ACQUISITION OF INFORMATION STRUCTURE IN KOREAN
: A PERCEPTION-BASED APPROACH

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Abstract

This dissertation investigates the perception of information structure in Korean, focusing on how adults and children perceive and process focus and topic marking. The study is organized into four experiments that examine different strategies for marking focus on direct objects and topic on subjects.

Experiments 1 and 2 examine how Korean speakers use accusative case markers, prosodic cues, and null marking to indicate focus on direct objects. The results reveal that adults prefer prosodic cues over case marking, while six-year-olds show delayed development in focus perception. By age ten, children's abilities begin to align more closely with adult patterns, although challenges remain in processing non-focused elements and deaccentuation.

Experiments 3 and 4 explore topic marking on subjects, analyzing participants' preferences for using the topic marker *-(n)un* versus the nominative marker *-i/ka* across different types of topics. Adults and ten-year-olds generally favor the topic marker for anaphoric, generic, and contrastive topics, while using the nominative marker for broad focus. However, ten-year-olds show some differences from adults in the frequency of using markers for contrastive topics, indicating ongoing development. Six-year-olds exhibit even less consistent preferences, particularly in their selection of markers for contrastive topics and broad focus, highlighting their developing understanding of topic marking.

The findings suggest that the acquisition of topic marking precedes focus marking, with children mastering non-contrastive topics before developing the ability to handle contrastive topics and focus on direct objects. This sequence reflects broader cognitive and linguistic development, where simpler, more general categories are acquired before more complex, specific ones.

This research contributes to the understanding of language acquisition in Korean, emphasizing the gradual and multifaceted nature of developing information structure. It highlights the interplay between prosodic, morphological, and syntactic cues in marking focus and topic, and it underscores the challenges children face in achieving adult-like proficiency in these areas.

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ACC	accusative
CON	contrastive
DAT	dative
FOC	focus
NOM	nominative
TOP	topic

Chapter 1. Introduction

1.1 Introduction

When communicating effectively, speakers must convey information appropriately, taking into account what the listener already knows or does not know. Speakers therefore tailor the information they convey to the listener based on their assumptions about the listener's knowledge.

Information structure encompasses how information is structured and highlighted during communication to emphasize its importance or relevance. It reflects how speakers structure their sentences to emphasize specific elements, such as the topic or focus of a message (Chafe, 1976; Halliday, 1967; Krifka, 2008; Lambrecht, 1994).

When it comes to the acquisition of information structure, this area remains relatively less explored compared to other aspects of first language acquisition. Existing findings suggest a tendency towards later acquisition in this domain compared to others. While certain language domains appear to develop before school age, studies indicate that the acquisition of information structure continues to evolve even after this period (Höhle et al., 2014; Wells et al., 2004). Particularly noteworthy is the frequent observation of an asymmetry between early production and late comprehension in this area (Höhle et al., 2014).

This dissertation aims to investigate how both Korean adults and children perceive focus marking and topic marking.

1.2 Terminology for focus, topic and contrast

In discussing information structure, it is essential to understand the concepts of focus, topic, and contrast, which are the fundamental categories within this field. However, the literature on these concepts is complex and often marked by varying interpretations, leading to confusion and debate among scholars. Various studies highlight the conceptual confusion surrounding these terms, noting their inconsistent use across different theoretical frameworks (Gundel, 1999; Jackendoff, 1972; Krifka, 2007; Lambrecht, 1994; Vallduví, 1992).

For the purposes of this dissertation, I will define these terms as they are used in this study. The basic concepts are summarized by adopting the typology from Neeleman et al. (2009) (Table 1.1) and Jun's (2015) definitions of focus and topic, with some adjustments to

better suit this research. Throughout this paper, brackets are used to mark foci, and underlining indicates topics.

Table 1.1 Adjusted typology of information structure, based on Neeleman et al. (2009)[1]

	Topic	Focus
Non-contrastive	Non-contrastive topic (Anaphoric topic / Generic topic) [+topic, -contrast]	Non-contrastive focus (New information focus) [+focus, -contrast]
Contrastive	Contrastive topic [+topic, +contrast]	Contrastive focus [+focus, +contrast]

I adopted the typology of topic, focus, and contrast from Neeleman et al. (2009), who treat these three concepts as orthogonal to one another, as shown in Table 1.1. However, I do not adopt their specific definitions of focus and topic. According to their framework, focus is defined as a highlighted piece of information in relation to the rest of the sentence, while topic refers to the "sentence topic" or what the sentence is about.

For this study, I use the definitions of Jun (2015), who distinguishes between new and old information: focus is defined as new information, while topic refers to the portion of old information that conveys aboutness (i.e., "tell me about X"). It is therefore important to clarify that I adhere to Jun's definition of focus as new information, rather than as merely a highlighted or prominent constituent, as described by Neeleman et al. (2009). Consequently, I have made adjustments to avoid defining focus solely in terms of prominence in this study.

[1] A committee member noted that topics may be interpreted differently based on this table.
1. In one interpretation, topic types are distinct:
Anaphoric topic: [+Topic, +Anaphoric, -Contrastive, -Generic]
Contrastive topic: [+Topic, +Contrastive, -Generic]
Generic topic: [+Topic, -Contrastive, +Generic]
2. Alternatively, topics can overlap in function:
Anaphoric topic: [+Topic, +Anaphoric]
Contrastive topic: [+Topic, +Contrastive]
Generic topic: [+Topic, +Generic]
In this study, I adopt the first interpretation, treating topics as one of three distinct types: anaphoric, contrastive, or generic.

A committee member pointed out that the term "new information focus" could be confusing, as contrastive focus also involves new information based on the distinction of givenness, and the two are not mutually exclusive. In this study, the term "new information focus" is used to refer to non-contrastive focus, distinguishing it from contrastive focus.

When discussing information structure, it is crucial to differentiate between new and old information. This distinction is based on givenness (Gundel & Fretheim, 2004). Old information refers to elements that have been previously mentioned within the discourse.

(1) A: What did Mina eat before the class?
B: She ate [an apple].

In this example, *an apple* is new information, while the rest of the sentence *she ate* is old information because it was mentioned in A's utterance. New information is crucial and cannot be omitted, whether it has been previously mentioned, while old information is less critical (Halliday, 1994; Prince, 1981; Chafe, 1976).

The distinction between old and new information is complementary within a sentence. Old information serves to connect the sentence to previous discourse or shared knowledge. In previous studies, these distinctions have been referred to as theme-rheme, topic-comment, topic-focus, focus-presupposition, focus-ground, and so on (Gundel, 1988, 1999; Halliday, 1967; Jackendoff, 1972; Sgall, Hajicova and Penevova, 1986; Vallduvi, 1990). This study refers to new information as focus and the rest as topic and the remainder.

In this typology, topic and focus are fundamental notions that can either convey non-contrastive focus and non-contrastive topic, or be combined with the concept of contrast. Focus refers to new information, the parts of sentences that a speaker cannot omit. In examples (1), speaker B cannot omit *an app*le because this is the specific information that speaker A wanted to know. Here, *an apple* is an instance of focus.

Topic refers to old information that conveys aboutness (i.e., 'tell me about X') in this study, which is information that has already been introduced or is assumed to be known by the listener. However, not all old information serves as the topic. To determine the topic within old information, I apply the "Tell me about X" test (Hockett, 1958; Jun, 2015; Kim, 2013; Lambrecht, 1994; Reinhart, 1981). According to this test, the topic is the part of the sentence that can answer the question "Tell me about X."

In this framework, the topic is the segment of old information that the utterance is specifically about. For instance, in utterance (1B), *she ate* is old information, but *ate* is not the topic. When asked, "Tell me about X," the answer would be *She, Mina*, making *she, Mina* the topic of the sentence. Thus, out of all old information, only the parts that pass the "Tell me about X" test are identified as the topic.

Contrastiveness is the quality of a word or phrase that sets it apart by contrasting it with another element. Lambrecht (1994) states that contrastiveness is orthogonal to topic and focus, meaning it operates independently of them, though it can be combined with both, as shown in Table 1.1.

(2) Contrastive focus

A: Did Mina eat a banana before the class?
B: No, she ate [an apple].

In (2B), *an apple* is highlighted as the contrastive focus by negating the alternative provided by speaker A (*a banana*), thus emphasizing the difference.

(3) Contrastive topic

A: What did children eat before the class?
B: Mina ate an apple and Sumi ate a banana.

In (3B), *Mina* and *Sumi* serve as the topics, representing old information, and they pass the "Tell me about X" test. The contrast is achieved by mentioning different objects (*an apple* and *a banana*), which distinguishes the two, making them contrastive topics.

1.3 Focus

1.3.1 The types of focus

In this study, focus refers to new information, which cannot be omitted due to its communicative importance. In linguistic terms, 'new' parts of sentences introduce elements that have not been previously mentioned or are assumed to be unknown to the listener. These include new information that answers a question or contrastive information that opposes something previously mentioned or implied (Jun, 2015; Féry & Samek-Lodovici, 2015; Krifka, 2008; Chen et al., 2012). Speaker B's responses in examples (4) through (8) illustrate the various ways in which focus, as new information, can be expressed based on the type of question posed.

(4) A: What happened before the class?
B: [Mina ate an apple]$_{FOC}$.

(5) A: What did Mina eat before the class?
B: She ate [an apple]$_{FOC}$.

(6) A: Who ate an apple before the class?
B: [Mina]$_{FOC}$ ate an apple.

(7) A: Did Mina eat a banana or an apple before the class?
B: She ate [an apple]$_{FOC/CON}$.

(8) A: Mina ate a banana before the class.
B: No, she ate [an apple]$_{FOC/CON}$.

Focus can be categorized based on the size of the focal constituent (Gussenhoven, 2007), distinguishing between narrow focus on specific words, such as *an apple* in (5B) and (7B), and *Mina* in (6B), and broad focus on larger constituents like a verb phrase or an entire sentence, as in (4B). Focus can be categorized based on the place of the focal constituent, such as object focus, *an apple* in (5B) and (7B) and subject focus, *Mina* in (7B). Additionally, focus can be combined with the concept of contrastiveness. In cases of contrastive focus, such as in (8B), *an apple* is compatible with focus, new information and contrast associated with the two choices of previously mentioned information, *a banana* or *an apple*. Thus, while *an apple* in (5B), (7B) and (8B) all of them represent focused constituents, they differ in terms of contrastiveness, despite referring to the same elements.

The properties of contrastive focus typically make it more prominent than non-contrastive focus because contrastive focus involves highlighting differences between alternatives, thereby adding an extra layer of emphasis (Horn, 1981; Rooth, 1992; Choi, 1999; Cowles, 2003). Contrastive focus draws attention to the contrast between options, making it more salient in discourse compared to non-contrastive focus, which simply introduces new information without additional contrastive implications.

1.3.2 Focus marking

Focus is typically manifested in spoken languages through various linguistic strategies employed to encode focus. Languages utilize different approaches for realizing focus, commonly employing three main strategies: a) Prosodic, b) Morphological, and c) Syntactic.

Prosodic strategies involve altering prosodic patterns in phrasing or phonetically modifying focused elements and their surroundings (Jun, 2011). In languages like English, focused elements often show expanded pitch range, increased duration, or greater amplitude. Broad focus tends to distribute these prosodic cues across the utterance, while narrow focus intensifies prominence on a specific constituent (Bartels & Kingston, 1994; Birch & Clifton, 1995, 2002; Breen et al., 2010; Gussenhoven, 1983, 1992; Selkirk, 1984, 1995; Xu & Xu, 2005). For instance, if the entire utterance is focused in (4B), both the verb and the NPs are likely to be realized with strong prosodic cues. Conversely, if only the NP is focused in (5B), it is likely to be produced with prominent prosodic features.

The Bantu language Chichewa also utilizes prosodic cues for realizing focus, albeit with differences from English. In Chichewa, focus is often marked by inserting a phonological phrase boundary after or before the focused parts (Zimmerman and Onea, 2011). Another method to mark focus involves morphological cues. For example, the Chadic language Guruntum encodes focus by inserting the morphological focus marker *a* before the focused constituent (Zimmerman and Onea, 2011). Syntactic strategies, such as non-canonical word order or clefting, represent a third way to mark focus (Rizzi, 1997).

While these three strategies are commonly used to encode focus, many languages employ a combination of strategies. For instance, Hungarian utilizes both pitch accent and non-canonical word order simultaneously (Szendroi, 2003).

1.3.3 Focus marking in Korean

1.3.3.1 Morphological focus marking in Korean

Korean appears to employ a combination of strategies to realize focus. Previous research has demonstrated that focus in Korean is expressed through both morphological and prosodic means. Morphologically, Korean utilizes case markers to mark focus. Scholars such as Lee (2011), Chung (2013), Kwon and Zribi-Hertz (2008) have shown that prominent arguments, such as direct objects in contrastive focus, are likely to be overtly case marked, whereas less prominent arguments, such as those in non-contrastive focus, tend to be less marked. For instance, in Lee (2011), a direct object like *hyutayphon* (a cell phone) in contrastive focus, as in (9b), was preferred when overtly case-marked with the accusative case marker *–(l)ul*, compared to a direct object in non-contrastive focus, as in (9a).

(9)a. New information focus (Non-contrastive focus)

A: Yumi-ka mwe-l sasse?
Yumi-NOM what-ACC bought
'What did Yumi buy?'

B: [hyutayphon -ul/– Ø] sasse.
cell-phone bought
'She bought a cell phone.'

b. Contrastive focus

A: Yumi-ka khemphyuthe-lul sasse?
Yumi-NOM computer-ACC bought
'Yumi bought a computer.'

B: aniya, [hyutayphon -ul/– Ø] sasse.
No cell-phone bought
'No, she bought a cell phone.'

Lee (2011) found that participants in a forced-choice task, in which they are asked to choose one of the two options (case marked form or null marked form of direct objects) selected about 68 percent of direct objects with case markers in the contrastive focus condition, compared to 55 percent in the non-contrastive focus condition. This trend was also evident in a judgment task using a 5-point scale. Sentences with case markers were rated 4.5 out of 5 in the contrastive focus condition, while sentences without case markers were rated 2.8. In the non-contrastive focus condition, sentences with case markers were rated 3.1, and sentences without case markers were rated 3.2. This suggests that focused constituents tend to be more overtly marked.

However, it is important to note that the conditions of focus in these studies do not include truly non-focused direct objects. The non-focused condition in Lee (2011) and Chung (2013) actually involves elements that are focused based on the concept of focus defined here—they represent new information in givenness. Therefore, what these studies reveal is not that focus itself affects case marking in Korean, but rather that contrastiveness does. To accurately assess the impact of focus versus non-focus on case marking, it is crucial to include examples of truly non-focused information.

1.3.3.2 Prosodic focus marking in Korean

According to Jun and Kim (2007) and Jun (2011), prosodic strategies are employed to indicate new information focus (non-contrastive) in Korean. They demonstrated that prosodic cues for focus involve altering prosodic patterns through phonological means, such as phrasing (grouping words)[2] or manipulating the duration, pitch range, or pitch accent of focused elements and surrounding material. For example, in a broad focus context like (10a), all lexical items in the entire sentence in (10c), including the subject *Yongho-nun*, the verb *mekyesse* ('fed'), and the direct object *tangkun-ul* ('a carrot'), represent new information and are thus highlighted. Consequently, each word is articulated distinctly. Conversely, in response to a question like (10b), only the direct object *tangkun-ul*, as a VP-initial argument, counts as focus. To emphasize the focused argument, a brief pause may be inserted before *tangkun-ul* at the beginning of (10c). Additionally, all items following the focused argument might be de-emphasized or produced with a reduced pitch range. For instance, in (10c) under the narrow focus condition, *mal-eykey mekyesse* ('fed to the horse') might be de-emphasized (Jun and Kim, 2007; Jun, 2011).

(10) An example from Jun and Kim (2007)

a. Broad focus: Read Answer c.

b. Narrow focus: What did Yongho feed to a horse?

c. Answer:

Yongho-nun	tangkun-ul	mal-eykey	mekyesse.
Yongho-TOP	carrot-ACC	horse-DAT	fed

'Yongho fed a horse a carrot.'

Lee (2015) conducted a crosslinguistic study that suggested prosody might not serve as a clear marker for encoding contrastive focus in Korean. They found that prosodic cues in Korean were not as effective in marking contrast compared to languages like English. This finding emerged from both a production and perception task. In the production task, participants were tasked with reading 10-digit number strings. In the contrastive focus

[2] The concept of "phrasing" refers to how speech is organized into units or groups of words that are pronounced together in a way that sounds natural and fluent. The intonational framework of Seoul Korean, along with the hierarchical organization of prosodic units and tonal affiliations in Korean, is provided in Appendix A. For more details, refer to Jun's K-ToBI (Jun, 2000).

condition, participants were required to respond to questions like the one presented in Example (11).

(11) A: Is Mary's number 215-418-5623?
B: No, the number is 215-41[7]-5623.

In Speaker B's response in (11), the corrected digit is 7. Unlike in languages such as English and Mandarin Chinese, there was no significant difference in f0, duration, and intensity between corrected and non-corrected digits in Korean and Japanese. This observation was consistent across perception tasks as well. The audio stimuli, selected from production data, included corrected digits like the 7 in (11B). Participants were asked to identify the corrected digit based solely on listening to the auditory stimuli. Correct identification rates were notably lower for Seoul Korean (44.6%) and South Kyungsang Korean (55.6%) compared to other languages such as English (97.3%) and Mandarin Chinese (94.9%). These results suggest that phonetic prosodic cues might not be effective for marking focus in Korean and Japanese. However, it is worth noting that the nature of the stimuli, consisting of single digits, might have influenced these results.

As Jun (2011) highlighted, the prosodic realization of focus varies across languages. Korean is characterized as an edge-prominence language, where phonological means, such as manipulating phrasing, are crucial for realizing focus. However, phonetic means, such as high f0, longer duration, and stronger intensity, also serve as secondary cues for marking focus in Korean. Yang (2017) found that phonological means are more effective than phonetic means for focus marking in Korean, based on a production study.

Given that the task in Lee (2015) involved reading digits, manipulating phrasing might not have effectively marked focus in Korean. A digit, such as *chil* ('7'), consists of only one syllable, which may not be long enough to represent the smallest intonation unit. Consequently, encoding focus on parts of a phrase rather than the entire phrase might be challenging in Korean. Thus, the cross-linguistic differences in realizing prosodic focus could explain why prosody was not an effective means of marking focus in Korean in Lee (2015). It is possible that the study did not fully capture the cross-linguistic differences in realizing prosodic focus.

In summary, prior research on focus in Korean has predominantly focused on investigating only one strategy. For instance, studies by Lee (2011) and Chung (2013) solely

examined case markers, while Jun concentrated exclusively on prosodic markings. Additionally, the tasks they employed varied significantly. Furthermore, the types of focus and the pairs used for comparison differed across studies, making direct comparisons challenging, as shown in Table 1.2.

Table 1.2 Summary of previous studies on focus marking in Korean

Study	Types of Focus	Way of Marking	Task
Lee (2011), Chung (2013)	Contrastive focus vs. Non-contrastive focus	Case	Written tasks (choice and rating) Production (answering questions)[3]
Jun and Kim (2007), Jun (2011)	Broad focus vs. Non-contrastive focus	Prosody (Phonological and phonetic means)	Production (answering questions)
Lee (2015)	Broad focus vs. Contrastive focus	Prosody (Phonetic means)	Production (answering questions), Perception (choosing the correct digit)
Yang (2017)	Non-contrastive focus vs. Contrastive focus vs. Non-object focus	Prosody (Phonological and phonetic means)	Production (answering questions)

1.3.4 Acquisition of focus marking in Korean

Acquisition studies on Korean focus have been explored by Chung (2013) and Yang (2017). Chung (2013) investigated the impact of focus on Korean case ellipsis using an elicited production task with children aged five to seven. The study revealed that while Korean-speaking children exhibited similar patterns to adults in marking focus on direct objects, the effect was not as pronounced as in adults; direct objects in contrastive focus were more likely to be case-marked than those in non-contrastive focus.

On the other hand, Yang (2017) delved into the developmental trajectory of phonological and phonetic marking of focus in Korean-speaking children. It was found that children aged four to five could employ phrasing (phonological marking) to denote different types of focus in a manner resembling adults, albeit less frequently. Furthermore, the use of phrasing increased with age. In contrast, the utilization of phonetic marking, such as duration

[3] Only Chung (2013) conducted a production task.

and pitch, emerged much later in development, with limited usage even among eleven-year-olds.

Chung's (2013) study stands as the sole investigation into the morphological marking of focus in Korean children. Although the findings indicated that five to six-year-olds displayed patterns similar to adults in distinguishing contrastive focused elements from non-contrastive focus ones, the study solely relied on elicited production, lacking listening tasks. Additionally, it focused solely on the factor of case ellipsis without examining prosody. Consequently, there remains uncertainty regarding whether participants utilized prosodic markers to encode focus. Moreover, while Chung's study examined factors influencing case ellipsis, such as focus, animacy, and definiteness, it did not delve into how different types of focus are marked. It is worth noting that the non-contrastive focus condition in Chung's study does not necessarily indicate non-focused elements, but rather those that are not contrastive focus.

1.4 Topic

The concept of topic is already explained in the previous section 1.2. In the example (12), *She* or *Mina*, out of all old information, only the parts that pass the "Tell me about X" test are identified as the topic.

1.4.1 The types of topic

Topics can be categorized based on contrastiveness into non-contrastive topics and contrastive topics.

(12) A: What did Mina eat before the class?
B: She ate an apple.

(13) A: What did children eat before the class?
B: Mina ate an apple and Sumi ate a banana.

While the topic *she* in (12B) lacks contrastiveness, the topic *Mina* in (13B) exhibits contrastiveness due to the subsequent mention of *Sumi*.

Moreover, non-contrastive topics can be further classified into generic topics and anaphoric topics. Kuroda (1972) defines a sentence as generic if the statement made by a generic topic pertains to a general, habitual, or constant state of affairs.

(14) A: Tell me about elephants.
B: Elephants have long noses.

In (14B), *elephants* serves as the generic topic, conveying a generic assertion about elephants as a category.

Conversely, an anaphoric topic is linked to an antecedent in previous discourse or a contextual antecedent. *She* functions as an anaphoric topic in (13B) because *Mina* was mentioned in the previous utterance (13A).

1.4.2 Topic marking in Korean

In Korean, topics are typically marked by the morphological topic marker, *-n(un)*. The following examples illustrate how topics are marked using the Korean topic marker.

(15) Anaphoric topic

A: What did Mina eat before the class?
B: mina-nun sakwa-lul mekesse
Mina-TOP apple-ACC ate
'Mina ate an apple'.

(16) Generic topic

A: Tell me about elephants.
B: khokkili-nun kho-ka kile.
Elephant-TOP nose-NOM long
'Elephants have long noses'.

(17) Contrastive topic

A: What did children eat before the class?
B: mina-nun sakwa-lul mek-ko swumi-nun panana-lul mekess
Mina-TOP apple-ACC ate-and Sumi-TOP banana-ACC ate
'Mina ate an apple and Sumi did a banana'

1.4.3 Previous studies of topic in Korean

Numerous studies have examined topic marking in Korean, but many of these rely on intuitive examples or corpus data, offering limited insight into the perceptual aspects of topic marking. Experimental studies were seldom conducted. Moreover, existing research has not specifically investigated how topic marking is perceived by native Korean-speaking adults (Choi, 1999; Choi, 2019; Kim, 2015; Laleko and Polinsky, 2016).

The acquisition of topic markers and nominative case markers in Korean has been explored in several studies, most of which emphasize corpus data or early developmental milestones. These markers typically emerge around 20 months, making it challenging to conduct experimental studies on their acquisition. When such studies are performed, they often involve bilinguals or language learners rather than monolingual children. Additionally, there has been no focused research on the perceptual development of topic marking in children (Choi, 1999; Choi, 2019; Kim, 2015; Laleko and Polinsky, 2016; Lee and Cho, 2009).

Previous research has generally assumed a very early acquisition of topic markers and nominative case markers. This assumption suggests that Korean children will acquire markers for subjects with anaphoric, generic, or contrastive topics, and focus consistently from an early age.

In sum, previous studies on the acquisition of information structure in Korean fail to provide a clear picture of this area. My dissertation offers the first experimental study that examines focus and topic marking from a perceptual perspective. Furthermore, by using the same tasks for adults as well as six-year-old children and ten-year-old children, the results can be directly compared to see the differences and similarities in encoding information structure in perception.

1.5 Research Questions

As for focus marking, the two main focus marking strategies (morphological or prosodic marking) are used. Conversely, topic marking in Korean is predominantly encoded by morphological marker *-(n)un* (Choi, 1999, 2019; Chung, 2013; Jun & Kim, 2007; Jun, 2011; Kim, 2015; Kwon & Zribi-Hertz, 2008; Laleko & Polinsky, 2016; Lee, 2011; Yang, 2017). Hence, we can examine which one among focus and topic children will acquire first. Since

even adults do not consistently demonstrate homogeneous performance patterns in many experiments on information structure, it is crucial to analyze adults' data initially.

The main questions of this dissertation revolve around three comparisons, which lead to four key questions.

1) Comparison between adults and children (six-year-olds and ten-year-olds)
2) Comparison between perception and production (drawing on previous studies in the latter case)
3) Comparison between focus and topic

i. Do Korean children exhibit a comparable ability to distinguish between various types of focus in perception, as observed in production studies?
ii. Will children demonstrate a pattern similar to that observed in adults concerning focus and topic?
iii. Do children display developmental changes with age regarding focus and topic?
iv. Are there developmental differences between focus and topic in children?

1.6 Dissertation outline

The dissertation is structured as follows, outlining the studies on Korean information structure marking in perception using auditory stimuli:

Chapter 2: Experimental design for Experiment 1 & 2: Perception of Focus Marking
This chapter presents the experimental framework designed to investigate how speakers perceive the focus marking of direct objects among Korean speakers. It encompasses both adult and child participants in Experiments 1 and 2.

Chapter 3: Experiment 1: Perception of Focus Marking in Korean by Adults
Here, the results of Experiment 1, focusing on adult participants, are discussed in detail, providing insights into how adults perceive focus marking in Korean.

Chapter 4: Experiment 2: Perception of Focus Marking in Korean by Children
This chapter presents the outcomes of Experiment 2, which replicates the focus marking experiment conducted with adults but involves child participants. A comparative analysis between adults and children is provided.

Chapter 5: Experimental design for Experiment 3 & 4: Perception of Subject Marking
Chapter 5 outlines the experimental design used to investigate how speakers perceive the topic marking of subjects among Korean speakers. It includes both adult and child participants in Experiments 3 and 4.

Chapter 6: Experiment 3: Perception of Subject Marking in Korean by Adults
The results of Experiment 3, focusing on adult participants, are presented and analyzed, shedding light on how adults perceive topic marking in Korean.

Chapter 7: Experiment 4: Perception of Subject Marking in Korean by Children
This chapter delves into the outcomes of Experiment 4, which replicates the topic marking experiment conducted with adults but involves child participants. A comparative analysis between adults and children is provided.

Chapter 8: General Discussions and Conclusions
The dissertation concludes with a summary of the findings and a discussion of their implications. Potential avenues for future research in the field of information structure marking in Korean are also explored.

Chapter 2. Experimental design for Experiment 1 & 2: Perception of Focus Marking

2.1 Introduction

This chapter outlines the experimental design used to investigate how Korean speakers, both adults and children, perceive the focus marking of direct objects in Experiments 1 and 2. The primary aim of these experiments is to examine how direct objects are marked for focus, whether through the use of the accusative case marker *-(l)ul*, prosodic cues, or null marking.

This study focuses specifically on direct objects rather than subjects because the omission of case marking is significantly less frequent with subjects. In many instances, null-marked direct objects sound natural, whereas null-marked subjects tend to sound less natural.

Table 2.1 below offers a brief overview of the three distinct types of focus applied to direct objects in this study.

Table 2.1 Summary of focus types for direct objects

Types of focus	Focus (Objects)	Contrast (Objects)	Example
Contrastive focus	Yes	Yes	A: Did John buy a ball? B: No, he bought [a book]$_{FOC}$
New information focus	Yes	No	A: What did Susan buy? B: She bought [a book]$_{FOC}$
Non-object focus	No	No	A: Jin bought a book. B: No, [Jane]$_{FOC}$ bought a book.[4]

2.2 Experimental Designs

2.2.1 The forced-choice task

Schütze and Sprouse (2014) have shown that a forced-choice task is more effective in discerning differences between levels compared to other judgment tasks such as a Likert scale or Magnitude estimation, particularly for effects of small to medium magnitude. For that reason, I adopted a similar task in which participants were asked to choose the dialogue that sounded more natural. To accommodate child participants, stimuli were presented visually through images, as illustrated in Figure 2.1.

[4] In this pattern, the direct object is neither focused nor contrastive because only the subject is focused and contrastive. The Non-object focus is included to compare the objects of the other two types of focus with non-focused objects.

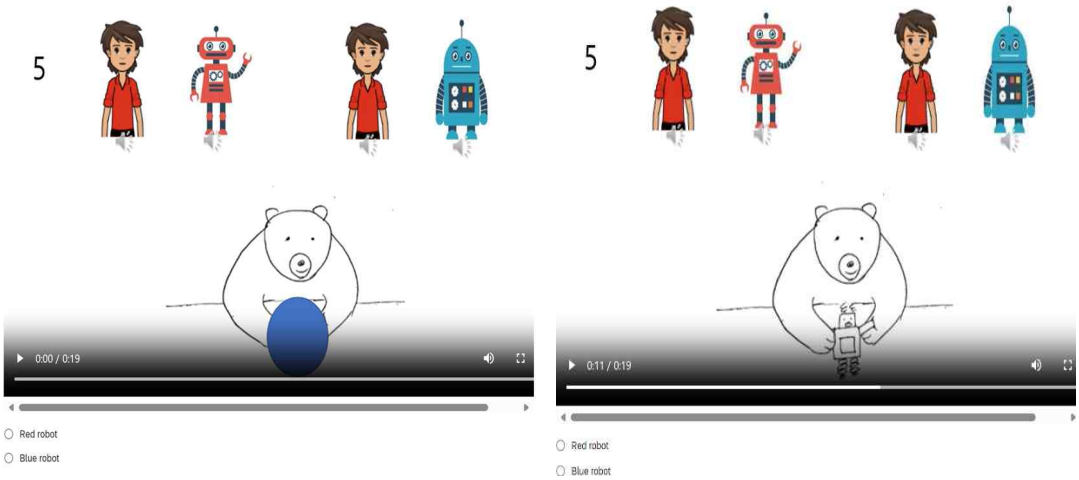

Figure 2.1. Example of an item with obscured information and without obscured information

As depicted in Figure 2.1, two pairs consisting of a man and a robot were positioned above the image. The man remained constant in both pairs. In the initial pair, the robot was consistently red, while in the second pair, it was consistently blue. Below the images, target pictures were displayed, containing a concealed object relevant to the experiment's design. A play button was situated at the bottom of the screen. Participants initiated the playback by clicking the button when they were prepared.

Initially, the man articulated a statement eliciting a response, which could involve correction or additional information. Subsequently, the concealed object was unveiled (refer to the second picture of Figure 2.1), and the first robot replied, addressing the speaker. The man then reiterated his initial statement, prompting the second robot to provide a response. The differentiation between the responses of the two robots was reflected solely in the use of prosodic cues or case marking on the direct objects. Following the presentation of both dialogues, participants were tasked with choosing the more natural response by clicking on either the red or blue robot. The sequence of responses is counterbalanced.

An illustrative sequence unfolds as follows (refer to Figure 2.2):

1. The First Man utters: 'Bear held a banana.'
2. The concealed object is revealed: The object that Bear held is a robot.
3. The first (Red) robot responds: 'No, Bear held a robot (a robot with case marking).'
4. In the second panel, the Second Man utters (the same one as the first sentence): 'Bear held a banana.'

5. The second (Blue) robot responds: 'No, Bear held a robot (a robot with prosodic marking).'

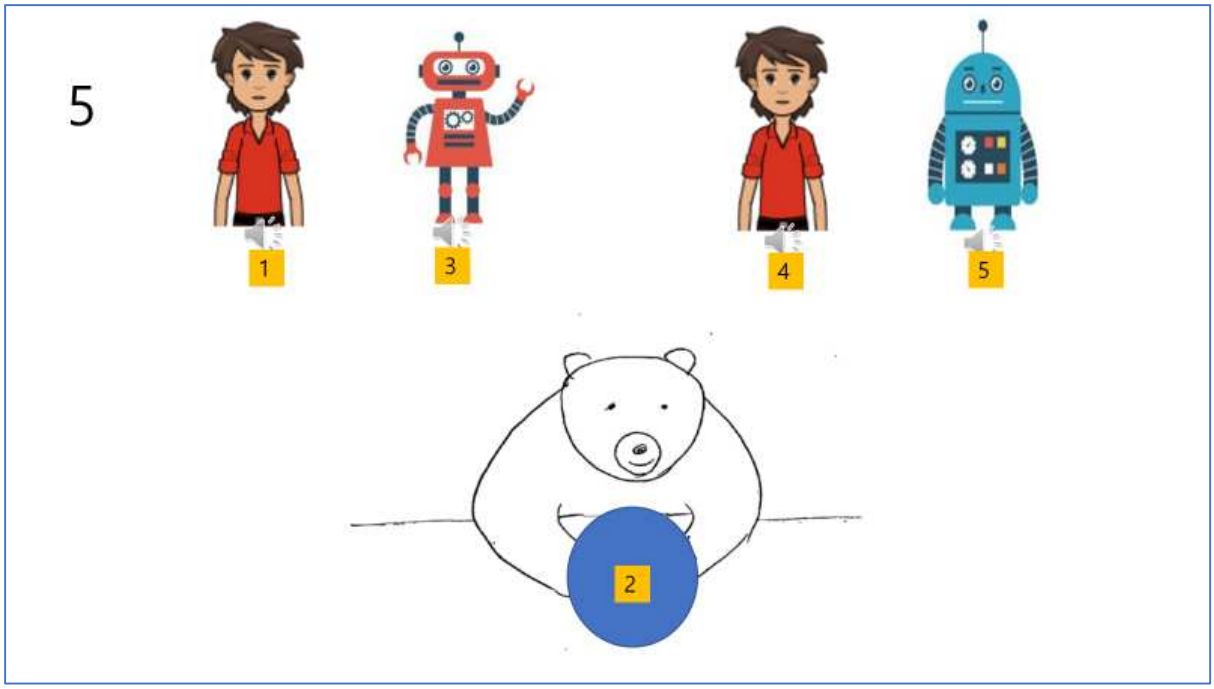

Figure 2.2 Sequence of an item

2.2.2 Materials and Design

The only difference between Experiment 1 and 2 was the number of items. In Experiment 1, designed for adults, a total of three practice items, 54 fillers, and 54 critical items (comprising 6 items across 9 conditions) were prepared. Of the 54 fillers, 36 are critical items for Experiment 3, while the remaining 18 are purely fillers. These 18 fillers were included to assess participant engagement; however, no data was excluded as all participants performed well. Refer to Appendix D (Critical items for Experiments 3 and 4, fillers for Experiments 1 and 2) and Appendix E (Pure fillers).

