical Period Hypothesis and broader discussions concerning the effects of maturation on second language acquisition.

Many scholars, however, contend that fossilization cannot be explained solely in terms of age. Han (2004) argues that fossilization emerges from the interaction of multiple factors, including first-language influence, insufficient or inconsistent input, limited opportunities for meaningful communication, learning strategies, and motivational variables.

This perspective suggests that fossilization is not the inevitable consequence of biological maturation but rather the result of complex interactions among cognitive, social, and

environmental influences. Consequently, learners of similar ages may demonstrate markedly different outcomes depending on their learning experiences and contexts. A further area of debate concerns the permanence of fossilized forms. Traditional interpretations often viewed fossilization as a stable and irreversible condition that prevented learners from making further progress in specific aspects of the target language. More recent research has challenged this view, suggesting that apparent fossilization may sometimes represent a prolonged developmental plateau rather than a complete cessation of learning.

Evidence from advanced second language learners indicates that continued exposure, intensive instruction, and sustained interaction can contribute to further development even after long periods of apparent stability. These findings have encouraged researchers to reconsider whether fossilization should always be regarded as permanent.

Despite ongoing disagreement regarding its definition, causes, and permanence, fossilization remains a central concept in second language acquisition research. The phenomenon provides valuable insight into why many learners experience limitations in achieving native-like proficiency and why substantial individual differences persist among learners. Because fossilization is frequently discussed in relation to age, its relationship with age-related factors continues to represent an important area of investigation within SLA research.

6.5 Age and Pronunciation Attainment Among the various components of second language acquisition, pronunciation has consistently been identified as one of the linguistic domains most strongly influenced by age.

While learners may achieve high levels of competence in vocabulary, grammar, and communication regardless of when language learning begins, attaining native-like pronunciation appears to be considerably more difficult for individuals who start learning a second language later in life. Consequently, pronunciation has become a major focus of research examining the relationship between age and language acquisition.

Numerous studies have reported a negative relationship between age of acquisition and pronunciation attainment. In general, learners who begin acquiring a second language during early childhood are more likely to develop pronunciation patterns that closely resemble those of native speakers. By contrast, learners who begin during adolescence or adulthood frequently retain identifiable features of their first-language phonological system.

These features may manifest as differences in stress placement, intonation, rhythm, vowel production, or consonant articulation.

One of the most influential contributions to this area of research was made by Flege, Munro, and MacKay (1995), who examined Italian immigrants living in Canada and investigated the relationship between age of arrival and English pronunciation. Their findings indicated that individuals who arrived at younger ages generally achieved more native-like pronunciation than those who arrived later. The study provided important evidence that age of acquisition is closely associated with phonological attainment and helped establish pronunciation as a key area for investigating age effects in second language learning.

Similar findings have been reported in a variety of linguistic contexts. Research conducted by Flege (1999) suggested that the ability to perceive and produce unfamiliar speech sounds becomes increasingly difficult with age, partly because learners rely on phonological categories established through their first language. As a result, adult learners may interpret second-language sounds through the framework of their native-language sound system, making it more challenging to develop native-like pronunciation patterns. This phenomenon helps explain why foreign accents often persist even among highly proficient second language speakers.

The relationship between age and pronunciation has frequently been interpreted as evidence supporting the Critical Period Hypothesis. Long (1990) argued that pronunciation may be particularly sensitive to maturational factors and that the likelihood of achieving native-like accent decreases substantially after childhood. Because pronunciation requires precise perception and production of phonetic distinctions, some researchers believe that it is more vulnerable to age-related constraints than other aspects of language acquisition.

Despite these findings, researchers have also emphasized that age does not entirely determine pronunciation outcomes. Individual differences remain evident among learners who begin learning at similar ages. Factors such as motivation, quantity of exposure, frequency of interaction with native speakers, length of residence in the target-language environment, and quality of instruction may significantly influence pronunciation development. Moyer (2004), for example, found that highly motivated adult learners could achieve levels of pronunciation that approached native-speaker norms, although such outcomes were relatively uncommon.

