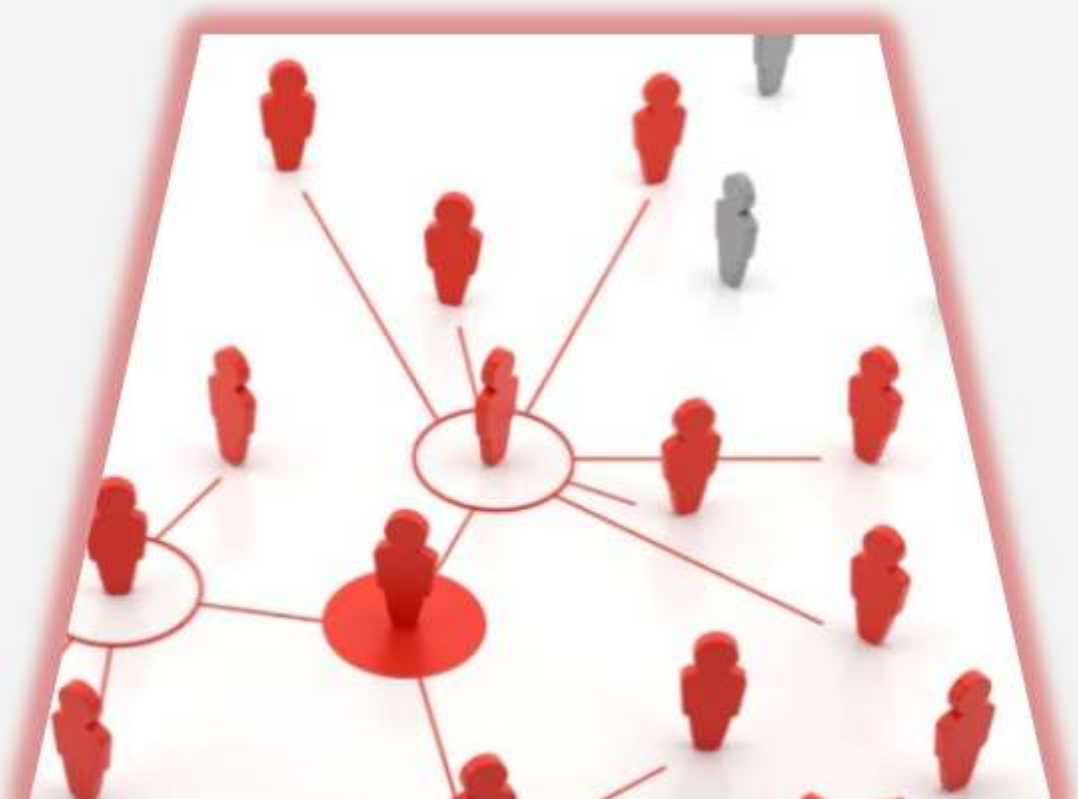




All Sciences Academy

# **TREND AND INNOVATIVE RESEARCH IN SOCIAL, HUMAN AND ADMINISTRATIVE SCIENCES**





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HUMAN AND  
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SCIENCES***

**Editor**

**Prof. Dr. Osman YILMAZ**





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# **Bilingualism and Speech Production: Conceptual Selection and Inhibitory Control Mechanisms**

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## ABSTRACT

This chapter examines bilingual speech production by focusing on how bilingual speakers select a language and retrieve words during speaking. Rather than viewing bilingualism as the coexistence of two independent language systems, the chapter adopts the perspective that bilingual language use reflects interaction between languages within a single cognitive system. After outlining key theoretical approaches to bilingualism, the discussion turns to models of language production and lexical access developed in monolingual research and considers how these models apply to bilingual speakers.

Two major perspectives on bilingual language control are examined. Concept-based accounts argue that language choice is largely shaped at the level of intention and meaning before lexical competition becomes critical. In contrast, inhibitory control models propose that both languages remain active during production and that successful speech requires suppressing non-target alternatives. Recent neurocognitive findings are also discussed to clarify at which stage of production control mechanisms are most strongly engaged and how task demands influence language selection.

By bringing together theoretical models and empirical evidence, the chapter argues that bilingual speech production cannot be explained by a single mechanism. Instead, it involves the coordination of meaning selection, lexical activation, and control processes that vary depending on context and proficiency. The chapter concludes by suggesting directions for future research that integrate behavioural and neurocognitive approaches to better understand bilingual language control.

*Key Words: Bilingualism; speech production; language selection; lexical access; conceptual selection; inhibitory control*

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## INTRODUCTION

Bilingual speech production has become a central topic in psycholinguistics because it offers a unique window into how the human mind selects, organizes, and regulates language in real time. Bilinguals do not operate as two separate monolingual systems placed side by side; rather, bilingual language use reflects an integrated repertoire in which two linguistic systems coexist and interact within the same speaker (Alptekin, 2010; Grosjean, 1992). This integrated view has encouraged researchers to move beyond purely descriptive accounts of “knowing two languages” and to examine bilingualism as a dynamic cognitive and communicative condition shaped by experience, context, and functional need (Grosjean, 2014). In this sense, bilingualism is not a single fixed state but a multidimensional phenomenon that varies across individuals in terms of acquisition histories,

proficiency patterns, and the social environments in which languages are used (Valdés, 2001a; Gass & Selinker, 2008).

At the same time, bilingualism has often been discussed in relation to cognition, particularly executive processes involved in monitoring and regulation. Early work suggested that bilinguals may show advantages in aspects of linguistic understanding, including sensitivity to grammatical and lexical structure (Bialystok, 1987). Yet more recent theorizing has emphasized that bilingual experience may not influence cognition through a simple transfer of language-specific skills to nonverbal tasks. Instead, bilingualism may gradually tune the broader attentional system, making attentional engagement more efficient—especially in situations that require sustained control under high demand (Bialystok, 2024). This proposal aligns with arguments that inconsistent findings in bilingual advantage research reflect limitations in the traditional component-based framing of executive function, where inhibition is treated as the primary explanatory mechanism. A more explanatory account, as suggested by Bialystok and Craik (2022), focuses on how attentional control is deployed and how group differences are most likely to appear when task demands exceed the control capacity available to one group.

These broader debates converge in a concrete question that lies at the heart of bilingual speech production: how bilinguals select the intended language and retrieve the appropriate word while minimizing interference from the non-target language. The challenge is not only to access a lexical item, but to do so under conditions in which both languages may remain simultaneously available. This has led to competing accounts of language control. On the one hand, conceptual selection approaches propose that language choice is largely resolved before lexical competition intensifies, such that contextual specification and preverbal planning bias production toward the intended language (La Heij, 2005). On the other hand, inhibitory control accounts suggest that because both languages can be activated, selection requires active regulation—often conceptualized as suppression of non-target alternatives within the production system (Green, 1998). Recent neurocognitive evidence reinforces the idea that language control is sensitive to task constraints: forced selection contexts appear to emphasize inhibitory processes, whereas free selection contexts recruit broader regulatory mechanisms associated with self-initiated control (Zhang et al., 2025). Complementary evidence further suggests that inhibitory control may be recruited most strongly during the execution phase of production, rather than at the earliest stage of language selection, indicating that control mechanisms may unfold across multiple stages of speaking (Geng et al., 2026).

Against this background, the present chapter brings together theoretical and empirical perspectives to clarify how bilingual speakers manage language selection and lexical access during speech production. After outlining key definitions and typologies that capture the multidimensional nature of

bilingualism (Valdés, 2001a; Gass & Selinker, 2008), the chapter reviews models of language production and the core stages of lexical access in monolingual and bilingual speakers (Levelt, 1989, 2001). It then focuses on bilingual language control by contrasting conceptually driven accounts of selection with inhibition-based accounts of competition and control (Green, 1998; La Heij, 2005). Finally, the discussion integrates recent neurocognitive findings to highlight how the locus and nature of control may vary depending on selection context and production stage (Zhang et al., 2025; Geng et al., 2026), thereby offering a more nuanced understanding of the mechanisms that support flexible bilingual speech.

## **THEORETICAL PERSPECTIVES: BILINGUALISM**

In recent years, bilingualism has been regarded as an important field of study by many researchers and linguists. Overseas trips for educational, professional or holiday purposes have brought with them the need to learn foreign languages, and as a result, bilingualism and multilingualism have become a necessity in the new world. As bilingualism has become more common, researchers have begun to rethink how it should be understood, moving away from viewing it as simply “two languages” and instead emphasizing more integrated accounts of bilingual competence. Alptekin (2010) states that it is incorrect to think of bilingual individuals as a combination of two monolingual individuals, because bilingualism in a holistic sense symbolises the interaction of two languages coexisting within the individual. Grosjean (1992) argues that it is incorrect to compare bilingual individuals with monolingual individuals from a linguistic perspective, as bilinguals possess a holistic language system and that there is a single language system in the brain of a bilingual individual, examining bilingual individuals from a neurolinguistic perspective. Bilingualism can be seen a process with cognitive, economic, cultural, and communicative benefits. For example, from a cognitive perspective, bilingualism fosters multilateral creative thinking, thereby creating cross-linguistic awareness. Bialystok (1987) noted that bilinguals are more successful than monolinguals in areas such as word and grammar comprehension. More recent discussions on the cognitive consequences of bilingualism have also questioned the traditional “transfer” explanation. Rather than assuming that specific language-processing skills directly transfer to nonverbal tasks, Bialystok (2024:987) argues that bilingual experience reshapes the broader attentional system itself. From this perspective, bilingual advantages do not arise from task similarity between linguistic and non-linguistic domains. Instead, bilingualism leads to an adaptation of attentional control mechanisms, making attention more efficient overall. As a result, bilingual individuals may require less attentional effort to achieve comparable performance levels and may demonstrate stronger performance than monolinguals in tasks that impose high attentional

demands. Deucher & Quay (2000) argue that bilingualism encompasses languages learned in childhood. Valdes (2001a), however, defines bilingualism not only as the ability to use two languages, but also as the ability to reach native speaker level in both languages.

When considering the concept of bilingualism acquired before the critical period in childhood, two types of bilingualism can be distinguished: simultaneous bilingualism and sequential bilingualism. Simultaneous bilingualism occurs when a baby acquires two languages at the same time from birth, while sequential bilingualism occurs when a baby acquires one language at home and then acquires another language later, presumably at nursery or kindergarten (Krashen, 1977, 1985). However, an important point to discuss is whether bilingualism can occur after the critical period. A review of the literature on these subject reveals differing opinions. For example, Anşın (2006) states that the majority of researchers argue that foreign language teaching is much more effective at an early age due to children's mental and sensory superiority and flexibility.