In Experiment 2, designed for children, three practice items, 24 fillers, and 36 critical items (comprising 4 items across 9 conditions) were prepared. Of the 24 fillers, 20 are critical items for Experiment 4, while the remaining 4 are purely fillers. These 4 fillers were included to assess participant engagement with three practice items; two participants' data were excluded as they got more of three wrong answers.

The experimental dialogues encompassed three conditions: the Contrastive focus condition, the New information focus condition, and the Non-object focus condition, exemplified below. The focal point consistently revolved around the direct object in the

robots' responses, with three distinct conditions involving variations in its prosodic or case marking. Here are examples of the first two conditions.

A. The Contrastive Focus Condition

Man:	Cat is drawing something. I will guess what. Cat drew a watermelon.			
Robot:	ani,	koyangi-ka	[kwaca(-lul)]$_{Foc}$	kulyesse
	no,	cat-NOM	cookie(-ACC)	drew
	'No, the cat drew cookies.'			

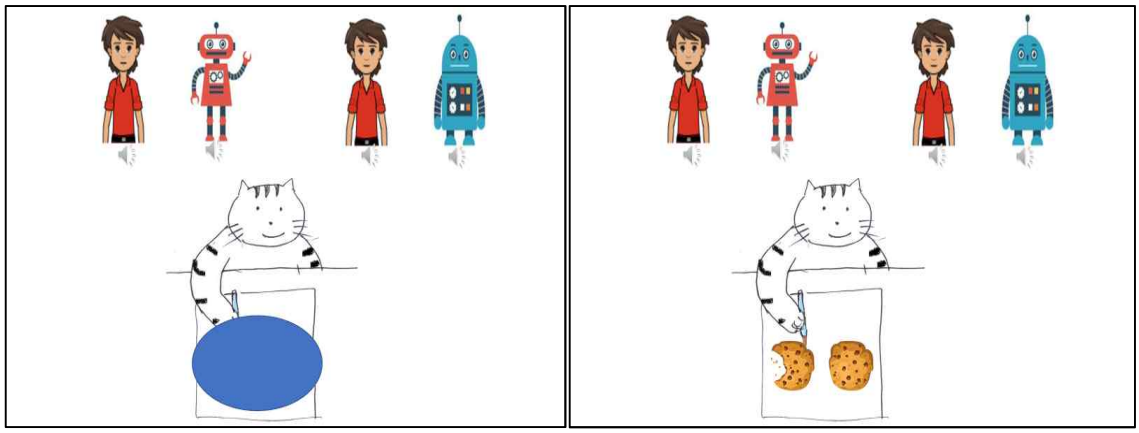

Figure 2.3 Sample context and target picture in the Contrastive focus condition

B. The New information Focus Condition

Man:	Elephant is looking at something. What is Elephant looking at?		
Robot:	khokkili-ka	[lopothu(-lul)]$_{Foc}$	chyetapwa
	elephant-NOM	robot(-ACC)	is looking at
	'Elephant is looking at a robot.'		

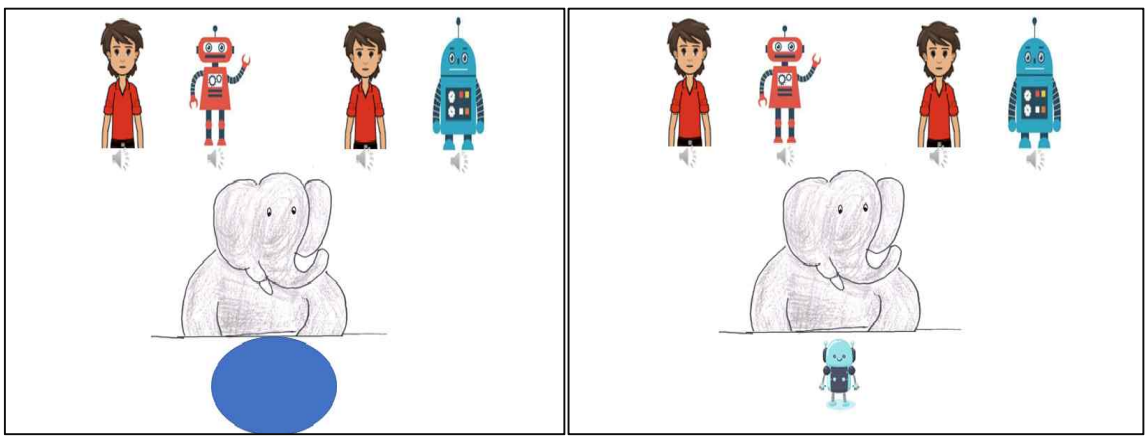

Figure 2.4 Sample context and target picture in the New information focus condition

In both the Contrastive focus and New information focus scenarios, the direct objects manifest narrow focus. In the Contrastive focus condition, depicted in A and Figure 2.3, the man provided incorrect information—a watermelon. Consequently, the term *kwaca* 'cookie' corrects the mistake, thereby creating a contrast. Conversely, in the New information focus condition represented by B and Figure 2.4, the man introduces new information regarding the direct object – a robot.

Finally, in the Non-object focus condition, illustrated below, the direct object is not emphasized, with the focus centered solely on the subject. This condition was included to draw a comparison between focused direct objects and non-focused direct objects.

C. The Non-object Condition

Man:	Somebody is touching a mango. I will guess who. Bear touched the mango.			
Robot:	ani,	[kangaci-ka]$_{Foc}$	mangko(-lul)	mancyesse.
	no	dog-NOM	mango(-ACC)	touched
	'No, Dog touched a mango.'			

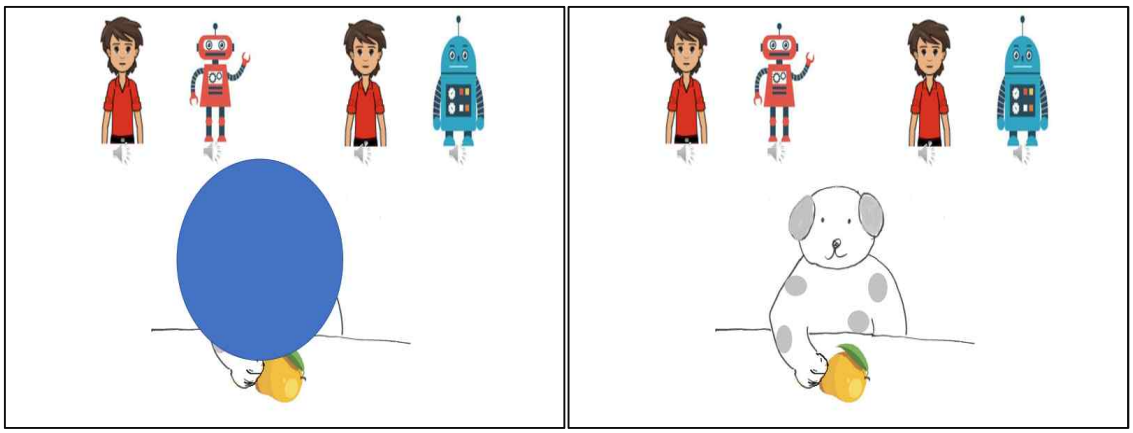

Figure 2.5 Sample context and target picture in the Non-object focus condition

In all three conditions, responses by the robots exhibited variation in accusative case marking and prosodic information, as illustrated below. A detailed explanation and analysis of the prosodic differences in the stimuli for Prosody vs. Null/Case conditions are included in Appendix B.

a. Case:	khokkili-ka	lopothu-lul	chyetapwa
b. Prosody:	khokkili-ka	LOPOTHU-Ø	chyetapwa
c. Null:	khokkili-ka	lopothu-Ø	chyetapwa
	elephant-NOM	robot(-ACC)	is looking at

'Elephant is looking at a robot.'

In each condition, the type of context is determined by the lead-in remarks made by the man referred to in the preceding three examples. The job of the participants is to choose between the responses that are produced by the two robots. Thus, in the case of the first comparison in Table 2.2 the participants choose between a response in which the direct object is marked by case with no prosody and a response in which there is no case or prosody. Moreover, these choices are presented in three different contexts – one in which the direct object is focused by virtue of providing new information, one in which it has contrastive focus by virtue of being a correction, and one in which it is unfocused. This design yields the nine experimental conditions outlined in Table 2.2. The nine conditions were grouped into three comparisons, each based on answer pairs, to facilitate data segmentation for result analysis. The responses involving both case and prosody were excluded for practical reasons, as including them would make the analysis overly complex.

Table 2.2 Summary of conditions

	Responses		Focus context
First comparison	Case (No prosody) vs. Null (neither case nor prosody)	1	Contrastive focus context
		2	New information focus context
		3	Non-object focus context
Second comparison	Prosody (No case) vs. Null (neither case nor prosody)	4	Contrastive focus context
		5	New information focus context
		6	Non-object focus context
Third comparison	Prosody (No case) vs. Case (No prosody)	7	Contrastive focus context
		8	New information focus context
		9	Non-object focus context

The robots` responses consistently took the form of transitive sentences. In topic-oriented languages like Korean and Japanese, subjects are often omitted if previously mentioned in discourse. However, in this study, subjects were explicitly included in order to maintain stimulus length. In both the Contrastive and Non-object focus conditions, the negative marker *aniyo* ('no') consistently preceded the response sentence.

To maintain controlled conditions, syllable counts for both direct objects and verbs were regulated. This precautionary measure was implemented because excessively long or short syllables in words can potentially impact phrasing. Direct objects consistently comprised two or three syllables, facilitating the articulation of appropriate contours within the Accentual Phrase[5], a small unit of intonation in Korean. Verbs were uniformly composed of three syllables.

To minimize the priming effect of the Man's questions, the use of accusative markers on direct objects was controlled. In the Man's utterances, half of all direct objects included accusative markers, while the other half did not.[6]

Moreover, factors such as the animacy and definiteness of direct objects were meticulously controlled to mitigate potential extraneous influences, as observed in Lee's (2011) study. All subject nouns are animate and definite (e.g., *kangaci*, 'puppy')[7], while all direct object nouns are inanimate and indefinite (e.g., *kong*, 'ball'), as shown in Table 2.3. Additionally, the sequencing of the robots' responses was balanced, introducing variations such as Case vs. Null and Null vs. Case. The specifics of the words utilized in stimulus creation are provided in Table 2.3.

Table 2.3 Words list

Subjects		Objects 1 (2 syllables)		Objects 2 (3 syllables)		Verbs	
kangaci	puppy	yenphil	pencil	lopothu	robot	tencita	throw
kepwuki	turtle	kawi	scissors	panana	banana	tulta	hold
koyangi	cat	swupak	watermelon	pokswunga	peach	capta	grab
komtoli	bear	yangpha	onion	saykcongi	color paper	mancita	touch
wenswungi	monkey	kwaca	cookies	swutkalak	spoon	chyetapota	look at
khokkili	elephant	wuyu	milk	catongcha	car	kulita	draw
		kamca	potato	cacenke	bicycle		
		mangko	mango	ceskalak	chopsticks		
		moca	hat	ciwukay	eraser		

[5] An Accentual Phrase (AP) in Korean is a small group of words that are spoken together with a specific pitch pattern. It usually consists of three or four syllables, and within this phrase, there's a predictable pattern of rising and falling tones, "Low-High-Low-High" pitch pattern. For example, *gongwon-eseo*, 'at the park' would typically form an Accentual Phrase. Refer to Appendix A for more details.

[6] In the fillers, eleven items used the contracted form of the accusative marker, *-l* (e.g., *mwo-l,* 'what').

[7] Although *kangaci* ('puppy') may generally refer to a generic noun, it is treated here as a proper name for definiteness, similar to 'Puppy' in English, indicating a specific, known character in the study.

The prosodic features of stimuli ("Prosody" versus "Null") were differentiated, emphasizing the distinctions between them. Each stimulus was recorded to highlight the contrast between the two categories. In the Case condition, prosodic strategies similar to those in the Null condition were employed. These strategies were informed by findings from prior studies. Further details on the in-depth analyses of prosodic stimuli are available in Appendix B.

2.2.3 Procedure

All sound stimuli were recorded in a sound-attenuated chamber at 24-bit, 44.1kHz, in mono. A male speaker presented the focus contexts, while a female speaker provided the answers. Both speakers used the Seoul dialect.

Participants were instructed to make linguistic judgments based on the recorded dialogues while referencing accompanying pictures. The task employed a forced-choice format, requiring participants to select the dialogue that sounded more natural.

The task was administered online, and participants were instructed to be in a quiet environment using a computer. They were directed to choose a red robot if the first dialogue sounded more natural, or a blue robot if the second dialogue was deemed more natural, after listening to the entire conversation. It was emphasized that the difference might pertain solely to prosody, such as accent, pitch, rhythm, or involve just one syllable. Participants were advised that their answers did not need to be consistent, and they were encouraged to choose intuitively and comfortably without prolonged deliberation. When they did not understand well, they could have the test item repeated. These instructions are intended for adults only. For children, a parent or guardian should read and explain the instructions. The parent or guardian is asked to click the answer when children choose a robot.[8] Qualtrics was employed for item presentation, and the item order was pseudo-randomized. Each participant responded to 54 critical items, randomly interspersed with 54 fillers. The experiment lasted approximately half an hour for adults and twenty minutes for children.

[8] A committee member raised concerns that the lack of blindness for parents might influence the results for children. However, given that the study was conducted online during the COVID-19 distancing period, this approach was considered the most feasible.

Chapter 3. Experiment 1: Perception of Focus Marking in Korean by Adults

3.1 Introduction

This chapter presents the findings of the focus marking experiment conducted with adult participants, addressing four key questions:

i. When Korean adult speakers engage in conversations, which is more likely to be chosen as a focus indicator: case marking or prosodic marking?

ii. Can prosody or case marking exclusively act as a focus marker? That is, does prosody marking express focus when a case marker is omitted, or does case marking itself function as a focus indicator without prosodic information?

iii. Which cue—morphology or prosody—provides a stronger indication of information structure?

iv. Are two distinct types of focus—Contrastive focus and New information focus—expressed differently?

The predictions outlined below are based on the results of prior studies (Chung, 2013; Jun and Kim, 2007; Lee, 2011; Yang, 2017).

Prediction 1: Participants will rate sentences with case marking in focus conditions (Contrastive focus condition and New information focus condition) more highly than in a Non-object condition when faced with the choice between Case and Null.

Prediction 2: Participants will rate sentences with prosodic marking in focus conditions (Contrastive focus condition and New information focus condition) more highly than in a Non-object condition when faced with the choice between Prosody and Null.

Prediction 3: Participants will rate sentences with case marking and prosodic marking in the Contrastive focus condition at a rate higher than or equal to the New information focus condition.

Prediction 4: Either case marking or prosody will have a similar effect as a focus marker.

3.2 Participants

Twenty-eight native adult speakers of Korean participated in the study (twenty-two females and six males, average age: thirty-four years). They were recruited from an online platform

affiliated with Seoul National University and received approximately $5 for their participation.

3.3 Statistical Analysis

To ascertain how speakers selected focus markers based on the type of focus, a series of statistical analyses were performed. The data were categorized into three distinct subsets based on the responses participants encountered: Case vs. Null; Prosody vs. Null; Prosody vs. Case.

Table 3.1 Summary of conditions

	Responses		Focus context
First Comparison	Case (No prosody) vs. Null (neither case nor prosody)	1	Contrastive focus context
		2	New information focus context
		3	Non-object focus context
Second comparison	Prosody (No case) vs. Null (neither case nor prosody)	4	Contrastive focus context
		5	New information focus context
		6	Non-object focus context
Third comparison	Prosody (No case) vs. Case (No prosody)	7	Contrastive focus context
		8	New information focus context
		9	Non-object focus context

All analyses were performed using mixed-effects modeling in the R program (R Core Team, 2012). The dependent variables were the two types of focus markers in the response (Case vs. Null; Prosody vs. Null; Prosody vs. Case). The independent variable, or fixed factor, was 'Focus Type' (Contrastive focus vs. New information focus vs. Non-object focus). The analyses were carried out separately for three distinct groups, as outlined in Table 3.1 in the preceding chapter.[9]

[9] The models were developed through a step-by-step process of adding variables. The null model included only random factors for participants and items. Although attempts were made to include random slopes in the models, they failed to converge, and therefore, random slopes were omitted from the final models.

3.4 Results

3.4.1 Adults: Case vs. Null

3.4.1.1 Group results

The initial comparison focused on the response pairs of Case and Null, with the goal of ascertaining whether Korean speakers' choice is influenced by the type of focus appearing in the conversations. A mixed logit regression was manually fitted to accuracy in R, employing a model with a 3 (focus type: Contrastive focus vs. New information focus vs. Non-object focus) × 2 (Case marking: Overt vs. Absent in the response) design. The models also included random intercepts for both subjects and items. The results are presented in Figure 3.1 and Tables 3.2 and 3.3.

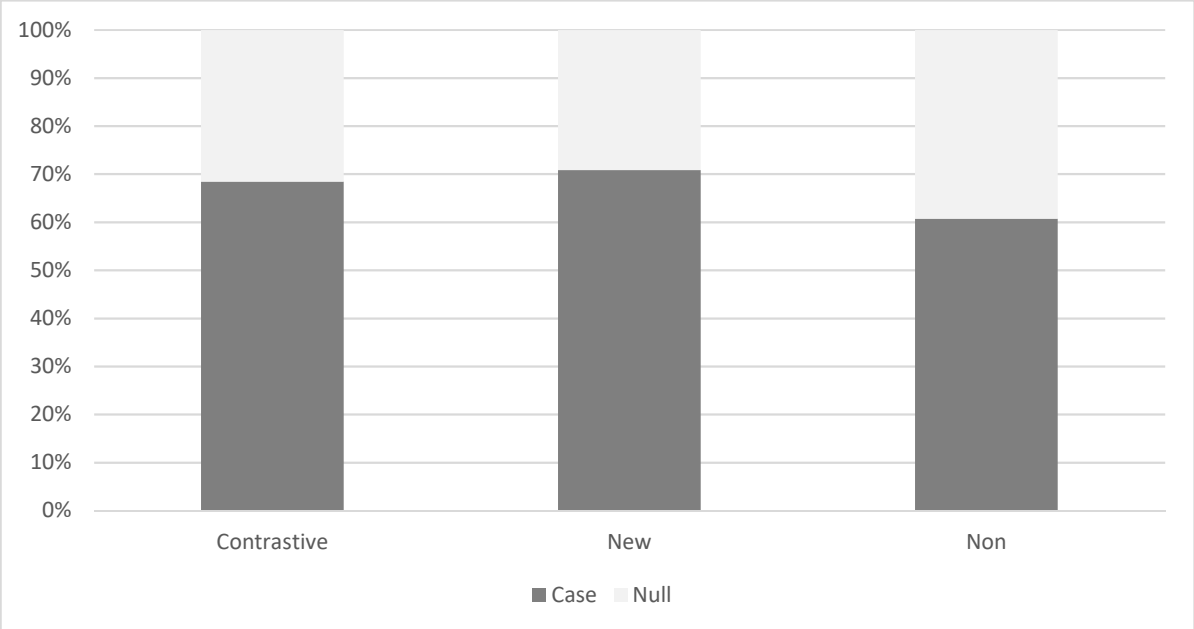

Figure 3.1 Distribution of focus markers (Case vs. Null) for types of focus

Table 3.2 Frequency of focus markers (Case vs. Null) for types of focus

	Contrastive		New information focus		Non-object focus	
Null	53	31.548%	49	29.167	66	39.286%
Case	115	68.452%	119	70.833	102	60.714%
total	168	100.00%	168	100.00%	168	100.00%

a,b,c	Responses	Type of focus	Focus context
First	Case (moca-lul)/Null(moca-Ø)	Contrastive	Man: Cat threw a car. Robot: No, Cat threw [a hat].
		New	Man: What did Cat throw? Robot: Cat threw [a hat].
		Non-object	Man: Bear threw a hat. Robot: No, [Cat] threw a hat.

The assessment of Korean speakers' choice between case marking and null marking revealed no significant influence from the type of focus. Figure 3.1 illustrates the pattern of case marking as a focus marker. Participants tended to select case marked stimuli more frequently for the focused conditions (Contrastive focus and New information focus) compared to the Non-object focus condition. Specifically, they chose the case marked answers approximately 68% of the time for Contrastive focus and around 71% for New information focus, in contrast to approximately 61% for Non-object focus.

Case: Contrastive focus (68%) and New information focus (71%) > Non-object focus (61%)

Meanwhile, they chose the null-marked answers approximately 32% of the time for Contrastive focus and about 29% for New information focus, compared to roughly 39% for Non-object focus.

Null: Contrastive focus (32%) and New information focus (29%) < Non-object focus (39%)

Nevertheless, despite this trend, the statistical results indicated that the types of focus did not have a significant effect on the choice between Case or Null (Table 3.3).

This finding therefore does not align with Prediction 1 that participants will rate sentences with case more highly in the focus conditions (Contrastive focus and New information focus) compared to the Non-object focus condition. These results suggest that this aspect of Prediction 1 is not supported, indicating that case marking without prosodic information may not be more likely to be chosen as focus indicators in Korean.

Table 3.3 The mixed effect model results: Focus (Case vs. Null)

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	0.4707	0.2585	1.821	0.0686
Contrastive	0.3588	0.3559	1.008	0.3134
New	0.4733	0.3575	1.324	0.1855

3.4.1.2 Individual results

In the group results for Case vs. Null, participants selected case-marked answers approximately 68% of the time for Contrastive focus and about 61% for Non-object focus, reflecting an 7% difference in the selection of case marking between the two focus types.

Group Results for Case: Contrastive Focus (68%) > Non-object (61%)

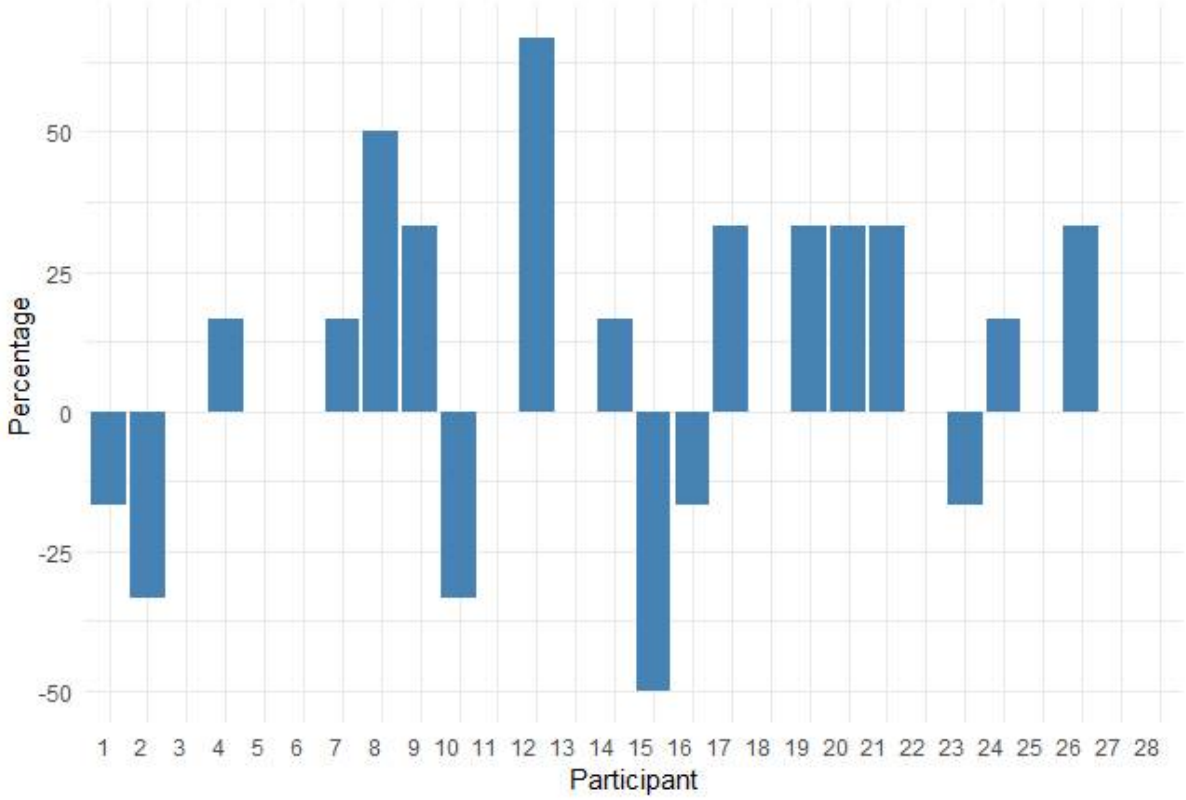

Figure 3.2 Individual results for case marking differences
between Contrastive Focus and Non-object focus (Case vs. Null)

Figure 3.2 illustrates individual results showing the differences in case marking between Contrastive focus and Non-object focus. The participants' performances were highly variable and did not follow a consistent pattern. Participants with a positive value above zero, such as Participants 4, 7, 8, and 9, chose case marking more frequently in Contrastive focus than in Non-object focus. In contrast, participants with a negative value below zero, such as Participants 1, 2, and 10, chose case marking more frequently in Non-object focus than in Contrastive focus. Participants with a zero value, such as Participants 3, 5, and 6, selected case marking equally in both focus types. For example, Participant 1 chose case marking 17% more often in Non-object focus than in Contrastive focus.

Group Results for Case: New Focus (71%) > Non-object (61%)

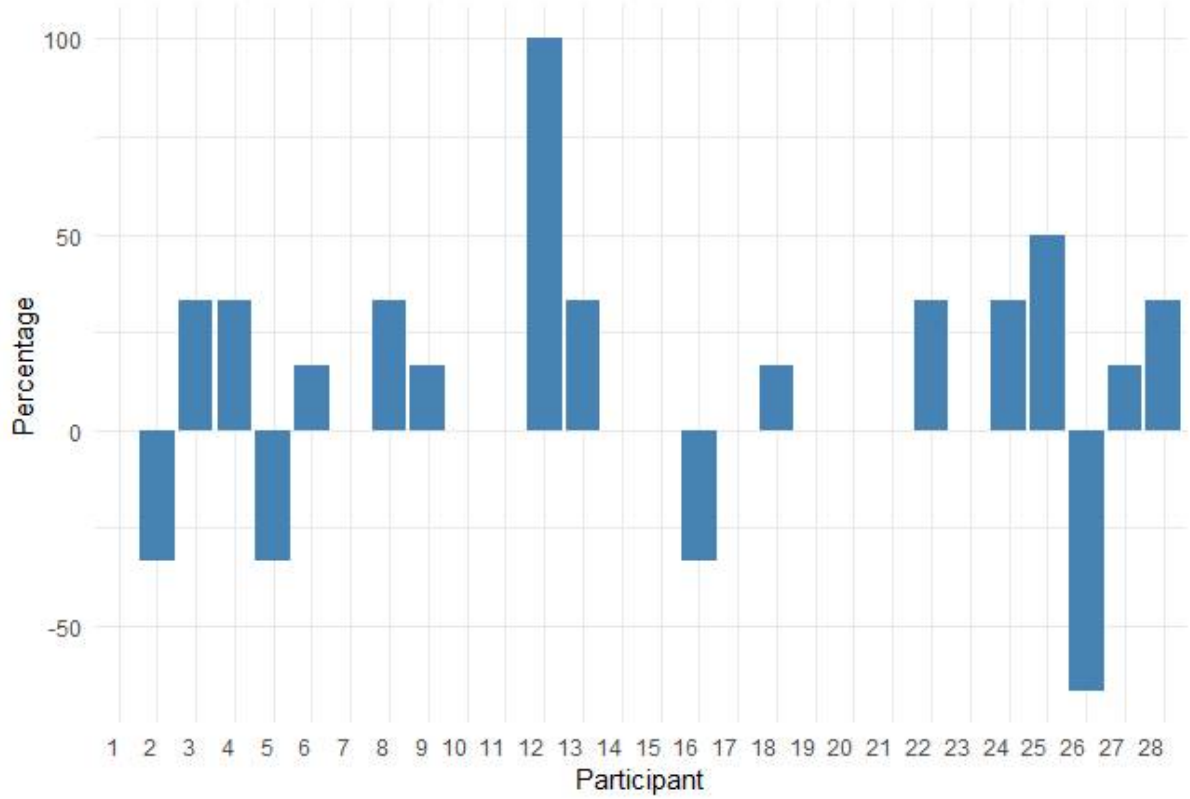

Figure 3.3. Individual results for case marking differences
between New information Focus and Non-object focus (Case vs. Null)

Figure 3.3 illustrates individual results showing the differences in case marking between New information focus and Non-object focus. In the group results, participants selected case-marked answers approximately 71% of the time for New information focus and about 61% for Non-object focus, indicating an 10% difference between the two focus types.

Similar to the differences observed between Contrastive focus and Non-object focus in Figure 3.2, the patterns in individual results for New information focus and Non-object focus are inconsistent, reflecting the group results that were not statistically significant.

The individual results are summarized in Figure 3.4 and Table 3.4 by counting the number of participants.

- Reverse (<0): Percentage of participants who chose case marking more frequently in Non-object Focus than in Contrastive or New information Focus.
- Equal (=): Percentage of participants who selected case marking equally in both focus types.
- Medium (≤50%): Percentage of participants who chose case marking up to 50% more frequently in Contrastive or New information Focus than in Non-object Focus.

- Strong (>50%): Percentage of participants who chose case marking more than 50% more frequently in Contrastive or New information Focus than in Non-object Focus.

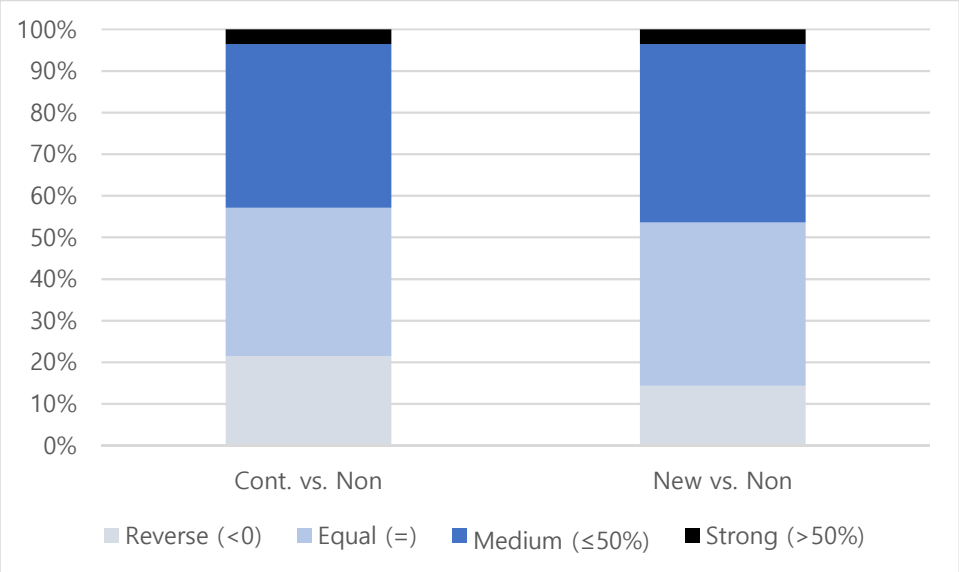

Figure 3.4 Summary of individual results for case marking differences (Case vs. Null)

Table 3.4 Percentage of individual results for case marking differences (Case vs. Null)

	Cont. - Non	New - Non
Reverse (<0)	21.43%	14.29%
Equal (=)	35.71%	39.29%
Medium (≤50%)	39.29%	42.86%
Strong (>50%)	3.57%	3.57%
Total	100.00%	100.00%
Reverse + Equal	57.14%	53.57%

In the Case/Null comparison, 57% of participants exhibited a reversed pattern (21%) or an equal pattern (36%), indicating that they could not distinguish between the two focus types, as illustrated by the first bar in Figure 3.4. A similar trend is observed in the second bar, which highlights the difference between New Information Focus and Non-object focus. Overall, more than 50% of participants failed to differentiate between focus and Non-object focus.

3.4.1.3 Item results

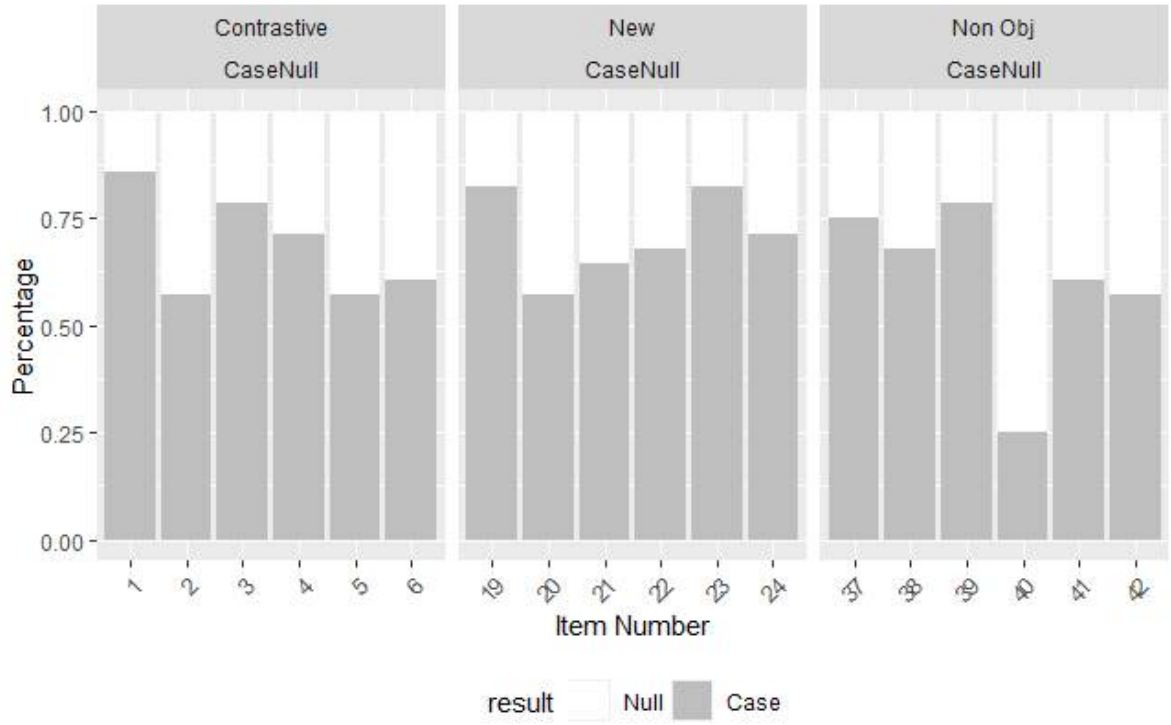

Figure 3.5 Item Distribution of focus markers (Case vs. Null) for types of focus

When we examine the item results in Figure 3.5, all items, except for item number 40, show patterns consistent with the group results.

In summary, when combining the group and individual results of the Case vs. Null comparison, it is evident that case marking without prosodic cues does not function as a focus marker in the perception of Korean.