Furthermore, recent research has challenged the assumption that native-like pronunciation should be regarded as the primary indicator of successful language acquisition. Some scholars argue that intelligibility and communicative effectiveness may be more meaningful measures of pronunciation competence than the complete absence of a foreign accent.

From this perspective, adult learners may achieve highly successful communication even when certain phonological features continue to reflect their first-language background.

Overall, the literature suggests that pronunciation is one of the linguistic domains most strongly associated with age-related differences in second language acquisition. Younger learners generally demonstrate greater success in attaining native-like pronunciation, lending support to arguments that age influences phonological development.

Nevertheless, the existence of successful adult learners and the influence of environmental and motivational factors indicate that age alone cannot fully account for pronunciation outcomes. Therefore,

pronunciation attainment should be understood as the result of a complex interaction between biological, cognitive, and experiential influences.

6.6 Age and Grammatical Development

Compared with pronunciation, the relationship between age and grammatical development has generated more diverse and sometimes contradictory findings in second language acquisition research. While many scholars agree that age influences language learning, there is less consensus regarding the extent to which age affects the acquisition of grammatical structures. As a result, grammatical development has become one of the most debated areas in discussions of age-related differences in second language acquisition.

Early research examining age effects on grammar often focused on the possibility that younger learners possess advantages similar to those observed in pronunciation. One of the most influential studies in this area was conducted by Johnson and Newport (1989), who investigated the English grammatical proficiency of Korean and Chinese immigrants who arrived in the United States at different ages. Their findings revealed a strong relationship between age of arrival and performance on grammatical judgment tasks, particularly among learners who began acquiring English before puberty. The researchers concluded that age appeared to influence ultimate attainment in grammatical competence, providing support for the existence of maturational constraints on language learning. Research conducted by DeKeyser (2000) further explored this relationship by examining highly successful second language learners. His findings suggested that age effects remain evident even among advanced learners and that native-like grammatical attainment becomes less common among individuals who begin learning a second language later in life.

These results have frequently been interpreted as supporting the argument that grammatical acquisition, like pronunciation, may be influenced by age-related factors. Despite this evidence, many researchers have challenged the view that grammar is subject to the same degree of age-related limitation as pronunciation. Unlike phonological development, grammatical learning often benefits from explicit instruction, conscious analysis, and metalinguistic awareness. Adult learners generally possess more advanced cognitive abilities than children and are therefore capable of understanding complex grammatical explanations and applying rule-based learning strategies. Consequently, adults frequently demonstrate rapid progress in grammar during the early stages of language acquisition, particularly in classroom settings.

Birdsong (1999) argued that the relationship between age and grammatical attainment is characterized by considerable variability. Although average performance may decline as age of acquisition increases, individual differences remain substantial. Some adult learners achieve exceptionally high levels of grammatical proficiency, challenging strong versions of the Critical Period Hypothesis. These findings suggest that age does not impose absolute limitations on grammatical learning and that successful acquisition remains possible under favorable conditions.

Another important consideration involves the distinction between explicit and implicit knowledge. Ellis (2008) notes that adult learners often rely more heavily on explicit learning processes, which involve conscious attention to grammatical rules and structures. Children, in contrast, tend to acquire language more implicitly through

exposure and interaction. This difference in learning mechanisms may help explain why adults often outperform children in formal instructional environments while children may demonstrate advantages in long-term naturalistic acquisition.

Recent research has increasingly emphasized the role of environmental and individual factors in grammatical development. Variables such as motivation, educational background,

language aptitude, quality of instruction, and frequency of language use have been shown to influence grammatical attainment. As a result, many contemporary scholars argue that age should be viewed as one factor among many rather than as the sole determinant of grammatical success.

Overall, the literature suggests that age influences grammatical development, but its effects appear to be less consistent and less pronounced than those observed in pronunciation.

While younger learners often demonstrate advantages in ultimate attainment, adult learners may benefit from cognitive maturity and explicit learning abilities that facilitate grammatical acquisition. Consequently, grammatical development provides evidence for a more nuanced understanding of age effects in second language acquisition, one that recognizes the interaction of biological, cognitive, and environmental influences.