Grosjean (2014) argues that some children acquire both languages simultaneously, but notes that their numbers are quite small compared to children who acquire both languages later. In fact, most bilingual children begin language acquisition monolingually. This is because they first acquire the language spoken at home and then acquire a second or even third language during their education or from their environment. Therefore, Grosjean (2014:7) argues in his study that older children and adults can also become bilingual. However, this will only occur when individuals move to another linguistic region or country and become immersed in a new language. Arguing that there is no age limit for acquiring a new language, becoming bilingual, and continuing one's life with two or more languages, Grosjean (2014) states that the fundamental factor influencing language acquisition and development is 'need'. Therefore, if the 'need' for language acquisition is present, and factors such as sufficient language input, language use, family, friends, work colleagues' assistance, and a positive attitude towards the language are also present, language acquisition and bilingualism will occur. Kroll & Sunderman (2003) argue that adult bilinguals with a high level of proficiency in both languages can also reach the language level of balanced bilinguals. Therefore, the level of success of adults in bilingualism depends on the fact that they acquire the second language at different levels of fluency. Some will lag behind, some will remain at a basic level and be able to communicate easily, while others will be functionally bilingual (Braine, 1987).

Consequently, researchers working in the field of bilingualism refer to both of these factors. As can be seen, there are differences of opinion regarding the term bilingualism, and as shown in Table 1, there are many types of bilingualism in the literature. As seen, bilingualism has been conceptualized through a wide range of classifications reflecting differences in age of acquisition, proficiency level, functional use, and sociolinguistic status

(Valdés, 2001a; Gass & Selinker, 2008). One of the most common distinctions concerns the age of acquisition. In this respect, *early bilinguals* are individuals who acquire two languages during early childhood, whereas *late bilinguals* become bilingual after childhood. Closely related to this distinction are *simultaneous bilinguals*, whose two languages are present from the onset of speech, and *successive (or consecutive) bilinguals*, whose second language is added after the first has begun to develop. The term *ascendant (or emergent) bilingual* refers to individuals whose ability in the second language is progressively developing due to increased use, while *incipient bilinguals* are at the very early stages of bilingualism, where one of the languages is not yet fully developed.

Another major dimension relates to proficiency and balance between languages. *Balanced (equilingual, symmetrical, or ambilingual) bilinguals* demonstrate roughly equivalent mastery in both languages. In contrast, *dominant bilinguals* display greater proficiency in one language and use it significantly more than the other. At the extremes of proficiency, *maximal bilinguals* exhibit near-native control of two or more languages, whereas *minimal bilinguals* possess only limited knowledge, such as a few words or phrases, in a second language. The concept of *semilingualism* describes individuals who have insufficient competence in either language.

Bilingualism has also been categorized according to language skills and modality of use. *Receptive (or passive) bilinguals* understand a second language in spoken and/or written form but may not necessarily produce it. By contrast, *productive bilinguals* are able not only to understand but also to speak and possibly write in two or more languages. *Functional bilinguals* may operate in two languages for specific tasks regardless of their overall fluency level, highlighting the task-dependent nature of bilingual competence.

From a cognitive and contextual perspective, distinctions have been drawn between *compound bilinguals*, who learn two languages simultaneously, often within the same context, and *coordinate bilinguals*, whose languages are acquired in distinctly separate contexts. *Subordinate bilinguals* demonstrate interference by mapping second-language structures onto first-language patterns. Furthermore, *subtractive bilingualism* occurs when acquisition of a second language leads to a weakening of abilities in the first language, whereas *additive bilingualism* describes situations in which the two languages complement and enrich one another.

Sociolinguistic considerations introduce additional classifications. *Horizontal bilinguals* use two languages of similar social status, while *vertical bilinguals* use a standard language alongside a related dialect or variety. *Diagonal bilinguals* combine a nonstandard language or dialect with an unrelated standard language. A *covert bilingual* may conceal knowledge of a language due to attitudinal or ideological factors. Meanwhile, *dormant* or *recessive bilinguals* experience attrition or reduced ease of expression as a result of limited use of one of their languages.

Finally, distinctions are made based on the mode of acquisition. *Natural (or primary) bilinguals* acquire their languages without formal instruction and may not necessarily possess translation or interpreting skills, whereas *secondary bilinguals* acquire a second language through formal education or instruction. The term *achieved bilingual* is often used synonymously with late bilingual, underscoring the developmental trajectory involved in becoming bilingual beyond early childhood. To sum up, these classifications demonstrate that bilingualism is not a monolithic phenomenon, but a multidimensional construct shaped by developmental timing, proficiency distribution, functional demands, cognitive organization, and sociocultural context. Such nuanced typologies provide a theoretical foundation for examining bilingual competence in fields such as second language acquisition, translation studies, and psycholinguistics.

Table 1. Types and definitions of bilingualism (adapted from Gass and Selinker, 2008:27,28; Buschfeld, et al., 2023:10) Original Source: Valdes, 2001a:41)

<b>Bilingual Type</b>	<b>Definition</b>
<b>Achieved bilingual</b>	Someone who became bilingual after childhood (see late bilingual).
<b>Additive bilingual</b>	Someone whose two languages combine in a complementary and enriching fashion.
<b>Ambilingual</b>	See balanced bilingual.
<b>Ascendant bilingual</b>	Someone whose ability to function in a second language is developing due to increased use.
<b>Ascribed bilingual</b>	See early bilingual.
<b>Asymmetrical bilingual</b>	See receptive bilingual.
<b>Balanced bilingual</b>	Someone whose mastery of two languages is roughly equivalent.
<b>Compound bilingual</b>	Someone whose two languages are learnt at the same time, often in the same context.
<b>Consecutive bilingual</b>	See successive bilingual.
<b>Coordinate bilingual</b>	Someone whose two languages are learnt in distinctly separate contexts.
<b>Covert bilingual</b>	Someone who conceals their knowledge of a given language due to an attitudinal disposition.
<b>Diagonal bilingual</b>	Someone who is bilingual in a nonstandard language or dialect and an unrelated standard language.
<b>Dominant bilingual</b>	Someone with greater proficiency in one of their languages and uses it significantly more than the other language(s).

<b>Bilingual Type</b>	<b>Definition</b>
<b>Dormant bilingual</b>	Someone who has emigrated to a foreign country for a considerable period of time and has little opportunity to keep the first language actively in use.
<b>Early bilingual</b>	Someone who has acquired two languages early in childhood.
<b>Emergent bilingual</b>	See ascendant bilingual.
<b>Equilingual</b>	See balanced bilingual.
<b>Functional bilingual</b>	Someone who can operate in two languages for a specific task, irrespective of overall fluency level.
<b>Horizontal bilingual</b>	Someone who is bilingual in two distinct languages which have a similar or equal status.
<b>Incipient bilingual</b>	Someone at the early stages of bilingualism where one language is not fully developed.
<b>Late bilingual</b>	Someone who has become bilingual later than childhood.
<b>Maximal bilingual</b>	Someone with near-native control of two or more languages.
<b>Minimal bilingual</b>	Someone with only a few words and phrases in a second language.
<b>Natural bilingual</b>	Someone who has not undergone specific training and is often not in a position to translate or interpret with facility between two languages.
<b>Passive bilingual</b>	See receptive bilingual.
<b>Primary bilingual</b>	See natural bilingual.
<b>Productive bilingual</b>	Someone who not only understands but also speaks and possibly writes in two or more languages.
<b>Receptive bilingual</b>	Someone who understands a second language (spoken or written, or both) but does not necessarily speak or write it.
<b>Recessive bilingual</b>	Someone who begins to feel difficulty in understanding or expressing themselves with ease due to lack of use.
<b>Secondary bilingual</b>	Someone whose second language has been added to a first language via instruction.
<b>Semibilingual</b>	See receptive bilingual.

<b>Bilingual Type</b>	<b>Definition</b>
<b>Semilingual</b>	Someone with insufficient knowledge of either language.
<b>Simultaneous bilingual</b>	Someone whose two languages are present from the onset of speech.
<b>Subordinate bilingual</b>	Someone who exhibits interference in their language usage by reducing patterns of the second language to those of the first.
<b>Subtractive bilingual</b>	Someone whose second language is acquired at the expense of abilities already acquired in the first language.
<b>Successive bilingual</b>	Someone whose second language is added at some stage after the first has begun to develop.
<b>Symmetrical bilingual</b>	See balanced bilingual.
<b>Vertical bilingual</b>	Someone who is bilingual in a standard language and a distinct but related language or dialect.

## **LANGUAGE SELECTION PROCESS**

How bilinguals and, previously, monolinguals achieve lexical access and how they make language choices has been a subject of interest to researchers. When monolinguals are given the task of naming a concept, it is thought that they proceed to word production without effort. In fact, this task is inherently quite complex. For example, when a monolingual individual is shown a picture to name, the stages of the lexical access process are not completed as easily as one might think. Monolingual individuals encounter the same problems as bilingual individuals in the processes of utterance production and language choice. If there is a model of utterance production that applies to monolinguals, this model will also apply to bilinguals (La Heij, 2005). Years of research on cognitive word production in monolinguals (Levelt, 2001; Navarrete & Costa, 2005) has also shed light on word production studies in bilingual individuals. As La Heij (2005) points out, these studies have shed light on many aspects of lexical access, such as morphological (Schriefers, 1993), semantic and phonological (Schriefers et al., 1990, Levelt et al., 1991, 1999) have shed light on many aspects of lexical access. Based on this idea, the language selection processes of monolingual and bilingual individuals, which are similar to each other, are discussed below as a subheading.