3.4.2 Adults: Prosody vs. Null

3.4.2.1 Group results

The second comparison focused on response pairs involving Prosody and Null. This section aimed to determine whether Korean speakers' choice between Prosody and Null is influenced by the type of focus in the conversations. A mixed logit regression was manually fitted to assess accuracy in R. The model, employing a 3 (focus type: Contrastive focus vs. New information focus vs. Non-object focus) × 2 (Prosody marking: Overt vs. Absent in the response) design, included random intercepts for both subjects and items. The results are presented in Figure 3.6 and Tables 3.5 and 3.6.

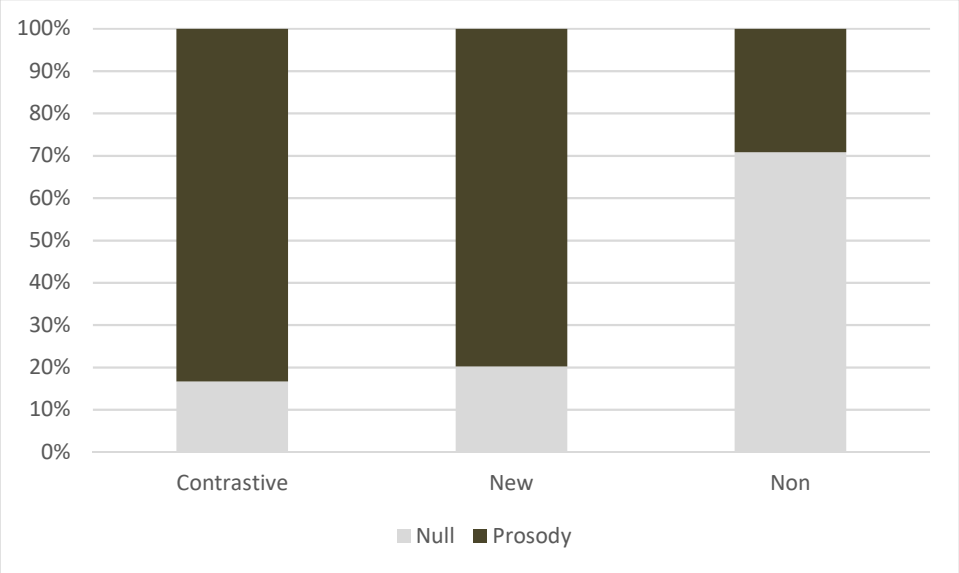

Figure 3.6 Distribution of focus markers (Prosody vs. Null) for types of focus

Table 3.5 Frequency of focus markers (Prosody vs. Null) for types of focus

	Contrastive		New		Non-object focus	
Null	28	16.667%	34	20.238%	119	70.833%
Prosody	140	83.333%	134	79.762%	49	29.167%
total	168	100.00%	168	100.00%	168	100.00%

[a,b,c]	Responses	Type of focus	Focus context
Second	Prosody (MOCA- Ø)/Null(moca-Ø)	Contrastive	Man: Cat threw a car. Robot: No, Cat threw [a hat].
		New	Man: What did Cat throw? Robot: Cat threw [a hat].
		Non-object	Man: Bear threw a hat. Robot: No, [Cat] threw a hat.

The assessment of Korean speakers' choice between prosody marking and null marking revealed an influence from the types of focus. Figure 3.6 illustrates the pattern of prosody marking as a focus indicator. Participants exhibited a preference for prosody-marked stimuli for the focused conditions (Contrastive focus and New information focus) compared to the Non-object focus condition. Specifically, they selected the prosody-marked answers approximately 83% of the time for Contrastive focus and around 80% for New information focus, in contrast to approximately 29% for Non-object focus.

Prosody: Contrastive focus (83%) and New information focus (80%) > Non-object focus (29%)

Meanwhile, they chose the null-marked answers approximately 17% of the time for Contrastive focus and about 20% for New information focus, compared to roughly 71% for Non-object focus.

Null: Contrastive focus (17%) and New information focus (20%) < Non-object focus (71%)

As documented in Table 3.6, the statistical results revealed a significant effect of the focus type on the choice between Prosody and Null.

This aligns with prediction 2 that participants would rate sentences with prosody higher in the focus conditions (Contrastive focus and New information focus) compared to the Non-object focus condition. These results suggest that this aspect of Prediction 2 is supported, indicating that prosody marking without case marking is more likely to be chosen as a focus indicator.

The two sets of results provide an answer to the second research question, which investigates whether case marking or prosody marking serve as mutually exclusive focus markers. The answer is twofold: Prosodic marking without case marking is more likely to be chosen as focus indicators, whereas case marking without prosodic marking is not.

Table 3.6 The mixed effect model results: Focus (Prosody vs. Null)

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-1.1268	0.3032	-3.717	p < 0.001***
Contrastive	3.1372	0.3404	9.217	p < 0.001***
New	2.8439	0.3236	8.787	p < 0.001***

3.4.2.2 Individual results

In the group results for Prosody vs. Null, participants selected prosodically marked answers approximately 83% of the time for Contrastive focus and about 30% of the time for Non-object focus, reflecting a 53% difference between the two focus types.

Group Results for Prosody: Contrastive Focus (83%) > Non-object (30%)

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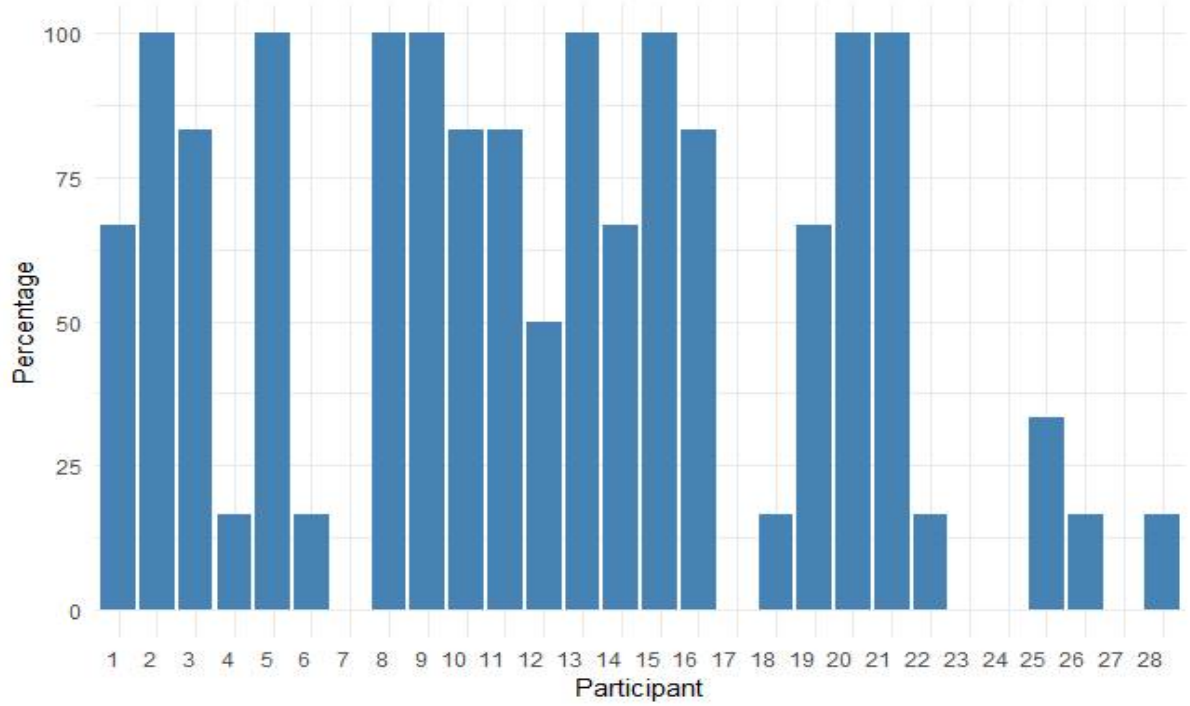

Figure 3.7 Individual results for prosody marking differences between Contrastive focus and Non-object focus (Prosody vs. Null)

Figure 3.7 illustrates individual results showing the differences in prosodic marking between Contrastive focus and Non-object focus. Unlike the individual results for Case vs. Null, there are no negative values, and participants display much more consistent patterns. More than 82% of participants, such as Participants 1, 2, 3, and 5, chose prosodic marking more frequently in Contrastive focus than in Non-object focus. However, five participants, such as 7, 17, 23, 24 and 27, chose prosodic marking equally for both Contrastive focus and Non-object focus.

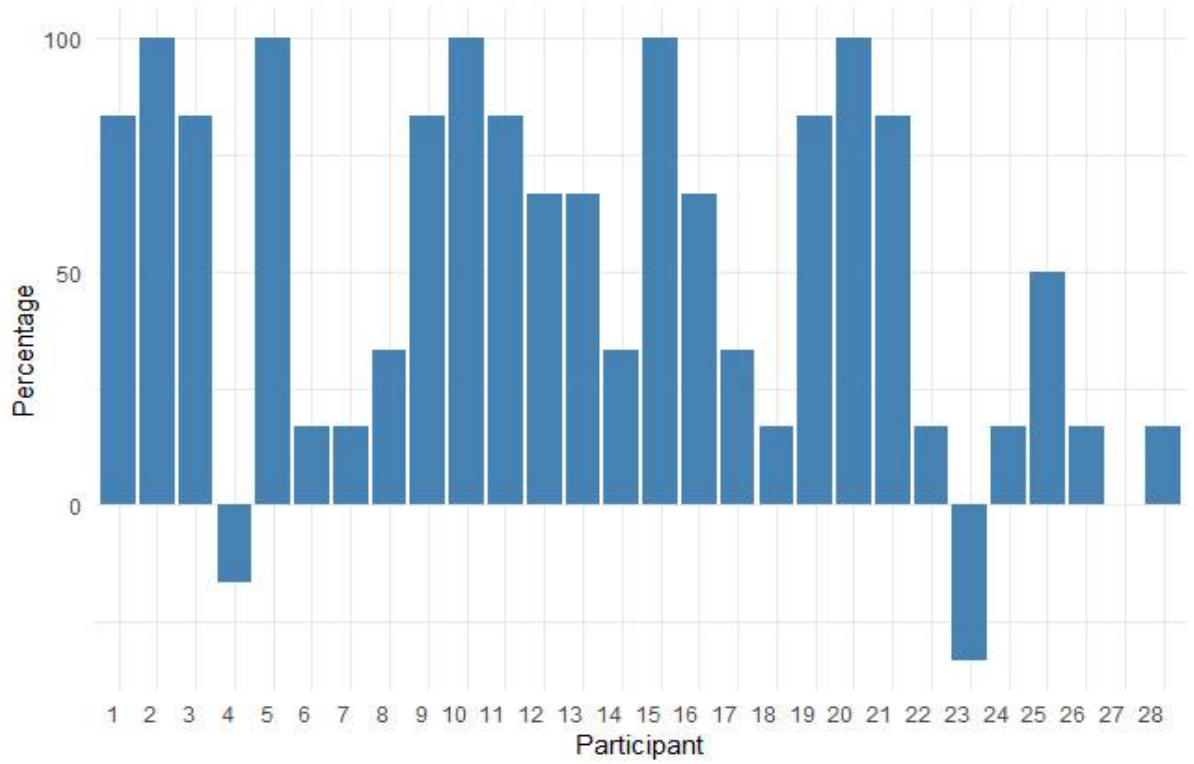

Figure 3.8 Individual results for prosody marking differences between New information focus and Non-object focus (Prosody vs. Null)

Group Results for Prosody: New Focus (80%) > Non-object (30%)

Figure 3.8 shows individual results illustrating the differences in prosodic marking between New information focus and Non-object focus. In the group results, participants selected prosodically marked answers about 80% of the time for New information focus and about 30% for Non-object focus, indicating a 50% difference between the two focus types, similar to the difference observed between Contrastive focus and Non-object focus.

Around 85% of participants chose prosodic marking more frequently in New information focus than in Non-object focus, similar to the patterns observed with Contrastive focus. However, two participants selected prosodically marked answers more frequently in Non-object focus than in New information focus, showing a reverse pattern compared to the group results.

The individual results are summarized in Figure 3.9 and Table 3.7 by counting the number of participants.

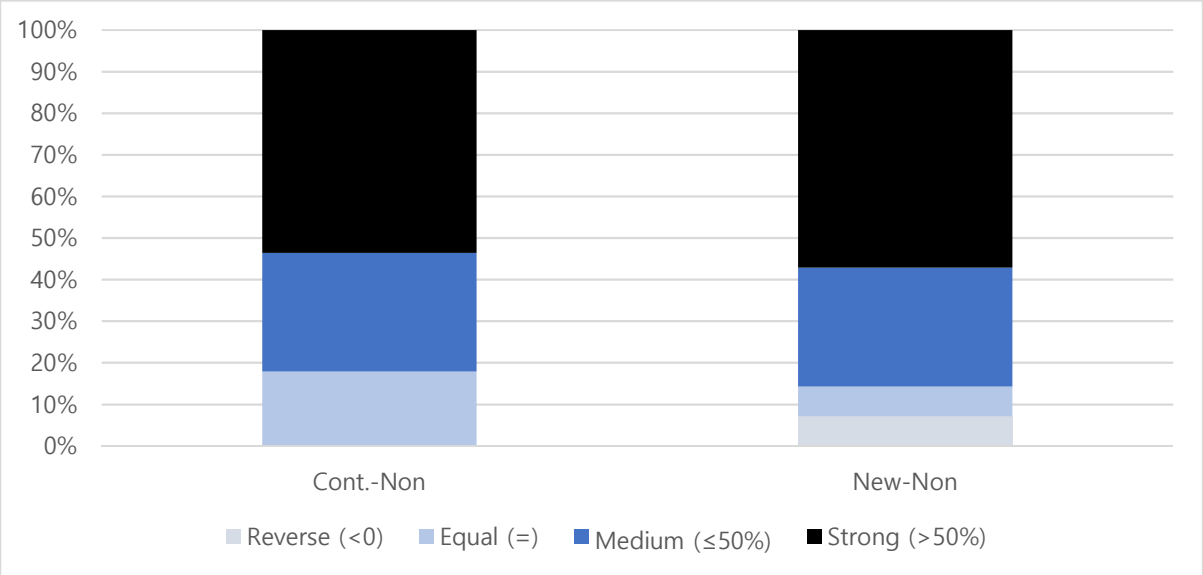

Figure 3.9 Summary of individual results for prosody marking differences (Prosody vs. Null)

Table 3.7 Percentage of individual results for prosody marking differences (Prosody vs. Null)

Adults	Prosody/Null	
	Cont. - Non	New - Non
Reverse (<0)	0.00%	7.14%
Equal (=)	17.86%	7.14%
Medium (≤50%)	28.57%	28.57%
Strong (>50%)	53.57%	57.14%
Total	100.00%	100.00%
Reverse + Equal	17.86%	14.29%

- Reverse (<0): Percentage of participants who chose prosody marking more frequently in Non-object Focus than in Contrastive or New information Focus.
- Equal (=): Percentage of participants who selected prosody marking equally in both focus types.
- Medium (≤50%): Percentage of participants who chose prosody marking up to 50% more frequently in Contrastive or New information Focus than in Non-object Focus.
- Strong (>50%): Percentage of participants who chose prosody marking more than 50% more frequently in Contrastive or New information Focus than in Non-object Focus.

In the Prosody/Null comparison, 18% of participants exhibited a reversed pattern, indicating that they could not distinguish between the two focus types, as shown by the first bar in Figure 3.9. A similar trend is observed in the second bar, where 14% of participants failed to

distinguish between New Information Focus and Non-object focus. Overall, fewer than 20% of participants were unable to differentiate between focus and Non-object.

3.4.2.3 Item results

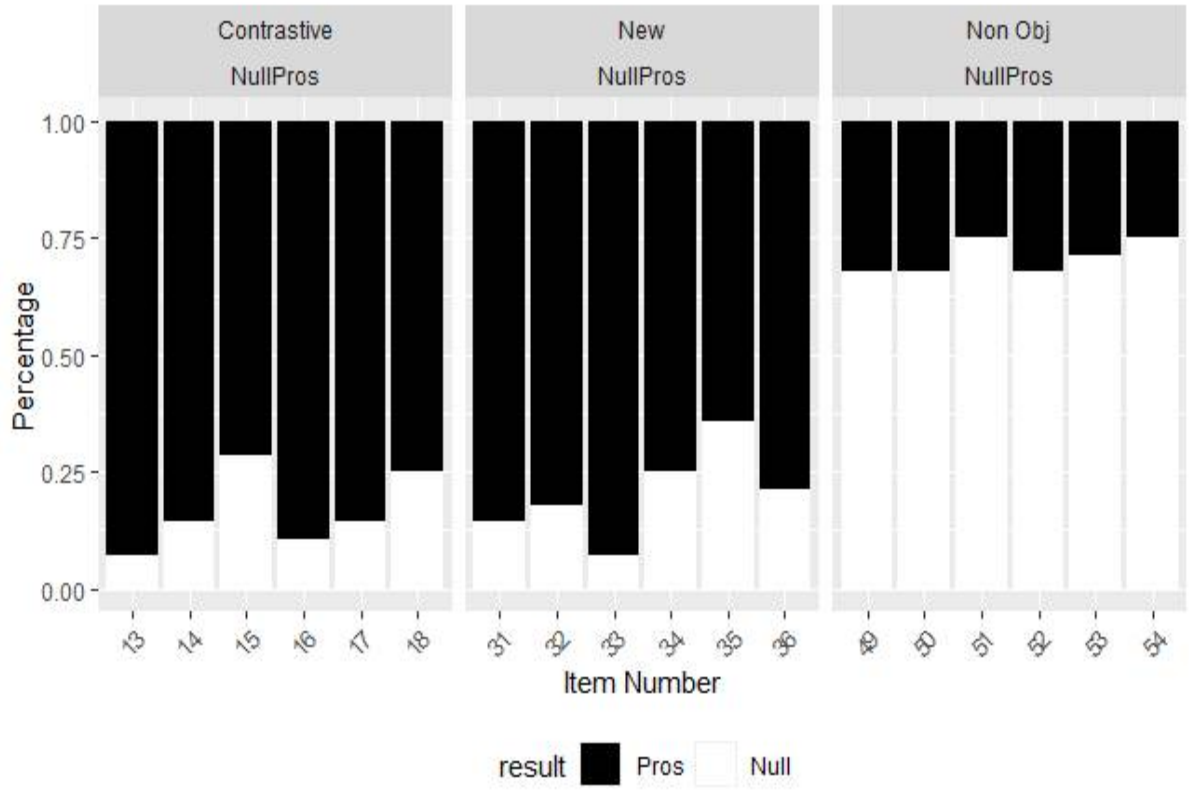

Figure 3.10 Item distribution of focus markers (Prosody vs. Null) for types of focus

When we examine the item results in Figure 3.10, all items show patterns consistent with the group results.

Overall, participants exhibited much more consistent patterns for Prosody vs. Null, with prosodically marked answers being chosen 50% more frequently in both Contrastive focus and New information focus than in Non-object focus. Although the results for Prosody vs. Null are more consistent compared to the individual results for Case vs. Null, there still remains some variability across participants.

3.4.3 Adults: Prosody vs. Case

3.4.3.1 Group results

The third comparison focused on response pairs involving Prosody and Case. This section aimed to determine which focus marker, Prosody or Case, is more likely to be chosen as a focus indicator. A mixed logit regression was manually fitted to assess accuracy in R. The model, employing a 3 (focus type: Contrastive focus vs. New information focus vs. Non-object focus) × 2 (Prosody vs. Case in the response) design, included random intercepts for both subjects and items. The results are presented in Figures 3.11, and Tables 3.8 and 3.9.

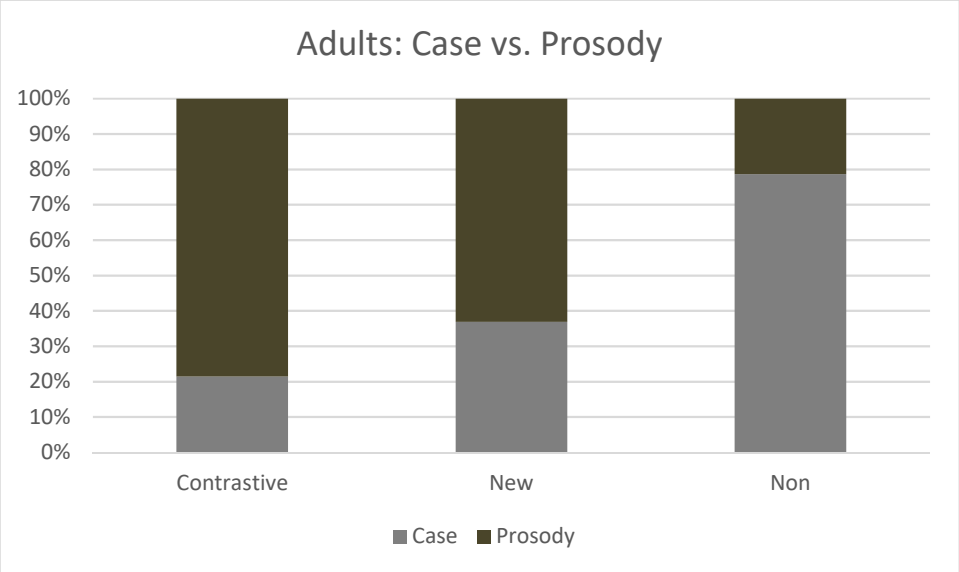

Figure 3.11 Distribution of focus markers (Case vs. Prosody) for types of focus

Table 3.8 Frequency of focus markers (Case vs. Prosody) for types of focus

	Contrastive		New information focus		Non-object focus	
Case	36	21.429%	62	36.905%	132	78.571%
Prosody	132	78.571%	106	63.095%	36	21.429%
total	168	100.00%	168	100.00%	168	100.00%

a,b,c	Responses	Type of focus	Focus context
Third	Prosody (MOCA- Ø)/Case (moca-lul)	Contrastive	Man: Cat threw a car. Robot: No, Cat threw [a hat].
		New	Man: What did Cat throw? Robot: Cat threw [a hat].
		Non-object	Man: Bear threw a hat. Robot: No, [Cat] threw a hat.

The evaluation of Korean speakers' choice between prosody marking and case marking reveals a higher preference for prosody marking over case marking in focused conditions. These results were anticipated even before examining the outcomes of Prosody/Case, aligning with the findings from the comparison of case marking and null marking in the

previous section (3.4.1). Case marking without prosodic information is evidently not more likely to be chosen as a focus indicator in Korean. These results align with the predictions, illustrating that case marking behaved comparably to null marking.

As depicted in Figure 3.11 and detailed in Table 3.8, the pattern of case marking closely resembles that of null marking in the Prosody/Null comparison, confirming the earlier prediction. Participants demonstrated a preference for prosody-marked stimuli for the focused conditions (Contrastive focus and New information focus) compared to the Non-object focused condition. Specifically, they selected prosody-marked answers approximately 79% of the time for Contrastive focus and around 63% for New information focus, in contrast to approximately 21% for Non-object focus.

Prosody: Contrastive focus (79%) and New information focus (63%) > Non-object focus (21%)

The participants chose case marked answers approximately 21% of the time for Contrastive focus and about 37% for New information focus, compared to roughly 79% for Non-object focus.

Case: Contrastive focus (21%) and New information focus (37%) < Non-object focus (79%)

These findings closely resemble those observed for the choice of null marking in the Prosody/Null comparison, as discussed in the preceding section.

Null in Prosody/Null: Contrastive focus (17%), New information focus (20%) < Non-object focus (71%)

The statistical results confirmed a significant effect of focus with respect to the type of prosody marking, as illustrated in Table 3.9. In other words, prosody marking is more likely than case marking to be chosen as a focus indicator.

In summary, the findings suggest that Korean prosody functions as focus marking, even in the absence of case marking. This contradicts Prediction 4, which forecast that either case marking or prosody will have a similar effect for marking focus. These results align with those observed in previous sections comparing Case/Null and Prosody/Null. Participants appear to prefer prosody over case in responses for focus conditions but favor case over prosody in responses for the Non-object focused condition. Consequently, the results imply that prosody marking is preferred for encoding focus. The statistical results are summarized in Table 3.9.

Table 3.9 The mixed effect model results: Focus (Case vs. Prosody)

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-1.4665	0.2635	-5.565	p < 0.001***
Contrastive	2.9334.	0.3222	9.105	p < 0.001***
New	2.0778	0.2960	7.020	p < 0.001***

3.4.3.2 Individual results

In the group results for Prosody vs. Case, participants selected prosodically marked answers approximately 79% of the time for Contrastive focus and about 21% of the time for Non-object focus, indicating a 58% difference between the two focus types.

Group Results for Prosody: Contrastive Focus (79%) > Non-object (21%)

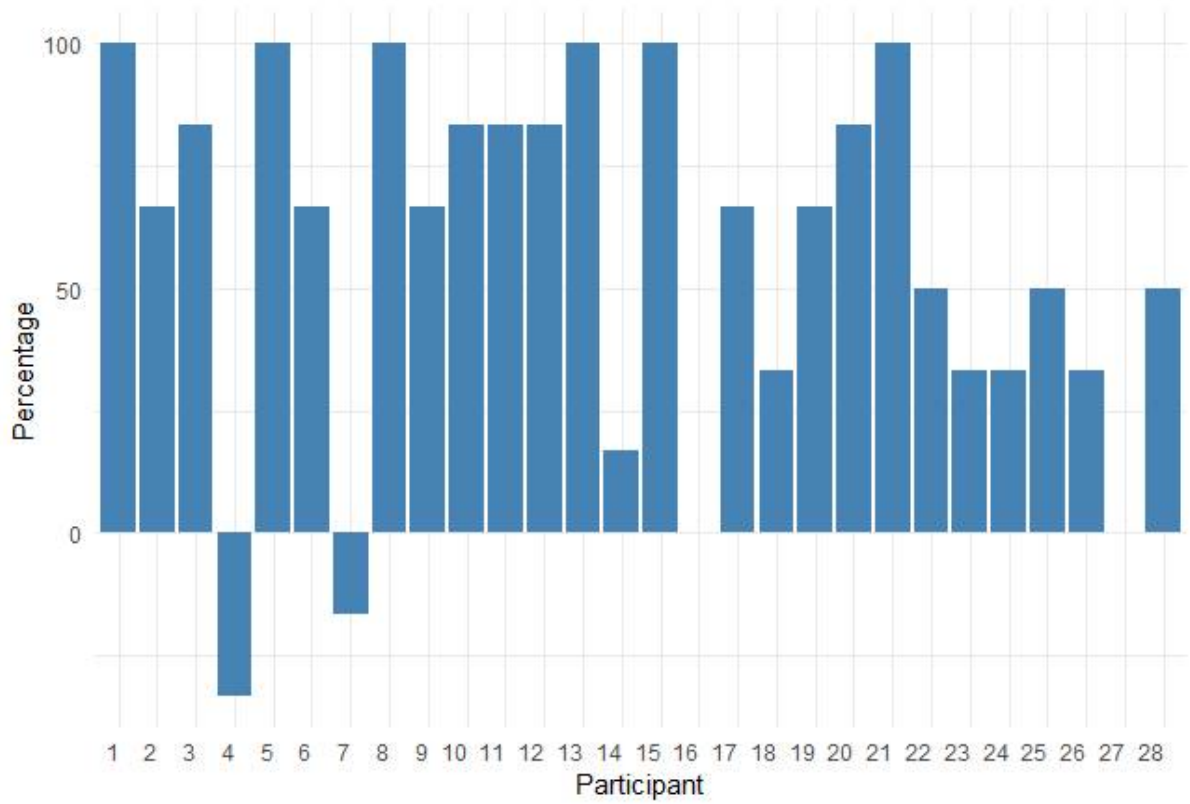

Figure 3.12 Individual results for prosody marking differences between Contrastive Focus and Non-object focus (Prosody vs. Case)

Figure 3.12 illustrates individual results showing the differences in prosodic marking between Contrastive focus and Non-object focus in the Prosody/Case comparison. Participants displayed patterns similar to those observed in the individual results for Prosody vs. Null.

More than 85% of participants, such as Participants 1, 2, 3, and 5, chose prosodic marking more frequently in Contrastive focus than in Non-object focus. Two participants, Participants 16 and 27, chose prosodic marking equally for both Contrastive focus and Non-object focus. Additionally, two participants, 4 and 7, selected prosodically marked answers more frequently in Non-object focus than in Contrastive focus, showing a reverse pattern compared to the group results.

Group Results for Prosody: New Focus (63%) > Non-object (21%)

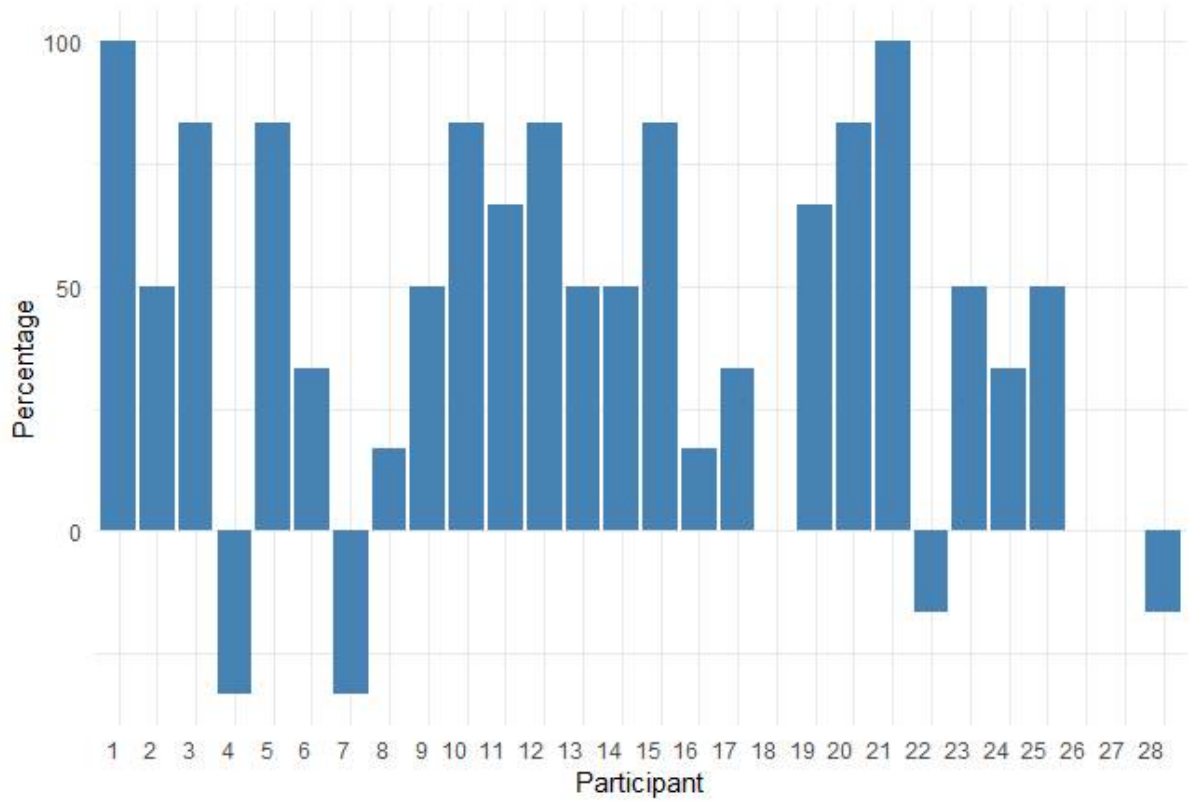

Figure 3.13 Individual results for prosody marking differences between New information Focus and Non-object focus (Prosody vs. Case)

Figure 3.13 shows individual results for the differences in prosodic marking between New information focus and Non-object focus. In the group results, participants selected prosodically marked answers approximately 63% of the time for New information focus and about 21% of the time for Non-object focus, reflecting a 42% difference between the two focus types. Around 75% of participants chose prosodic marking more frequently in New information focus than in Non-object focus, mirroring the patterns observed with Contrastive focus. However, four participants selected prosodically marked answers more frequently in

Non-object focus than in New information focus, showing a reverse pattern compared to the group results.

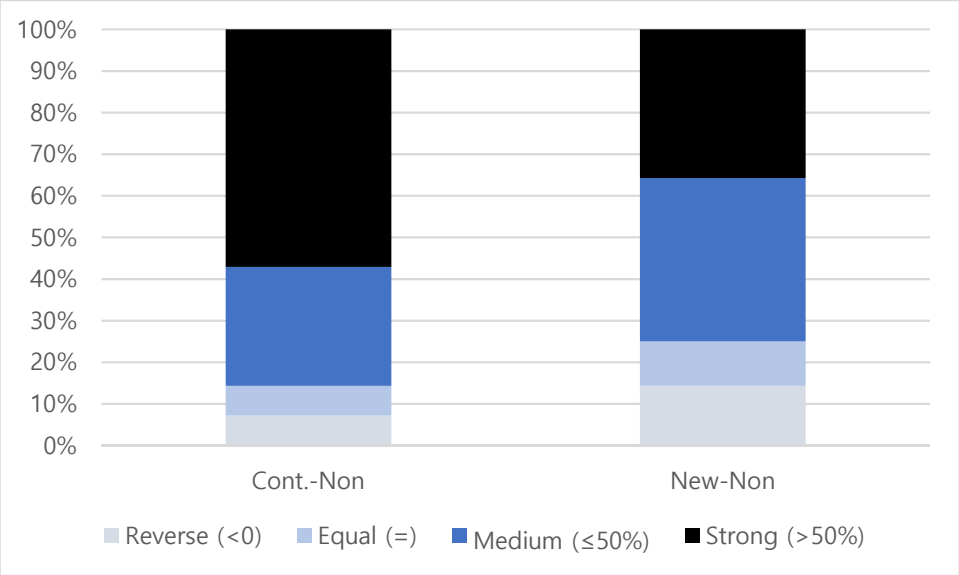

Figure 3.14 Summary of individual results for prosody marking differences (Prosody vs. Case)

Table 3.10 Percentage of individual results for prosody marking differences (Prosody vs. Case)

Adults	Prosody/Case	
	Cont. - Non	New - Non
Reverse (<0)	7.14%	14.29%
Equal (=)	7.14%	10.71%
Medium (≤50%)	28.57%	39.29%
Strong (>50%)	57.14%	35.71%
Total	100.00%	100.00%
Reverse + Equal	14.29%	25.00%

In the Prosody/Case comparison, 14% of participants exhibited a reversed pattern (7%) or an equal pattern (7%), indicating that they could not distinguish between the two focus types, as shown by the first bar in Figure 3.14. In the second bar, 25% of participants failed to distinguish between New Information Focus and Non-object focus. Overall, 14% to 25% of participants were unable to differentiate between focus and Non-object.