6.7 Cognitive Explanations for Age Effects In addition to documenting differences between younger and older learners, researchers have sought to explain the cognitive mechanisms that may account for age-related variation in second language acquisition. While empirical studies have frequently identified a relationship between age and language-learning outcomes, understanding the reasons behind these differences remains a central objective of SLA research. Consequently, several cognitive explanations have been proposed to clarify how age may influence the process of acquiring a second language.

One of the most widely discussed explanations involves neurological plasticity. Neurological plasticity refers to the brain's capacity to adapt, reorganize, and form new neural connections in response to learning and experience. According to proponents of the Critical Period Hypothesis, children benefit from a higher degree of neural flexibility, which facilitates the acquisition of linguistic patterns through natural exposure and interaction. As individuals mature, this flexibility is believed to decline gradually, potentially making certain

aspects of language acquisition more challenging. This explanation has often been used to account for age-related differences in pronunciation and native-like attainment.

At the same time, cognitive maturity provides older learners with advantages that are generally unavailable to children. Adults possess more advanced reasoning abilities, greater problem-solving skills, and a more developed capacity for abstract thinking. These cognitive resources enable adult learners to analyze language consciously, identify grammatical patterns, and apply learning strategies more effectively. As a result, adults frequently demonstrate rapid progress during the initial stages of second language learning, particularly in formal instructional settings where explicit explanations play a significant role.

Researchers have also distinguished between implicit and explicit learning processes when explaining age effects. Implicit learning occurs without conscious awareness of

linguistic rules and is often associated with natural language acquisition through exposure and interaction. Explicit learning, in contrast, involves conscious attention to language forms and deliberate attempts to understand grammatical structures. Ellis (2008) argues that children tend to rely more heavily on implicit learning mechanisms, whereas adults often depend on explicit learning strategies. This distinction may help explain why children frequently excel in long-term naturalistic acquisition while adults perform well in classroom-based environments that emphasize grammatical instruction.

Another cognitive factor that has received considerable attention is metalinguistic awareness. Metalinguistic awareness refers to an individual's ability to reflect upon and analyze language as a system. Adult learners generally possess higher levels of metalinguistic awareness because they have already acquired a first language and developed formal educational skills. This awareness allows them to understand grammatical terminology, compare linguistic structures across languages, and apply analytical learning techniques.

Consequently, adults may compensate for certain age-related disadvantages by drawing upon cognitive abilities that support language learning.

Memory processes have likewise been identified as important contributors to second language acquisition. Working memory, which is responsible for temporarily storing and manipulating information, plays a significant role in vocabulary learning, grammatical processing, and language comprehension. Studies suggest that individual differences in memory capacity can influence language-learning success regardless of age. Some researchers therefore argue that variations in cognitive abilities among learners may explain a substantial portion of the differences traditionally attributed to age alone. Furthermore, contemporary research increasingly emphasizes the interaction between cognitive and environmental factors. Cognitive abilities do not operate independently of learning conditions; rather, their influence may depend on the quantity and quality of language exposure, instructional methods, motivation, and opportunities for communication.

As a result, many scholars reject purely biological explanations of age effects and instead advocate multifactorial approaches that recognize the combined influence of cognitive, social, and experiential variables.

Overall, cognitive explanations provide important insights into the mechanisms underlying age-related differences in second language acquisition. The literature suggests that younger learners may benefit from greater neurological plasticity and implicit learning capacities, whereas older learners often possess advantages associated with cognitive maturity, metalinguistic awareness, and explicit learning strategies. These findings reinforce the view that age influences language acquisition in complex ways and cannot be understood solely through biological or cognitive explanations alone.