### ***Language Selection Process in Monolinguals***

In language production tasks, concept selection and subsequent lexical access develop similarly between monolingual and bilingual or multilingual individuals. Kroll et al. (2006) state that the act of naming any object occurs

in the following steps: first, describing the object, then considering its functions, deriving its meaning, matching it with the appropriate word, and finally producing it by customising the pronunciation associated with that word. Numerous studies on the relationship between monosyllabicity and lexical action concepts also support the views of Kroll and colleagues at this point. For example, Levelt (1989) divided monosyllabic word production into four stages: 1) message formation; 2) grammatical coding; 3) phonological coding; 4) production. Levelt's (1989) model, which explains the word production process and classifies it as conceptualiser, formulator, and articulator, is shown in Figure 1. In the conceptualiser category, the object being referred to becomes conceptually active, while in the formulator category, this concept brings along other related concepts to reach the lexical level. Finally, in the articulator category, the appropriate word is found from among the related concepts brought along by this concept and is produced with the appropriate pronunciation. This process reveals the relationship between monolingual speakers' mental processes in language selection and word production. On the other hand, some researchers argue that word selection occurs in a different way throughout the conceptual, lexical and phonological processes, and that the phonological development of the word itself occurs in parallel with the processing prior to production (Starreveld & La Heij, 1995; Caramazza, 1997). La Heij (2005), however, mentions the existence of a preverbal message in the individual before these stages occur. La Heij (2005) argues that there are two main steps at the core of all language production models. These are the conceptual system and the lexicon. The 'conceptual system' contains knowledge of the world in the form of non-verbal representation. It contains a separate lexical-semantic system, which contains the meanings of words. The 'lexicon', on the other hand, involves the representation of words through their morphological, phonological and semantic properties. According to La Heij (2005:291), the naming of an object involves the following stages. The visual perception process of an object is achieved by activating its representation within the conceptual system, enabling the individual to become aware of the object and begin to perceive its function, smell, taste, etc. This process is considered conceptual processing. Subsequently, the speaker selects the conceptual information they wish to express, i.e., their intended meaning, and this selection is referred to as conceptual selection. In his work, La Heij (2005) addresses Levelt's (1989) assumption of speech production, referred to as the speaker's blueprint, stating that the pre-speech message is merely input for the formulator. Arguing that all concepts activated in lexical access can be part of the pre-utterance message, La Heij (2005) proposes the following basic model for lexical access. As shown in Figure 2, when the image of a 'dog' is shown to an individual, the conceptual representation of that object emerges at the conceptual level during the naming stage, which is referred to as concept selection. At the lexical level, word candidates semantically related to the

word ‘dog’ are activated, thus enabling lexical selection. Starreveld & La Heij (1995) state their assumptions about lexical access models as follows:

In these models, conceptual images automatically activate their own names at the lexical level in a situation very similar to a word-context situation. To explain semantic facilitation with the image context, we propose two adaptations for current models. The first is lexicalisation and is limited to the pre-utterance message (as proposed by Levelt, 1989), and the second is that this pre-speech message activates a set of semantically related words (as proposed in the word production models of Morton, 1969 and Levelt, 1989) (p. 297).” As can be seen, lexicalisation is limited to a single pre-speech message, and this message assists the individual in speech production (La Heij, 2005: 295). Lexical access and language choice situations have been explained under different assumptions and the development process has been examined from different perspectives. However, as seen, the common point reached by many researchers is that the language production process occurring in monolingualism is similar in bilingualism and that a bilingual individual also goes through the same stages. The next section will address bilinguals and their language choices, lexical access during this choice, and competition between languages.

### ***Language Selection Process in Bilinguals***

From the perspective of bilingual individuals, when asked to name any word, the concept selection in their minds and the subsequent competition in language selection and verbalisation of the language do not occur in a very different or complex way compared to monolingual individuals. The ability to distinguish between the two languages throughout the discourse production process and to select the appropriate lexical item is one of the most important competences of bilinguals (Costa & Santesteban, 2004). In line with the model proposed by Poulisse and Bongaerts (1994), lexical access may be described as a “mixed access, easy selection” process. When the pre-speech message already specifies the intended language and meaning, lexical selection becomes relatively straightforward, as the most appropriate candidate is determined by its level of activation (La Heij, 2005). At the same time, word selection is understood to depend primarily on the activation strength of lexical representations. This view has also been characterized in the literature as “easy access, complex selection”. One of the topics discussed in the literature on language production and language choice among bilinguals is why, for example, an English-Italian bilingual systematically uses the word *scarpe* ‘shoes’ in one situation, even though both words mean “shoes” and express the same conceptual content, while in another situation they use the word *shoes* to mean “shoe”. The explanation for this situation comes from La Heij (2005). According to La Heij (2005), these two words do not actually have the same meaning. This is because the word *scarpe* contains characteristics and concepts specific to Italian, while the word *shoes* contain characteristics specific to English. In other words, the words from L1 and L2

have already been decoded as part of the pre-utterance message. Poulisse & Bongaerts (1994) and Poulisse (1997) also defend the same assumption, mentioning the existence of a language cue within the pre-utterance message in order to produce words in the intended language. The language cue, acting in conjunction with conceptual knowledge, attempts to activate the correct language and the correct word and elements in the correct meaning. On the other hand, proponents of language non-selective selection models. Some reserachers (Green, 1998; Hermans et al., 1998; Poulisse, 1997; Costa et al., 1999) emphasise that lexical access and language selection are not such simple processes, arguing that there is a selection or control process that must be used by the individual during selection. These control mechanisms either completely restrict the selection of words in one language or restrict the words of one language to assist in the production of the other.

Recent neurocognitive evidence further refines this debate. Zhang et al. (2025:205) demonstrate that both forced and voluntary language selection contexts involve measurable switching costs, indicating the engagement of inhibitory control mechanisms. Nevertheless, their neuroimaging findings reveal a dissociation: forced language selection predominantly recruits left frontal regions associated with inhibition, whereas free language naming engages bilateral fronto-parietal networks linked to intention formation and self-regulation. These results suggest that bilingual language control cannot be reduced to a single mechanism. Instead, the selection process appears to be context-sensitive, involving inhibitory control when externally constrained and broader regulatory processes when language choice is internally initiated. As can be seen, the process is quite complex, because either the pre-speech message will contain all the information necessary for production, allowing the individual to choose from among the relevant words, or, with the help of inhibition mechanisms, all irrelevant words will be restricted, assisting the individual in producing the target language.

## LEXICAL ACCESS

Lexical access, which may appear to be only a small part of bilingual language production and language selection, actually constitutes the first stage of production. Levelt (1989) emphasises that lexical access is the lifeblood of the cognitive process, noting that it encompasses semantic memory, word retrieval, selective attention, and other executive functions. Therefore, it is certain that the more we understand lexical access, the more we will know about cognitive processing. Against this theoretical background, it becomes necessary to examine how lexical access operates specifically within bilingual contexts and which mechanisms guide word selection during production.

### ***Language-Specific Lexical Access and Concept Selection Model (CSM)***

As mentioned in the literature, there are many debates regarding bilingual discourse production. When it comes to the competition between

lexical candidates in both languages and the activation process for establishing correct discourse and producing the necessary word in the target language beforehand, researchers present two different views. The first is language-specific lexical access. The activation of words in each language during production and the decision on which word to select depend on the control and selection within the lexicon's function (Francis, 2000; Kroll et al., 2006). Researchers state that there is a language-specific mechanism, and that word candidates in both languages of a bilingual individual are activated throughout speech production but do not compete with each other at the selection stage (Costa et al., 1999; Costa, 2005). According to the researchers, the intention to speak in a particular language limits the selection mechanism of the language to be produced, and there is interaction between languages but no competition. The competition to switch to word production occurs within a language, i.e., it is language-specific.

In their work, Kroll et al. (2006) stated that when bilinguals were given mixed language blocks to perform a picture naming task, individuals translated faster if there were similar words in both languages. The researchers attempted to prove that bilinguals use a language-specific language selection mechanism, noting that when only the more dominant language is to be produced, bilinguals make language choices just like monolinguals (Kroll et al., 2000; Gollan & Kroll, 2001).

In light of these explanations, La Heij (2005), who advocates the idea of 'mixed process, easy choice', proposed the Concept Selection Model (CSM) based on language-specific selection characteristics through experiments. The CSM (La Heij, 2005) has been one of the most debated models among those developed on bilingualism, discourse production, lexical access, and language choice. This model emphasises that choosing between two words competing at the lexical level during discourse production is a difficult task for bilinguals. According to this model, the problem has already been solved at the conceptual level, but lexical access at other levels has become complex.

Bloem et al. (2004), however, reject the assumption that all activated concepts automatically activate their own names at the lexical level, arguing that a concept is selected at the conceptual level to enter the lexicalisation process, while the non-target concept is deactivated. In fact, this assumption is consistent with Levelt's (1989) thinking. That is, not only activated concepts but also concepts contained in the pre-utterance message enter the formulation process. For example, when asked to name a picture in English (L2), some Turkish words will be activated from the perspective of the individual whose L1 is Turkish, but nevertheless, only English words will be considered in the lexical selection process. For example, when a person whose L1 is Turkish is asked to name a picture of a "door" in L2, the pre-speech message customises the target language and concept. Lexical nodes in the target language are activated more than others, and this activation is selected based on the level

of activation of the correct word candidate from the moment it is sent to the lexical level and is sent to the phonological level. Thus, language selection occurs at the conceptual level. CSM proponents state that language selection is related to the conceptual level and that the decision on the language to be produced is made in pre-speech processing, i.e., before lexical access. Bloem & La Heij (2003) argue that competition between words occurs at the conceptual level, not at the lexical level. In their later work, Bloem & La Heij (2003) state that the language cue is responsible for disabling competition at the lexical level. That is, the language cue is tasked with indicating that the activation levels of words in the target language are higher than the activation levels of words in the non-target language.

Schwietter (2007:8,9) provides the following example in his thesis:

a picture of a chair is shown to an English-Spanish bilingual who is told to name the picture in English. Under the Concept Selection Hypothesis, the preverbal message is responsible for specifying the concept and the target language (in addition to other elements as mentioned above). Consequently, the target lexical nodes receive more activation from the preverbal message than the non-target lexical nodes (as represented by the darker lines). Although the irrelevant language's lexical nodes receive some degree of activation, the amount is much less (as represented by the dotted lines). It will be easy, then, to choose the appropriate word because of the large discrepancy in activation levels: the target word will ultimately have the highest activation level and will be selected for production based on that."

Finkbeiner et al. (2006a) state that words in the target language are easily selected and produced based on their high activation levels. With this production, La Heij (2005) clarifies the lexical access in concept selection, as mentioned, and concludes that no inhibitory mechanism is needed in word production. Rejecting inhibitory mechanisms and presenting CSM to explain concept selection, La Heij (2005) also addresses lexical selection in his work, noting that lexical access models in language production generally emphasise concept selection in similar situations. In fact, according to La Heij, lexical selection is a simple process dependent solely on the activation levels of lexical representations; in short, there is no information at the lexical level about the meanings of words, their function states, or the reasons for their activation. Consequently, the meaning and activation status of the word cannot be used in the selection process; the response to be given is entirely determined by the activation levels of lexical representation and the content of the pre-utterance message (La Heij, 2005).

### ***Language Non-Specific Lexical Access and Inhibitory Control Model (ICM)***

Green (1986, 1998) introduced the Inhibitory Control Model to explain bilingual language selection. According to this model, language choice is not primarily determined at the conceptual level but is governed by inhibitory

mechanisms operating at the lexical stage. Within this framework, each lexical entry is assumed to carry a language tag that specifies the language to which it belongs. Green (1998) states that the problem of word choice is linked to the problem of how words are symbolized in the minds of bilingual individuals. In his work, Green also states that bilinguals can establish a direct lexical link from a word in their L2 to its translational equivalent in L1. The result of this type of operation is that access to the meaning of the word in L2 is only possible by accessing its equivalent in L1.