3.4.3.3 Item results

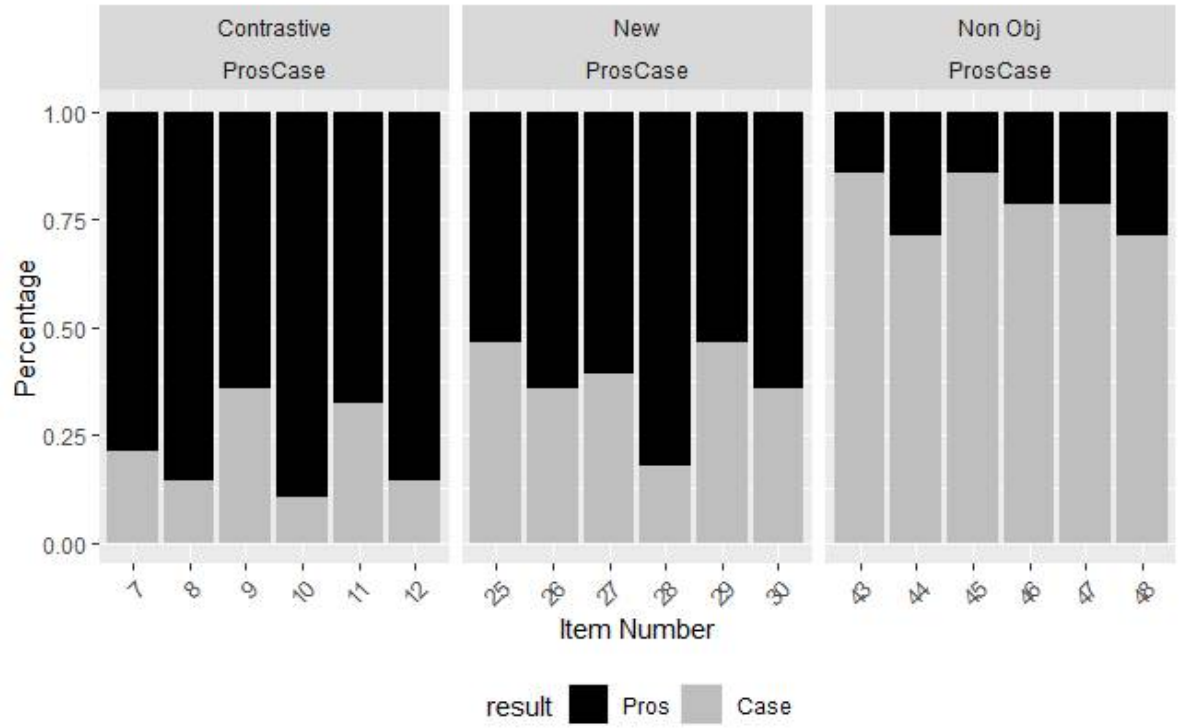

Figure 3.15 Item distribution of focus markers (Prosody vs. Case) for types of focus

When we examine the item results in Figure 3.15, the patterns observed for all items generally align with the group results.

Overall, participants exhibited patterns in the individual results for Prosody vs. Case that were not only similar to those observed in Prosody vs. Null, but also showed some variability across participants.

3.4.4 Focus types: Contrastive focus vs. New information focus

3.4.4.1 Group results

To address the fourth question regarding the distinction between the two focus types (Contrastive focus and New information focus), additional analyses were conducted. Three mixed logit regressions were manually fitted to assess accuracy in R. The models, employing a 2 (focus type: Contrastive focus vs. New information focus) × 2 (1. Case vs. Null; 2. Prosody vs. Null; 3. Prosody vs. Case in the response) design, included random intercepts for both subjects and items. The results are presented in Figures 3.16, and Tables 3.11.

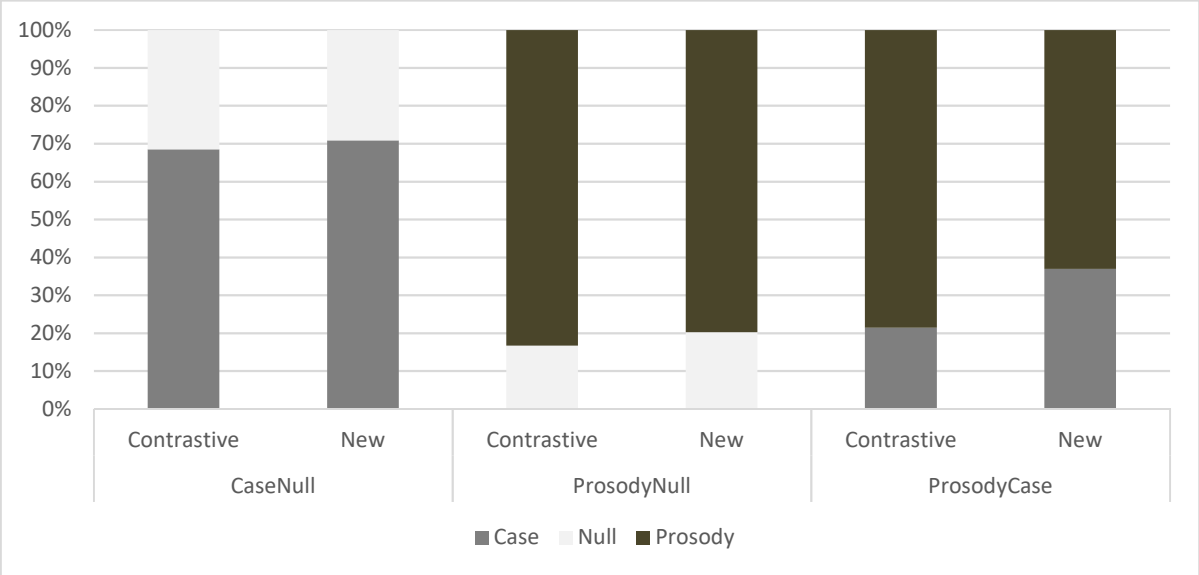

Figure 3.16 Distribution of focus markers for Contrastive focus vs. New information focus

Table 3.11 Frequency of focus markers for Contrastive focus vs. New information focus

	Case/Null		Prosody/Null		Prosody/Case	
	Cont.	New	Cont.	New	Cont.	New
Case	68%	71%			21%	37%
Null	32%	29%	17%	20%		
Prosody			83%	80%	79%	63%
Total	100%	100%	100%	100%	100%	100%

In the Case/Null comparison, as illustrated in the first two bars of Figure 3.16, participants consistently favored case marking over null marking regardless of focus types:

Contrastive focus:	Case (68%) > Null (32%)
New information focus:	Case (71%) > Null (29%)

Similarly, in the Prosody/Null comparison, depicted in the middle two bars of Figure 3.16, participants consistently preferred Prosody marking over Null marking, irrespective of focus types:

Contrastive focus:	Prosody (83%) > Null (17%)
New information focus:	Prosody (80%) > Null (20%)

However, slight variations in preferences emerged when scrutinizing the distinction between the two focus types. For instance, participants selected case marked stimuli more frequently for the New information focus condition compared to the Contrastive focus condition within the Case/Null comparison, as depicted in the first two bars of Figure 3.16. Nevertheless, these

differences were subtle and did not attain statistical significance (^β = 0.25, z = 0.56, p = .57).

Case (Case/Null): Contrastive focus (68%) < New information focus (71%)

A reverse pattern emerged for the Prosody/Null comparison, as represented in the middle two bars of Figure 3.16. Participants exhibited a preference for prosody-marked answers more often for Contrastive focus than for New information focus. However, these differences did not attain statistical significance (^β = 0.29, z = 0.92, p = .36).

Prosody (Prosody/Null): Contrastive focus (83%) > New information focus (80%)

These trends became more pronounced in the third contrast as observed in the last two bars of Figure 3.16. Participants selected prosody-marked answers more frequently for Contrastive focus than for New information focus, although they consistently preferred prosody marking over case marking for both types of focus:

Prosody (Prosody/Case): Contrastive focus (79%) > New information focus (63%)

In other words, the participants favored case marked answers more for New information focus than for Contrastive focus:

Case (Prosody/Case): Contrastive focus (21%) < New information focus (37%)

Unlike the previous analyses, this difference reached statistical significance, clearly highlighting the distinction between Contrastive focus and New information focus (^β = 0.86, z = 0.29, p < .001).

We have established that case marking, without prosody, is not more likely to be chosen as focus indicators, as discussed in Section 3.4.1. Thus, the rate of choosing case marking in the Prosody/Case comparison closely resembles the rate of choosing null marking in the Prosody/Null comparison. However, although case marking is not a strong indicator of focus, our findings indicate that they are chosen more in New information focus than in Contrastive focus, while prosody marking is favored more in Contrastive focus than in New information focus. These results are clearly demonstrated in the third analysis and in the last two bars of Figure 3.16, as well as in the statistical results.

These findings partially support Prediction 3, according to which participants were expected to rate sentences with case marking and prosody in the Contrastive focus condition at a rate greater than or equal to the New information focus condition. It becomes evident that the two focus types, Contrastive focus and New information focus, are encoded differently.

3.4.4.2 Individual results

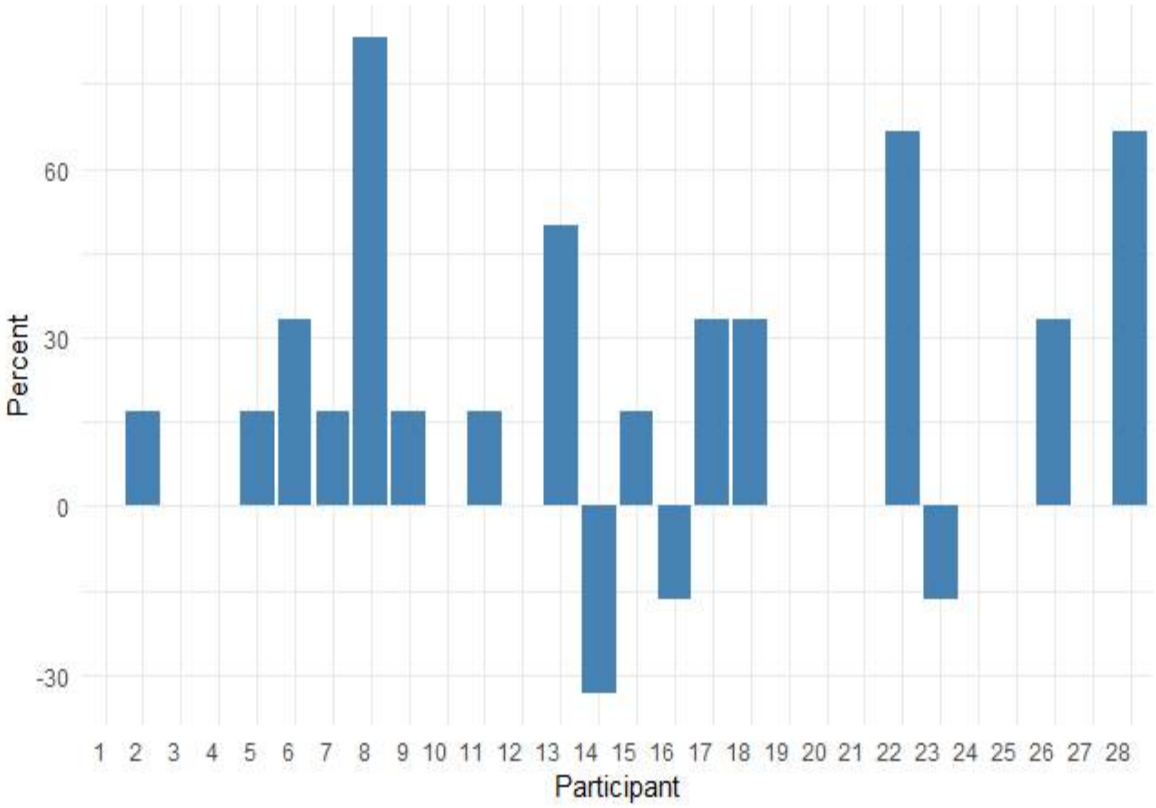

Figure 3.17 Individual results for prosody marking differences between Contrastive focus and New information focus (Prosody vs. Case)

Group Results for Prosody (Prosody/Case): Contrastive focus (79%) > New information focus (63%)

In the group results comparing Contrastive focus and New information focus for Prosody vs. Case, participants selected prosodically marked answers approximately 79% of the time for Contrastive focus and about 63% of the time for New information focus, indicating a 16% difference between the two focus types. This difference is much smaller than that observed between Contrastive focus and Non-object focus and between New information focus and Non-object focus.

Figure 3.17 illustrates the differences in prosodic marking between Contrastive focus and New information focus in the Prosody/Case comparison. Half of the participants (14 out of 28) displayed patterns consistent with the group results by selecting prosodically marked answers more often in Contrastive focus than in New information focus. However, only four

of these participants—Participants 8, 13, 22, and 28—showed a difference greater than 50% between the two focus types. Eleven participants, such as Participants 1, 3, and 4, did not distinguish between the two types of focus, selecting prosodic marking equally for both Contrastive focus and New information focus. Additionally, three participants—Participants 14, 16, and 23—showed a reverse pattern compared to the group results by selecting prosodic marking more frequently in New information focus than in Contrastive focus.

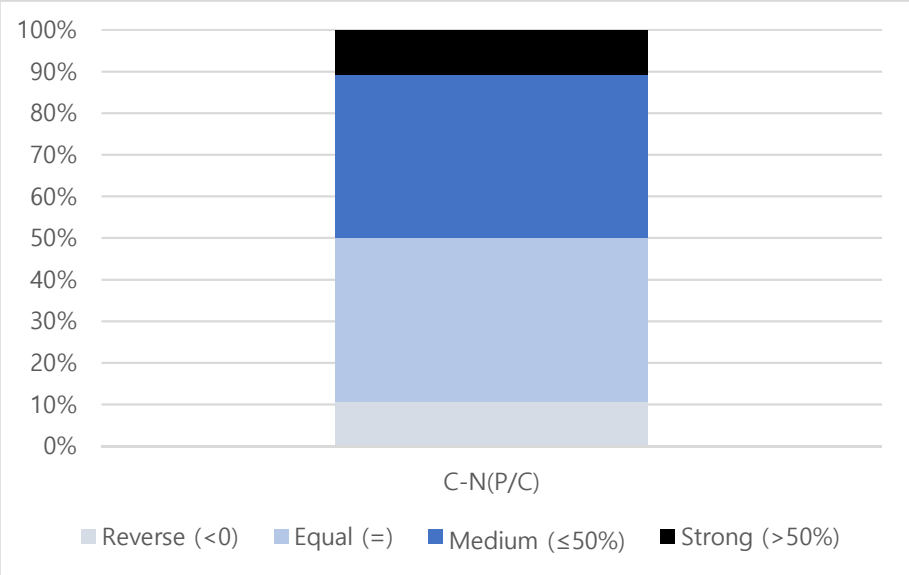

Figure 3.18 Summary of individual results for prosody marking differences (Contrastive focus vs. New information focus, Prosody vs. Case)

Table 3.12 Percentage of individual results for prosody marking differences (Contrastive focus vs. New information focus, Prosody vs. Case)

Adults	Cont. - New
Reverse (<0)	10.71%
Equal (=)	39.29%
Medium (≤50%)	39.29%
Strong (>50%)	10.71%
Total	100.00%
Reverse + Equal	50.00%

In the Prosody/Case comparison, 50% of participants exhibited a reversed pattern (11%) or an equal pattern (39%), indicating that they could not distinguish between the two focus types, as shown in Figure 3.18.

When examining the group results, it is clear that the two focus types, Contrastive Focus and New Focus, are encoded differently. However, only half of the participants were

able to distinguish between them when we observed the individual results. There was also greater individual variability in distinguishing between Contrastive Focus and New Focus than in the comparisons between either focus type (Contrastive or New) and Non-object.

3.5 Discussion

The results can be summarized as follows:

First, in the listening forced-choice task, Korean listeners rated sentences with prosody marking in the focus conditions (Contrastive focus and New information focus) more favorably than in the non-focused condition (Non-object focus), aligning with the predicted outcome. This indicates that prosody marking, even without case marking, is more likely to be chosen as a focus indicator.

Second, Korean listeners rated sentences with case marking (but no prosodic clue) in the focus conditions (Contrastive focus and New information focus) equally to those in the Non-object focus condition, which was not anticipated. This suggests that case marking, in the absence of prosody marking, is not likely to be chosen as a focus marker.

Third, Korean listeners showed a preference for prosodic cues over case marking to indicate focus (Prosody > Case).

Fourth, the two types of focus, contrastive focus and non-contrastive (New information) focus, exhibit differences. In both cases, participants favored focus markers over null marking and prosody marking over case marking. However, distinctions arose when participants had to choose between case marking and prosody marking. Specifically, Korean listeners more frequently selected responses with prosody marking in the Contrastive focus condition than in the non-contrastive (New information) focus condition, whereas they opted for answers with case marking in the non-contrastive (New information) focus more frequently than in the Contrastive focus condition.

Lastly, in the analysis of individual variance, even the data sets that showed statistically significant results exhibited substantial individual differences. Notably, only half of the participants were able to distinguish between contrastive focus and non-contrastive focus. The first set of results aligns with prior research on prosody as a focus marker, as observed in studies by Jun and Kim (2007), Jun (2011), and Yang (2017). However, the second set of results, which showed that Korean listeners rated sentences with case marking (but no prosodic clue) in the focus conditions (Contrastive focus and New information focus) equally to those in the Non-object focus condition, deviates from previous research on case

marking, such as Lee (2011) and Chung (2013). While my results indicated that participants preferred objects with case marking in the focus conditions over the Non-object focus condition, this difference did not reach statistical significance in the current study.

What could account for the limited effectiveness of case markers as focus indicators in this study? One possibility is that prior studies suggesting the capability of case markers to encode focus may be affected by methodological limitations. Earlier research, exemplified by Lee (2011) and Chung (2013), may not have isolated the two cues, relying on corpus-based studies, written judgment tasks, and production tasks without analyzing prosodic components. Participants in these studies may not have consciously considered implicit prosodic cues while engaging with the experimental stimuli. Consequently, the results indicating case markers' function as a focus indicator in previous studies might be attributed not only to case markers themselves but also to the combined effect of case and prosody. Without prosodic information, case markers may not effectively function as focus indicators.

Consider that case markers have two primary functions: 1) expressing grammatical relations, and 2) indicating focus. In this experiment, the second function does not enter into play when prosodic information is absent, leading case markers to serve primarily as grammatical markers—distinguishing the grammatical relation of arguments. This clarifies why, in the current study, case marking was chosen more frequently than null marking, regardless of the types of focus. Although case markers did not perform well as focus indicators, they were chosen very frequently, even for non-focused objects. Therefore, it is plausible to conclude that Korean accusative case markers may not operate as focus markers but rather solely as grammatical markers, indicating direct objects when their prosodic information is absent.

The third set of results, indicating a preference for prosodic cues over case suffixes as focus markers, can be explained using the same logic. Case marking might function as focus indicators only when accompanied by prosodic information. Thus, prosody marking was favored as focus indicators in this study because case marking alone in this particular study could not operate as focus indicators.[10]

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[10] A committee member raised questions about whether the use of overt nouns is sufficient to mark focus. This seems plausible. Lee (2017) examines referential choices in narratives produced by 10 Korean-speaking children (ages 4;06–7;11). Out of 1208 referential forms, null forms were used less frequently for new referents (focus) than for old referents (16.99% vs. 62.18%). In contrast, nominal forms were used more frequently for new referents than for old referents (73.79% vs. 28.94%). This provides indirect evidence that the use of overt nouns is sufficient to mark focus.

The fourth set of results aligns with previous studies that have investigated the difference between contrastive focus and non-contrastive (New information) focus. However, the distinct patterns do not represent a one-to-one correspondence between focus types and focus markers, but rather signify slight preferences for particular marking. These findings seem to corroborate previous studies that have identified subtle distinctions between contrastive focus and non-contrastive focus (Yang 2017; Thorson and Morgan 2021).

The final consideration involves the individual results. We observed considerably greater individual variation than expected, despite the group results being statistically significant. This suggests that focus marking is not a categorical feature that can be judged as grammatically correct or incorrect, but rather a subtle preference or trend, even among adult Korean speakers.

Chapter 4. Experiment 2: Perception of Focus Marking in Korean by Children

4.1 Introduction

This chapter reveals the results of a focus marking experiment, identical to the one conducted with adults in the preceding chapter. The aim is to explore the perception of focus marking among six-year-old and ten-year-old child participants. The adult results, recall, can be summarized as follows:

i. Sentences with case marking (lacking prosodic cues) in focus conditions received ratings equal to those in the Non-object focus condition in the listening forced-choice task, contrary to expectations. This suggests that, without prosody marking, case marking is less likely to function as independent focus indicators.

ii. Sentences with prosody marking in focus conditions (both Contrastive focus and New information focus) were rated more favorably than those in the Non-object focus condition in the listening forced-choice task. This implies that prosody marking, even without case marking, is likely to serve as standalone focus indicators.

iii. Korean listeners displayed a preference for prosodic cues over case suffixes as focus marking (Prosody > Case).

iv. Variation was noted between Contrastive Focus and New Focus. When participants faced the choice between case marking and prosody marking, Korean listeners demonstrated a higher frequency of selecting answers with prosody marking in the Contrastive Focus condition compared to the New Focus condition. Conversely, they more frequently opted for answers with case marking in the New Focus condition as opposed to the Contrastive Focus condition.

Considering that case marking lacking prosodic information did not demonstrate strong functionality as focus indicators in adult results, this chapter will delve into a more extensive examination of prosody marking compared to case marking.

To juxtapose our perceptual results with production data, I will summarize the findings of Yang (2017) regarding the production of prosodic focus by Korean children. Yang classified Korean prosodic marking into two categories:

1) phonological: utilizing phrasing (see Appendix A and B in this dissertation for more details.)

2) phonetic: involving duration or pitch-related cues.

In Korean, phonological markers are primary cues, while phonetic cues are considered secondary. Korean-speaking children master phrasing, the primary cue, at an earlier stage than the secondary phonetic cues.

By the age of four to five, Korean-speaking children demonstrate the ability to employ adult-like phonological phrasing for focus-marking, albeit with less frequency than adults. In the focus conditions, they de-phrase post-focal elements (i.e., remove phrase boundaries) more frequently than in non-focused conditions. The utilization of phrasing is more prominent in seven to eight-year-olds; by ten to eleven, its application becomes even more prevalent, though still not reaching the frequency observed in adults.

Regarding phonetic cues, four to five-year-olds do not yet employ duration or pitch to mark focus. However, by the age of seven to eight, children start incorporating duration-related phonetic cues for focus-marking. In ten to eleven-year-olds, there is a limited emergence of pitch-related cues.

In addition, even adults distinguished between New information focus and Contrastive focus only by phonological cues. Speakers were more likely to de-phrase the target word (direct objects), and post-focal elements (verbs) in cases of Contrastive focus than New information focus. They mark the Contrastive focus and the New information focus in the same way but with differences of frequency. This focus effect was consistent across age groups, with four to five-year-old children starting to distinguish between New information focus and Contrastive focus.

In summary of Yang (2017), the acquisition of prosodic focus-marking in Korean is characterized by an early adoption of the phonological cue (phrasing) at four to five years of age, followed by a delayed incorporation of phonetic cues (duration and pitch) after the age of five. Furthermore, within the realm of phonetic cues, pitch is introduced later than duration in the developmental process. Even at the age of ten to eleven, children fall short of the frequency or proficiency observed in adults.

In Yang (2017), Korean seven to eight-year-olds produced phonological markers for marking focus (primary cues) but did not use phonetic cues (secondary cues) very well. The stimuli for prosody marking used in our study have both phonological and phonetic cues for prosody responses (See Appendix B in this dissertation). Thus, if we assume that Korean six-year-olds acquired phonological cues as focus markers but did not acquire phonetic cues sufficiently, will this information be adequate to perceive prosody marking, which has both phonological and phonetic cues?

Moreover, it is possible that the six-year-old children in this study might exhibit delayed development in prosodic marking to indicate focus compared to the findings in Yang (2017)'s production study. In the acquisition of information structure, numerous results suggest an asymmetry, with early production but late comprehension or perception of linguistic means related to information structure (Höhle et al. 2014). The reason for this asymmetry remains unclear, and it is uncertain whether it stems from the inherent difficulty of comprehension or from methodological issues.

The research questions and predictions for this study were derived from the results obtained from adult participants and from Yang (2017)'s Korean children production data.

i. Do Korean children exhibit a comparable ability to distinguish between various types of focus through prosody marking in perception, as observed in production studies like Yang (2017)'s research?

ii. Will children exhibit a pattern similar to that observed in adults, with prosody being favor for focus marking compared to case marking?

iii. Will Korean children differentiate between two distinct types of focus—Contrastive focus and New information focus—similarly to adults?

iv. Do children display developmental changes with age?

Predictions: Assuming that children will exhibit the same ability in perception as they do in production, six-year-old Korean children are expected to behave similarly to adults in this experiment.

Prediction 1: Korean six-year-old children will rate sentences with prosody in focus conditions (the Contrastive focus condition and the New information focus condition) at a higher rate than in the Non-object focus condition.

Prediction 2: Korean six-year-old children will select answers with prosody marking in the Contrastive condition more frequently than in the New information focus, whereas they will opt for answers with case marking in the New information focus condition more frequently than in the Contrastive condition.

Prediction 3: Ten-year-old children show developmental changes compared to six-year-old children.

4.2 The experiment

4.2.1 Participants

Two groups of children participated in the experiment:[11]

- eighteen younger children (six to seven-year-olds, average age: 6;09, range: 6;01~7;01, gender: ten females and eight males)
- twenty older children (ten- to eleven-year-olds, average age: 10;06, range: 10;01~11;01, gender: eleven females and nine males)[12].

The children were recruited from an online platform for mothers related to the local area affiliated with Seoul and Kyunggi province; they received approximately $10 for their participation. Only participants that speak Seoul Korean as their native language were recruited.

4.2.2 Method

The same method employed in the experiment conducted with adults was employed for children.

4.3 Statistical Analysis

To ascertain how Korean children selected focus markers based on the type of focus, a series of statistical analyses were performed. As in the adult version of the experiment, the data were categorized into three distinct subsets based on the responses pairs that participants encountered: Case vs. Null; Prosody vs. Null; Prosody vs. Case.

[11] A committee noted the relatively small number of speakers per age group in the study, which was due to practical constraints. Nevertheless, the number of speakers aligns with the standards in published studies on language acquisition and the development of information structure (e.g., Chung, 2013, with 23 Korean-speaking children aged 5–7; Yang, 2017, with 6–8 Korean-speaking children per age group). While the committee remarked on the imbalance in gender distribution, such imbalances are not atypical in studies within this field.

[12] I chose ten-year-olds for this study in order to compare their data with the eleven-year-olds' data from Yang (2017).

Table 4.1 Summary of conditions

	Responses		Focus context
First Comparison	Case (No prosody) vs. Null (neither case nor prosody)	1	Contrastive focus context
		2	New information focus context
		3	Non-object focus context
Second comparison	Prosody (No case) vs. Null (neither case nor prosody)	4	Contrastive focus context
		5	New information focus context
		6	Non-object focus context
Third comparison	Prosody (No case) vs. Case (No prosody)	7	Contrastive focus context
		8	New information focus context
		9	Non-object focus context

All analyses were conducted using mixed-effects modeling in the R program (R Core Team, 2012). The dependent variables consisted of the two types of focus markers in the response (Case vs. Null; Prosody vs. Null; Prosody vs. Case). The independent variables, or fixed factors, were 'Focus Type' (Contrastive vs. New vs. Non-object focus) and 'Age' (Age 6 vs. Age 10 vs. Adults). Non-object focus was designated as the reference category for 'Focus Type' (For the analysis of Contrastive focus vs. New information focus, Contrastive was chosen since Non-object focus was excluded in the analysis). The Adult group served as the reference category for 'Age'. The main effects of 'Focus Type,' 'Age,' and the interaction were entered into the models. The model included random factors for participants and items.[13]

4.4 Results

4.4.1 Children: Case vs. Null

4.4.1.1 Group results

The initial comparison focused on the response pairs of Case and Null. As detailed in Chapter 3 of the adult study, it was established that case marking, in the absence of prosody marking, was not inherently more likely to be chosen to indicate focus. This analysis sought to determine whether Korean children's choice of case marking aligns with that of adults in conversational settings.

[13] Despite attempts to include random slopes in the models, they failed to converge; consequently, random slopes were omitted from the final models.

We employed mixed logit regressions in R, using Focus Markers as the dependent variable with two categories: Case and Null. The independent variables included the main effect of ‘Focus Type’ and ‘Age’, along with the interaction effect of ‘Focus Type’ and ‘Age’. The model incorporated random factors for participants and items, considering the main effects of 'Age' and 'Focus Type,' as well as the interaction between 'Age' and 'Focus Type.' The adult group was designated as the reference category for ‘Age,’ and ‘Non-object focus’ served as the reference category for Focus Type. The outcomes are illustrated in Figure 4.1 and detailed in Tables 4.2 and 4.3.

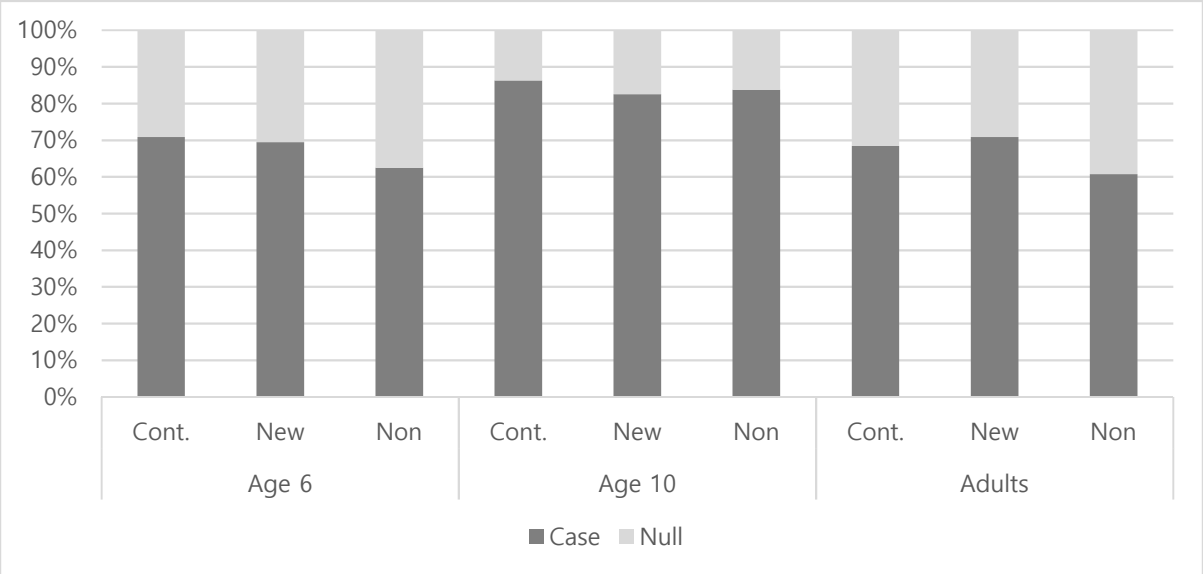


Figure 4.1 Distribution of focus markers (Case vs. Null) for types of focus: Children

Table 4.2 Frequency of focus markers (Case vs. Null) for types of focus: Children

		Contrastive		New		Non-object	
Age 6	Null	21	29.17%	22	30.56%	27	37.50%
	Case	51	70.83%	50	69.44%	45	62.50%
	Total	72	100.00%	72	100.00%	72	100.00%
Age 10	Null	11	13.75%	14	17.50%	13	16.25%
	Case	69	86.25%	66	82.50%	67	83.75%
	Total	80	100.00%	80	100.00%	80	100.00%
Adults	Null	53	31.548%	49	29.167	66	39.286%
	Case	115	68.452%	119	70.833	102	60.714%
	Total	168	100.00%	168	100.00%	168	100.00%

a,b,c	Responses	Type of focus	Focus context
First	Case (moca-lul) / Null(moca-Ø)	Contrastive	Man: Cat threw a car. Robot: No, Cat threw [a hat].
		New	Man: What did Cat throw? Robot: Cat threw [a hat].
		Non-object	Man: Bear threw a hat. Robot: No, [Cat] threw a hat.

The examination of the choice between Case and Null revealed that only the main effect of 'Age' was statistically significant, as indicated in Table 4.3. Neither the main effect of 'Focus Type' nor the interaction effect of 'Focus Type' and 'Age' reached significance. 'Focus Type' exhibited no observable effect across age groups when participants favored case marking or null marking. Participants across all three age groups did not display a tendency to choose case marked stimuli more frequently when the context was focused (Contrastive focus and New information focus) compared to when it was not (Non-object focus).

In the main effect of 'Age,' only ten-year-old children showed a significant difference compared to adults. As illustrated in Figure 4.1, the results suggest noticeable distinctions between the older children and the other two groups. Ten-year-old children consistently chose case marking more frequently, regardless of focus types, compared to adults and younger children. In particular, ten-year-old children selected case marking over 80% of the time, irrespective of focus types, whereas both the six-year-olds and the adults chose case marking about 60% to 70% of the time. Considering the lack of significant results for the interaction, this difference was not influenced by focus type.

Table 4.3 The mixed effect model results: Focus (Case vs. Null)

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	0.5773	0.2863	2.0170	0.0437*
Contrastive	0.2295	0.3629	0.6320	0.5271
New	0.3633	0.3598	1.0100	0.3126
Age 6	-0.0886	0.4438	-0.2000	0.8418
Age 10	1.1766	0.4779	2.4620	0.0138*
Contrastive : Age 6	0.3948	0.5751	0.6870	0.4924
New : Age 6	0.1329	0.6173	0.2150	0.8295
Contrastive : Age 10	0.1891	0.6311	0.3000	0.7645
New: Age 10	-0.2777	0.6609	-0.4200	0.6743

4.4.1.2 Summary of individual results

The individual results (See Appendix F for details.) are summarized in Figure 4.2 and Table 4.4 by counting the number of participants by Age group.

- Reverse (<0): Percentage of participants who chose case marking more frequently in Non-object Focus than in Contrastive or New information Focus.
- Equal (=): Percentage of participants who selected case marking equally in both focus types.

- Medium (≤50%): Percentage of participants who chose case marking up to 50% more frequently in Contrastive or New information Focus than in Non-object Focus.
- Strong (>50%): Percentage of participants who chose case marking more than 50% more frequently in Contrastive or New information Focus than in Non-object Focus.