6.8 Environmental and Social Factors Affecting Second Language Acquisition

Although age has received considerable attention in second language acquisition research, contemporary scholars generally agree that language learning outcomes cannot be explained by age alone. A growing body of research has demonstrated that environmental and social factors play a crucial role in shaping learners' progress and ultimate attainment. These factors often interact with age-related influences, making it difficult to attribute success or failure in second language acquisition to a single variable. One of the most frequently discussed environmental factors is language input. Input

refers to the linguistic exposure learners receive through listening, reading, and interaction with speakers of the target language. Krashen (1985) emphasized the importance of comprehensible input, arguing that language acquisition occurs when learners are exposed to

language that is slightly beyond their current level of competence but remains understandable through context and prior knowledge. Learners who receive abundant and meaningful exposure to the target language generally demonstrate greater progress than those with limited opportunities for interaction.

The quality of language input is equally important. Merely being exposed to a second language does not guarantee successful acquisition. Research indicates that learners benefit

most when they engage with authentic language in meaningful communicative situations. Long's (1996) Interaction Hypothesis highlights the role of interaction in facilitating language development. Through communication, learners receive feedback, negotiate meaning, and modify their language use, all of which contribute to language growth. Consequently, learners who regularly participate in communicative activities often achieve higher levels of proficiency than those whose exposure is restricted to passive learning.

Motivation has also been identified as a significant factor influencing second language acquisition. Gardner (1985) proposed that motivated learners are more likely to invest effort, persist through difficulties, and seek opportunities to use the target language.

Motivation may be instrumental, such as learning a language for academic or professional purposes, or integrative, involving a desire to become part of the target-language community.

Numerous studies have reported positive relationships between motivation and language-learning success, suggesting that highly motivated learners can achieve substantial progress regardless of their age.

Another important variable is the learning environment. Educational settings differ considerably in terms of instructional methods, teacher expertise, available resources, and opportunities for language use. Learners enrolled in programs that emphasize communication, interaction, and meaningful language use often demonstrate better outcomes than those exposed primarily to memorization and mechanical practice.

Furthermore, access to supportive educational environments may influence learners' confidence, participation, and willingness to communicate in the target language.

Social factors also contribute significantly to language development. Learners who interact frequently with native speakers or members of the target-language community often gain greater exposure to authentic language and cultural practices. Such interactions provide opportunities to refine linguistic skills, receive feedback, and develop communicative competence. Conversely, limited social contact with target-language speakers may restrict opportunities for meaningful language use and slow the acquisition process.

In addition, attitudes toward the target language and its speakers have been shown to influence language learning outcomes. Positive attitudes may encourage learners to engage more actively with the language, whereas negative attitudes can reduce motivation and limit

participation.

Similarly, cultural adaptation and social integration have been associated with successful second language development, particularly among immigrant learners who use the target language in their daily lives.

The importance of environmental and social influences has significant implications for understanding fossilization. Researchers have argued that limited exposure, insufficient interaction, low motivation, and restricted opportunities for language use may contribute to the stabilization of non-native forms in learners' interlanguage. From this perspective, fossilization cannot be attributed solely to age-related biological factors. Instead, it emerges from the interaction of multiple influences that affect learners throughout the language acquisition process.

Overall, the literature suggests that environmental and social factors play a fundamental role in second language acquisition. While age may influence learning outcomes, variables such as language input, interaction, motivation, educational context, and social engagement also contribute significantly to language development.

Recognizing the importance of these factors provides a more comprehensive understanding of second language acquisition and helps explain why learners of similar ages often achieve very different levels of proficiency.

6.9 Review of Previous Empirical Studies A substantial body of empirical research has examined the relationship between age and second language acquisition. Although researchers generally agree that age influences language-learning outcomes, considerable debate remains regarding the extent of this influence and the mechanisms through which it operates. Empirical studies have investigated a wide range of linguistic domains, including pronunciation, grammar, ultimate attainment, and fossilization, producing findings that both support and challenge age-based explanations of second language acquisition.

A significant portion of the empirical literature has reported a relationship between age of acquisition and language attainment. Findings reported by Johnson and Newport (1989) and Patkowski (1980) consistently suggest that learners who begin acquiring a second language during childhood are more likely to achieve higher levels of grammatical proficiency than those who begin learning later in life. These studies have frequently been

cited as evidence supporting the view that age-related factors influence ultimate attainment and have contributed substantially to discussions surrounding the Critical Period Hypothesis.