Grosjean (1988, 1997), a researcher who has worked in the field of language choice and selection mechanisms, states that bilinguals are subject to or change certain inhibitory mechanisms in the lexical selection process depending on various factors but largely make choices based on external input and internal guidance capacities. Unlike CSM, ICM does not accept the assumption that pre-discourse messages exist that enable words in the target language to reach a higher activation level. Instead, according to this model, lexical selection is possible through the suppression of activated words in the language that will not be produced. Within the framework of the Inhibitory Control Model, Green (1998) maintains that the intention to speak in a particular language forms part of the conceptual representation and must connect with the corresponding lexical entries in order for production to occur. At the same time, he characterizes inhibition as a reactive process, suggesting that bilingual speech production is achieved through the regulation of both language systems, with the non-target language being controlled to allow successful output in the intended language. Drawing on Kroll and Stewart (1994), Green outlines the lexical access process as follows: first, the semantic system activates lexical representations in both languages. During production, however, the language that is not intended for use is suppressed. The degree of suppression is not fixed; rather, it varies according to the activation strength of each language. The more strongly activated language requires stronger inhibition to allow the target language to be produced successfully. As discussed earlier, differences in proficiency between L1 and L2 influence this process. Because L1 typically has a broader and more strongly established network, it demands greater inhibition when L2 is being produced. In contrast, L2, which generally has a less extensive network, requires less suppression when L1 is in use and therefore causes comparatively less interference. Recent neurocognitive findings have sought to determine more precisely where inhibitory control operates within the language production process. Geng et al. (2026:9) distinguish between language selection and language execution processes and demonstrate that these stages recruit different neural systems. While language selection is associated with regions involved in conceptual processing and information retrieval, language execution engages areas traditionally linked to inhibitory control. Notably, inhibitory control-related activation increases during second-language production and language switching. These findings suggest that inhibitory control is primarily involved

in the execution phase of bilingual language production rather than at the initial conceptual selection stage.

Bialystok and Craik (2022:1246) argue that the widely held claim that bilingualism enhances executive function across the lifespan has produced inconsistent empirical findings, not because of weak evidence, but due to the dominance of a componential executive function framework that overemphasizes inhibition. They contend that this model does not adequately reflect the nature of bilingual experience. Instead, they propose a broader attentional control account, suggesting that differences between monolinguals and bilinguals arise from variations in the efficiency and allocation of attentional resources. According to this perspective, group differences emerge primarily when task demands exceed the control capacity of one group, rather than being attributable to isolated inhibitory mechanisms. Meuter & Allport (1999) explained this language change situation with their work involving the task of numerical naming. According to their findings, language changes between L1 and L2 occur more slowly during switch trials than during non-switch trials. In non-switch trials, the production of L2 is slower than that of L1. In switch trials, the change to L2 occurs faster than the change to L1. Finally, with each successful switch, the response time increases, meaning the individual starts producing in the target language faster. In conclusion, the most important difference between lexical competition and lexical comprehension is that, according to lexical competition, bilingual individuals are functionally monolingual in utterance planning. While lexical competition situations differ, the options in the target language also vary. According to lexical competition, utterance production occurs through the direct selection of the language to be produced without the addition of the language not to be produced, whereas in lexical competition, the selection of the language to be produced is only possible by blocking the language not to be produced. The discussion of inhibitory control mechanisms in bilingual production can also be interpreted within a broader cognitive framework. Bialystok (2024:987) challenges the assumption that bilingual cognitive advantages stem from direct transfer of language-specific processes to nonverbal domains. Instead, bilingual experience appears to recalibrate the attentional system itself. In this sense, bilingual language regulation—requiring constant monitoring, selection, and suppression—may function as long-term training of attention. Consequently, bilinguals may exhibit greater efficiency in tasks that demand sustained or complex attentional engagement, not because of structural overlap between tasks, but because their attentional resources have been adaptively tuned.

## **CONCLUSION AND DISCUSSION**

This chapter has explored bilingual speech production by focusing on concept selection, lexical access, and inhibitory control. Rather than treating

bilingualism as the simple coexistence of two separate language systems, the discussion has shown that bilingual language use involves ongoing interaction between languages within the same speaker. Concept-based accounts suggest that language choice may begin at the level of intention and meaning, while inhibition-based approaches highlight the need to manage competing alternatives during speech. Recent neurocognitive findings further indicate that control processes do not operate in a single, uniform way. Instead, the role of inhibition and attention appears to depend on task demands and the stage of production.

Overall, bilingual speech production cannot be reduced to one explanatory mechanism. It involves the coordination of meaning selection, word activation, control of interference, and regulation of attention during communication. Future research should continue to examine these processes together, drawing on behavioural and neurocognitive evidence to better understand how bilingual speakers manage their languages in different communicative situations. Such efforts may help clarify how sustained bilingual experience shapes language control and broader cognitive functioning over time.

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# **Emotionally Intelligent Green Leadership and Green Organizational Citizenship Behavior: A Behavioral Perspective on Organizational Sustainability**

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## ABSTRACT

This chapter advances a behavioral and psychologically grounded understanding of organizational sustainability by integrating green leadership, emotional intelligence (EI), and green organizational citizenship behavior (GOCB). Moving beyond policy-driven and structural approaches to sustainability, the chapter emphasizes employees' voluntary pro-environmental behaviors as a critical pathway through which sustainability is enacted in everyday organizational practice. Drawing on social learning theory and transformational leadership theory, the chapter conceptualizes green leadership as a value-driven and role-modeling process through which leaders legitimize environmental responsibility. Emotional intelligence is positioned as a central micro-foundation that enables leaders to translate environmental values into emotionally resonant influence, fostering trust, value internalization, and intrinsic motivation. GOCB is presented as the key behavioral outcome emerging from this interaction, reflecting employees' discretionary engagement in sustainability-related actions beyond formal role requirements. An integrative conceptual framework is developed and supported through prior empirical evidence, highlighting leadership as an emotionally embedded and socially constructed driver of sustainability. The chapter concludes by outlining theoretical contributions, practical implications, and future research directions for sustainability-oriented leadership.

*Keywords – green leadership, emotional intelligence (EI), and green organizational citizenship behavior, Organizational Sustainability, Pro-environmental Employee Behavior*

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## INTRODUCTION

Sustainability has emerged as one of the most pressing imperatives confronting contemporary organizations. Escalating climate change, resource depletion, biodiversity loss, and environmental degradation have intensified expectations that organizations move beyond compliance-oriented environmental policies toward more proactive and responsible forms of engagement. In this context, organizations are increasingly recognized not merely as economic actors but as social institutions whose decisions and behaviors shape ecological outcomes at local, national, and global levels. While regulatory frameworks, technological innovation, and environmental management systems remain essential, growing evidence suggests that these structural mechanisms alone are insufficient to achieve meaningful and enduring sustainability outcomes.

Recent scholarship reflects a shift in sustainability discourse from a primary focus on formal strategies and policies toward behavioral

sustainability within organizations. This perspective emphasizes employees' everyday actions, discretionary behaviors, and voluntary engagement in environmentally responsible practices. Such behaviors, commonly conceptualized as organizational citizenship behaviors for the environment (OCBE), extend beyond formal job requirements and are rarely enforced through reward or control systems. Instead, they are shaped by social, psychological, and contextual influences embedded within organizational life (Chang et al., 2019; Luu, 2018; Srouf et al., 2020).

Within this behavioral turn, leadership has been identified as a central mechanism through which sustainability values are interpreted, legitimized, and enacted. Leaders act as sense-makers who translate environmental strategies into meaningful cues for employees, signaling which behaviors are valued and supported. Drawing on social learning theory, leadership influences sustainability not only through formal authority but also through role modeling, value alignment, and interpersonal influence (Bandura, 1971, 1977). Empirical studies demonstrate that leaders who visibly prioritize environmental responsibility foster stronger pro-environmental attitudes, norms, and behaviors among employees (Begum et al., 2021; Nawaz Khan, 2022; Tosun et al., 2022).

Among leadership approaches examined in the sustainability literature, green leadership has gained particular prominence. Green leadership emphasizes leaders' commitment to environmental values, integration of sustainability into decision-making, and encouragement of environmentally responsible behavior among followers. Evidence across sectors suggests that green leadership is positively associated with green innovation, environmental performance, and OCBE (Al-Swidi et al., 2021; Riva et al., 2021; Singh et al., 2020). However, much of this work has focused on strategic or structural pathways, offering limited insight into the psychological mechanisms through which green leadership shapes employee behavior.

One emerging mechanism of particular relevance is emotional intelligence (EI). Defined as the ability to perceive, understand, regulate, and utilize emotions effectively, EI has long been linked to leadership effectiveness, interpersonal influence, and employee motivation (Issah, 2018; Wong & Law, 2004). In sustainability contexts, emotionally intelligent leaders may be better equipped to communicate environmental values, manage resistance to change, and inspire intrinsic motivation for pro-environmental behavior. Recent studies indicate that EI strengthens the impact of green and transformational leadership on employees' green attitudes and OCBE, positioning EI as a critical micro-foundation of sustainability-oriented leadership (Leonard & Maulding Green, 2018; Nurwahdah & Muafi, 2022).

Despite these advances, research integrating green leadership, emotional intelligence, and OCBE remains fragmented. Existing studies

often examine these constructs in isolation, limiting theoretical integration and cumulative knowledge development. This chapter addresses this gap by advancing a psychologically grounded framework that explains how green leadership influences voluntary pro-environmental behavior through emotional and social mechanisms. By positioning emotional intelligence as a key enabling mechanism, the chapter contributes to sustainability scholarship in three ways. First, it deepens theoretical understanding of leadership as a social and emotional process rather than a purely strategic function. Second, it highlights OCBE as a critical behavioral pathway linking leadership to organizational environmental performance. Third, it offers practical insights for organizations seeking to cultivate sustainability through leadership development, green HRM practices, and emotionally intelligent management.

Overall, this chapter argues that sustainable organizational futures depend not only on green strategies and technologies, but on leaders who can emotionally engage, ethically guide, and behaviorally inspire employees toward shared environmental responsibility.