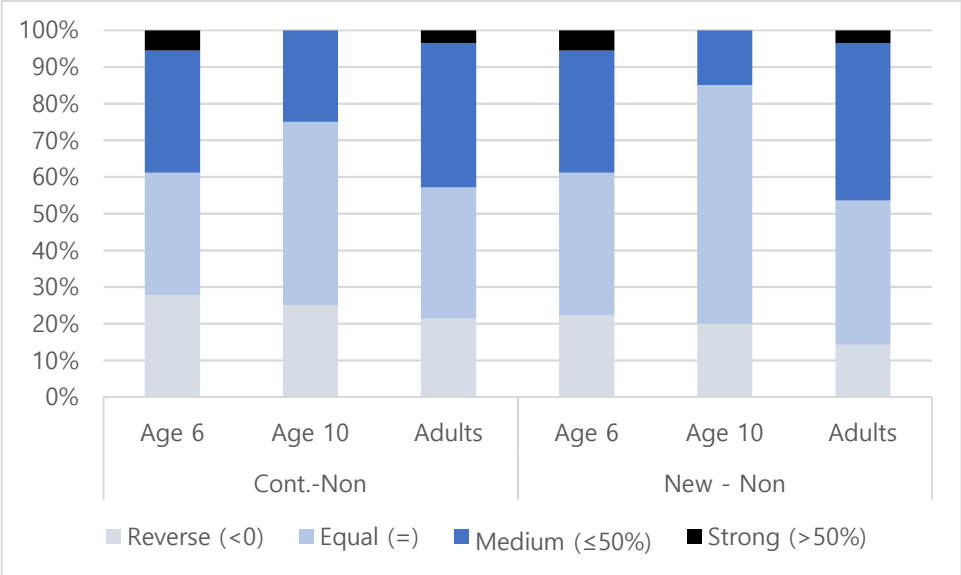


Figure 4.2 Summary of individual results for case marking differences (Case vs. Null, Age)

Table 4.4 Percentage of individual results for case marking differences (Case vs. Null, Age)

Case/Null	Cont.-Non			New - Non		
	Age 6	Age 10	Adults	Age 6	Age 10	Adults
Reverse (<0)	27.78%	25.00%	21.43%	22.22%	20.00%	14.29%
Equal (=)	33.33%	50.00%	35.71%	38.89%	65.00%	39.29%
Medium (≤50%)	33.33%	25.00%	39.29%	33.33%	15.00%	42.86%
Strong (>50%)	5.56%	0.00%	3.57%	5.56%	0.00%	3.57%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Reverse + Equal	61.11%	75.00%	57.14%	61.11%	85.00%	53.57%

In the Prosody/Null comparison, Figure 4.2 reveals a noticeable age group difference. A significantly higher percentage of ten-year-old participants exhibited a reversed or equal pattern (75% for Contrastive Focus vs. Non-object focus; 85% for New Information Focus vs. Non-object focus) compared to adults (57% for Contrastive Focus vs. Non-object focus; 54% for New Information Focus vs. Non-object focus). Previous analysis of the adult data indicated that case marking does not function as a focus marker. Therefore, this age group

difference might be due to the ten-year-olds' higher tendency to choose case marking regardless of focus type.

In summary, Korean children do not select case marking without prosodic information as a focus indicator, aligning with the behavior of adults. However, ten-year-old children exhibit a significantly higher frequency of choosing case marking than the other two groups, regardless of focus types.

4.4.2 Children: Prosody vs. Null

4.4.2.1. Group results

The second comparison focused on response pairs involving Prosody and Null. In Chapter 3 of the adult study, it was established that prosody marking, in the absence of case marking, is more likely to be chosen as a stand-alone focus marker. This section aimed to investigate whether Korean children's choice between Prosody and Null aligns with the patterns observed in adult conversations.

We employed mixed logit regressions in R, with the dependent variables being the two types of focus markers in the response (Prosody vs. Null). The independent variables included 'Focus Type' and 'Age' (Age 6 vs. Age 10 vs. Adults). The final model incorporated the interaction effect of 'Focus Type' and 'Age,' along with the two main effects and the two random factors for participants and items. The adult group served as the reference category for 'Age,' and 'Non-object focus' was chosen as the reference category for Focus Type. The results are presented in Figure 4.3 and Tables 4.5 and 4.6.

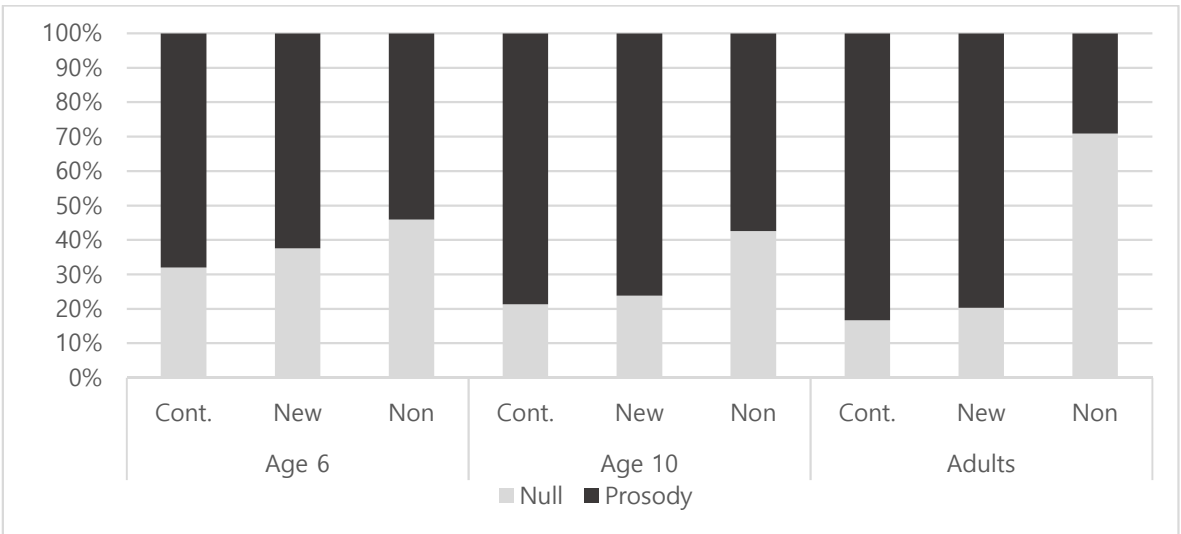


Figure 4.3 Distribution of focus markers (Prosody vs. Null) for types of focus: Children

Table 4.5 Frequency of focus markers (Prosody vs. Null) for types of focus: Children

		Contrastive		New		Non-object focus	
Age 6	Null	23	31.94%	27	37.50%	33	45.83%
	Prosody	49	68.06%	45	62.50%	39	54.17%
	Total	72	100.00%	72	100.00%	72	100.00%
Age 10	Null	17	21.25%	19	23.75%	34	42.50%
	Prosody	63	78.75%	61	76.25%	46	57.50%
	total	80	100.00%	80	100.00%	80	100.00%
Adults	Null	28	16.667%	34	20.238%	119	70.833%
	Prosody	140	83.333%	134	79.762%	49	29.167%
	Total	168	100.00%	168	100.00%	168	100.00%

a,b,c	Responses	Type of focus	Focus context
Second	Prosody (MOCA- Ø) / Null(moca-Ø)	Contrastive	Man: Cat threw a car. Robot: No, Cat threw [a hat].
		New	Man: What did Cat throw? Robot: Cat threw [a hat].
		Non-object	Man: Bear threw a hat. Robot: No, [Cat] threw a hat.

In the model, both the main effect of ‘Age’ and the interaction of ‘Age’ and ‘Focus Type’ are statistically significant, as indicated in Table 4.6. These results suggest that the influence of 'Focus Type' varies across different age groups. Adults and children demonstrate distinct behaviors in certain focus conditions (Non-object focus) but not in others (New information focus and Contrastive focus), as illustrated in Figure 4.3.

Table 4.6 The mixed effect model results: Focus (Prosody vs. Null)

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	1.0933	0.2762	3.959	p < 0.001***
Contrastive	-3.075	0.3428	-8.971	p < 0.001***
New	-2.7516	0.3233	-8.512	p < 0.001***
Age 6	-1.2382	0.4501	-2.751	0.0059**
Age 10	-1.4047	0.4421	-3.177	0.0014**
Contrastive : Age 6	2.333	0.5181	4.503	p < 0.001***
New : Age 6	2.3245	0.509	4.567	p < 0.001***
Contrastive : Age 10	1.7952	0.5289	3.394	p < 0.001***
New: Age 10	1.6776	0.5187	3.234	0.0012**

Post-hoc tests, conducted as mixed models for within age group differences between focus types, revealed a significant contrast in the choice between Prosody and Null for ten-year-old children, while no such significance was found for six-year-olds, as indicated in Tables 4.7 and 4.8.

The first three bars of Figure 4.3 depict the prosody marker pattern as a focus indicator for six-year-old children. They exhibited a preference for prosody-marked stimuli in focused contexts (Contrastive focus and New information focus) compared to non-focused contexts (Non-object focus). Specifically, they selected prosody-marked answers approximately 68% of the time for Contrastive focus and around 63% for New information focus, in contrast to approximately 54% for Non-object focus:

> Age 6: Prosody - Contrastive focus (68%) and New information focus (63%) > Non-object focus (54%)

However, despite these observed trends, the statistical results for this group indicated no significant effect of focus types concerning the choice between Prosody and Null in younger children (Table 4.7).

On the other hand, the choice between Prosody and Null revealed an impact of focus types for ten-year-old children. The middle three bars of Figure 4.3 illustrate the pattern of prosody marking as a focus indicator for ten-year-old children. They exhibited a preference for prosody-marked stimuli in focused contexts (Contrastive and New) compared to non-focused contexts (Non-object focus). Specifically, they selected prosody-marked answers approximately 79% of the time for Contrastive focus and around 76% for New information focus, in contrast to approximately 58% for Non-object focus.

> Age 10: Prosody - Contrastive focus (79%) and New information focus (76%) > Non object focus (58%)

The statistical results indicated a significant effect of focus types in the choice between Prosody and Null for ten-year-olds in Table 4.8.

Table 4.7 The post-hoc test results: Focus (Prosody vs. Null), Age 6

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.1732	0.262	-0.661	0.5086
Contrastive	-0.6148	0.3541	-1.736	0.0825
New	-0.359	0.347	-1.035	0.3008

Table 4.8 The post-hoc test results: Focus (Prosody vs. Null), Age 10

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.3659	0.435	-0.841	0.4003
Contrastive	-1.2719	0.5544	-2.294	0.0218 *
New	-1.069	0.5437	-1.966	0.0493 *

We also examined age differences within each focus type condition. Post-hoc pairwise comparisons between age groups revealed a significant difference in adults' choice between Prosody and Null in the Non-object focus condition compared with both child groups, with adults choosing prosody marking significantly less than the child groups (Table 4.11).

Prosody in Non-object focus: Adults < Age 6, Age 10

In terms of Contrastive focus, ten-year-olds demonstrated no discernible differences from adults, while six-year-olds exhibited marginal significance compared to adults. For New information focus, only six-year-olds displayed a significant difference, choosing more null marking than the adult group (refer to Tables 4.9 and 4.10).

Contrastive focus, New information focus: Age 6 ≠ Adults; Age 10 = Adults

The only difference between ten-year-olds and adults is that ten-year-olds selected prosody marking more frequently compared to adults for the Non-object focus condition.

The results are not consistent with Prediction 1, repeated below.

Prediction 1: Korean six-year-old children will rate sentences with prosody in focus conditions (Contrastive focus and New information focus) at a higher rate than in the Non-object focus condition.

The results suggest that Korean six-year-old children tended to treat sentences with prosody in focus conditions (Contrastive focus and New information focus) similarly to those in the Non-object focus condition. Although trends resembling adult-like patterns were observed, statistical significance was not found for six-year-olds. In contrast, ten-year-old children rated sentences with prosody in focus conditions at a higher rate than in the Non-object focus condition, exhibiting a more adult-like response. This supports Prediction 3 that ten-year-old children show developmental changes compared to six-year-old children. In summary, six-year-olds did not show a preference for prosody marking over null marking as a focus indicator. This is in contrast to Korean four to five-year-olds in Yang's (2017) study, who did exhibit a preference for prosody marking.

Unlike the six-year-olds, ten-year-olds demonstrated a preference for prosody marking as a focus indicator. However, in contrast to adults, the ten-year-olds tended to choose prosody marking more frequently for the Non-object focus condition, suggesting an insensitivity to the need to deaccent non-focused elements.

Table 4.9 The post-hoc test results: Focus (Prosody vs. Null), Contrastive focus

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-1.8947	0.34	-5.573	p < 0.001***
Age 6	0.9213	0.5084	1.812	0.07
Age 10	0.2404	0.5187	0.463	0.643

Table 4.10 The post-hoc test results: Focus (Prosody vs. Null), New information focus

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-1.848	0.3672	-5.032	p < 0.001***
Age 6	1.189	0.5409	2.198	0.0279 *
Age 10	0.3259	0.5423	0.601	0.5479

Table 4.11 The post-hoc test results: Focus (Prosody vs. Null), Non-object focus

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	1.3080	0.0014	914.2600	p < 0.001***
Age 6	-1.5152	0.4584	-3.3060	p < 0.001***
Age 10	-1.6942	0.0014	-1184.6440	p < 0.001***

4.4.2.2 Summary of individual results

In the group results of the Prosody vs. Null comparison, ten-year-old children could distinguish between focus and non-focus by selecting sentences with prosody in focus conditions more frequently than in the Non-object condition, displaying an adult-like response. However, individual results reveal greater variability among ten-year-olds, with a higher percentage of participants unable to distinguish between focus and non-focus than adults (30–35% for Age 10; 14–18% for Adults in the Reverse and Equal patterns). This increased variability may be due to the ten-year-olds' tendency to choose prosody marking more frequently even in the Non-object condition. Additionally, there is a notable difference in the Strong pattern: the percentage of ten-year-olds who can strongly distinguish between focus and non-focus is much lower compared to adults (5% for Age 10; 54–57% for Adults in the Strong pattern). (See Appendix F for details.)

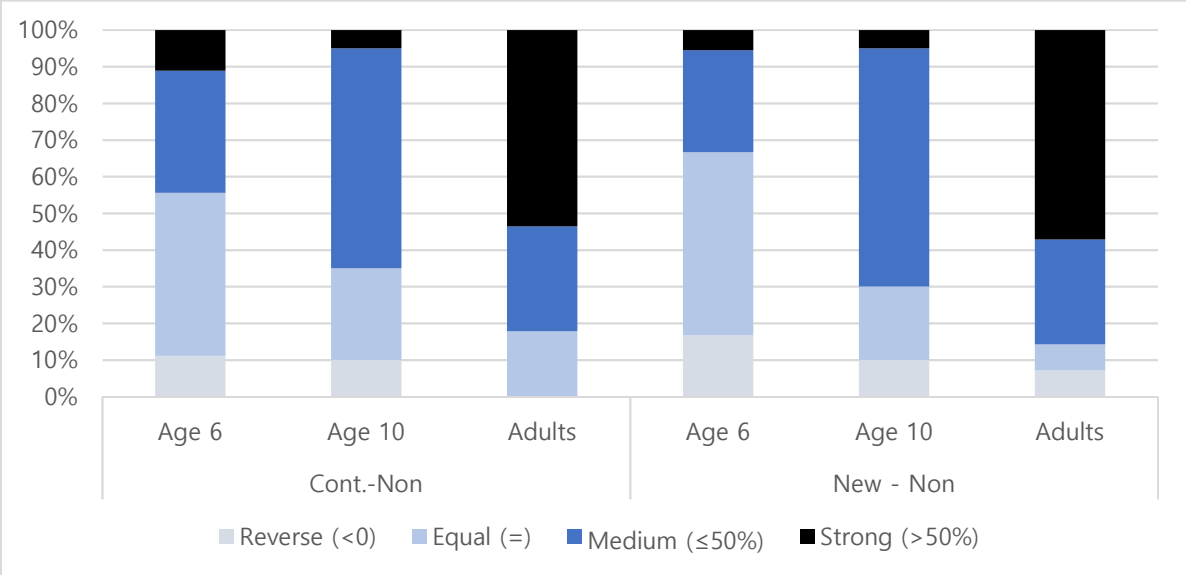


Figure 4.4 Summary of individual results for prosody marking differences (Prosody vs. Null, Age)

Table 4.12 Percentage of individual results for prosody marking differences (Prosody vs. Null, Age)

Prosody/Null	Cont.-Non			New - Non		
	Age 6	Age 10	Adults	Age 6	Age 10	Adults
Reverse (<0)	11.11%	10.00%	0.00%	16.67%	10.00%	7.14%
Equal (=)	44.44%	25.00%	17.86%	50.00%	20.00%	7.14%
Medium (≤50%)	33.33%	60.00%	28.57%	27.78%	65.00%	28.57%
Strong (>50%)	11.11%	5.00%	53.57%	5.56%	5.00%	57.14%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Reverse + Equal	55.56%	35.00%	17.86%	66.67%	30.00%	14.29%

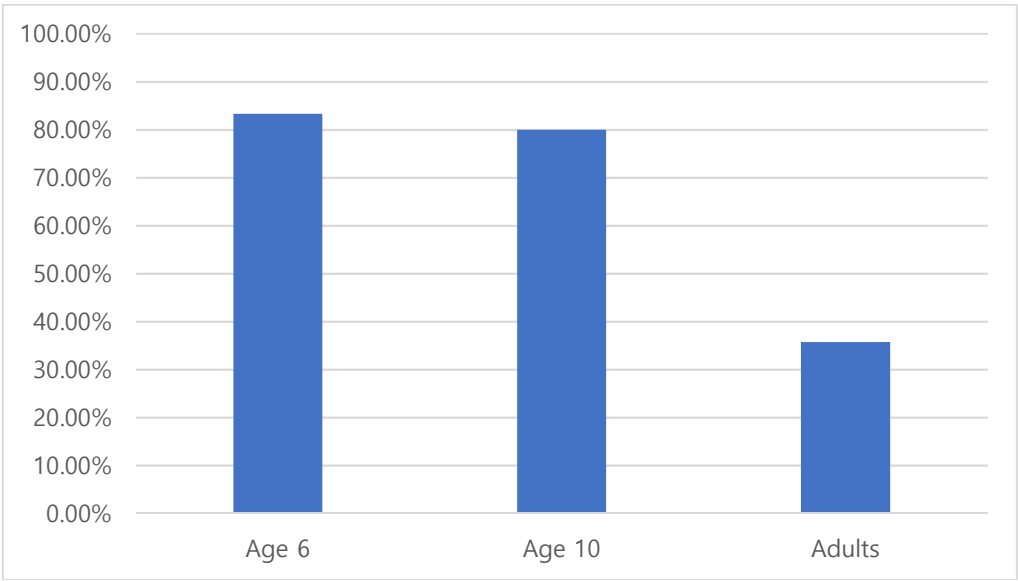


Figure 4.5 Summary of individual results of prosody marking for Non-object focus

Table 4.13 Percentage of individual results of prosody marking for Non-object focus

	Age 6	Age 10	Adults
Non-object focus (≥ 50%)	83.33%	80.00%	35.71%

In the group results, ten-year-olds showed insensitivity to the need to deaccent non-focused elements, as they chose prosody-marked answers for Non-object focus more frequently than adults did (Adults: 29%, Age 10: 57%). Figure 4.5 and Table 4.13 summarize the individual results for Non-object focus, showing the percentage of individuals who selected prosody marking for Non-object focus 50% of the time or more. This suggests that a significantly higher percentage of ten-year-old participants (80%) failed to properly deaccent the unfocused elements compared to adults (36%). See Appendix F for details.

4.4.3 Children: Prosody vs. Case

4.4.3.1 Group results

The third comparison focused on response pairs involving Prosody and Case. In Chapter 3 of the adult study, it was determined that prosody is more likely than case marking to be chosen to mark focus when speakers are required to choose between the two. This section aimed to investigate whether Korean children's choice of the two focus markers, prosody or case, aligns with the patterns observed in adults.

We employed mixed logit regressions in R. The dependent variable was Focus Markers with two categories: Prosody and Case. The independent variables included the main effect of ‘Focus Type’ and ‘Age,’ as well as the interaction effect of ‘Focus Type’ and ‘Age.’ The model incorporated random factors for participants and items. The main effects of 'Age' and 'Focus Type,' along with the interaction between 'Age' and 'Focus Type,' were included in the model. The adult group served as the reference category for ‘Age’, and ‘Non-object focus’ was chosen as the reference category for 'Focus Type'. The results are presented in Figure 4.6 and Tables 4.14 and 4.15.

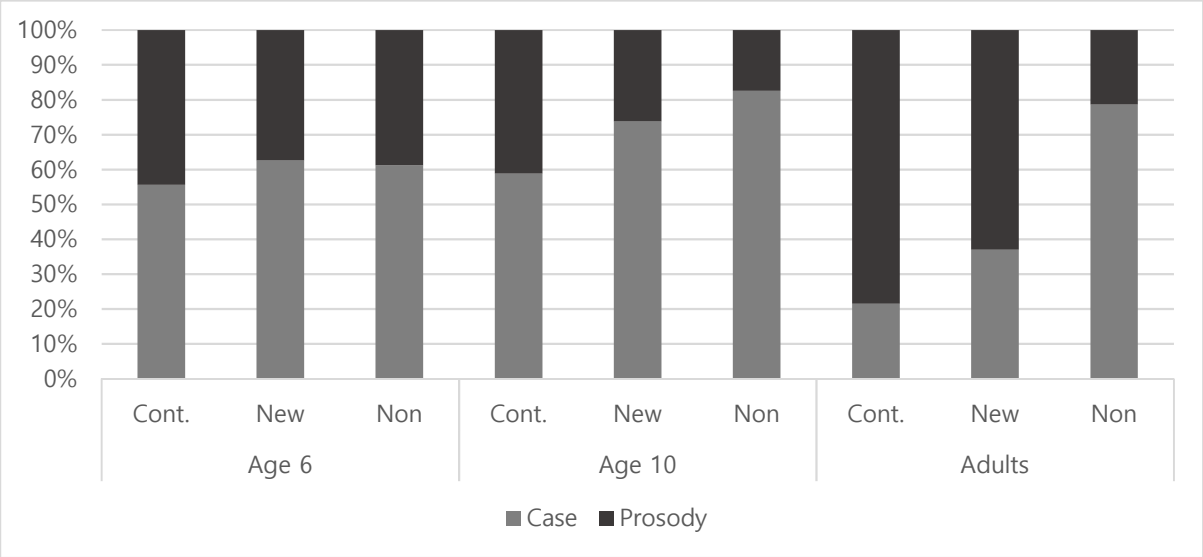


Figure 4.6 Distribution of focus markers (Case vs. Prosody) for types of focus: Children

Table 4.14 Frequency of focus markers (Case vs. Prosody) for types of focus: Age 10

		Contrastive		New		Non-object focus	
Age 6	Case	40	55.56%	45	62.50%	44	61.11%
	Prosody	32	44.44%	27	37.50%	28	38.89%
	Total	72	100.00%	72	100.00%	72	100.00%
Age 10	Case	47	58.75%	59	73.75%	66	82.50%
	Prosody	33	41.25%	21	26.25%	14	17.50%
	Total	80	100.00%	80	100.00%	80	100.00%
Adults	Case	36	21.429%	62	36.905%	132	78.571%
	Prosody	132	78.571%	106	63.095%	36	21.429%
	Total	168	100.00%	168	100.00%	168	100.00%

[a,b,c]	Responses	Type of focus	Focus context
Third	Case (moca-lul)/Prosody (MOCA- Ø)	Contrastive	Man: Cat threw a car. Robot: No, Cat threw [a hat].
		New	Man: What did Cat throw? Robot: Cat threw [a hat].
		Non-object	Man: Bear threw a hat. Robot: No, [Cat] threw a hat.

The model indicated that the main effect of 'Focus Type' and the interaction effect of 'Focus Type' and 'Age' are statistically significant. However, the main effect of 'Age' is not significant. These findings imply that the variation across age groups is influenced by the focus type (Table 4.15).

Table 4.15 The mixed effect model results: Focus (Prosody vs. Case)

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	1.4518	0.3006	4.8290	p < 0.001***
Contrastive	-2.9719	0.3575	-8.3120	p < 0.001***
New	-2.0460	0.3354	-6.1000	p < 0.001***
Age 6	-0.9242	0.4855	-1.9030	0.0570
Age 10	0.4387	0.5156	0.8510	0.3948
Contrastive : Age 6	2.6956	0.5698	4.7310	p < 0.001***
New : Age 6	2.1222	0.5531	3.8370	p < 0.001***
Contrastive : Age 10	1.5260	0.5922	2.5770	0.0099**
New: Age 10	1.4362	0.5838	2.4600	0.01388*

Post-hoc tests were conducted as mixed models for the within age group differences between the focus types. They revealed a significant difference between focus types in the choice of focus markers by the ten-year-olds (only with Contrastive focus) but not by the six-year-olds, as seen in Tables 4.16 and 4.17.

As the last three bars of Figure 4.6 above illustrate, adults chose prosody marking more frequently for the two focus conditions than for the Non-object focus condition. The pattern of choosing case marking based on the types of focus in the Prosody/Case comparison closely mirrors the observed pattern of choosing null marking in the Prosody/Null comparison in adults' data, as discussed in the previous chapter.

Adults:
Case in Prosody/Case - Contrastive focus (21%) and New information focus (37%) < Non-object focus (79%)
Null in Prosody/Null: Contrastive focus (17%), New information focus (20%) < Non-object focus (71%)

However, as depicted in the first three bars of Figure 4.6, six-year-old children do not distinguish between Prosody and Case based on the type of focus. The corresponding statistical results are summarized in Table 4.16:

Age 6:
Case in Prosody/Case - Contrastive focus (56%) and New information focus (62%) ≈ Non-object focus (61%)

Table 4.16 The post-hoc test results: Focus (Prosody vs. Case), Age 6

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	0.51812	0.37312	1.389	0.165
Contrastive	-0.26665	0.45449	-0.587	0.557
New	0.06914	0.45756	0.151	0.88

On the other hand, ten-year-old children exhibited a preference for prosody-marked stimuli for Contrastive focus and New information focus compared to Non-object focus, as illustrated in the middle three bars of Figure 4.6. However, this preference was statistically significant only in the Contrastive focus condition, as indicated in Table 4.17:

> Age 10:
> Case in Prosody/Case Contrastive focus (59%) and New information focus (74%) < Non-object focus (83%)

Table 4.17 The post-hoc test results: Focus (Prosody vs. Case), Age 10

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	2.1848	0.5873	3.72	p < 0.001***
Contrastive	-1.6468	0.638	-2.581	0.009846 **
New	-0.7157	0.637	-1.123	0.261229

We also explored age differences within each focus type condition. Post-hoc pairwise comparisons of the choice of the two focus markers between age groups revealed a significant difference in adults' choice of focus markers in the types of focus conditions compared with both other groups (Table 4.18, 4.19, and 4.20). For both focus conditions, both child groups chose significantly more case marking compared to the adults. In the Non-object focus condition, only six-year-olds showed a significant difference, choosing less case marking than the other groups.

> Case (Contrastive focus; New information focus): Age 6, Age 10 > Adults
> Case (Non-object focus): Age 6 < Age 10, Adults

Table 4.18 The post-hoc test results: Focus (Prosody vs. Case), Contrastive focus

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-1.9458	0.4735	-4.109	p < 0.001***
Age 6	2.2371	0.7163	3.123	0.001791 **
Age 10	2.4793	0.7146	3.469	p < 0.001***

Table 4.19 The post-hoc test results: Focus (Prosody vs. Case), New information focus

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.7003	0.3469	-2.019	0.043522 *
Age 6	1.3796	0.5689	2.425	0.015318 *
Age 10	2.0984	0.5838	3.594	p < 0.001***

Table 4.20 The post-hoc test results: Focus (Prosody vs. Case), Non-object focus

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	1.508	0.3118	4.836	p < 0.001***
Age 6	-0.9833	0.4776	-2.059	0.0395 *
Age 10	0.2814	0.5019	0.561	0.5749

4.3.3.2 Summary of individual results

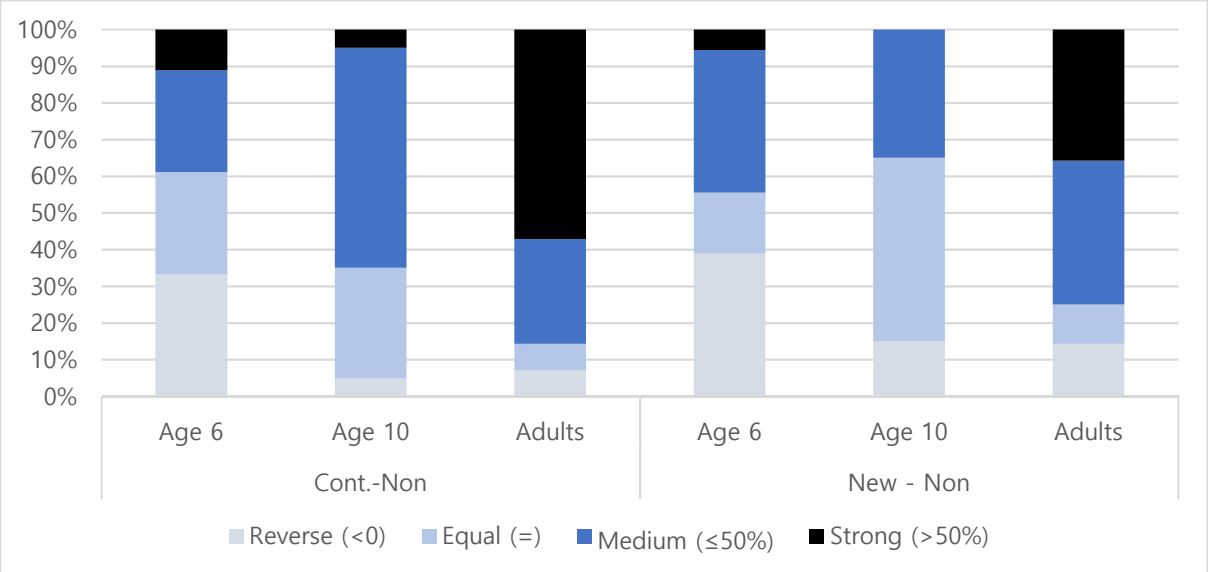


Figure 4.7 Summary of individual results for prosody marking differences (Prosody vs. Case, Age)

Table 4.21 Percentage of individual results for prosody marking differences (Prosody vs. Case, Age)

Prosody/Case	Cont.-Non			New - Non		
	Age 6	Age 10	Adults	Age 6	Age 10	Adults
Reverse (<0)	33.33%	5.00%	7.14%	38.89%	15.00%	14.29%
Equal (=)	27.78%	30.00%	7.14%	16.67%	50.00%	10.71%
Medium (≤50%)	27.78%	60.00%	28.57%	38.89%	35.00%	39.29%
Strong (>50%)	11.11%	5.00%	57.14%	5.56%	0.00%	35.71%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Reverse + Equal	61.11%	35.00%	14.29%	55.56%	65.00%	25.00%

As the group results of the Prosody vs. Case comparison closely resembled those of the Prosody vs. Null comparison, the individual results were similarly aligned. However, in the group results of the Prosody vs. Case comparison, ten-year-old children could only distinguish between Contrastive Focus and Non-object focus, but not between New Information Focus and Non-object focus. The individual results provide a clearer picture: 65% of ten-year-old participants could not distinguish between them, with a much higher percentage unable to differentiate between New information focus and Non-object than adults (65% for Age 10; 25% for Adults in the Reverse and Equal patterns). This increased variability may be due to the ten-year-olds' tendency to choose case marking more frequently across all focus conditions compared to other groups. Additionally, the difference observed in the Strong pattern also appeared in the Prosody vs. Case comparison: the percentage of ten-year-olds who can strongly distinguish between Contrastive Focus and Non-object focus is much lower than that of adults (5% for Age 10; 57% for Adults in the Strong pattern). See Appendix F for details.

In summary, unlike adults who favor prosody marking as a focus indicator when there is a choice between Case and Prosody, children did not exhibit a similar pattern. Six-year-olds demonstrated a preference for case marking, irrespective of focus types. In contrast, ten-year-old children differentiated between Contrastive focus and Non-object focus by choosing prosody marking. Thus, there is a developmental change with age in terms of the choice between the two types of focus marking in children.

4.4.4 Focus types: Contrastive focus vs. New information focus

4.4.4.1 Group results

To address the question of whether children can distinguish between the two focus types (Contrastive and New), additional analyses were conducted. The adult results showed that Korean listeners more frequently selected answers with prosody marking in the Contrastive condition than in the New information focus condition, whereas they opted for answers with case marking in the New information focus condition more frequently than in the Contrastive condition. In the adult data from the previous chapter, the significant difference between Contrastive focus and New information focus was found only in the third comparison (the response pairs of Case and Prosody), prompting us to analyze the children’s data exclusively in this section.

We employed mixed logit regressions in R. The dependent variable was Focus Markers with two categories: Prosody and Case. The independent variables included the main effect of ‘Focus Type’ and ‘Age,’ as well as the interaction effect of ‘Focus Type’ and ‘Age.’ The model incorporated random factors for participants and items. The main effects of 'Age' and 'Focus Type,' along with the interaction between 'Age' and 'Focus Type,' were included in the model. The adult group served as the reference category for ‘Age’, and ‘Contrastive’ was chosen as the reference category for 'Focus Type'. The results are presented in Figure 4.8 and Tables 4.22 and 4.23.

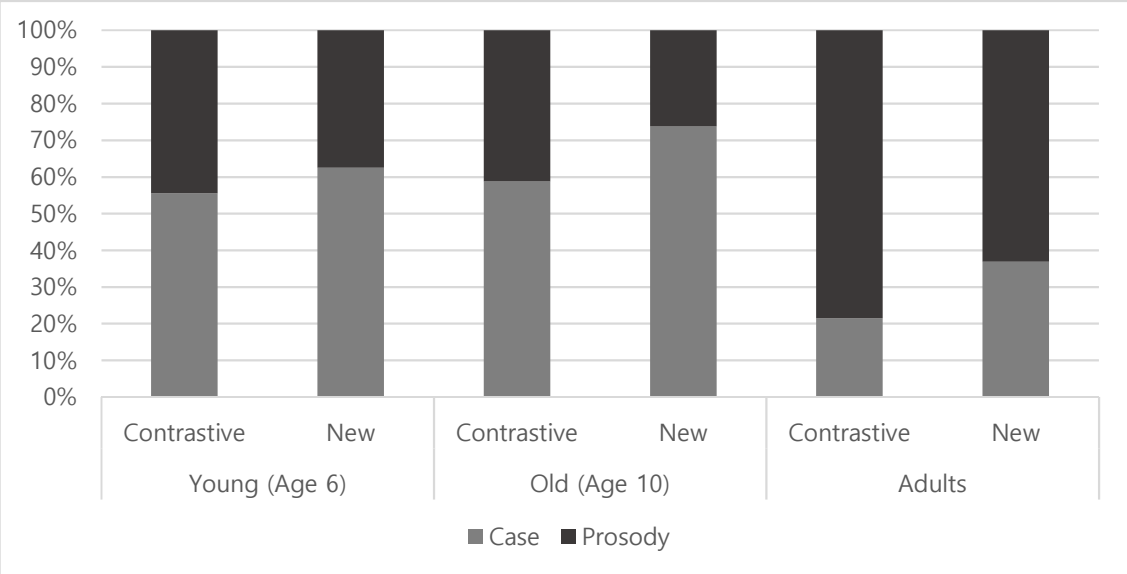


Figure 4.8 Distribution of focus markers for Contrastive vs. New: Children

Table 4.22 Frequency of focus markers (Prosody/Case) for Contrastive vs. New: Children

		Contrastive		New	
Age 6	Case	40	55.56%	45	62.50%
	Prosody	32	44.44%	27	37.50%
	Total	72	100.00%	72	100.00%
Age 10	Case	47	58.75%	59	73.75%
	Prosody	33	41.25%	21	26.25%
	Total	80	100.00%	80	100.00%
Adults	Case	36	21.429%	62	36.905%
	Prosody	132	78.571%	106	63.095%
	Total	168	100.00%	168	100.00%

a,b,c	Responses	Type of focus	Focus context
Third	Case (moca-lul)/Prosody (MOCA- Ø)	Contrastive	Man: Cat threw a car. Robot: No, Cat threw [a hat].
		New	Man: What did Cat throw? Robot: Cat threw [a hat].