Research examining pronunciation has produced some of the strongest evidence for age-related effects. Findings reported by Flege, Munro, and MacKay (1995), together with results from subsequent studies, indicate that earlier exposure to a second language is generally associated with more native-like pronunciation. Such evidence has led many researchers to conclude that phonological development is particularly sensitive to age-related influences and may be more strongly affected by age than other components of language acquisition.

Despite the consistency of these findings, empirical research has also highlighted considerable variability among second language learners. Birdsong (1999) documented cases of highly proficient adult learners who achieved near-native levels of

performance, challenging the notion of a strict biological cutoff point for successful language acquisition.

Similarly, DeKeyser (2000) demonstrated that although age effects remain evident, factors such as cognitive ability, learning conditions, and language exposure can contribute significantly to language attainment. These findings suggest that successful second language acquisition remains possible beyond childhood and that age alone cannot fully account for individual differences in proficiency.

Empirical investigations of fossilization have likewise produced complex findings. Selinker's (1972) original formulation of fossilization emphasized the tendency for certain linguistic features to become stabilized within a learner's interlanguage despite continued exposure and instruction. Subsequent research by Han (2004) expanded this perspective by demonstrating that fossilization is influenced by multiple interacting factors, including first-language transfer, limited input, insufficient interaction, and learner-related variables. These findings indicate that fossilization cannot be attributed solely to age-related constraints and that environmental influences play an important role in long-term language development.

More recent empirical research has increasingly adopted multifactorial approaches to second language acquisition. Studies examining motivation, language aptitude, educational background, quality of instruction, and quantity of language exposure have shown that learners of similar ages often achieve markedly different outcomes. Such findings challenge explanations based exclusively on biological maturation and support the view that age operates alongside a range of cognitive, social, and environmental influences.

Taken together, previous empirical studies demonstrate that age exerts a significant influence on second language acquisition, particularly in relation to pronunciation and ultimate attainment. However, the literature also indicates that age alone cannot adequately explain variation in language-learning outcomes. Factors such as motivation, language exposure, learning environment, cognitive abilities, and social interaction contribute substantially to language development and may either strengthen or weaken age-related effects. Consequently, contemporary empirical research supports a comprehensive understanding of second language acquisition in which age interacts with multiple cognitive, social, and environmental variables rather than functioning as an isolated determinant of success.

7. Discussion

The present review demonstrates that age remains one of the most influential variables in second language acquisition; however, the evidence also indicates that its effects are far more complex than early theoretical perspectives originally proposed. Although numerous studies have identified advantages associated with younger learners, the literature consistently suggests that age alone cannot adequately explain variation in second language attainment. Instead, language-learning outcomes appear to result from

the interaction of biological, cognitive, social, and environmental factors that influence learners throughout the acquisition process.

One of the most consistent findings emerging from the literature concerns pronunciation attainment. Across a variety of linguistic contexts, learners who begin acquiring a second language during childhood are generally more likely to develop pronunciation patterns that approximate those of native speakers. This finding provides substantial support for the view that phonological development is particularly sensitive to age-related influences and may be closely linked to maturational processes. At the same time, the existence of highly proficient adult learners demonstrates that age does not function as an absolute determinant of pronunciation outcomes. Rather, factors such as motivation, quality of input, frequency of interaction, and sustained exposure appear capable of influencing phonological development alongside age.

In contrast, the relationship between age and grammatical development appears considerably more nuanced. While many studies suggest that earlier exposure contributes to higher levels of ultimate grammatical attainment, adult learners often possess cognitive advantages that facilitate language learning. Greater metalinguistic awareness, advanced reasoning abilities, and the capacity for explicit learning enable adults to analyze linguistic structures and benefit from formal instruction. Consequently, the evidence suggests that age-related effects on grammar are less pronounced and less consistent than those observed in pronunciation, highlighting the importance of considering both cognitive and environmental influences when evaluating grammatical development.