Table 1. Core Constructs and Conceptual Definitions

<b>Construct</b>	<b>Conceptual Definition</b>	<b>Key Dimensions</b>
Green Leadership	A form of values-driven leadership that integrates environmental sustainability into strategic decision-making, role modeling, and employee influence processes	Environmental vision, ethical responsibility, role modeling, long-term orientation
Emotional Intelligence (EI)	The capacity to perceive, understand, regulate, and utilize emotions in oneself and others to guide thought and behavior toward adaptive outcomes	Self-awareness, self-regulation, empathy, social skills
Green Organizational Citizenship Behavior (OCBE)	Voluntary, discretionary employee behaviors that contribute to environmental sustainability beyond formal job requirements	Eco-initiatives, environmental advocacy, resource conservation

(Robertson & Barling, 2013; Wong & Law, 2002; Daily et al., 2009)

## THEORETICAL FOUNDATIONS

This chapter is grounded in leadership and behavioral theories that explain how leaders shape employees' values, attitudes, and discretionary behaviors. Two complementary perspectives; Social Learning Theory and Transformational Leadership Theory provide a robust foundation for understanding sustainability-oriented leadership.

### **Social Learning Theory and Environmental Behavior**

Social Learning Theory, originally articulated by Bandura (1977), posits that individuals acquire attitudes, values, and behavioral patterns through observation and imitation of significant others. Within organizational settings, leaders occupy a highly visible and influential position, making them powerful social models whose actions convey implicit norms about acceptable and desirable behavior. Employees are particularly likely to attend to leaders' behaviors when those behaviors are perceived as legitimate, rewarded, or aligned with organizational values.

In the sustainability context, leaders who consistently demonstrate environmentally responsible practices, such as resource conservation, ethical decision-making, or advocacy for green initiatives send strong behavioral signals to employees. Through observational learning, employees internalize these behaviors not merely as compliance requirements but as shared organizational values. Over time, this process contributes to the normalization of environmental responsibility as part of the organizational culture rather than as an externally imposed obligation (Robertson & Barling, 2013).

A central contribution of Social Learning Theory to environmental behavior lies in its explanation of discretionary actions. Organizational citizenship behaviors for the environment (OCBE) are voluntary, informal, and typically unrewarded through formal performance systems (Organ, 1988; Daily et al., 2009). Because such behaviors are not mandated, employees rely heavily on social cues to determine whether engaging in them is worthwhile or socially supported. Leaders who act as consistent role models reduce uncertainty and legitimize environmentally proactive behavior, thereby increasing employees' willingness to engage in OCBE.

Furthermore, Social Learning Theory emphasizes cognitive and emotional processes in learning. Employees do not merely replicate observed behaviors; they interpret the underlying values and intentions associated with those behaviors. When leaders frame environmental actions

as morally meaningful or socially responsible, employees are more likely to internalize sustainability values and translate them into sustained behavioral patterns (Bandura, 1977; Norton et al., 2017). Thus, social learning processes offer a compelling explanation for how leadership influences environmental behavior at a deeper, value-based level.

## **Transformational Leadership and Sustainability**

Transformational Leadership Theory provides an additional and complementary lens for understanding sustainability-oriented leadership. Transformational leaders influence followers by articulating a compelling vision, demonstrating moral integrity, and motivating employees to transcend self-interest in pursuit of collective goals (Bass, 1985). These characteristics make transformational leadership particularly relevant to sustainability, which inherently involves long-term thinking, ethical responsibility, and collective action.

One of the defining features of transformational leadership is idealized influence, through which leaders act as ethical role models. In environmental contexts, this moral dimension is critical. Sustainability initiatives often require employees to invest effort without immediate personal gain, making ethical leadership and credibility essential for gaining commitment. Leaders who visibly align their actions with environmental values enhance trust and legitimacy, thereby increasing employees' willingness to support sustainability goals (Graves et al., 2013).

Another core component, inspirational motivation, plays a central role in translating sustainability objectives into meaningful organizational narratives. Transformational leaders frame environmental goals as part of a broader purpose, linking individual actions to societal and ecological outcomes. This sense of purpose fosters intrinsic motivation and encourages employees to engage in pro-environmental behaviors even in the absence of formal incentives (Chen & Chang, 2013; Robertson & Barling, 2013).

Transformational leadership is also associated with heightened employee engagement, psychological empowerment, and value alignment, all of which are essential for sustaining OCBE. By encouraging creativity, autonomy, and shared responsibility, transformational leaders create an environment in which employees feel both capable of and accountable for contributing to environmental performance (Boiral & Paillé, 2012). As a result, sustainability becomes embedded in everyday work practices rather than confined to strategic documents or corporate rhetoric.

Taken together, Social Learning Theory and Transformational Leadership Theory provide a coherent theoretical foundation for this chapter. While Social Learning Theory explains how employees acquire and internalize environmentally responsible behaviors through observation and modeling, Transformational Leadership Theory explains why employees are motivated to go beyond compliance and engage in discretionary environmental actions. Integrating these perspectives allows for a more comprehensive understanding of leadership as a behavioral, moral, and motivational force in advancing organizational sustainability

## **CONCEPTUALIZING GREEN LEADERSHIP**

As organizations increasingly confront environmental challenges, leadership scholarship has expanded to address the role of leaders in promoting sustainability-oriented values and behaviors. Within this evolving body of literature, green leadership has emerged as a distinct construct that captures leaders' commitment to environmental responsibility and their capacity to influence environmentally sustainable practices within organizations. Conceptual clarity is essential, as green leadership is often discussed alongside, or conflated with, broader leadership approaches such as transformational leadership. This section defines green leadership, traces its conceptual evolution, distinguishes it from general transformational leadership, and situates it within organizational contexts.

### **Definition and Core Characteristics of Green Leadership**

Green leadership refers to a leadership approach in which leaders actively integrate environmental values into their vision, decision-making processes, and everyday behaviors, thereby encouraging environmentally responsible practices among employees. Unlike compliance-based environmental management, green leadership emphasizes voluntary engagement, ethical responsibility, and long-term ecological considerations. Leaders who exhibit green leadership not only support environmental policies but also demonstrate personal commitment through visible actions and consistent behavioral cues (Robertson & Barling, 2013).

Core characteristics of green leadership include environmental value orientation, role modeling of sustainable behavior, and support for employee-driven environmental initiatives. Green leaders communicate the importance of sustainability as part of organizational purpose and encourage employees to contribute ideas and actions that reduce environmental impact. By fostering a climate in which environmental responsibility is socially valued, green leaders legitimize discretionary green behaviors and embed

sustainability into everyday work practices (Boiral & Paillé, 2012; Norton et al., 2017).

Another defining characteristic of green leadership is its emphasis on ethical and moral responsibility. Environmental decisions often involve trade-offs between short-term economic gains and long-term ecological well-being. Green leaders address these tensions by prioritizing responsible stewardship and signaling that environmental considerations are integral to organizational integrity rather than optional add-ons.

## **Evolution of the Concept of Green Leadership**

The concept of green leadership has evolved alongside broader developments in sustainability and management research. Early organizational approaches to environmental responsibility were largely reactive, focusing on regulatory compliance and risk mitigation. Leadership involvement during this phase was often limited to endorsing environmental management systems or responding to external pressures.

As sustainability became recognized as a strategic and cultural issue, scholars began to examine the role of leadership in shaping pro-environmental values and behaviors within organizations. This shift marked a move from structural and technical solutions toward behavioral and relational perspectives, highlighting the influence of leaders on employees' environmental attitudes and discretionary actions (Daily et al., 2009).

More recent research has positioned green leadership as a proactive and value-driven approach that integrates environmental responsibility into organizational identity. Rather than treating sustainability as a separate initiative, green leadership frames it as a shared commitment that guides decision-making, innovation, and employee engagement. This evolution reflects a growing recognition that sustainable outcomes depend not only on formal policies but also on leaders' ability to inspire and sustain environmentally responsible behavior over time (Chen & Chang, 2013; Graves et al., 2013).

## **Distinction Between Green Leadership and General Transformational Leadership**

Although green leadership shares several features with transformational leadership, the two constructs are conceptually distinct. Transformational leadership is a broad leadership approach characterized by vision, inspiration, intellectual stimulation, and individualized consideration across a range of organizational goals (Bass, 1985). Its focus is not

inherently environmental; rather, it emphasizes motivating followers to achieve collective objectives, which may or may not include sustainability.

Green leadership, by contrast, is content-specific, with environmental responsibility as its central focus. While transformational leaders may inspire change in general, green leaders explicitly prioritize ecological values and sustainable practices. This specificity is critical for understanding why some transformational leaders successfully promote environmental behavior while others do not. Without an explicit environmental orientation, transformational leadership alone may be insufficient to foster consistent green behaviors (Robertson & Barling, 2013).

Moreover, green leadership places greater emphasis on leaders' personal environmental conduct as a source of influence. Employees are more likely to engage in discretionary environmental behavior when they observe leaders consistently acting in environmentally responsible ways, reinforcing the importance of authenticity and value alignment (Norton et al., 2017).

Table 2 Conceptual Distinction Between Transformational Leadership and Green Leadership

<b>Dimension</b>	<b>Transformational Leadership</b>	<b>Green Leadership</b>
Primary focus	Broad organizational goals and change	Environmental sustainability
Value orientation	General ethical and motivational values	Explicit ecological and environmental values
Behavioral emphasis	Inspiration and performance	Pro-environmental role modeling
Outcome focus	Organizational effectiveness	Sustainability and GOCB
Content specificity	Goal-neutral	Environment-specific

### **Green Leadership in Organizational Contexts**

In organizational contexts, green leadership operates as a social and cultural mechanism that shapes how environmental responsibility is understood and enacted by employees. Green leaders influence sustainability not only through formal authority but also through everyday interactions, informal communication, and symbolic actions. By endorsing employee-led environmental initiatives, allocating resources to sustainability projects, and recognizing pro-environmental efforts, green leaders create supportive conditions for OCBE.

Green leadership is particularly relevant in complex organizational environments where formal monitoring of environmental behavior is limited. In such contexts, leadership-driven norms and values play a critical role in guiding employee behavior. Research suggests that when employees perceive strong leadership support for sustainability, they are more likely to engage in voluntary green behaviors, advocate for environmental improvements, and integrate sustainability into their work roles (Boiral & Paillé, 2012; Daily et al., 2009).

Furthermore, green leadership contributes to the development of a shared sustainability climate, reinforcing collective responsibility for environmental outcomes. By embedding environmental values into organizational culture, green leaders help ensure that sustainability efforts are resilient, self-reinforcing, and less dependent on external enforcement.