Analyzing the contrast between Contrastive focus and New information focus in the Prosody/Case comparison, we observed that the main effects of 'Age' and 'Focus Type' were statistically significant. However, the interaction effect disappeared (Table 4.23).

Table 4.23 The mixed effect model results: Contrastive focus vs. New information focus

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-1.8376	0.3988	-4.6080	p < 0.001***
New	1.0772	0.3793	2.8400	0.0045**
Age 6	2.1016	0.6299	3.3360	p < 0.001***
Age 10	2.3581	0.6195	3.8070	p < 0.001***
New : Age 6	-0.6933	0.6106	-1.1360	0.2562
New: Age 10	-0.1792	0.6059	-0.2960	0.7674

The main effect of 'Focus Type' and the absence of the interaction effect suggest a consistent preference for a focus marker for a given focus type across age groups. Participants favored Prosody more frequently for Contrastive focus than for New information focus, and favored Case more for the New information focus than for the Contrastive focus. The main effect of 'Age' implies that both groups of children chose case marking more frequently than adults did.

Post-hoc tests were conducted as mixed models for the within-age group differences between the focus types. Ten-year-olds exhibited a clear distinction between the Contrastive focus and the New information focus like adults. They chose responses with prosody marking more frequently for Contrastive focus than for New information focus and favored case marking more for the New information focus condition than for the Contrastive focus condition.

Prosody: Contrastive focus (41%) > New information focus (26%)
Case: Contrastive focus (59%) < New information focus (74%)

The p-value (0.0697) suggests that this effect is marginally significant, as seen in Table 4.25. Six-year-olds showed a similar pattern to ten-year-olds and adults. However, this difference did not reach statistical significance, as seen in Table 4.24.

Table 4.24 The post-hoc test results: Contrastive focus vs. New information focus, Age 6

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	0.2714	0.5256	0.5160	0.6060
New	0.4156	0.5721	0.7270	0.4680

Table 4.25 The post-hoc test results: Contrastive focus vs. New information focus, Age 10

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	0.5	0.4474	1.118	0.2637
New	0.8993	0.4958	1.8140	0.0697

The findings do not align with Prediction 2, suggesting that Korean six-year-old children showed a tendency to select responses with prosody marking in the Contrastive focus condition equally to those in the New information focus condition. Similarly, they opted for answers with case marking in the New information focus condition equally to those in the Contrastive focus condition. Notably, they did not exhibit a clear distinction between Contrastive focus and New information focus. In contrast, Korean ten-year-old children demonstrated a marginally significant difference, favoring answers with prosody marking in the Contrastive focus condition more frequently than in the New information focus condition. At the same time, they chose answers with case marking in the New information focus condition more frequently than in the Contrastive focus condition. These outcomes provide support for Prediction 3, indicating that ten-year-old children undergo developmental changes compared to six-year-old children. In summary, whereas ten-year-olds can differentiate between Contrastive focus and New information focus, six-year-olds do not show this ability.

4.4.4.2 Summary of individual results

When examining the individual results for Contrastive Focus and New Focus, we see that more than half of the ten-year-old participants did not distinguish between the two focus types as effectively as adults (60% for Age 10; 50% for Adults in the Reverse and Equal patterns) in Figure 4.9 and Table 4.26. (See Appendix F for details.)

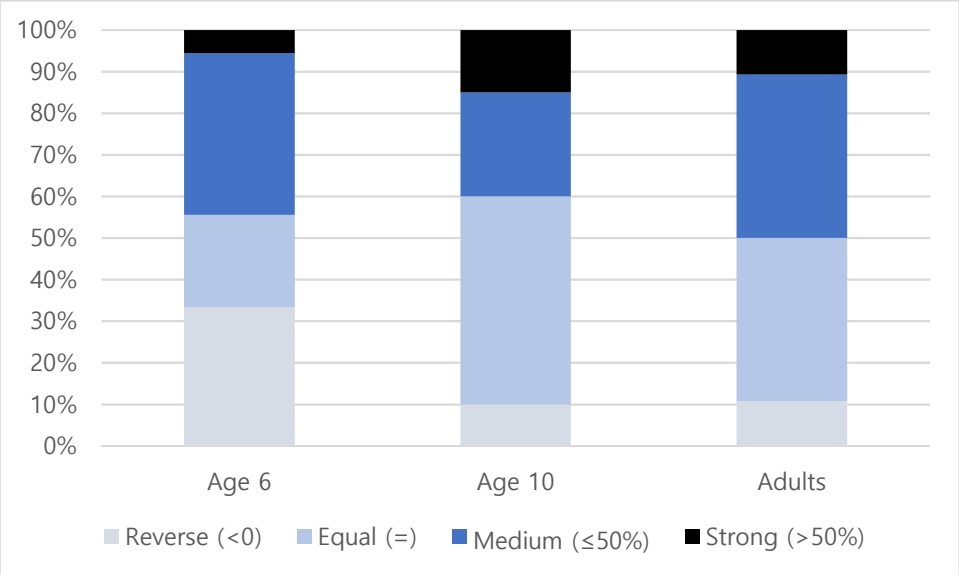


Figure 4.9 Summary of individual results for prosody marking differences (Prosody vs. Null, Age)

Table 4.26 Percentage of individual results for prosody marking differences (Prosody vs. Null, Age)

Cont. - New	Age 6	Age 10	Adults
Reverse (<0)	33.33%	10.00%	10.71%
Equal (=)	27.78%	50.00%	39.29%
Medium (≤50%)	27.78%	25.00%	39.29%
Strong (>50%)	11.11%	15.00%	10.71%
Total	100.00%	100.00%	100.00%
Reverse + Equal	55.56%	60.00%	50.00%

4.5 Discussion

We investigated the preferences of Korean-speaking six-year-old and ten-year-old children (case marking or prosody marking) to distinguish focus (Contrastive focus and New information focus) from Non-object focus in a forced-choice task of perception. The results can be summarized as follows:

Firstly, Korean children rated sentences with case marking (without prosodic clues) in the focus conditions (Contrastive focus and New information focus) equally to those in the Non-object focus condition in the listening judgment task, aligning with adults' data.

Secondly, Korean-speaking six-year-olds do not favor prosodic marking as a focus indicator. They exhibited a preference for prosody-marked stimuli when the context was focused (Contrastive focus and New information focus) compared to when it was not (Non-object focus), similar to adults. However, despite the observed trends, the statistical results

for this group indicated no significant effect of focus. Additionally, Korean-speaking six-year-olds cannot distinguish Contrastive focus and New information focus.

Thirdly, Korean-speaking ten-year-old children prefer prosody marking as a focus indicator, as do adults. Ten-year-old children exhibited a preference for prosody-marked stimuli when the context was focused (Contrastive and New information focus) compared to when it was not (Non-object focus). Moreover, Korean-speaking ten-year-old children can distinguish between contrastive focus and non-contrastive (New information) focus, demonstrating developmental progress compared to six-year-old children.

Fourthly, ten-year-old children behaved somewhat differently in selecting non-focused elements compared to the adult group in terms of frequency. They selected null-marked elements much less frequently for the Non-object focus condition, whereas adults selected null-marked elements much more frequently for the Non-object focus condition. Additionally, the individual analysis revealed that a much larger proportion of ten-year-olds (80%) struggled to properly choose deaccented answers for the unfocused elements, compared to 36% of adults. This suggests that even ten-year-olds had difficulties perceiving and selecting the deaccented elements in the task.

Lastly, ten-year-olds selected case marking much more frequently, regardless of focus types, compared to the other two groups. A number of issues now arise.

Let's first explore why six-year-olds in this study demonstrate delayed development compared to their peers in production data. In this study, six-year-olds do not rely on prosodic marking as a focus indicator, whereas even four to five-year-old Korean children in Yang (2017) demonstrated this ability using phonological means, specifically phrasing.

As previously mentioned, Korean-speaking four to five-year-olds in Yang's (2017) study showcased the ability to employ adult-like phrasing for focus-marking in their production, albeit with less frequency than adults. In the focus conditions, they de-phrased post-focal elements more frequently than in non-focused conditions. However, in this study, Korean-speaking six-year-olds do not choose prosodic marking as a focus indicator, despite exhibiting a trend for preferring prosody-marked stimuli in focused conditions compared to the non-focused condition. The asymmetry between the two studies raises questions. Do these results reflect the availability of underlying pragmatic representations, indicating early production and late comprehension in the acquisition of focus markers in Korean? Or might other issues be involved?

There are three potential explanations for this: 1) the misinterpretation of the results in this study, 2) the overinterpretation of Yang (2017)'s production data, and 3) the impact of COVID-19. Höhle et al. (2014) noted that late acquisition in perception can be caused by underestimating children's comprehension capacities. Regarding the underestimation of the results in this study, two key factors should be considered. The first is related to methodological challenges. Examining children's perception ability in these phenomena poses a more methodological challenge than investigating their production. Earlier studies in this area often employed picture selection tasks, which might incur significant processing costs. Late acquisition results typically arose from studies using offline methods. For instance, some early studies (Hornby 1971; Cruttenden 1985) used picture selection tasks to assess whether six- to ten-year-old English-speaking children could exploit accent patterns to identify contrastive information or the topic–comment structure of a sentence. In both studies, even ten-year-olds did not exhibit the expected responses. However, both studies are methodologically disputable, as no adults were included and sets of highly heterogeneous experimental materials were used, as Höhle et al. (2014) pointed out.

Recent studies employing experimental methods that provide a measure of children's processing of prosodic information during sentence comprehension, such as online eye-tracking studies (Arnold 2008; Höhle et al. 2009), indicate a much earlier capacity to make use of prosodic marking of information structure. However, online tasks do not inherently provide evidence that young children can exploit accentuation. My study adopted a forced-choice task to lessen the processing cost compared to picture selection tasks, even though it is an offline task. However, the results indicating the late acquisition of prosodic marking as a focus indicator compared to Yang (2017)'s production data might point to the methodological limitations of this study.

The second concerns the small sample size used in this study. One limitation was the relatively small number of items per condition and participants per age group due to practical constraints. This limitation primarily increases the risk of Type 2 errors. A Type 2 error occurs when a study fails to detect a true effect or difference that actually exists, often due to insufficient statistical power. Small sample sizes reduce the study's power, making it harder to achieve statistically significant results, even when a genuine effect is present. As a result, the study might incorrectly conclude that there is no effect (false negative). Therefore, if the sample size had been larger, we might have found significant results even for the six-year-olds.

We can consider an alternative explanation for these results: the overestimation of the production study, as Höhle et al. (2014) suggested. Cutler and Swinney (1987) propose that the delayed effects observed in children's sentence processing indicate that the development of the necessary mental structures continues throughout the school-age period. They propose that a child's early ability to use prosody to emphasize crucial information in language production does not necessarily indicate the presence of underlying pragmatic representations. Instead, it stems from a physiological mechanism that instinctively prompts the speaker to articulate the more acoustically prominent parts of an utterance that they are enthusiastic about, without considering shared knowledge.

Höhle et al. (2014) mentioned that their review of children's production capacities supported this idea. The basic means to emphasize information were produced early on. However, detailed analyses showed that the ability to fine-tune prosodic prominence in accord with the specific language seem to take more time to acquire. They suggest that for comprehension, this fine-tuning may be required before the information provided by prosody can be adequately integrated into the processing of a sentence in a specific language.

The results of Yang's (2017) phonetic analyses are compatible with this view. In the study, four to five-year-olds did not yet employ phonetic cues like duration or pitch to mark focus, which are secondary cues for prosodic focus markers in Korean. By seven to eight years old, children started incorporating duration-related phonetic cues for focus-marking. However, even in ten to eleven-year-olds, there was limited emergence of pitch-related cues.

The prosodic stimuli for my study included all of the information on phonological and phonetic means for focus marking. So, if sensitivity to all fine-tuned phonological and phonetic information is needed for perception, the same-aged children might have difficulty in differentiating focus in this experiment.

Another potential factor contributing to the delayed development observed in the six-year-olds in my study, compared to their peers in production data, is the impact of COVID-19. The experiment took place in the late stages of the 2023 pandemic. Charney et al. (2022) have emphasized the potential consequences of the COVID-19 Pandemic on communication and language skills in children. Although the six-year-old children in this study were already fluent speakers at the age of three before the onset of COVID-19, their pragmatic development might have been adversely affected. Social interaction plays a crucial role in the development of information structure and pragmatics. However, during the pandemic, children faced challenges due to social distancing measures, restrictions on large group

gatherings, and the prolonged use of facial masks. These factors collectively might have negatively impacted social interaction and contributed to the delayed development of focus marking in the six-year-olds.

Now, let's explore why ten-year-olds have not yet mastered a sensitivity to unaccented non-focused elements. Grünloh et al. (2015) demonstrated that German children encountered challenges in deaccenting given information compared to adults. They attributed this difficulty to input factors, the still-developing motor control of children, or cognitive factors. Notably, they found that input factors played a crucial role, revealing that children's caregivers were less likely to de-accent given information than other adults. While the participants in the Grünloh et al. (2015) study were two to three years old, considerably younger than the ten-year-olds in our study, it is less likely that input or motor control factors would influence the failure to deaccent non-focused elements in ten-year-olds during this perception study. However, cognitive factors appear to be relevant to this outcome.

When a speaker aims to deaccent certain information, an understanding of the listener's mental state becomes essential – grasping what the listener knows (Chafe, 1976) and determining the significance of information in this processing. Cognitive factors, therefore, play a crucial role in deaccenting. To comprehend the listener's mental state, a speaker requires a type of knowledge dubbed Theory of Mind, the ability to recognize that others have beliefs, desires, intentions, and perspectives that may differ from one's own. The ability to discern what information is more or less important involves attentional control, goal maintenance, and the inhibition of less-relevant information. These cognitive processes undergo substantial changes with age (Balota & Faust, 2001; Waszak, Li, & Hommel, 2010; Zelazo, Craik, & Booth, 2004). Castel et al. (2011) reported that children, including adolescents, exhibit delayed development in the ability to selectively remember information, in contrast to adults who excel at remembering high-valued information.

Yang (2017)'s study reveals a somewhat similar phenomenon. Adults tend to deaccent post-focus elements, such as verbs, through dephrasing when objects are focused in Korean. However, children exhibited a lower frequency of dephrasing post-focus elements compared to adults. This pattern persisted even at the age of eleven, although it diminished with increasing age. Yang attributed the failure of deaccenting non-focused elements to children's delayed speaking rate. Jun (1993, 2003) demonstrated that phrasing can be influenced by speaking rate, with slower speech rates resulting in more phrased sentences. While Yang did not explicitly indicate whether children's speaking rate was slower than that

of adults in the study, a delayed speech rate could contribute to children's reduced dephrasing compared to adults.

Supporting this, Martins et al. (2007) found that children's speech rate is generally slower than that of adults. In their study involving Portuguese-speaking children aged five to seventeen in a picture description task, a significant age effect was observed in speech rate compared to adults. Portuguese-speaking adults, who were analyzed using the same methodology (Afonso, 1994), produced an average speech rate of 147.1 WPM. In contrast, eleven-year-olds in Martins et al. (2007) exhibited an average speech rate of 101 WPM, and although seventeen-year-olds reached 125 WPM, their speech rate remained slower than that of adults. Therefore, if phrasing is linked to speech rate, children's delayed speech rate may contribute to their less frequent dephrasing of non-focused elements compared to adults. However, it remains unclear whether the delayed speech rate of children can affect the perception of phrasing.

Finally, there remains an enigma regarding the ten-year-olds' inclination towards case marking irrespective of focus types, even in comparison to adults. At present, a definitive explanation for this phenomenon eludes us. Further studies are warranted to delve into and illuminate this aspect.

Chapter 5. Experimental design for Experiment 3 & 4: Perception of Subject Marking

5.1 Introduction

Whereas the preceding chapters focused on direct object marking through accusative case-markers *-(l)ul*, prosody, or null markers, the current chapter and the ones that follow delve into the examination of subject marking. In the Korean language, subjects may be indicated by the nominative markers *-i/ka* or topic markers *-(n)un*. It is noteworthy that subjects have the flexibility to either omit markers entirely or to be marked by other elements, such as the additive marker *-to*, similar to objects; however, this specific aspect is not within the scope of this study.

The discussion in this chapter centers on the categorization of subjects, specifically marking them with topic markers *-(n)un* or nominative markers *-i/ka* based on their function. Notably, this study focuses on four subject types: Anaphoric topic, Contrastive topic, Generic topic, and Broad focus. These selections are particular
ly pertinent to information structure[14].
Table 5.1 summarizes the types of subject marking used in Experiments 3 and 4.

Table 5.1 Summary of subject marking[15]

	Topic (Subject)	Contrast (Subject)	Example
Anaphoric topic	Yes	No	A: What did Elephant hold? B: Elephant held a ball.
Contrastive topic	Yes	Yes	A: What are Elephant and Bear doing? B: Elephant is throwing a banana and Bear is throwing a hat.
Generic topic	Yes	No	A: Can you tell me about an elephant? B: An elephant has a long nose.
Broad focus	No [Focus]	No	A: What's happening? B: [Cat hugged Zebra].

[14] Information structure refers to the way information is organized and highlighted in communication to convey its importance or relevance. It involves how speakers structure their sentences to emphasize certain elements, such as the topic or focus of a message (Lambrecht, K., 1994).

[15] In this dissertation, topic features are defined as follows (see Chapter 1):
Anaphoric topic: [+Topic, +Anaphoric, -Contrastive, -Generic]
Contrastive topic: [+Topic, +Contrastive, -Generic]
Generic topic: [+Topic, -Contrastive, +Generic]

5.2 Experimental Designs

5.2.1 The forced-choice task

Schütze and Sprouse (2014) have shown that a forced-choice task is more effective in discerning differences between levels compared to other judgment tasks such as a Likert scale or Magnitude estimation, particularly for effects of small to medium magnitude. For that reason, I adopted a similar task in which participants were asked to choose the dialogue that sounded more natural. To accommodate child participants, stimuli were presented visually through images, as illustrated in Figure 5.1.

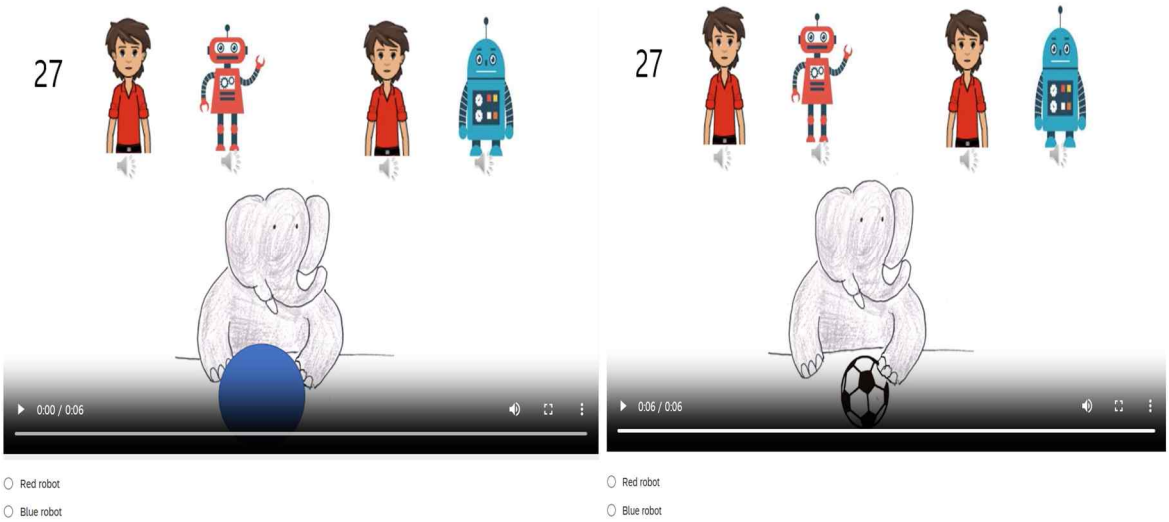


Figure 5.1 Example of an item with obscured information and without obscured information

As depicted in Figure 5.1, two pairs consisting of a man and a robot were positioned above the image. The man remained constant in both pairs. In the initial pair, the robot was consistently red, while in the second pair, it was consistently blue. Below the images, target pictures were displayed, containing a concealed object relevant to the experiment's design. A play button was situated at the bottom of the screen. Participants initiated the playback by clicking the button when they were prepared.

Initially, the man articulated a statement eliciting a response, which could involve either a correction or additional information. Subsequently, the concealed object was unveiled (refer to Figure 5.1), and the first robot replied, addressing the speaker. The man then reiterated his initial statement, prompting the second robot to provide a response. The responses of the two robots relied solely on the use of prosodic cues or case marking on the direct objects. Following the presentation of both dialogues, participants were tasked with

choosing the more natural response by clicking on either the red or blue robot depicted at the bottom of the image. The sequence of responses is counterbalanced.

An illustrative sequence unfolds as follows:

1. The First Man utters: ‘What did Elephant hold?’
2. The concealed object is revealed, showing that the object that Elephant held is a ball.
3. The first (Red) robot responds: ‘Elephant held a ball.’ (Elephant with a case-marker).'
4. In the second panel, the man then asks ‘What did Elephant touch?’
5. The second (Blue) robot responds: ‘Elephant held a ball.’ (Elephant with a topic-marker).’

5.2.2 Materials and Design

The only distinction between Experiment 3 and Experiment 4 lies in the number of items. In Experiment 3, tailored for adults, a total of three practice items, 72 fillers, and 36 critical items were generated. These included 10 items for each of the three conditions: Generic topic, Anaphoric topic, and Contrastive topic, along with 6 items for the Broad focus condition. Of the 72 fillers, 54 are critical items for Experiment 1, while the remaining 18 are purely fillers. These 18 fillers were included to assess participant engagement; however, no data was excluded as all participants performed well. Refer to Appendix C (Critical items for Experiments 1 and 2, fillers for Experiments 3 and 4) and Appendix E (Pure fillers).

In Experiment 4, designed for children, three practice items, 40 fillers, and 20 critical items were prepared. This comprised 6 items for each of the three conditions: Generic topic, Anaphoric topic, and Contrastive topic, and 2 items for the Broad focus condition. Of the 40 fillers, 36 are critical items for Experiment 2, while the remaining 4 are purely fillers. These 4 fillers were included to assess participant engagement along with three practice items. Data from two six-year-old participants were excluded, as they provided more than three incorrect answers.

The experimental dialogues encompassed four conditions: Anaphoric topic, Contrastive topic, Generic topic, and Broad focus condition, as illustrated below. Unlike the preceding experiments (1 and 2), where the focus was on objects, Experiment 3 and 4 consistently centered around the subject, each with its distinctive morphological marker. The following are examples of the conditions:

A. Anaphoric Condition: Topic marker (anaphoric) vs. Case marker

A: 'What did Elephant hold?'

B: khokkili-nun/-ka kong capasse.
Elephant-TOP/-NOM ball held
'Elephant held a ball.'

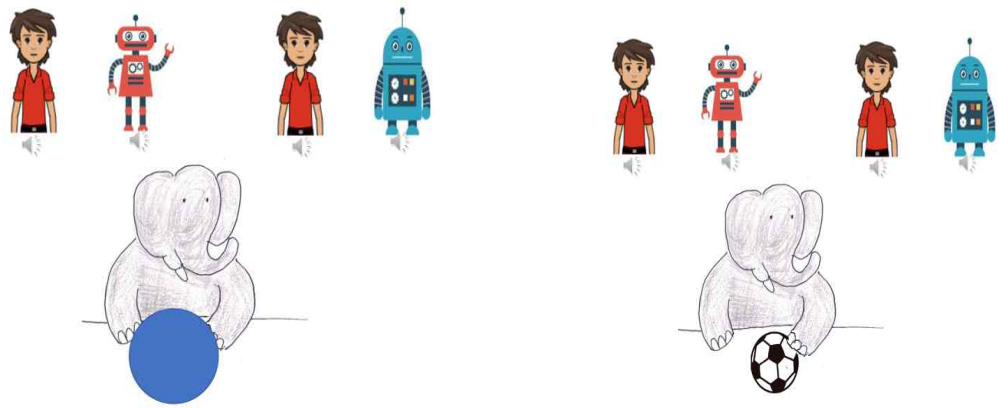


Figure 5.2 Sample context and target picture in the Anaphoric topic condition

B. Contrastive topic condition

A: 'What are Elephant and Bear doing?'

B: khokkili-nun/-ka panana tenci-ko komtoli-nun/-ka moca tencye.
Elephant-TOP/-NOM banana throw-and Bear-TOP/-NOM hat throw
'Elephant is throwing a banana and Bear is throwing a hat.'

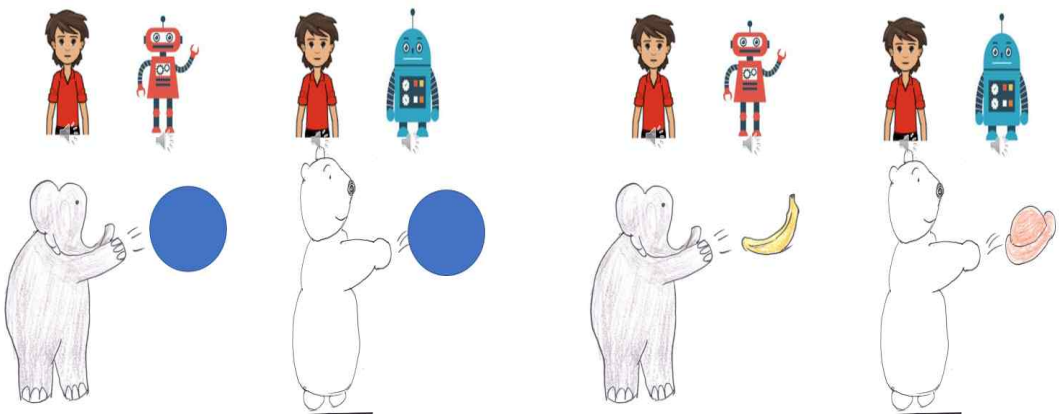


Figure 5.3 Sample context and target picture in the Contrastive topic condition

In the scenarios involving Anaphoric topic, Contrastive topic, and Generic topic, the subjects exhibit a topical role. In the Anaphoric topic condition, exemplified in A and Figure 5.2, the man poses a question such as 'What did Elephant touch?'. Consequently, ‘Elephant’, the subject in the robots' responses, takes on the role of the topic.

In the Contrastive topic condition, depicted in B and Figure 5.3, the man poses a similar question like 'What are Elephant and Bear doing?'. Figure 5.3 illustrates two characters performing the same action, such as throwing, with concealed objects. Upon revealing the obscured parts, it becomes evident that the two objects are different, for example, 'a banana' and 'a hat', introducing a contrast.

In the Generic topic condition, illustrated in C and Figure 5.4, the image features animals or objects with a red circle highlighting their generic characteristics, like 'Elephants' long nose'. The focus here is solely on the subject. The man poses a generic question about the animals or objects, such as 'Can you tell me about the elephant?'. Notably, in this condition, there are no concealed parts in the pictures.

For these three conditions, given that the subjects in the man's utterance are already mentioned, they naturally assume the role of topics in the robots' responses.

C. Generic condition

A: Can you tell me about the elephant?

B: khokkili-nun/-ka kho-ka kile.
elephant-TOP/-NOM nose-NOM long.
‘The elephant has a long nose.’

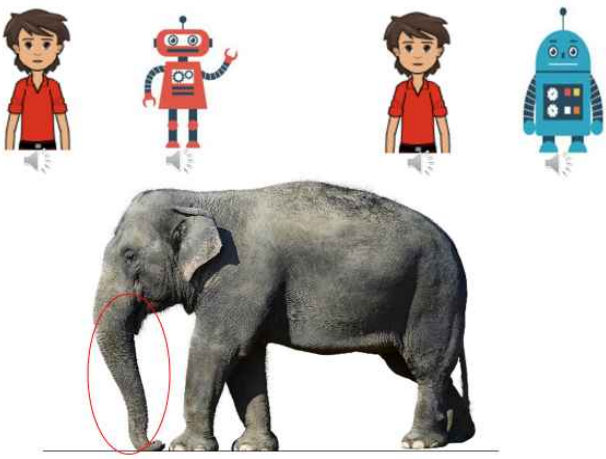


Figure 5.4 Sample context and target picture in the Generic topic condition

Conversely, in D and Figure 5.5, within the Broad focus condition, the man refrains from mentioning any specific character, posing a broad question such as 'What's happening?'. Furthermore, the entire picture remains concealed, revealing nothing until prompted by the man's inquiry. Once the man's utterance concludes, the picture unveils scenes such as a cat hugging a zebra. In this particular scenario, the subjects in the robots' response assume the role of new information, serving as the focus rather than the topic.

D. Broad focus condition

A:	What's happening?		
B:	[koyangi-ka/nun	ellwukmal	anasse].
	cat-TOP/-NOM	zebra	hugged
	'Cat hugged Zebra.'		

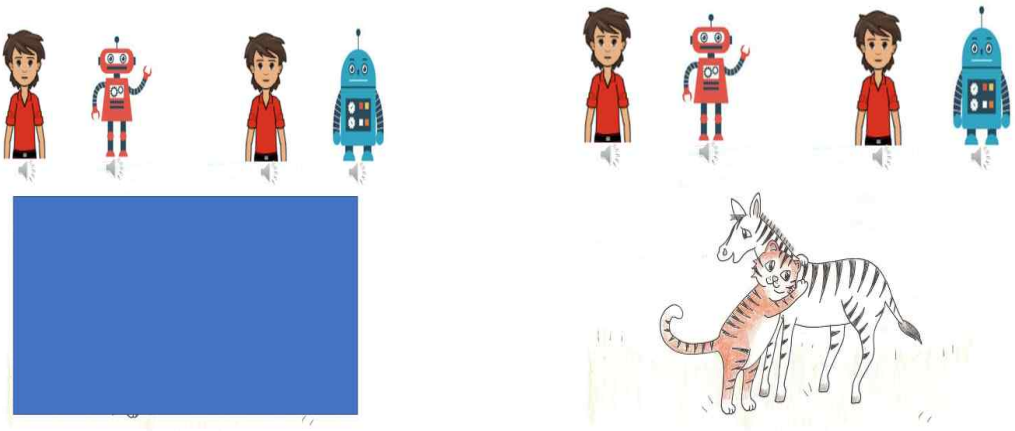


Figure 5.5 Sample context and target picture in the Broad focus condition

In each condition, the contextual type is determined by the introductory statements made by the man, as illustrated in the preceding four examples. Participants were tasked with selecting between two types of responses—nominative case-marker *-i/ka* or topic markers *-(n)un*—during the experiment. Thus, across all conditions, participants had to choose between a response in which the subject is marked by Case or a response with Topic. The examples are provided below. The sequencing of the robots' responses was controlled, introducing variations such as Case vs. Topic and Topic vs. Case.

a. Case :	khokkili-ka	kong	capasse.
b. Topic:	khokkili-nun	kong	capasse.
	Elephant-TOP/-NOM	ball	held
	‘Elephant held a ball.’		

Table 5.2 Summary of conditions

	Types of Subjects	Responses
1	Anaphoric topic	Topic *-(n)un* vs. Case *-i/ka*
2	Contrastive topic	Topic *-(n)un* vs. Case *-i/ka*
3	Generic topic	Topic *-(n)un* vs. Case *-i/ka*
4	Broad focus	Topic *-(n)un* vs. Case *-i/ka*

5.2.3 Procedure

All sound stimuli were recorded in a sound-attenuated chamber at 24-bit, 44.1kHz, in mono. A male speaker presented the focus contexts, while a female speaker provided the answers. Both speakers used the Seoul dialect.

Participants were instructed to make linguistic judgments based on the recorded dialogues while referencing accompanying pictures. The task employed a forced-choice format, requiring participants to select the dialogue that sounded more natural.

The task was administered online, and participants were instructed to be in a quiet environment using a computer. They were directed to choose a red robot if the first dialogue sounded more natural, or a blue robot if the second dialogue was deemed more natural, after listening to the entire conversation. It was emphasized that the difference might pertain solely to prosody, such as accent, pitch, rhythm, or involve just one syllable. If they did not perceive any difference, they were asked to choose freely with minimal hesitation. Additionally, participants were advised that their answers could vary from item to item, and they were encouraged to choose intuitively and comfortably without prolonged deliberation. When they did not understand well, they could request to have the test item repeated. These instructions are intended for adults only. For children, a parent or guardian should read and explain the instructions. The parent or guardian is asked to click the answer when children choose a robot. Qualtrics was employed for item presentation, and the item order was pseudo-randomized. The experiment lasted approximately half an hour for adults and twenty minutes for children.

Chapter 6. Experiment 3: Perception of Subject Marking in Korean by Adults

6.1 Introduction

This chapter presents the findings of an experiment on subject marking conducted with adult participants. The primary goal is to investigate the perception of subject marking among adults.

While numerous previous studies have examined topic markers or nominative case markers, many of them rely on intuitive examples or corpus data. Experimental studies, when conducted, often involve bilinguals or language learners. Moreover, none of the existing studies have focused specifically on perception (Choi, 1999; Choi, 2019; Kim et al., 2017; Laleko and Polinsky, 2016).

Previous research has generally assumed a categorical distribution of topic markers and nominative case markers. This assumption suggests that subjects with anaphoric, generic, or contrastive topics will consistently be marked with topic markers, while subjects with broad focus will be marked with nominative markers. Consequently, if subjects with anaphoric, generic, or contrastive topics are marked with a nominative marker, Korean native speakers might deem the sentence ungrammatical. Based on this background, the following predictions can be made:

Prediction 1: Korean native speakers will prefer subjects marked by the topic marker *-(n)un* for Anaphoric, Generic, or Contrastive topics over nominative case markers *-i/ka* when listening to conversations.

Anaphoric Topic: Topic > Case

Generic Topic: Topic > Case

Contrastive Topic: Topic > Case

Prediction 2: No significant differences are predicted among the three types of topics (anaphoric, generic, or contrastive) in terms of their selection of topic markers.

Anaphoric topic = Contrastive topic = Generic topic

Prediction 3: Korean native speakers will favor subjects marked by the nominative marker *–i/ka* for Broad focus over topic markers when listening to conversations.

Broad focus: Topic < Case

In contrast to the results of focus marker experiments in previous chapters that demonstrated a gradual and preferable distribution, the outcomes of this chapter are expected

to show an almost categorical distribution, with participants choosing each marker nearly 100% of the time, except for occasional errors.

6.2 Participants

Twenty-eight native adult speakers of Korean participated in the study (twenty-two females and six males, average age: thirty-four years). They were recruited from an online platform affiliated with Seoul National University and received approximately $5 for their participation.

Table 6.1 Summary of conditions

	Types of Subjects	Responses
1	Anaphoric topic	Topic *-(n)un* vs. Case *-i/ka*
2	Contrastive topic	Topic *-(n)un* vs. Case *-i/ka*
3	Generic topic	Topic *-(n)un* vs. Case *-i/ka*
4	Broad focus	Topic *-(n)un* vs. Case *-i/ka*

6.3 Results

To investigate the selection of topic markers or case-markers for each subject type among Korean adult participants, several statistical tests were conducted.