The findings reviewed in this study also support the continued relevance of the Critical Period Hypothesis as a framework for understanding age-related differences in second language acquisition. Nevertheless, contemporary research provides limited support for strong interpretations of the hypothesis that assume a fixed biological cutoff point after which successful language learning becomes impossible. The documented success of some adult learners indicates that language acquisition remains achievable beyond childhood, even if native-like attainment becomes less common. These findings suggest that age-related influences are best understood as gradual and probabilistic rather than absolute and deterministic.

The literature on fossilization further illustrates the complexity of second language acquisition. Although fossilization has frequently been associated with learners who begin acquiring a second language later in life, the evidence reviewed suggests that age alone cannot account for the persistence of non-native linguistic features. Factors such as first-language transfer, limited exposure to the target language, insufficient feedback, restricted opportunities for meaningful communication, and motivational influences all appear to contribute to the stabilization of interlanguage forms. Consequently, fossilization should be viewed as a multifaceted phenomenon resulting from the interaction of learner-related and environmental factors rather than as a direct consequence of age alone.

Another important finding emerging from the literature is the significant role of environmental and social influences in shaping language-learning outcomes. Research

consistently demonstrates that learners who receive extensive exposure to the target language, participate in meaningful interaction, and maintain high levels of motivation are more likely to achieve successful outcomes regardless of their age of acquisition.

These findings

emphasize that language learning is not determined solely by biological factors but is also strongly affected by the contexts in which learning occurs. Educational opportunities, quality of instruction, social integration, and access to authentic communication all contribute substantially to second language development.

The review also highlights the importance of distinguishing between the rate of learning and ultimate attainment. Adult learners frequently demonstrate faster progress during the initial stages of acquisition because of their cognitive maturity, educational experience, and explicit learning abilities. Younger learners, however, often possess advantages in long-term attainment, particularly in pronunciation and certain aspects of language use. Recognizing this distinction helps explain why findings concerning age effects occasionally appear contradictory and reinforces the need for a more nuanced interpretation of empirical research.

Overall, the evidence reviewed in this study supports the conclusion that age influences second language acquisition, but its effects vary across linguistic domains and learning contexts. Pronunciation appears to be the aspect of language most strongly associated with age-related differences, whereas grammatical development and communicative competence are influenced by a broader range of interacting variables. Similarly, fossilization cannot be attributed solely to biological maturation but must be understood within a wider framework that incorporates cognitive, social, and environmental influences. Therefore, a comprehensive understanding of second language acquisition requires moving beyond single-factor explanations and recognizing the dynamic interplay of variables that shape language-learning outcomes. The findings of this review support contemporary perspectives that view age as an important, yet non-exclusive, factor in second language acquisition and emphasize the need to consider multiple influences when examining learner success and long-term language development.

8. Conclusion

The present study reviewed previous research concerning the influence of age on second language acquisition and examined the relationship between age and fossilization.

Through an analysis of major theoretical perspectives and empirical findings, the study explored the extent to which age affects language-learning outcomes and considered the role of fossilization in explaining limitations in second language attainment.

The review demonstrates that age remains an important factor in second language acquisition.

A substantial body of research indicates that learners who begin acquiring a second language at an earlier age are generally more likely to achieve native-like pronunciation and higher levels of ultimate attainment than those who begin learning later in life. These

findings have provided considerable support for theories that emphasize the role of biological maturation in language learning, particularly the Critical Period Hypothesis. However, the evidence also suggests that the influence of age is neither absolute nor uniform across all aspects of language acquisition.

The findings of this review indicate that age alone cannot adequately explain differences in second language attainment. Adult learners frequently benefit from cognitive maturity, metalinguistic awareness, and explicit learning abilities that facilitate language acquisition, especially in formal instructional settings. Furthermore, the literature consistently demonstrates that factors such as motivation, language exposure, quality of instruction, social interaction, and individual learner characteristics play significant roles in shaping language-learning outcomes. Consequently, successful second language acquisition should be understood as the result of multiple interacting influences rather than a single age-related factor.