### **EMOTIONAL INTELLIGENCE AS A MICRO-FOUNDATION OF GREEN LEADERSHIP**

While green leadership provides a value-based and strategic orientation toward sustainability, its effectiveness ultimately depends on leaders' ability to influence employees at an emotional and interpersonal level. In this regard, emotional intelligence (EI) functions as a critical micro-foundation that enables green leaders to translate environmental values into meaningful and sustained employee behavior. Micro-foundations emphasize the psychological capacities and social processes through which higher-level organizational phenomena emerge, positioning EI as a key mechanism through which green leadership operates in practice.

Table 3 Emotional Intelligence Dimensions Enabling Green Leadership Effectiveness

<b>EI Dimension</b>	<b>Leadership Function</b>	<b>Sustainability-Relevant Outcome</b>
Emotional awareness	Recognizing employee emotional responses to sustainability initiatives	Reduced resistance to green change
Empathy	Understanding employee concerns and values	Value internalization
Emotional regulation	Managing stress and uncertainty during sustainability transitions	Psychological safety
Authentic emotional expression	Aligning emotions with environmental values	Trust and leader credibility

## **Conceptualizing Emotional Intelligence in Leadership Contexts**

Emotional intelligence broadly refers to an individual's ability to perceive, understand, regulate, and use emotions effectively in oneself and others. Within leadership research, EI has been consistently associated with interpersonal effectiveness, ethical decision-making, conflict management, and follower motivation (Wong et al., 2004; Issah, 2018). Emotionally intelligent leaders are better equipped to navigate complex social environments, align individual values with collective goals, and foster trust-based relationships.

In sustainability contexts, EI is particularly salient because environmental initiatives often require behavioral change, value reorientation, and long-term commitment in the absence of immediate rewards. Leaders with high EI are more capable of recognizing employees' emotional responses to environmental demands, such as uncertainty, skepticism, or change fatigue, and responding in ways that reduce resistance while enhancing engagement (Peixoto & Muniz, 2022).

### **Emotional Intelligence and the Internalization of Environmental Values**

A defining challenge of green leadership is fostering the internalization of environmental values rather than reliance on external enforcement. Emotional intelligence facilitates this process by enabling leaders to communicate sustainability goals in ways that resonate with employees' intrinsic motivations. Through empathy and emotional awareness, leaders can frame environmental responsibility as personally meaningful, socially valued, and morally relevant.

Research indicates that emotionally intelligent leaders are more effective at promoting value congruence between individual employees and organizational goals, which in turn strengthens voluntary pro-environmental behavior (Majeed et al., 2017; Irshad & Hashmi, 2014). By acknowledging employees' concerns and aspirations, leaders create psychological conditions conducive to internal commitment rather than superficial compliance.

### **Emotional Regulation and Sustainability-Oriented Change**

Environmental initiatives frequently involve organizational change, which can generate emotional strain and resistance. Emotional regulation, a core component of EI enables leaders to manage their own emotional responses while supporting employees through transitions. Leaders who demonstrate emotional stability, optimism, and resilience provide a sense of

psychological safety that encourages experimentation and sustained engagement with sustainability initiatives.

Empirical studies suggest that leaders' emotional regulation capabilities enhance followers' willingness to engage in discretionary behaviors, including organizational citizenship behaviors for the environment (Nurwahdah & Muafi, 2022). In this way, EI supports green leadership by maintaining positive affective climates that reinforce pro-environmental norms even in challenging circumstances.

### **Emotional Intelligence as an Enabler of Role Modeling**

Social learning processes are central to green leadership, as employees often learn appropriate behaviors by observing leaders. Emotional intelligence strengthens the credibility and influence of role modeling by ensuring consistency between leaders' expressed values and their emotional conduct. When leaders respond to environmental issues with authenticity, empathy, and ethical concern, employees are more likely to perceive sustainability as a genuine organizational priority.

Studies on leadership and emotional intelligence indicate that emotionally intelligent leaders are perceived as more trustworthy and morally grounded, enhancing the likelihood that employees will emulate their behaviors (Leonard & Maulding Green, 2018; Walumbwa et al., 2010). In sustainability contexts, this alignment between emotional expression and environmental values reinforces the social legitimacy of green behavior.

### **Linking Emotional Intelligence, Green Leadership, and OCBE**

The integration of emotional intelligence into green leadership provides a clearer explanation of how leaders stimulate organizational citizenship behavior for the environment (OCBE). EI enables leaders to inspire, support, and emotionally engage employees in ways that foster voluntary environmental behavior beyond formal job requirements. Rather than relying on monitoring or incentives, emotionally intelligent green leaders cultivate intrinsic motivation and shared responsibility for environmental outcomes.

Emerging evidence suggests that EI acts as both a mediating and reinforcing mechanism between leadership and green behavior, strengthening the relationship between leaders' environmental orientation and employees' discretionary actions (Majeed et al., 2017; Nurwahdah & Muafi, 2022). As such, EI represents a critical micro-level foundation

through which green leadership translates into sustained organizational sustainability.

## **GREEN ORGANIZATIONAL CITIZENSHIP BEHAVIOR (OCBE) AS A BEHAVIORAL OUTCOME**

Sustainability initiatives within organizations increasingly rely on employees' voluntary and discretionary behaviors rather than formalized rules or monitoring systems. In this context, Green Organizational Citizenship Behavior (OCBE) has emerged as a critical behavioral outcome that captures employees' willingness to engage in environmentally responsible actions beyond prescribed job roles. OCBE represents a behavioral manifestation of sustainability-oriented values, translating organizational and leadership-level commitments into everyday practices that collectively contribute to environmental performance.

### **Conceptual Definition of OCBE**

OCBE refers to discretionary, non-mandated behaviors performed by employees that support environmental sustainability within the organization. These behaviors are not explicitly recognized through formal reward systems, yet they play a vital role in reducing environmental impact and fostering a sustainability-oriented organizational culture. Typical examples of OCBE include conserving energy and resources, voluntarily recycling, promoting environmentally friendly practices among colleagues, and suggesting eco-efficient improvements to work processes (Boiral & Paillé, 2012).

A defining feature of OCBE is its voluntary nature. Unlike task-related green behaviors that are embedded in job descriptions, OCBE reflects employees' intrinsic motivation and personal commitment to environmental responsibility. As such, OCBE is particularly sensitive to social and psychological influences, including leadership behavior, organizational norms, and value alignment (Luu, 2018).

### **Dimensions of Green Organizational Citizenship Behavior**

The OCBE construct encompasses multiple behavioral dimensions that collectively support environmental sustainability. Prior research distinguishes between eco-initiatives, eco-civic engagement, and eco-helping behaviors. Eco-initiatives involve proactive efforts by employees to reduce environmental harm or enhance sustainability practices, such as proposing green innovations or improving resource efficiency. Eco-civic engagement reflects employees' participation in organizational environmental programs

and voluntary sustainability activities. Eco-helping behaviors involve assisting colleagues in adopting environmentally responsible practices, reinforcing shared accountability for environmental outcomes (Boiral & Paillé, 2012; Chang et al., 2019).

These dimensions highlight the socially embedded nature of OCBE, emphasizing that green behaviors are often influenced by interpersonal interactions and collective norms rather than individual preferences alone.

### **OCBE and Organizational Sustainability Outcomes**

A growing body of empirical research links OCBE to improved organizational environmental performance and broader sustainability outcomes. Employees who consistently engage in OCBE contribute to reduced resource consumption, lower waste generation, and enhanced compliance with environmental standards. Beyond operational outcomes, OCBE strengthens organizational reputation and supports the development of a sustainability-oriented culture that extends beyond formal environmental management systems (Al-Swidi et al., 2021; Singh et al., 2020).

OCBE also plays a strategic role by bridging the gap between organizational sustainability policies and actual practice. Even well-designed environmental strategies may fail if employees do not voluntarily support or enact them. OCBE ensures that sustainability is embedded in daily routines, making environmental responsibility resilient to changes in leadership or external pressures.

### **Leadership and the Emergence of OCBE**

Leadership is consistently identified as a primary antecedent of OCBE. Leaders influence employees' discretionary behaviors by shaping norms, signaling priorities, and modeling appropriate conduct. When leaders demonstrate commitment to environmental responsibility, employees are more likely to perceive sustainability as a valued organizational goal and engage in OCBE accordingly (Robertson & Barling, 2013).

Green leadership, in particular, fosters OCBE by emphasizing environmental values, encouraging employee participation in sustainability initiatives, and recognizing voluntary green efforts. These leadership behaviors create a supportive psychological environment in which employees feel empowered to contribute beyond formal role expectations (Srouf et al., 2020; Widisatria & Nawangsari, 2021).

## **OCBE as an Outcome of Emotional and Social Processes**

OCBE does not emerge in isolation; it is shaped by emotional and social processes within the organization. Employees are more likely to engage in discretionary green behaviors when they experience positive affect, psychological safety, and value congruence. Emotional intelligence plays a crucial role in this process by enabling leaders to foster trust-based relationships and emotionally engaging sustainability narratives.

Studies indicate that emotionally intelligent leadership enhances employees' intrinsic motivation and willingness to engage in OCBE, reinforcing the role of emotional processes in sustainability-oriented behavior (Nurwahdah & Muafi, 2022; Majeed et al., 2017). Thus, OCBE can be understood as a behavioral outcome that reflects the successful alignment of leadership values, emotional engagement, and organizational sustainability

### **INTEGRATIVE FRAMEWORK: LINKING GREEN LEADERSHIP, EMOTIONAL INTELLIGENCE, AND GOCB**

This section presents the core conceptual framework of the chapter, explaining how green leadership contributes to green organizational citizenship behavior (GOCB) through emotionally grounded leadership processes. The framework integrates insights from green leadership research, emotional intelligence theory, and organizational behavior to clarify the mechanisms through which sustainability-oriented leadership translates into discretionary pro-environmental action within organizations.

#### **Green Leadership and GOCB**

Green leadership influences GOCB by shaping pro-environmental norms and expectations within the organization. Leaders who consistently demonstrate environmental concern, prioritize sustainability in decision-making, and visibly engage in environmentally responsible practices signal the legitimacy and importance of pro-environmental behavior. Such leadership behavior establishes sustainability as a shared organizational value rather than a compliance-driven requirement.

Drawing on social learning theory, employees are likely to model leaders' environmentally responsible behaviors, particularly when leaders are perceived as credible and value-driven (Ashkanasy & Daus, 2005). Through role modeling and normative reinforcement, green leaders encourage employees to engage voluntarily in behaviors such as conserving resources, supporting environmental initiatives, and promoting sustainability among colleagues. These discretionary actions constitute GOCB and

represent a critical pathway through which leadership contributes to organizational sustainability.