6.3.1 Group results

6.3.1.1 Anaphoric topic

The anticipated outcome was a preference for topic markers in the case of Anaphoric topics. However, based on the data presented in Figure 6.1 and Table 6.2, the observed p-values exceeded the significance level of 0.05 ($X^2 = 0.12857$, df = 1, p = 0.7189). Therefore, there is no significant preference observed among speakers for topic markers in the context of Anaphoric topics.

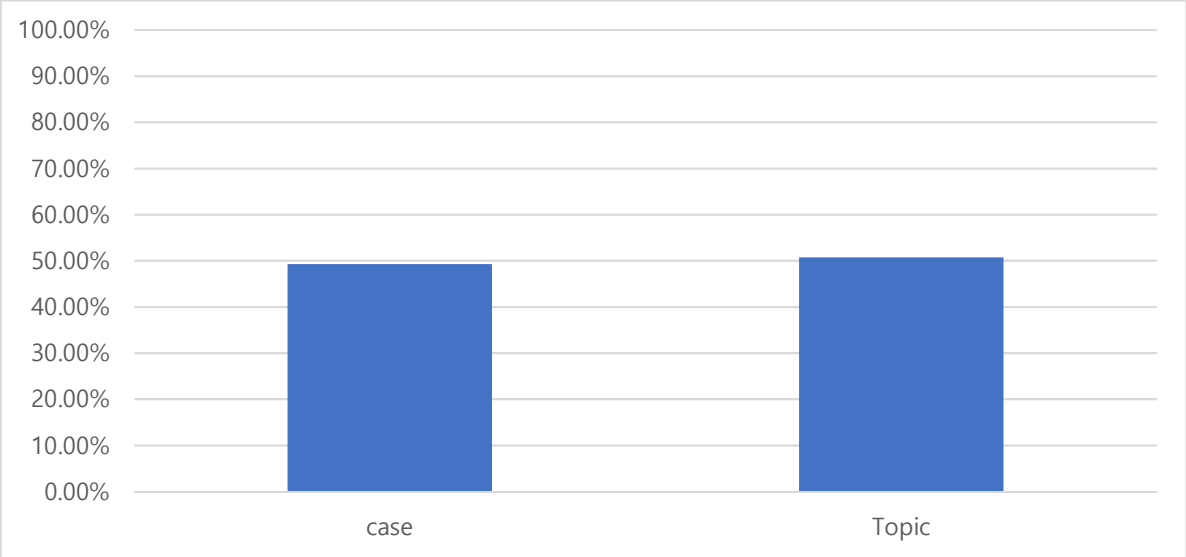


Figure 6.1 Distribution of Topic/Case for Anaphoric topic

Table 6.2 Frequency for markers (Anaphoric topic)

Marker	Frequency	Percentage
Case	137	48.93%
Topic	143	51.07%
Total	280	100.00%

a,b,c	Types of Subjects	Responses	Subject context
1	Anaphoric topic	Cat *-(n)un* vs. Cat *-i/ka*	Man: What did Cat hold? Robot: Cat held a ball.

Korean adult speakers exhibited a near-equivalent preference for answers with topic markers compared to those with case markers in the Anaphoric topic condition. They selected topic-marked responses approximately 51% of the time, with case-marked responses chosen around 49%, as depicted in Figure 6.1.

Anaphoric topic: Topic (51%) ≈ Case (49%)

Despite the anticipation that adults would prefer topic markers over case markers in the Anaphoric topic, the results diverged from expectations. Korean adults appeared impartial between a topic marker and a case marker, deeming both grammatical or natural for the Anaphoric topic, at least within the constraints of this experiment. Further analysis was conducted in the next section to delve into the reasons behind the unexpected results for Anaphoric topics.

6.3.1.1.1 The two types of Anaphoric topic condition

The contexts in the Anaphoric topic consist of two types. The first type revolves around "what questions" and answers, as illustrated in the example of A. Following the man's inquiry

'What did Elephant hold?', a robot responds by providing information about what Elephant held.

A. Context 1: What

Man:	‘What did Elephant hold?’		
Robot:	khokkili-nun/-ka	kong	capasse.
	Elephant-TOP/-NOM	ball	held
	‘Elephant held a ball.’		

In contrast, the second type involves affirmative responses to yes-answer questions. As demonstrated in the example of B, after the man inquires 'Did Dog get a ball?', a robot answers in the affirmative without introducing corrected or additional information, responding simply with 'Yes, Dog got the ball.'

B. Context 2: Yes

Man: ‘Did Dog get a ball?’				
Robot:	ung,	kangaci-ka/nun	kong	tulesse.
	yes	dog-NOM/TOP	ball	got
	‘Yes, Dog got the ball.’			

Before the experiment, no distinction was anticipated between the two types of conversations because the subjects of the answers were always anaphoric. However, due to unexpected results in the Anaphoric topic, further analysis was conducted to explore the reasons behind these outcomes.

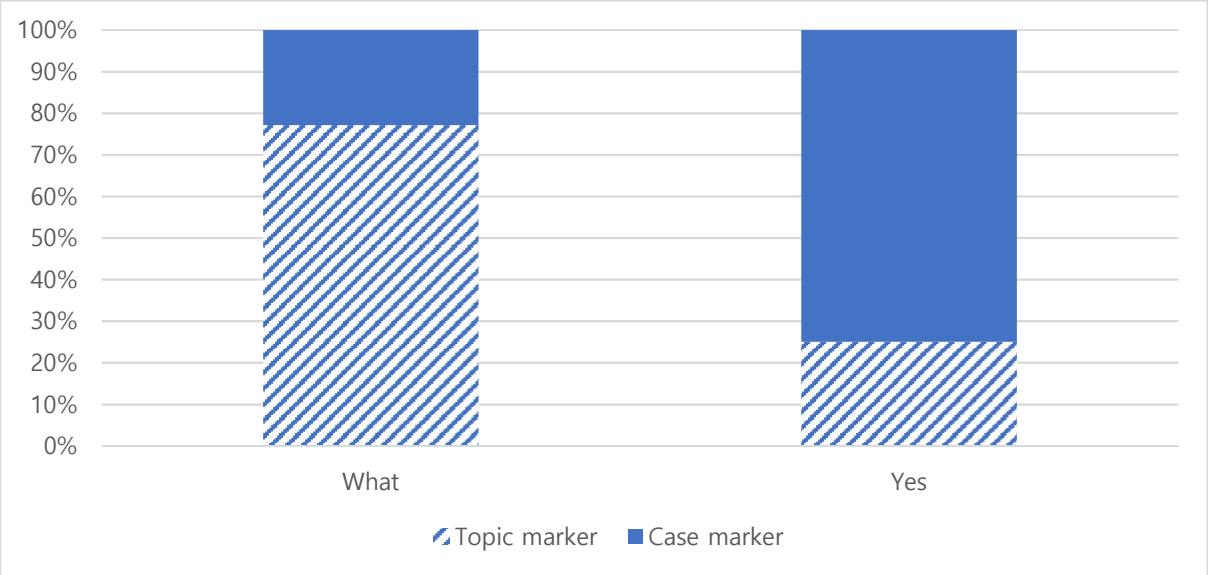


Figure 6.2 Distribution of topic markers and case-markers for Anaphoric topic

Table 6.3 Frequency of markers (Anaphoric topic, What/Yes)

	What		Yes	
Topic	108	77.14%	35	25.00%
Case	32	22.86%	105	75.00%

a,b,c	Anaphoric topic	Responses	Subject context
1	What	Cat *-(n)un* vs. Cat *-i/ka*	Man: What did Cat hold? Robot: Cat held a ball.
	Yes		Man: Did Cat hold a ball? Robot: Yes, Cat held the ball.

As depicted in Figure 6.2, speakers exhibited a higher frequency of choosing topic markers for the "What" type, whereas they demonstrated a higher frequency of selecting case markers for the "Yes" type.

What: Topic markers (77%) > Case markers (23%)

Yes: Topic markers (25%) < Case markers (75%)

An analysis of the selection between topic markers and nominative case-markers for Anaphoric topics unveiled a significant association with the type of answer (What vs. Yes). The Pearson's Chi-squared test indicated a highly significant association, with a test statistic of $\chi^2 = 76.16$, 1 degree of freedom, and a p-value of 0.001***.

To evaluate the preference for topic markers and case-markers for each type of contexts within the Anaphoric topic condition, chi-square tests of independence were conducted. The p-values for the Anaphoric topic, as presented in Table 6.4, fell below the significance level of 0.001 (What: $\chi^2 = 41.257$, df = 1, $p < 0.001$***; Yes: $\chi^2 = 35$, df = 1, $p < 0.001$***;). Consequently, they indicate a significant association between topic markers and

case-markers for the Anaphoric topic condition, implying a preference for topic markers in the "What" type and a preference for case-markers in the "Yes" type.

Table 6.4 The chi-square test results: Anaphoric topic

Context type	X-squared	df	P-value
What	41.257	1	$p < 0.001$***
Yes	35	1	$p < 0.001$***

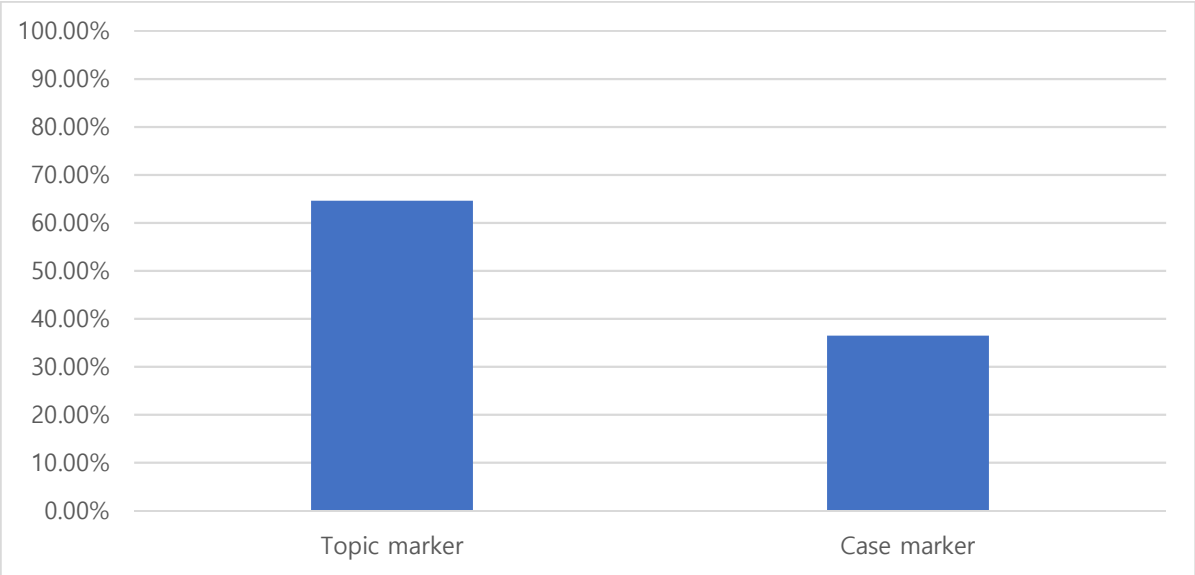


Figure 6.3 Distribution of Topic/Case for Anaphoric topic (What)

Hence, the results for "What" contexts aligned with expectations, whereas the outcomes for "Yes" contexts diverged from the predicted preference for topic markers in the context of Anaphoric topics.

Anaphoric topic (Only What): Topic (77%) > Case (23%)

6.3.1.2 Contrastive topic

The expected outcome was a preference for topic markers in the case of Contrastive topics. The results aligned with expectations, as depicted in Figure 6.4 and Table 6.5. A chi-square test of independence, conducted to evaluate the preference for topic markers and case-markers for the Contrastive topic type, confirmed this alignment. The obtained p-values were well below the significance level of 0.001 ($\chi^2 = 126.23$, $df = 1$, $p < 0.001$***). Therefore, a significant preference for topic markers in the context of Contrastive topics was observed among speakers.

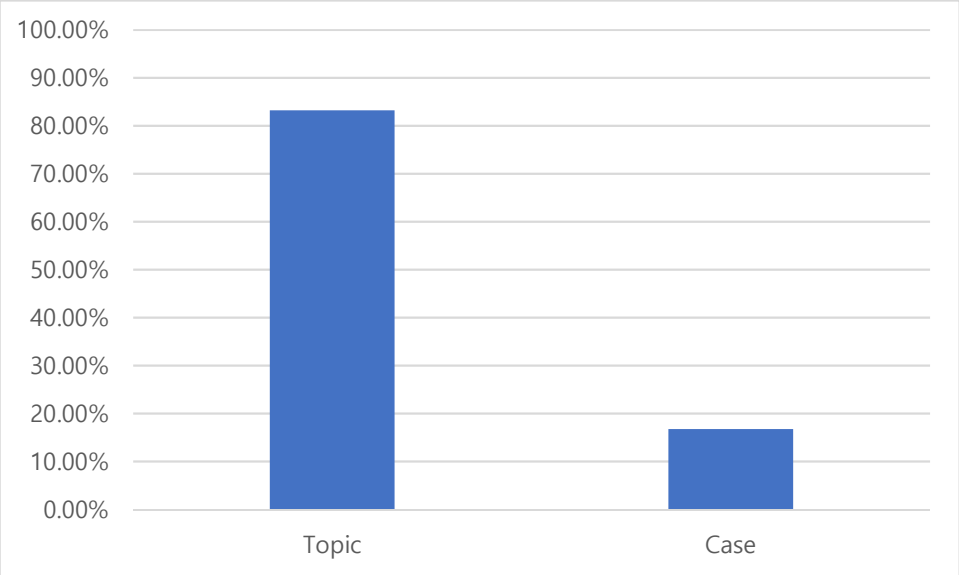


Figure 6.4 Distribution of Topic/Case for Contrastive topic

Table 6.5 Frequency of markers (Contrastive topic)

Marker	Frequency	Percentage
Case	46	16.43%
Topic	234	83.57%
Total	280	100.00%

a,b,c	Types of Subjects	Responses	Subject context
2	Contrastive topic	Cat/Bear *-(n)un* vs. Cat/Bear *-i/ka*	Man: What are Elephant and Bear doing? Robot: Cat is throwing a banana and Bear is throwing a hat.

Consistently, participants favored answers with topic markers over those with case markers in the Contrastive topic condition. Specifically, they selected topic-marked answers approximately 84% of the time, with case-marked answers chosen around 16%.

Contrastive topic: Topic (84%) > Case (16%)

Thus, the results align with the prediction for the Contrastive topic condition

6.3.1.3 Generic topic

The expected result was a preference for topic markers in the case of Generic topics. The results aligned with expectations, as depicted in Figure 6.5 and Table 6.6. A chi-square test of independence, conducted to evaluate the preference for topic markers and case-markers for the Generic topic type, confirmed this alignment. The obtained p-values were well below the significance level of 0.001 ($\chi^2 = 248.91$, df = 1, $p < 0.001$***). Therefore, a significant preference for topic markers in the context of Generic topics was observed among speakers.

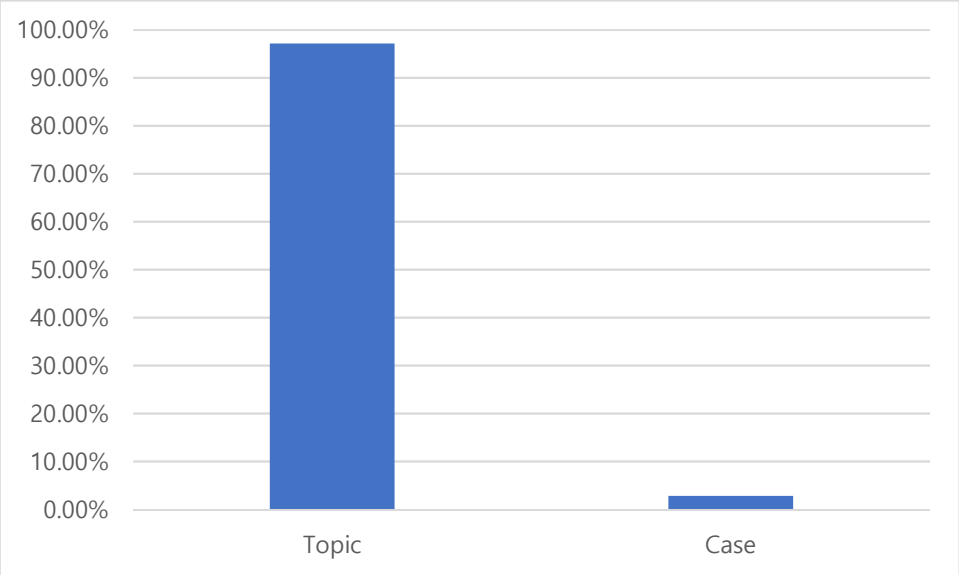


Figure 6.5 Distribution of Topic/Case for Generic topic

Table 6.6 Frequency of markers (Generic topic)

Marker	Frequency	Percentage
Case	8	2.86%
Topic	272	97.14%
Total	280	100.00%

a,b,c	Types of Subjects	Responses	Subject context
3	Generic topic	Cat *-(n)un* vs. Cat *-i/ka*	Man: Can you tell me about the cat? Robot: The cat has whiskers.

Consistently, participants favored answers with topic markers over those with case markers in the Generic topic condition. Specifically, they selected topic-marked answers approximately 97% of the time, with case-marked answers chosen around 3%.

Generic topic: Topic (97%) > Case (3%)

Thus, the results align with the prediction for the Generic topic condition.

6.3.1.4 Broad focus

The expected outcome was a preference for case markers in the case of Broad focus. The results aligned with expectations, as depicted in Figure 6.6 and Table 6.7. A chi-square test of independence, conducted to evaluate the preference for topic markers and case-markers for the Broad focus type, confirmed this alignment. The obtained p-values were well below the significance level of 0.001 ($\chi^2 = 116.67$, df = 1, $p < 0.001$***). Therefore, a significant preference for case markers in the context of Broad focus was observed among speakers.

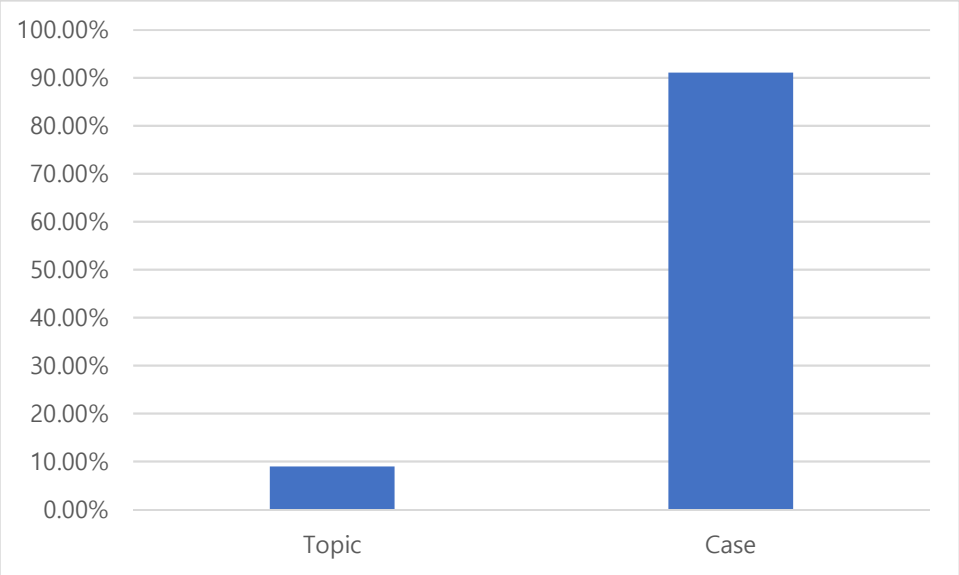


Figure 6.6 Distribution of Topic/Case for Broad focus

Table 6.7 Frequency of markers (Broad focus)

Marker	Frequency	Percentage
Case	154	91.67%
Topic	14	8.33%
Total	168	100.00%

a,b,c	Types of Subjects	Responses	Subject context
4	Broad focus	Cat *-(n)un* vs. Cat *-i/ka*	Man: What's happening? Robot: [Cat hugged Zebra].

Consistently, participants favored answers with case markers over those with topic markers in the Broad focus condition. Specifically, they selected case-marked answers approximately 92% of the time, with topic-marked answers chosen around 8%.

Broad focus: Topic (8%) < Case (92%)

Thus, the results align with the predictions for the Broad focus condition.

Table 6.8 The chi-square test results: Adults

Subject type	X-squared	df	P-value
Anaphoric topic (What)	41.257	1	$p < 0.001$***
Contrastive topic	126.23	1	$p < 0.001$***
Generic topic	248.91	1	$p < 0.001$***
Broad focus	116.67	1	$p < 0.001$***

6.3.1.5 The differences among the topic types

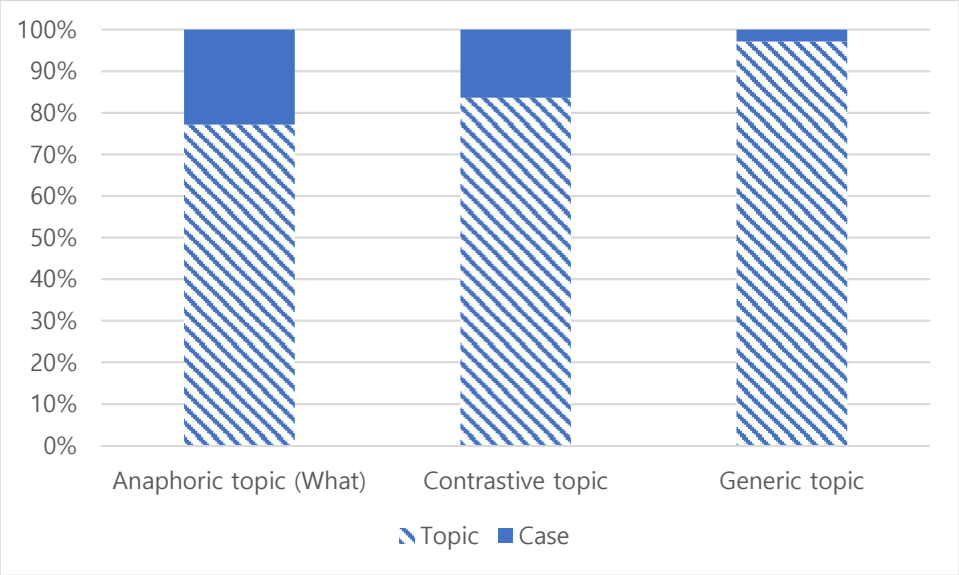


Figure 6.7 Distribution of topic markers and case-markers for topic types

Table 6.9 Frequency of topic markers (Case vs. Topic)

	Anaphoric (What)		Contrastive		Generic	
Case	32	22.86%	46	16.43%	8	2.86%
Topic	108	77.14%	234	83.57%	272	97.14%
Total	140	100.00%	280	100.00%	280	100.00%

a,b,c	Types of Subjects	Responses	Subject context
1	Anaphoric topic	Cat *-(n)un* vs. Cat *-i/ka*	Man: What did Cat hold? Robot: Cat held a ball.
2	Contrastive topic	Cat/Bear *-(n)un* vs. Cat/Bear *-i/ka*	Man: What are Elephant and Bear doing? Robot: Cat is throwing a banana and Bear is throwing a hat.
3	Generic topic	Cat *-(n)un* vs. Cat *-i/ka*	Man: Can you tell me about the cat? Robot: The cat has whiskers.

To examine the distinctions among the three types of topics, a mixed-effects modeling analysis was conducted using the R program (R Core Team, 2012). The dependent variables included the two types of markers in the response (Topic vs. Case). The independent variable, or fixed factor, was 'Topic Type' (Anaphoric topic vs. Contrastive topic vs. Generic topic), with the Anaphoric topic condition designated as the reference category. The model incorporated random factors for both participants and items. For the Anaphoric topic, only the "What" type was considered in this analysis.

Prediction 2 posited that no significant differences are anticipated among the three types of topics (Anaphoric topic, Contrastive topic, Generic topic) in terms of their selection of topic markers.

Anaphoric topic = Contrastive topic = Generic topic

To examine the results of the difference between the four types of subjects, refer to Figure 6.7 and Table 6.9. The assessment of Korean speakers' choice between topic markers and nominative case-markers revealed a significant influence from Topic types (Table 6.10). However, the results do not align with prediction 2. In contrast to the prediction, the three types exhibited significant differences, as depicted in Figure 6.7.

Topic: Anaphoric topic (77%) < Contrastive topic (84%) < Generic topic (97%)

Table 6.10 The mixed effect model results: The three types of Topic (Topic vs. Case), Adults

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-3.6506	0.3777	-9.665	p < 0.001***
Anaphoric topic	2.3622	0.4125	5.726	p < 0.001***
Contrastive topic	1.9351	0.3928	4.927	p < 0.001***

Nonetheless, the results provide support for Prediction 1, indicating that Korean native speakers prefer subjects marked by the topic marker *-(n)un* for Anaphoric, Generic, or Contrastive topics over nominative case markers *-i/ka* when listening to conversations. This finding held true for the three types of topics analyzed, specifically focusing on the "What" type for Anaphoric topics.

Additionally, Prediction 3, asserting that Korean native speakers will favor subjects marked by the nominative marker *-i/ka* for Broad focus over topic markers when listening to conversations, was confirmed.

The results for the three types of subjects among the four did not exhibit the predicted distribution. Instead of showing a categorical distribution, the preferences were observed to be gradual.

To summarize the results:

Anaphoric topic (What): Topic (77%) > Case (23%) Contrastive topic: Topic (84%) > Case (16%) Generic topic: Topic (97%) > Case (3%) Broad focus: Topic (9%) < Case (91%) Overall Topic Preference: Anaphoric topic (77%) < Contrastive topic (84%) < Generic topic (97%)

6.3.2 Summary of individual results

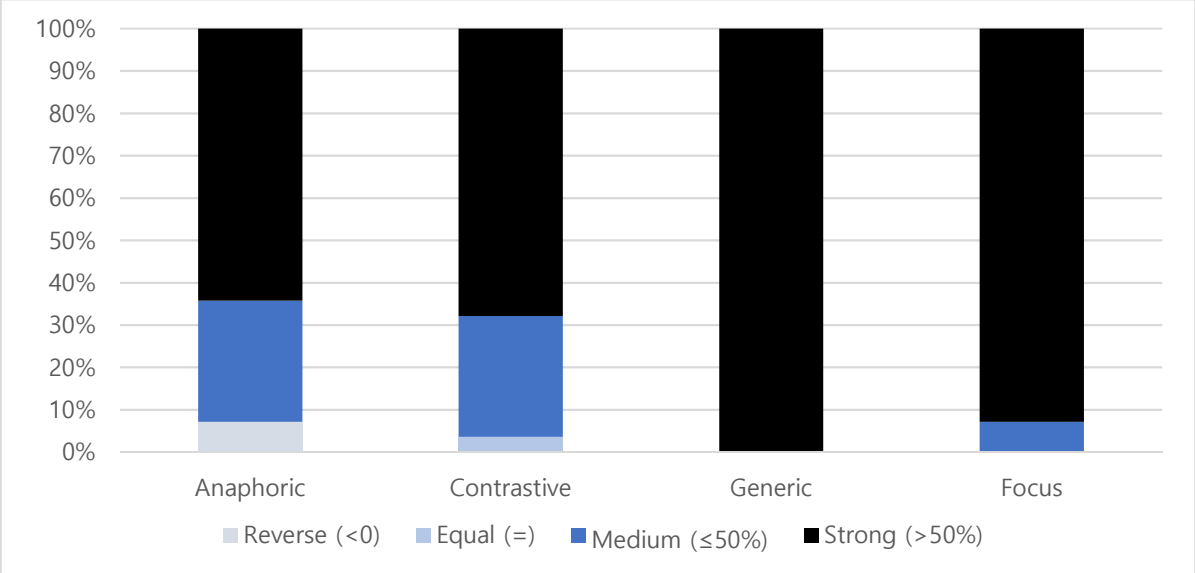


Figure 6.8 Distribution of participant preferences across subject conditions

Table 6.11 Summary of participant preferences across subject conditions

	Anaphoric	Contrastive	Generic	Broad Focus
Reverse (<0)	7.14%	0.00%	0.00%	0.00%
Equal (=)	0.00%	3.57%	0.00%	0.00%
Medium (≤50%)	28.57%	28.57%	0.00%	7.14%
Strong (>50%)	64.29%	67.86%	100.00%	92.86%
Total	100.00%	100.00%	100.00%	100.00%
Reverse + Equal	7.14%	3.57%	0.00%	0.00%

The individual results (See Appendix F for details.) are summarized in Figure 6.8 and Table 6.11 by categorizing participants based on their preferences:

- Reverse (<0): Percentage of participants who favored case markers (or topic markers in the Broad Focus condition).
- Equal (=): Percentage of participants who selected case markers and topic markers equally.
- Medium (≤50%): Percentage of participants who favored topic markers up to 50% more frequently (or case markers in the Broad Focus condition).
- Strong (>50%): Percentage of participants who favored topic markers more than 50% more frequently (or case markers in the Broad Focus condition).

4–7% of participants, equivalent to 1 or 2 individuals, showed a pattern inconsistent with the group results, choosing case markers more frequently than topic markers for Anaphoric and Contrastive topics. However, while 93–100% of participants exhibited Strong patterns in the Generic topic and Broad Focus conditions, about 30% showed a slight preference for topic markers in Anaphoric and Contrastive topics, indicating some individual variability. Nevertheless, this variability is smaller than the individual differences observed in subject marking compared to focus marking of objects in Experiment 1 (Chapter 3).

6.3.3 Item analysis

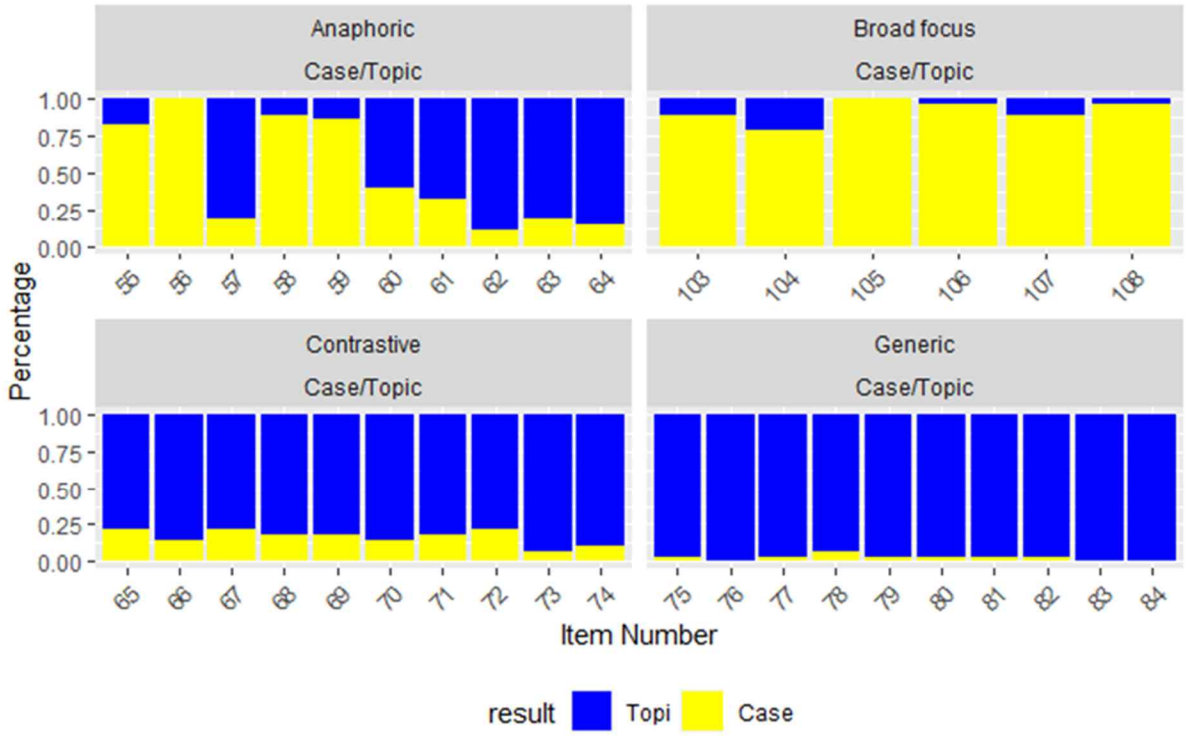


Figure 6.9 Item distribution of subject marking

Item variance was observed in item number 57. This item was included in the initial analysis but was later excluded, as it belonged to the "yes" type of Anaphoric topic, which was omitted from the final analysis. Consequently, it does not affect any results in the final or individual analyses of the Anaphoric topic type.

Items 60 and 61 showed relatively high frequencies of case marking, at 39% and 32%, respectively. This may have influenced the results, indicating a higher preference for case marking than in other conditions.

6.4 Discussion

The study investigated how Korean adults selected topic markers or case-markers for subjects based on the type of contexts. With the exception of the “Yes” type of Anaphoric topics, the results mostly aligned with the predictions, showing that Korean native speakers prefer subjects marked by the topic marker *-(n)un* for Anaphoric, Generic, or Contrastive topics over nominative case markers *-i/ka*. Additionally, they favored subjects marked by the nominative marker *-i/ka* for Broad focus over topic markers in perception.

However, unexpected results surfaced, even though all four contexts demonstrated the predicted preferences for topic markers for the three topic types and case-markers for Broad focus.

The first unexpected result pertains to the differences among the three types of topics. Contrary to the prediction that the three types of topics would exhibit a similar pattern, they showed different distributions. The preferences were observed to be gradual: Anaphoric topic (77%) < Contrastive topic (84%) < Generic topic (97%). This contrasts with previous studies that assumed a more categorical distribution. In real language environments, the distribution of topic markers and case markers seems to follow a gradient distribution.

Several factors may account for these differences. There were methodological limitations on Anaphoric topic in this experiment. Because of them, differences arose between Anaphoric topics and the other two topics (Contrastive and Generic). While subjects could be omitted in Anaphoric topics, sentences for Contrastive and Generic topics required explicit subjects. In this experiment, simplified stimuli for both adults and children led to overly simplistic Anaphoric sentences, potentially influencing the higher selection of case-markers, as subjects were considered redundant due to repetition.

Another plausible explanation for the higher frequency of case markers in Anaphoric topics compared to the other two types of topics lies in the two types of contexts within Anaphoric topics. The items for Anaphoric topics encompassed two different context types. When examining only the results of "What" contexts, speakers conformed to predictions, whereas those of "Yes" contexts did not. Anaphoric topics are defined as being "linked to prior discourse via a linguistic or contextual antecedent" (Laleko and Polinsky, 2016).

Therefore, even though both subjects of robots' responses from the two context types are previously mentioned in the discourse, they differ in some way. For instance, providing information when an interlocutor poses a question like 'What did Elephant hold?' requires more cognitive processing compared to answering an affirmative yes-question like 'Yes, Dog got the ball.' which is almost a repetition of the question 'Did Dog get a ball?'. Consequently, I posit that the divergent results between the two context types within Anaphoric topics stem from this difference in processing levels.