The review also examined fossilization as a central concept in second language acquisition research. Although fossilization has often been associated with learners who begin acquiring a second language later in life, the literature suggests that its development cannot be attributed solely to age. Instead, fossilization appears to result from a complex interaction of factors, including first-language transfer, limited input, insufficient feedback, restricted opportunities for meaningful communication, and motivational influences. These findings support the view that fossilization is a multidimensional phenomenon shaped by both learner-related and environmental conditions.

Another important conclusion emerging from the literature is that age affects different aspects of language acquisition in different ways. Pronunciation appears to be the linguistic domain most strongly influenced by age-related factors, whereas grammatical development and communicative competence are affected by a broader range of cognitive, social, and environmental influences. This distinction highlights the complexity of second language acquisition and underscores the limitations of explanations that rely exclusively on biological maturation.

Overall, the findings reviewed in this study support the conclusion that age exerts a significant influence on second language acquisition, particularly in relation to pronunciation and ultimate attainment. Nevertheless, language-learning outcomes are also shaped by cognitive abilities, learning environments, social experiences, and individual learner characteristics. A comprehensive understanding of second language acquisition therefore requires recognition of the dynamic interaction among these factors rather than reliance on a single explanatory variable.

In conclusion, the relationship between age and second language acquisition is complex and multifaceted. While age remains an important predictor of language-learning outcomes, it functions alongside numerous cognitive, social, and environmental influences that collectively shape the acquisition process. Future research should

continue investigating the interaction between age, fossilization, and other learner - related variables in order to further clarify the mechanisms underlying successful second language acquisition and long -term language development.

9. Recommendations

Based on the findings of the present review, several recommendations can be proposed for language educators, learners, curriculum developers, and future researchers.

Recommendations for Language Educators Language educators should recognize that learners of different ages possess distinct strengths, needs, and learning characteristics. Consequently, instructional approaches should be adapted to accommodate age -related differences rather than relying on a single method for all learners.

Greater emphasis should be placed on providing opportunities for meaningful communication in the target language. Regular interaction enables learners to develop communicative competence, receive feedback, and refine their language skills, thereby reducing the likelihood of fossilization.

Pronunciation instruction should receive particular attention, especially for learners who begin acquiring a second language later in life. Early identification and correction of persistent pronunciation difficulties may contribute to improved long -term language outcomes.

Educators should also foster supportive learning environments that encourage motivation, confidence, and active participation. Positive classroom experiences can enhance learner engagement and promote sustained commitment to language learning.

Recommendations for Language Learners

Learners are encouraged to engage with the target language beyond the classroom through reading, listening, speaking, and interaction with proficient speakers. Consistent exposure to authentic language use can contribute significantly to language development.

Adult learners should capitalize on their cognitive maturity and metalinguistic awareness by employing effective learning strategies and actively monitoring their progress. Conscious reflection on language use may facilitate the acquisition of complex linguistic structures.

Learners should seek regular feedback from teachers, peers, or proficient speakers in order to identify and address persistent errors before they become firmly established in their interlanguage.

Long-term commitment to language practice should be maintained, as continuous exposure and use of the target language may help learners overcome developmental plateaus and achieve higher levels of proficiency.

Recommendations for Curriculum Developers Language programs should be designed with consideration for age-related differences in learning needs, cognitive characteristics, and instructional preferences.

Curricula should incorporate communicative activities that promote meaningful language use and interaction rather than focusing exclusively on memorization and isolated grammatical instruction.

Adequate attention should be given to pronunciation, speaking, and listening skills alongside grammar and vocabulary in order to support balanced language development.

Educational materials should provide authentic language input and create opportunities for learners to engage with language in realistic communicative contexts.

Recommendations for Future Research Future research should continue examining the relationship between age and second language acquisition across diverse linguistic, cultural, and educational settings.

Further investigation is needed into the interaction between age and other variables, including motivation, language aptitude, social integration, quality of language input, and learning environment.

Additional studies should explore the nature of fossilization and examine whether apparently 'fossilized' forms can be modified through specific instructional interventions and extended exposure to the target language.

Longitudinal research following learners over extended periods may provide deeper insight into the ways age influences language development, fossilization, and ultimate attainment.