### **Emotional Intelligence as an Enabling Mechanism**

Emotional intelligence functions as a key enabling mechanism that enhances the effectiveness of green leadership. Leaders high in EI are better able to recognize and manage their own emotions and those of others, allowing them to communicate environmental goals with empathy, authenticity, and emotional consistency. This emotional capability strengthens leader credibility and fosters trust, which are essential for motivating discretionary pro-environmental behavior.

EI also facilitates the internalization of environmental values by employees. By responding sensitively to concerns, managing resistance constructively, and reinforcing positive affect around sustainability initiatives, emotionally intelligent leaders transform green leadership from symbolic advocacy into meaningful interpersonal influence. In this way, EI operates as a process through which green leadership becomes effective, amplifying its impact on employee motivation and engagement in GOCB (Robertson & Barling, 2017).

### **Conceptual Model Explanation**

The proposed conceptual model specifies a sequential relationship in which green leadership influences emotional intelligence processes, which in turn foster GOCB:



Figure 1. Integrative Conceptual Framework of Emotionally Intelligent Green Leadership

This relationship is explained through two complementary mechanisms. First, social learning enables employees to acquire pro-environmental behaviors by observing leaders who model sustainability and demonstrate emotional congruence (Ashkanasy & Daus, 2005). Second, emotional contagion allows leaders' expressed concern for the environment, moral commitment, and positive affect to be transmitted to employees, shaping collective emotional responses to sustainability initiatives.

Together, these mechanisms highlight that green leadership exerts its influence not only through strategic direction but also through emotionally embedded interactions. Emotional intelligence thus acts as the conduit through which green leadership is translated into sustained discretionary pro-environmental behavior at the employee level.

### **Sequential Influence of Green Leadership on GOCB via Emotional Intelligence Green Leadership Orientation**

This stage reflects leaders' articulation of environmental values, ethical responsibility, and sustainability-focused vision, which collectively signal the strategic and moral importance of environmental priorities within the organization.

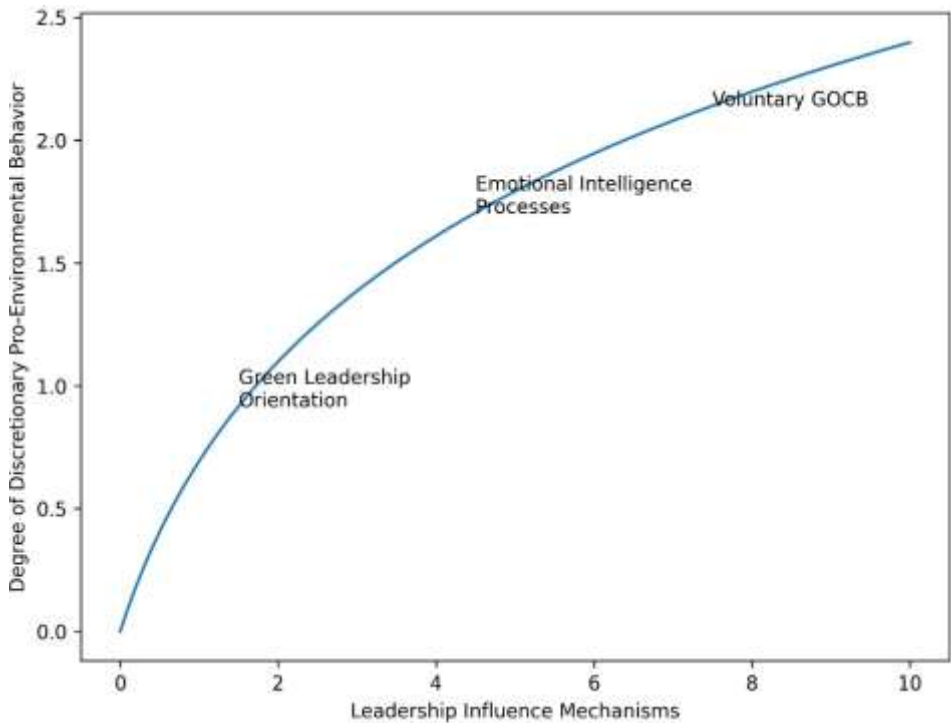
#### **Emotional Intelligence Processes**

At this stage, leaders' abilities to perceive, regulate, and utilize emotions become central. Emotional intelligence enables leaders to engage employees through empathy, emotional regulation, and motivational communication, thereby strengthening value alignment and commitment to environmental goals.

#### **Voluntary Green Organizational Citizenship Behavior (GOCB)**

The final stage represents employees' voluntary and self-initiated pro-environmental actions that extend beyond formal role requirements. These behaviors reflect the internalization of sustainability values rather than compliance with organizational directives.

#### **Sequential Stages Along the Curve**



Graph 1. Sequential Influence of Green Leadership on GOCB via Emotional Intelligence

The graph illustrates a gradually ascending curve that represents the increasing expression of employees’ discretionary pro-environmental behaviors as leadership influence becomes more emotionally embedded. Rather than depicting a linear or causal relationship, the curve conveys a developmental progression, emphasizing the evolving nature of sustainability-oriented leadership influence within organizations.

### EMPIRICAL ILLUSTRATION FROM PRIOR RESEARCH

The conceptual arguments developed in this chapter are informed by empirical research previously conducted by the author and colleagues that examined leadership attributes and emotionally embedded processes within organizational settings. This work was carried out in a structured managerial context in which leaders held formal responsibility for employee development, learning, and performance outcomes, making it particularly suitable for investigating leadership–emotion–behavior relationships. Although the study did not explicitly address environmental leadership or sustainability-oriented behaviors, it focused on leadership qualities closely associated with ethical influence, individualized consideration, and emotional awareness dimensions widely recognized as central to transformational and values-based leadership (Bass, 1985; Ashkanasy &

Daus, 2005). The findings indicated that leadership influence was shown to operate primarily through relational and affective mechanisms rather than through formal authority or transactional control, echoing prior evidence on the socially constructed nature of leadership influence (Bandura, 1977; Walumbwa et al., 2010). These results lend empirical support to the chapter’s central proposition that emotionally intelligent leadership creates the psychological and relational conditions necessary for discretionary employee engagement. When extended to the sustainability domain, such emotionally grounded leadership processes provide a compelling behavioral foundation for the emergence of green organizational citizenship behavior, reinforcing arguments that sustainability is enacted through voluntary employee action rather than imposed through formal structures alone (Daily et al., 2009; Boiral & Paillé, 2012).

Table 4 Prior Research Supporting the Green Leadership–EI–GOCB Framework

<b>Analytical Dimension</b>	<b>Key References (Authors &amp; Year)</b>	<b>Core Constructs Examined</b>	<b>Empirical / Theoretical Insights</b>	<b>Contribution to the Chapter’s Conceptual Framework</b>
<b>Theoretical Foundations of Leadership Influence</b>	Bandura (1971, 1977); Bass (1985); Organ (1988)	Social learning, transformational leadership, organizational citizenship behavior	Leadership shapes employee behavior through role modeling, value transmission, and discretionary effort	Establishes leadership as a socially learned and behavior-shaping process, foundational for green leadership and GOCB
<b>Green Leadership as Value-Based Influence</b>	Chen & Chang (2013); Robertson & Barling (2013, 2017); Riva et al. (2021); Tosun et al. (2022); Nawaz Khan (2022)	Green transformational leadership, environmental values, leader role modeling	Green leaders legitimize environmental priorities and encourage voluntary green behaviors	Supports conceptualization of green leadership as a moral and symbolic driver of sustainability behaviors
<b>Emotional Intelligence in Leadership</b>	Ashkanasy & Daus (2005);	Emotional awareness, emotion	EI enhances leaders’ ability to influence,	Positions EI as a micro-foundation

	Wong et al. (2004); Leonard & Maulding Green (2018); Issah (2018); Peixoto & Muniz (2022)	regulation, leadership effectiveness	motivate, and build trust through emotional processes	enabling green leadership to translate values into action
<b>EI as a Mediating Mechanism</b>	Irshad & Hashmi (2014); Majeed et al. (2017); Nurwahdah & Muafi (2022)	EI as mediator between leadership and OCB/green behavior	Leadership effects on citizenship behaviors are strengthened through emotional intelligence	Empirically supports EI as the emotional conduit between green leadership and GOCB
<b>Green Organizational Citizenship Behavior (GOCB)</b>	Daily et al. (2009); Boiral & Paillé (2012); Srouf et al. (2020); Widisatria & Nawangsa ri (2021)	OCBE/GOCB measurement, voluntary pro-environmental behavior	Employees engage in discretionary environmental actions beyond formal job roles	Validates GOCB as the central behavioral outcome of sustainability-oriented leadership
<b>Contextual and Organizational Enablers</b>	Renwick et al. (2013); Luu (2018); Al-Swidi et al. (2021); Chang et al. (2019)	Green HRM, organizational support, green climate, shared vision	Supportive organizational contexts amplify leadership effects on green behavior	Demonstrates how leadership–EI effects are embedded within organizational systems
<b>Leadership, Motivation, and Pro-environmental Behavior</b>	Graves et al. (2013); Norton et al. (2017); Singh et al. (2020)	Motivation, environmental ethics, behavioral intentions	Transformational leadership motivates employees toward sustained green actions	Reinforces the motivational and ethical pathways underlying GOCB

In summary, the body of research synthesized in the table underscores the central role of leadership in embedding sustainability within everyday organizational behavior. Across theoretical traditions and empirical contexts, the evidence consistently points to emotionally attuned, values-based leadership as a key condition for transforming environmental intentions into meaningful employee action. Emotional intelligence emerges as a critical enabling capability, allowing leaders to connect ethical and environmental priorities with employees' motivations, relationships, and sense of responsibility. Through these emotionally grounded processes, green organizational citizenship behavior develops as a discretionary yet durable form of engagement, reinforcing the view that organizational sustainability is ultimately sustained through human interaction, shared meaning, and voluntary commitment rather than formal structures alone.

## **IMPLICATIONS FOR THEORY AND PRACTICE**

### **Theoretical Implications**

This chapter contributes to green leadership literature by integrating emotional intelligence as a central explanatory mechanism rather than treating it as an ancillary individual difference. By positioning EI as a micro-level capability that enables sustainability-oriented leadership, the framework advances theoretical understanding of how green leadership operates through relational and emotional processes.

Furthermore, the chapter extends sustainability scholarship by conceptualizing EI as a sustainability capability. This perspective highlights that environmental performance is not solely dependent on policies, technologies, or structures, but also on leaders' emotional capacities to foster value internalization, moral engagement, and discretionary pro-environmental behavior. In doing so, the framework bridges leadership theory, emotional intelligence research, and organizational sustainability literature.

### **Practical Implications**

From a practical standpoint, the framework underscores the importance of integrating emotional intelligence into green leadership development initiatives. Organizations seeking to advance sustainability should move beyond technical environmental training and invest in developing leaders' emotional awareness, empathy, and ethical communication skills.

The findings also support closer alignment between green leadership and green human resource management practices. Recruitment, performance appraisal, and training systems can reinforce sustainability values by emphasizing emotionally intelligent leadership behaviors and discretionary pro-environmental contributions (Renwick et al., 2013). In addition, managerial training and policy design should incorporate emotionally informed approaches to sustainability, enabling leaders to motivate

employees through trust, shared values, and intrinsic commitment rather than compliance alone (Daily et al., 2009).

### **FUTURE RESEARCH DIRECTIONS**

Future research can extend this framework in several important ways. Cross-cultural comparative studies would enhance understanding of how cultural values and emotional norms influence the effectiveness of emotionally intelligent green leadership. Such research could clarify whether the proposed relationships hold across diverse institutional and cultural contexts.

Longitudinal research designs are also needed to capture the dynamic nature of emotionally embedded leadership and sustainability behavior over time. Additionally, scholars may examine other psychological mechanisms; such as moral identity, environmental self-efficacy, or psychological ownership that interact with emotional intelligence in shaping green organizational citizenship behavior.

Finally, sector-specific studies would offer deeper insight into how sustainability-oriented leadership operates in industries facing varying environmental pressures, regulatory demands, and stakeholder expectations. These directions can further refine the emotionally grounded understanding of sustainability leadership proposed in this chapter.

### **CONCLUSION**

This chapter has argued that sustainable organizational performance is fundamentally human and relational in nature. By integrating green leadership, emotional intelligence, and green organizational citizenship behavior, the chapter highlights the central role of emotionally intelligent leadership in fostering discretionary pro-environmental behavior.

The framework underscores employees' role as active agents of sustainability rather than passive recipients of environmental policies. When leaders demonstrate genuine environmental commitment and engage employees through emotionally intelligent interactions, sustainability becomes embedded in everyday organizational behavior.

Ultimately, leadership emerges as the human foundation of environmental performance. Emotionally intelligent green leadership not only articulates sustainability goals but also creates the emotional and moral conditions necessary for employees to translate those goals into meaningful, sustained action.

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# **Susceptibility Pattern of Multi-Drug Resistance Urine *Providencia* in Children**

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## ABSTRACT

The genus *Providencia* constitutes natural human gastrointestinal tract flora. The most encountered species include *P. alcalifaciens*, *P. rettgeri*, *P. stuartii*, *P. rustigianii*, and *P. heimbachae*; *Providencia*, earlier considered a rare pathogen, is now increasingly recognized as a notorious opportunistic pathogen capable of causing serious nosocomial infections, mainly urinary tract infections (UTIs). The objective of the present study is to provide an overall view of the prevalence of *Providencia spp.* causing UTIs, and their antibiotic susceptibility pattern especially in children supposed that are suffering from urinary tract infections, 6 strains of *Providencia* are isolated from urine samples of outpatients, and the median age of patients was 10 years (all the patients are girls). The antimicrobial susceptibility profile was determined by the reference method of disk diffusion in Mueller Hinton Agar (Kirby-Bauer Disk Diffusion Susceptibility Test) and the interpretation was determined as per Clinical and Laboratory Standards Institute guidelines. All *Providencia* strains are multi-drug resistance (MDR) strains that resist more than 3 antibiotics, a higher rate of acquired resistance is noticed for amoxicillin (83.33%), a percentage of resistance between (66.67%) for amoxicillin+ clavulanic acid, and piperacillin, and piperacillin. And a percentage of (50%) for nalidixic acid. These results show a high level of resistance to clinical *Providencia* which is an opportunistic pathogen that cannot be neglected due to escalating antibiotic resistance. This increasing evolution of resistance of *Providencia* against several classes of antibiotics creates an alarming situation to raise awareness. Effective infection control and antibiotic stewardship policies are required to prevent the development of further antibiotic resistance.

*Keywords – Multi-drug resistance, Providencia, Urinary tract infections, Antibiotic resistance*

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### I. INTRODUCTION

The emergence and spread of multidrug-resistant Enterobacterales (MDR) are a global public health issue. This problem also concerns urinary tract infections (UTI), which are the second most frequent infections after respiratory infections[1], [2]

The genus *Providencia*, earlier considered a rare pathogen, is now increasingly recognized as a notorious opportunistic pathogen [3] meaning it primarily affects individuals with compromised immune systems or underlying medical conditions. This gram-negative bacteria is capable of causing serious nosocomial infections including urinary tract infections, and respiratory tract infections[3]

Materials and Method

This study was carried out at the prevention and hygiene laboratory (Setif; Algeria). 15 strains are collected from non-hospitalized outpatients, in September 2021. All samples are urine samples.

### 1. Bacterial culture and Identification

Samples are cultured in ordinary and selected media, by loop on nutrient Agar, Hektoon Agar, and Chapman Agar. And positive bacterial growth in Enterobacteriaceae species if bacterial colony grows. Samples with a colony count greater than 10<sup>5</sup> CFU/ml were considered the target group.

A urinalysis is done, morphological examination and bacterial identification were performed using standard biochemical and microbiological tests, and an API 20<sup>E</sup> gallery was used to confirm the identification.

### 2. Antibiogram Test

The pattern of antibiotic resistance was determined using the guideline of the European Committee on Antimicrobial Susceptibility Testing 2020 (EUCAST 2020) by disk diffusion method in Mueller Hinton Agar According to Kirby-Bauer Disk Diffusion Susceptibility Test; we use antibiotic discs as follows: amoxicilline 25, amoxicilline + clavulanic acid 30, piperacilline 100, ticarcilline + clavulanic acid 85, imipenem 10, cefixime 5, fosfomycine 50, cephalaxine 30, nalidixic acid 30, ofloxacin 5, cotrimoxazol 25.

## II. RESULTS

In 15 urine samples collected, about 86.67% was positive for Enterobacteriaceae bacteria (Table1).

Table1. Frequency of isolation of spices

Type of Bacteria	Frequency
<i>Escherichia coli</i>	26.67%
<i>Providencia</i>	40%
<i>Klebsiella</i>	6.67%
<i>Pseudomonas</i>	6.67%
<i>Proteus</i>	13.33%
<i>Enterococcus</i>	6.67%

10 samples are represented in female, while 33.33% of samples are represented in male (a sex ratio of 0.5); 53.33% of samples are collected in children (Figure 1).

*Providencia* is the most representif spices in all collected samples especially in children (all *Providencia* samples are collected in girls in middle age 10 years), she has also a high level of resistance to many classes of antibiotics, that is the reason that our study is focused on *Providencia*, between the 12 antibiotics tested, a high level of acquired resistance is noticed for

amoxicillin(83.33%), and also for the combination amoxicillin + clavulanic acid, and piperacillin (66.67%), a resistance of (50%) is observed for nalidixic acid. Ticarcillin+ clavulanic acid and fosfomicin, and ofloxacin make a percentage of resistance of (33.33%), and finally (16.67%) of resistance is noticed for imipenem and cotrimoxazole (Figure 2).

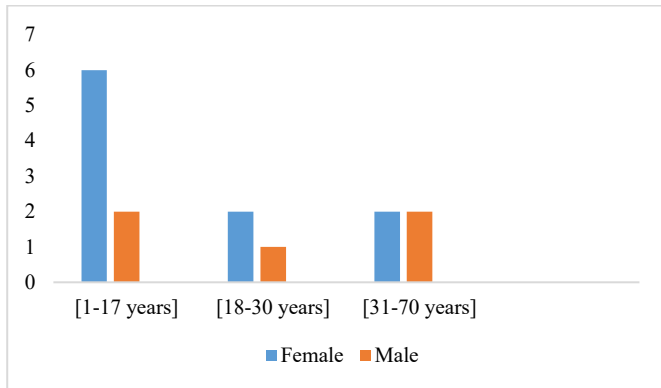


Figure1. Distribution of spices according to sex and age.

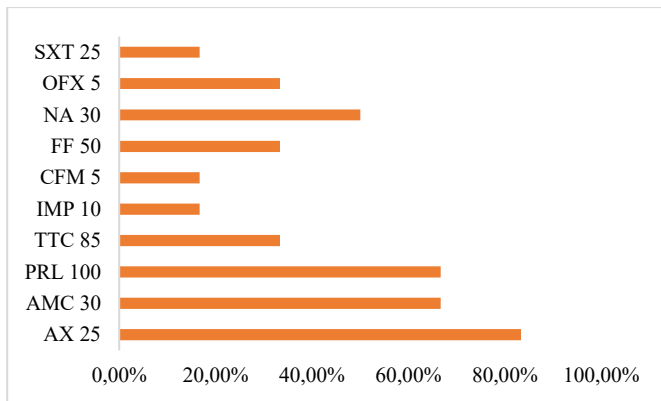


Figure 2. Resistance of Providencia

### III. DISCUSSION

A multidrug- resistance bacteria is a bacteria that resist to three or more family of antibiotics, in this study the *Enterobacteriaceae* is the major class of bacteria that isolated in urinary tract infection, among which 26.67% were identified as *Escherichia coli*, and this finding is consistent with what he found [4]. Women are more at risk to develop a urinary tract infection for various reasons: the structure of the urinary tree, due to the female lower urinary tract anatomy and its proximity to the reproductive organs. The

female urethra is relatively short, reducing the distance for bacterial ingress. sexual activity as well excessive use of intimate hygiene products interfering with natural vaginal microbiome are often to blame and pregnancy [5]–[7].

Our study show that urinary *Providencia* has a resistance to Beta-lactamines (AX 25, AMC 30, PRL100, TTC 85, IMP10), and also cephalosporines (CFM5), phosphonic acid (FF 50), quinolones (NA 30), fluoroquinolones (OFX 5), trimethoprim+ sulfamethoxazole (SXT25). So *Providencia* showed a high level of resistance to many classes of antibiotics Additionally, intrinsic inherited resistance to aminopenicillins, colistin, beta-lactams such as early generation of cephalosporins, carbapenems, as well as quinolones and fluoroquinolones by different mechanisms [8], [9].

#### IV. CONCLUSION

This study show that Enterobacteriaceae is the most frequent family of bacteria isolated in urinary tract infections, with a predominance of *E. coli*, in children MDR *Providencia* show a high level of resistance to several classes of antibiotics, this results confirms the evolving and worrying nature of resistance to antibiotics of urinary *Providencia* This increasing evolution of resistance of *Providencia* against several classes of antibiotics creates an alarming situation to raise awareness. Effective infection control and antibiotic stewardship policies are required to prevent the development of further antibiotic resistance.

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