Future investigations should also examine age effects across different linguistic domains, including pronunciation, grammar, vocabulary, and communicative competence, in order to determine whether these aspects of language acquisition are influenced by age in similar or distinct ways.

References

- Bialystok, E., & Hakuta, K. (1999). Confounded age: Linguistic and cognitive factors in age differences for second language acquisition. In D. Birdsong (Ed.), *Second language acquisition and the critical period hypothesis* (pp. 161 –181). Lawrence Erlbaum Associates.
- Birdsong, D. (Ed.). (1999). *Second language acquisition and the critical period hypothesis*. Lawrence Erlbaum Associates.
- Birdsong, D. (2018). Plasticity, variability and age in second language acquisition and bilingualism. *Frontiers in Psychology*, 9 , Article 81. <https://doi.org/10.3389/fpsyg.2018.00081>
- DeKeyser, R. M. (2000). The robustness of critical period effects in second language acquisition. *Studies in Second Language Acquisition*, 22 (4), 499 –533. <https://doi.org/10.1017/S0272263100004022>
- Ellis, R. (2008). *The study of second language acquisition* (2nd ed.). Oxford University Press.

- Flege, J. E. (1999). Age of learning and second -language speech. In D. Birdsong (Ed.), *Second language acquisition and the critical period hypothesis* (pp. 101–131). Lawrence Erlbaum Associates.
- Flege, J. E., Munro, M. J., & MacKay, I. R. A. (1995). Factors affecting strength of perceived foreign accent in a second language. *The Journal of the Acoustical Society of America*, 97(5), 3125–3134. <https://doi.org/10.1121/1.413041>
- Gardner, R. C. (1985). *Social psychology and second language learning: The role of attitudes and motivation*. Edward Arnold.
- Han, Z.-H. (2004). *Fossilization in adult second language acquisition* . Multilingual Matters.
- Johnson, J. S., & Newport, E. L. (1989). Critical period effects in second language learning: The influence of maturational state on the acquisition of English as a second language. *Cognitive Psychology*, 21 (1), 60 –99. [https://doi.org/10.1016/0010-0285\(89\)90003-0](https://doi.org/10.1016/0010-0285(89)90003-0)
- Krashen, S. D. (1985). *The input hypothesis: Issues and implications*. Longman.
- Lenneberg, E. H. (1967). *Biological foundations of language*. Wiley.
- Long, M. H. (1990). Maturational constraints on language development. *Studies in Second Language Acquisition*, 12 (3), 251 –285. <https://doi.org/10.1017/S0272263100009165>
- Barq, A. M. (2026). The difficulties faced by third year university students when learning English online. *Al-Farooq Journal of Sciences*, 2(3), 1661-1667.
- Long, M. H. (1996). The role of the linguistic environment in second language acquisition. In W. C. Ritchie & T. K. Bhatia (Eds.), *Handbook of second language acquisition* (pp. 413–468). Academic Press.
- Elkhimry, H. A., Abusrafa, M. A., & Aboglila, D. S. (2026). A Discourse Analysis of Gen Z and Gen Alpha Slang in Xiaoma’s Guest Speech to High School Students. *Al-Farooq Journal of Sciences*, 2(3), 1615-1624.
- Moyer, A. (2004). Age, accent and experience in second language acquisition: An integrated approach to critical period inquiry. *Multilingual Matters*.
- Patkowski, M. S. (1980). The sensitive period for the acquisition of syntax in a second language. *Language Learning*, 30 (2), 449 –468. <https://doi.org/10.1111/j.1467-1770.1980.tb00328.x>
- Selinker, L. (1972). Interlanguage. *International Review of Applied Linguistics in Language Teaching*, 10(1–4), 209–231. <https://doi.org/10.1515/iral.1972.10.1-4.209> .
- Almntasir, S. Y., Elmuaget, H. M., ALtarabulsi, D. J., & Salah, A. B. (2026). The Impact of Environmental Awareness on Sustainable Water Conservation Behavior among Postgraduate Students: Field Study. *Al-Farooq Journal of Sciences*, 2(4), 315-331.