Examining the differences between Contrastive and Generic topics, the study found that speakers chose more case-markers for Contrastive topics than for Generic topics, consistent with previous findings on the contrast effect of case-markers (Chung, 2013; Lee, 2011). The contrastive nature of the stimuli likely contributed to a higher preference for case-markers in Contrastive topics compared to Generic topics.

In summary, the study's results showed both predicted preferences and unexpected variations, highlighting the complexity of subject marking choices in Korean discourse. Methodological considerations and contextual differences played crucial roles in shaping speakers' preferences across different types of topics. Further exploration is necessary to gain a more nuanced understanding of these language processing dynamics.

Chapter 7. Experiment 4: Perception of Subject Marking in Korean by Children

7.1 Introduction

This chapter presents the findings of an experiment on subject marking with child participants, identical to the one conducted with adults in the preceding chapter. The primary goal is to investigate the difference between children and adults in the perception of subject marking.

The adult results, recall, can be summarized as follows:

i. Korean native speakers prefer subjects marked by the topic marker *-(n)un* for Anaphoric ("What" type), Generic, or Contrastive topics over nominative case markers *-i/ka* when listening to conversations. This finding held true for the three types of topics analyzed, specifically focusing on the "What" type of Anaphoric topics.

ii. Additionally, Korean native speakers favor subjects marked by the nominative marker *-i/ka* for Broad focus over topic markers *-(n)un* when listening to conversations.

iii. The results for the three types of topics did not exhibit a categorical distribution, the preferences of topic markers were observed to be gradual.

To elaborate on the results:

Anaphoric topic (What): Topic (77%) > Case (23%)
Contrastive topic: Topic (84%) > Case (16%)
Generic topic: Topic (97%) > Case (3%)
Broad focus: Topic (9%) < Case (91%)
Overall Topic Preference: Anaphoric topic (77%) < Contrastive topic (84%) < Generic topic (97%)

While several previous studies have explored the acquisition of topic markers or nominative case markers in Korean, many of them heavily rely on corpus data. Due to the very early appearance and acquisition of these two markers (around 20 months), experimental studies are seldom conducted. When experimental studies are conducted, they often involve bilinguals or language learners. Moreover, none of the existing studies have specifically focused on perception with children (Choi, 1999; Choi, 2019; Kim et al., 2017; Laleko and Polinsky, 2016; Lee and Cho, 2009).

Previous research has generally assumed a very early acquisition of topic markers and nominative case markers. This assumption suggests that Korean children will acquire

markers for subjects with anaphoric, generic, or contrastive topics and Broad focus consistently from an early age.

Additionally, considering that focus marking involves both morphological and prosodic markers, while subject marking with topic markers or nominative markers relies solely on morphological markers, it is predicted that subject marking with topic markers or nominative markers is easier to acquire than object marking with focus markers.

If we hypothesize that the early appearance of these two markers reflects early acquisition or mastery, even six-year-olds should display the same patterns as adults. If not, their patterns will differ from those of adults.

Based on this hypothesis, the following predictions can be made:

Prediction 1: Korean six-year old children will prefer subjects marked by the topic marker *-(n)un* for Anaphoric (Only What), Generic, or Contrastive topics over nominative case markers *-i/ka* when listening to conversations.

Anaphoric Topic: Topic > Case

Generic Topic: Topic > Case

Contrastive Topic: Topic > Case

Prediction 2: Korean six-year old children will favor subjects marked by the nominative marker *–i/ka* for Broad focus over topic markers when listening to conversations.

Broad focus: Topic < Case

Prediction 3: No significant differences are predicted among Age 6, Age 10, and adults in terms of their selection of subject marking because children typically reach the mastery of subject marking before age 6.

7.2 The experiment

7.2.1 Participants

Two groups of children participated in the experiment:

- eighteen younger children (six to seven-year-olds, average age: 6;09, range: 6;01~7;01, gender: ten females and eight males)
- twenty older children (ten- to eleven-year-olds, average age: 10;06, range: 10;01~11;01, gender: eleven females and nine males).

The children were recruited from an online platform for mothers related to the local area affiliated with Seoul and Kyunggi province; they received approximately $10 for their

participation. Only participants that speak Seoul Korean as their native language were recruited.

7.2.2 Method

The same method employed in the experiment conducted with adults was employed for children.

7.3 Results

To ascertain how Korean children selected topic markers or nominative markers based on the type of subject, a series of statistical analyses were performed.

7.3.1 Anaphoric topic

7.3.1.1 Group results

To explore the choice between topic markers and case-markers for Anaphoric topics among Korean children, a series of statistical tests were conducted. Specifically, the "What" type of Anaphoric topic was considered for this analysis. For adults, a preference for topic markers was observed in the case of Anaphoric topics.

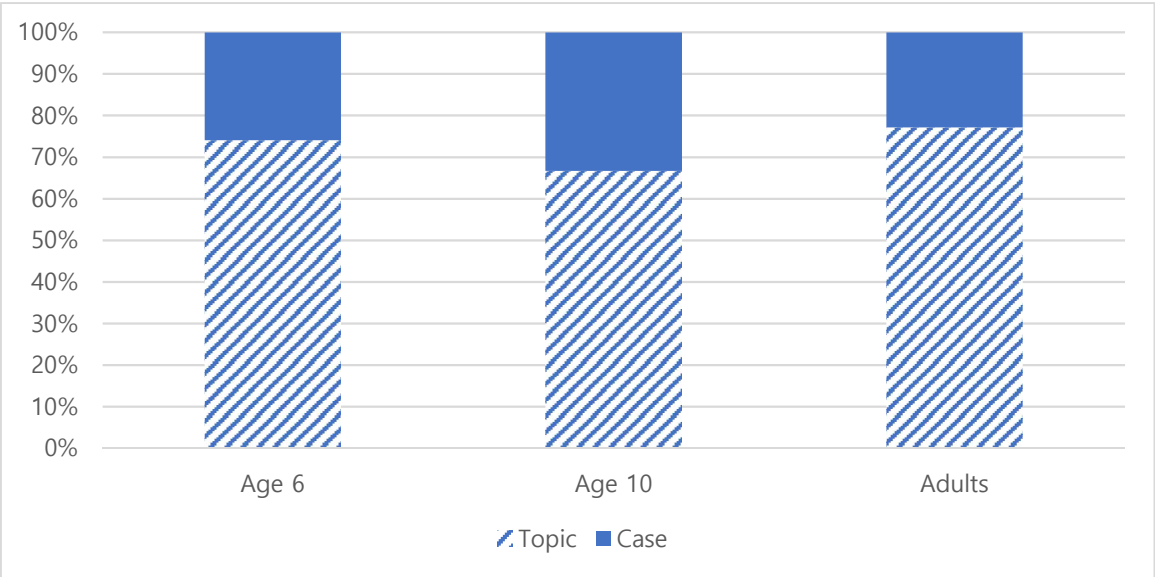


Figure 7.1 Distribution of topic markers and case-markers for Anaphoric topic

The anticipated result was a preference for topic markers for Anaphoric topics across both children groups. The obtained results were in line with expectations, as illustrated in Figure

7.1 and Table 7.1. To evaluate the preference for topic markers and case-markers for the Anaphoric topic type within each age group, chi-square tests of independence were utilized. The p-values for all three age groups, as outlined in Table 7.2, were below the significance level of 0.05. These findings indicate a significant association between topic markers and case-markers for the Anaphoric topic type across all participants, suggesting a universal preference for topic markers in the Anaphoric topic condition, specifically the "What" type. The expected outcome of a preference for topic markers for Anaphoric topics held true across both children groups.

Table 7.1 Frequency of subject marking (Case vs. Topic): Anaphoric topic

Age	Marker	Frequency	Percentage
Age 6	Case	14	25.93%
	Topic	40	74.07%
	Total	54	100.00%
Age 10	Case	20	33.33%
	Topic	40	66.67%
	Total	60	100.00%
Adults	Case	51	36.43%
	Topic	89	63.57%
	Total	140	100.00%

a,b,c	Types of Subjects	Responses	Subject context
1	Anaphoric topic	Cat *-(n)un* vs. Cat *-i/ka*	Man: What did Cat hold? Robot: Cat hold a ball.

Consistently, participants exhibited a preference for answers with topic markers over those with case markers in the Anaphoric topic condition (specifically the "What" type).

Anaphoric topic for Age 6: Topic (74%) > Case (26%)

Anaphoric topic for Age 10: Topic (67%) > Case (33%)

Anaphoric topic for Adults: Topic (77%) > Case (23%)

Table 7.2 The chi-square test results: Anaphoric topic

Anaphoric Topic	X-squared	df	P-value
Age 6	12.519	1	$p < 0.001$***
Age 10	6.6667	1	0.009823**
Adults	41.257	1	$p < 0.001$***

To analyze age differences, a statistical analysis was performed using mixed-effects modeling in the R program (R Core Team, 2012). The dependent variables were the two types of markers in the responses (Topic vs. Case). The main independent variable was 'Age' (Age 6

vs. Age 10 vs. Adults), with the Adult group serving as the reference category for 'Age'. The model incorporated random factors for both participants and items.

The examination of anaphoric topic markers did not reveal a significant 'Age' effect, as illustrated in Figure 7.1, depicting the pattern of markers functioning as an anaphoric topic marker (Table 7.3). No discernible differences were observed among the three age groups.

Topic markers for Anaphoric - Age 6 (74%): Age 10 (67%): Adults (77%)
Topic markers for Anaphoric - Age 6 = Age 10 = Adults

Table 7.3 The mixed effect model results: Age effect for Anaphoric topic

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	0.1034	0.6072	0.17	0.865
Age 6	0.1834	0.9935	0.185	0.854
Age 10	-0.386	0.9968	-0.387	0.699

The results aligned with both predictions: prediction 1, which anticipated a preference for topic markers for Anaphoric topics in six-year-old children, and prediction 3, which posited no differences among the three age groups.

7.3.1.2 Summary of individual results

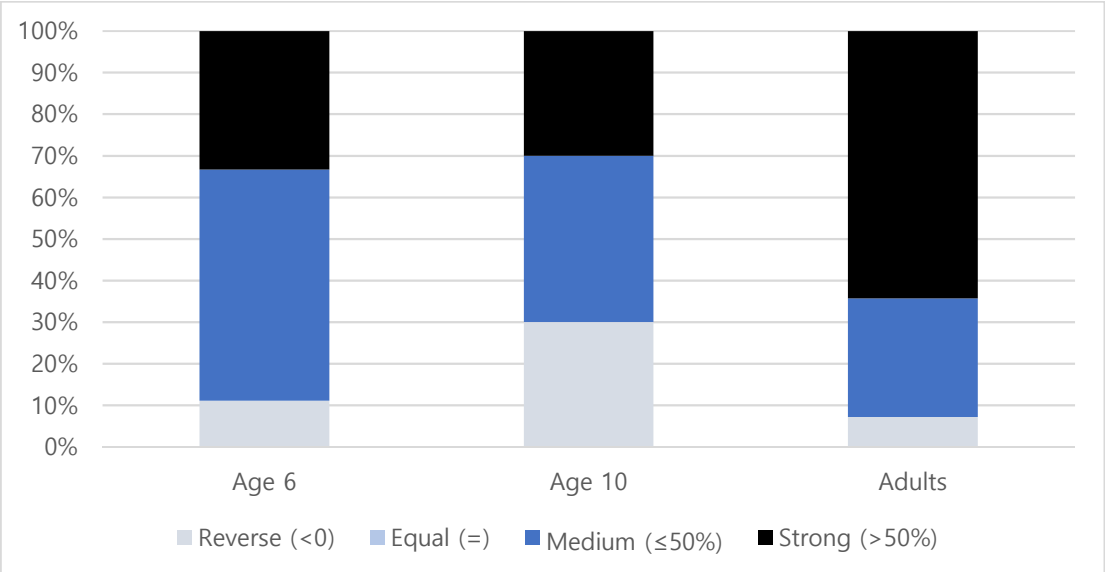


Figure 7.2 Distribution of participant preferences for Anaphoric topic across Age groups

The individual results are summarized in Figure 7.2 and Table 7.4 by categorizing participants based on their preferences:

- Reverse (<0): Percentage of participants who favored case markers (or topic markers in the Broad Focus condition).
- Equal (=): Percentage of participants who selected case markers and topic markers equally.
- Medium (≤50%): Percentage of participants who favored topic markers up to 50% more frequently (or case markers in the Broad Focus condition).
- Strong (>50%): Percentage of participants who favored topic markers more than 50% more frequently (or case markers in the Broad Focus condition).

Table 7.4 Summary of participant preferences for Anaphoric topic across Age groups

Anaphoric topic	Age 6	Age 10	Adults
Reverse (<0)	11.11%	30.00%	7.14%
Equal (=)	0.00%	0.00%	0.00%
Medium (≤50%)	55.56%	40.00%	28.57%
Strong (>50%)	33.33%	30.00%	64.29%
Total	100.00%	100.00%	100.00%
Reverse + Equal	11.11%	30.00%	7.14%

Although no difference was found between the ten-year-olds and adults in the group results for the Anaphoric topic, a difference emerges in the individual results. Thirty percent of ten-year-olds (6 individuals) chose nominative markers more frequently than topic markers, compared to only 7% of adults (2 individuals). This difference may be partly due to the small number of items—only three were used for the Anaphoric topic in the children's analysis, as 'Yes' responses were excluded. As a result, if a child selected two nominative markers and one topic marker, it would be classified as a reversed pattern.

7.3.2 Contrastive topic

7.3.2.1 Group results

To explore the choice between topic markers and case-markers for Contrastive topics among Korean children, a series of statistical tests were conducted. For adults, a preference for topic markers was observed in the case of Contrastive topics.

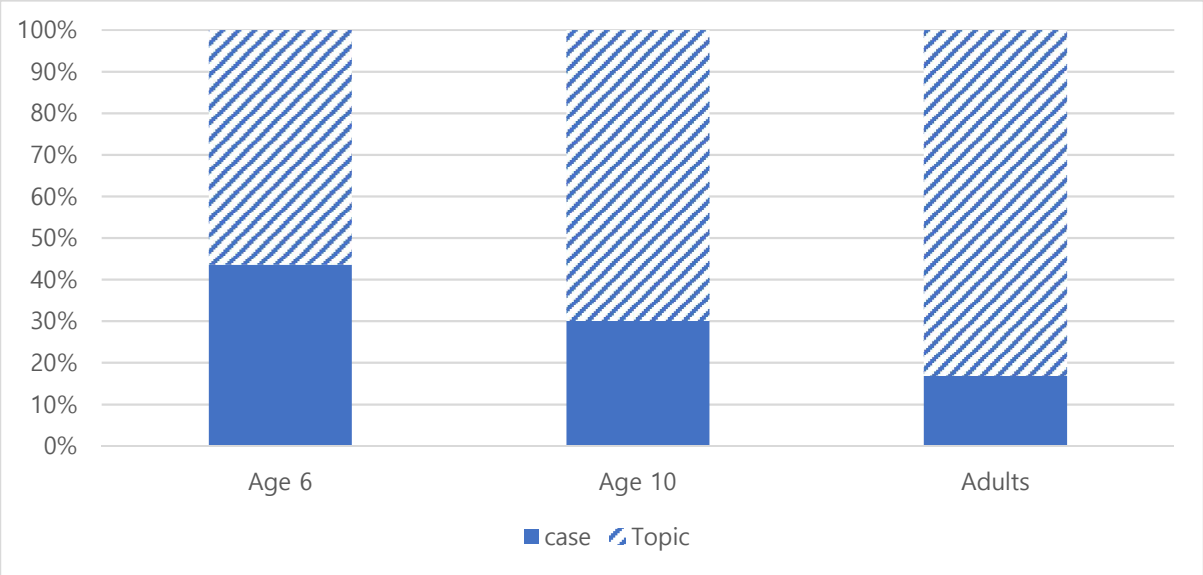


Figure 7.3 Distribution of topic markers and case-markers for Contrastive topic

The expected result was a preference for topic markers in the case of Contrastive topics for both children groups. The findings aligned with expectations for ten-year-olds but not for six-year-olds, as depicted in Figure 7.3 and Table 7.5. To assess the preference for topic markers and case-markers for the Contrastive topic type within each age group, a chi-square test of independence was conducted. The p-values for the Age 6 group, as seen in Table 7.6, exceeded the significance level of 0.05, while the p-values for Age 10 and Adults were below the significance level of 0.001. This suggests no significant association between topic markers and case-markers for the Contrastive topic type for six-year-olds, whereas adults and ten-year-olds showed a significant preference for topic markers in the Contrastive topic condition.

Table 7.5 Frequency of subject marking (Case vs. Topic): Contrastive topic

Age	Marker	Frequency	Percentage
Age 6	Case	47	44%
	Topic	61	56.48%
	Total	108	100.00%
Age 10	Case	36	30.00%
	Topic	84	70.00%
	Total	120	100.00%
Adults	Case	46	16.43%
	Topic	234	83.57%
	Total	280	100.00%

	Types of Subjects	Responses	Subject context
2	Contrastive topic	Cat/Bear *-(n)un* vs. Cat/Bear *-i/ka*	Man: What are Elephant and Bear doing? Robot: Cat is throwing a banana and Bear is throwing a hat.

The two groups, comprising ten-year-olds and adults, exhibited a preference for answers with topic markers over those with case markers in the Contrastive topic condition. Specifically, adults selected topic-marked answers approximately 84% of the time, while choosing case-marked answers around 16%. Ten-year-old children displayed a similar trend, favoring topic markers 70% of the time, though to a lesser extent compared to adults. Conversely, six-year-olds did not seem to have fully acquired the concept of the Contrastive topic, indicating a slight preference of only 56% for topic markers. This might suggest a somewhat random choice between the two markers at this age. It appears that six-year-olds may be delayed in developing a clear preference for topic markers in the context of the Contrastive topic.

Contrastive topic for Age 6: Topic (56%) ≈ Case (44%)
Contrastive topic for Age 10: Topic (70%) > Case (30%)
Contrastive topic for Adults: Topic (84%) > Case (16%)

Table 7.6 The chi-square test results: Contrastive topic

Contrastive Topic	X-squared	df	p value
Age 6	1.8148	1	0.1779
Age 10	19.2	1	$p < 0.001$***
Adults	123.56	1	$p < 0.001$***

To investigate the age differences for Contrastive topics among Korean participants, a statistical analysis was conducted using mixed-effects modeling in the R program (R Core Team, 2012). The dependent variables were the two types of markers in the responses (Topic vs. Case). The independent variable – the main effect – was 'Age' (Age 6 vs. Age 10 vs. Adults), with the Adult group serving as the reference category for 'Age'. The model incorporated random factors for both participants and items.

Topic markers for Contrastive topic – Age 6 (56%): Age 10 (70%): Adults (83%)
Contrastive Topic: Age 6 ≠ Adults; Age 10 ≠ Adults

The examination of contrastive topic markers revealed a significant 'Age' effect, as illustrated in Figure 7.3, depicting the pattern of markers functioning as a Contrastive topic marker. Discernible differences were observed among the three age groups (Table 7.7).

Table 7.7 The mixed effect model results: Age effect for Contrastive topic

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-1.7503	0.2165	-8.085	p < 0.001***
Age 6	1.4683	0.329	4.463	p < 0.001***
Age 10	0.8365	0.3251	2.573	0.0101*

The results did not align with either prediction 1, which anticipated a preference for topic markers for Contrastive topics in six-year-old children, or prediction 3, which posited no differences among the three age groups.

Six-year-olds do not appear to have acquired the concept of Contrastive topic yet. In contrast, ten-year-olds demonstrated a robust preference for topic markers in the Contrastive topic condition, similar to adults. This suggests that they have likely acquired an understanding of Contrastive topic marking. However, a statistical difference compared to adults emerged, with ten-year-olds choosing topic markers less frequently than adults in the context of Contrastive topics.

7.3.2.2 Summary of individual results

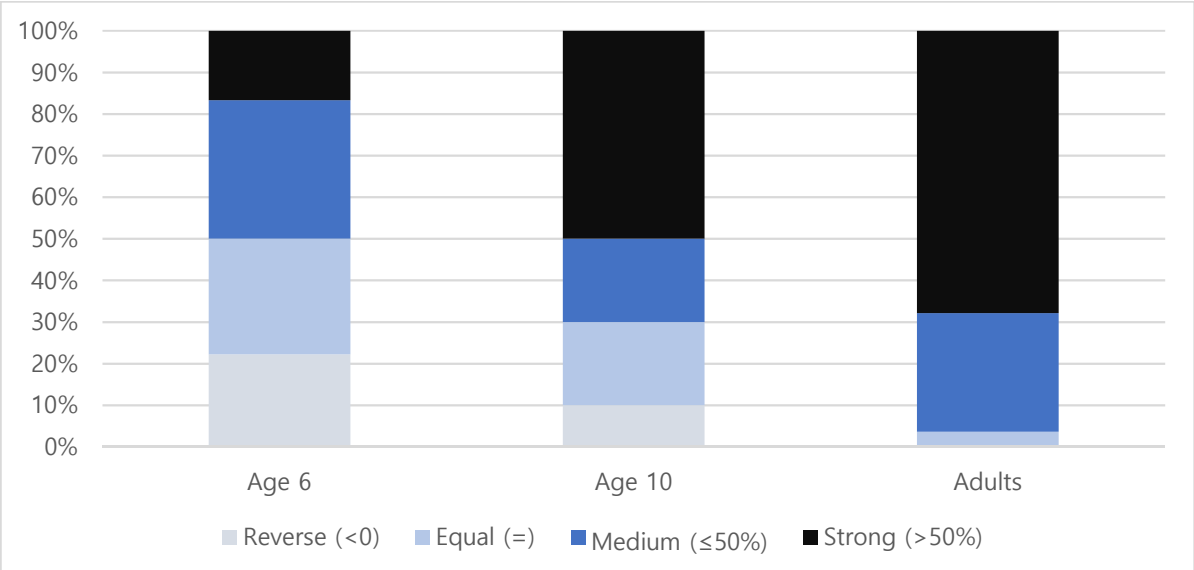


Figure 7.4 Distribution of participant preferences for Contrastive topic across Age groups

Table 7.8 Summary of participant preferences for Contrastive topic across Age groups

Contrastive topic	Age 6	Age 10	Adults
Reverse (<0)	22.22%	10.00%	0.00%
Equal (=)	27.78%	20.00%	3.57%
Medium (≤50%)	33.33%	20.00%	28.57%
Strong (>50%)	16.67%	50.00%	67.86%
Total	100.00%	100.00%	100.00%
Reverse + Equal	50.00%	30.00%	3.57%

For the Contrastive topic, significant differences were found between age groups in the group results, which are also reflected in the individual results (Figure 7.4 and Table 7.8). While only 4% of adult participants (1 individual) deviated from the group pattern, 30% of ten-year-olds (6 individuals) and 50% of six-year-olds (9 individuals) exhibited different patterns.

7.3.3 Generic topic

7.3.3.1 Group results

To explore the choice between topic markers and case-markers for Generic topics among Korean children, a series of statistical tests were conducted. For adults, a preference for topic markers was observed in the case of Generic topics.

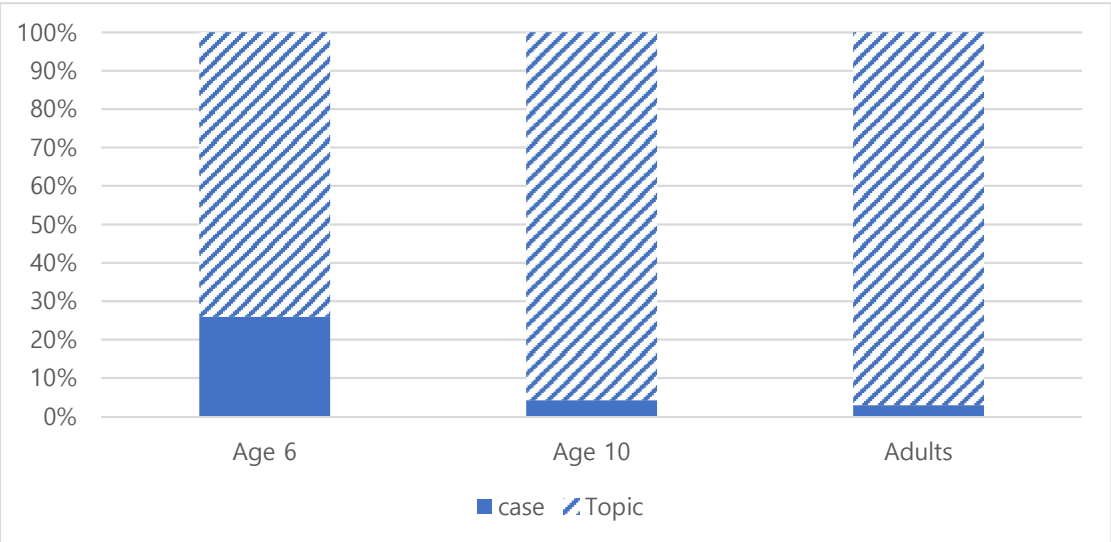


Figure 7.5 Distribution of topic markers and case-markers for Generic topic

The anticipated outcome was a preference for topic markers in the case of Generic topics for both children groups. The results were in line with expectations, as illustrated in Figure 7.5 and Table 7.9.

To assess the preference for topic markers and case-markers for the Generic topic type within each age group, chi-square tests of independence were conducted. The p-values for all three age groups, as seen in Table 7.10, were below the significance level of 0.001. Consequently, this indicates a significant association between topic markers and case-markers for the Generic topic type for all participants, suggesting a universal preference for topic markers in the Generic topic condition.

Table 7.9 Frequency of subject marking (Case vs. Topic): Generic topic

Age	Marker	Frequency	Percentage
Age 6	Case	28	25.93%
	Topic	80	74.07%
	Total	108	100.00%
Age 10	Case	5	4.17%
	Topic	115	95.83%
	Total	120	100.00%
Adults	Case	8	2.86%
	Topic	272	97.14%
	Total	280	100.00%

a,b,c	Types of Subjects	Responses	Subject context
3	Generic topic	Cat *-(n)un* vs. Cat *-i/ka*	Man: Can you tell me about the cat? Robot: <u>The cat</u> has whiskers.

Participants consistently favored answers with topic markers over those with case markers in the Generic topic condition. Specifically, adults chose topic-marked answers approximately 97% of the time, with case-marked answers chosen around 3%. Ten-year-old children exhibited the same pattern, showing a preference for topic markers (96% of the time). Even six-year-olds showed a similar preference for topic markers in the Generic topic condition (74% of the time), although their responses were not as high as that of the two older groups. Thus, we can suggest that ten-year-olds fully reached an adult-like level, whereas six-year-olds had establish a preference for topic marking for the Generic topic.

Generic topic for Age 6: Topic (74%) > Case (26%)

Generic topic for Age 10: Topic (96%) > Case (4%)

Generic topic for Adults: Topic (97%) > Case (3%)

Table 7.10 The chi-square test results: Generic topic

Generic Topic	X-squared	df	p value
Age 6	25.037	1	p < 0.001***
Age 10	100.83	1	p < 0.001***
Adults	248.91	1	p < 0.001***

To explore the age differences of topic markers or case-markers for Generic topics among Korean participants, we conducted a statistical analysis using mixed-effects modeling in the R program (R Core Team, 2012). The dependent variables were the two types of markers in the responses (Topic vs. Case). The independent variable, the main effect, was 'Age' (Age 6 vs. Age 10 vs. Adults), with the Adult group serving as the reference category for 'Age'. The model incorporated random factors for both participants and items.

The examination of Generic topic markers revealed a significant 'Age' effect only with Age 6. Discernible differences were observed in the group of Age 6 and the other two age groups. The detailed statistical results are presented in Tables 7.11.

Topic markers for Generic topic – Age 6 (74%): Age 10 (96%): Adults (97%)
Generic Topic: Age 6 ≠ Adults; Age 10 = Adults

Table 7.11 The mixed effect model results: Age effect for Generic topic

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-4.2357	0.6046	-7.006	p < 0.001***
Age 6	2.8096	0.6891	4.077	p < 0.001***
Age 10	0.3198	0.783	0.408	0.683

The results aligned with prediction 1, which anticipated a preference for topic markers for Generic topics in six-year-old children, but did not with prediction 3, which posited no differences among the three age groups.

Six-year-olds appeared to have acquired an awareness of how the Generic topic should be marked, although they chose the topic marking option less frequently than adults do. In contrast, ten-year-olds did not show any differences compared to adults for Generic topics.

7.3.3.2 Summary of individual results

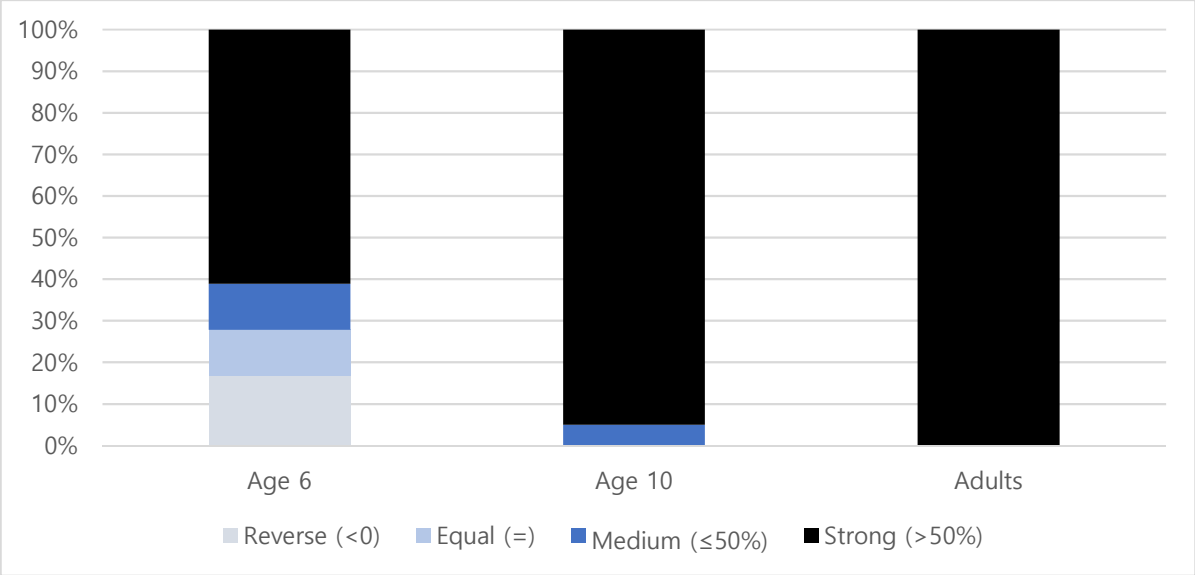


Figure 7.6 Distribution of participant preferences for Generic topic across Age groups

Table 7.12 Summary of participant preferences for Generic topic across Age groups

Generic topic	Age 6	Age 10	Adults
Reverse (<0)	16.67%	0.00%	0.00%
Equal (=)	11.11%	0.00%	0.00%
Medium (≤50%)	11.11%	5.00%	0.00%
Strong (>50%)	61.11%	95.00%	100.00%
Total	100.00%	100.00%	100.00%
Reverse + Equal	27.78%	0.00%	0.00%

For the Generic topic, significant differences were found only between six-year-olds and adults in the group results, which were also reflected in the individual results. While none of the adult or ten-year-old participants deviated from the group pattern, 28% of six-year-olds (5 individuals) exhibited different patterns.

7.3.4 Broad focus

7.3.4.1 Group results

To explore the choice between topic markers and case-markers for Broad focus among Korean children, a series of statistical tests were conducted. For adults, a preference for nominative markers was observed in the case of Broad focus.

The expected result was a preference for nominative markers in the case of Broad focus for both children groups. The findings aligned with expectations for ten-year-olds but not for six-year-olds, as depicted in Figure 7.7 and Table 7.13.

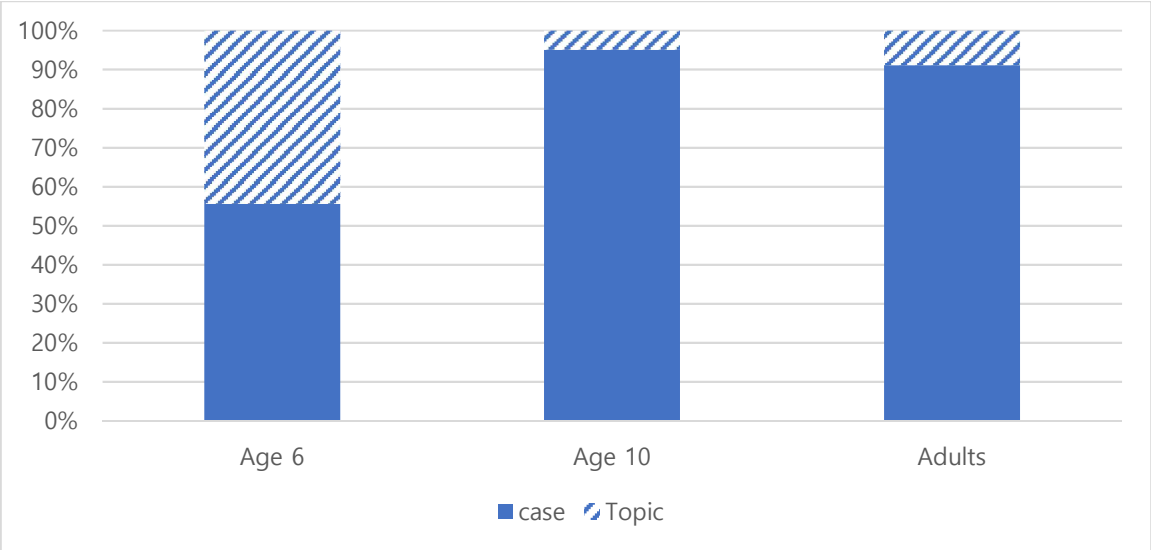


Figure 7.7 Distribution of topic markers and case-markers for Broad focus

To assess the preference for topic markers and case-markers for Broad focus within each age group, chi-square tests of independence were conducted. The p-values for the Age 6 group, as seen in Table 7.14, exceeded the significance level of 0.05, while the p-values for Age 10 and Adults were below the significance level of 0.001. This indicates no significant association between topic markers and case-markers in the interpretation of Broad focus for six-year-olds, whereas adults and ten-year-olds showed a preference for case-markers in the Broad focus condition.

Table 7.13 Frequency of subject marking (Case vs. Topic): Broad focus

Age	Marker	Frequency	Percentage
Young (Age 6)	Case	20	55.56%
	Topic	16	44.44%
	Total	36	100.00%
Young (Age 10)	Case	38	95%
	Topic	2	5.00%
	Total	40	100.00%
Adults	Case	153	91.07%
	Topic	15	8.93%
	Total	168	100.00%

a,b,c	Types of Subjects	Responses	Subject context
4	Broad focus	Cat *-(n)un* vs. Cat *-i/ka*	Man: What's happening? Robot: [Cat hugged Zebra].

Ten-year-olds favored answers with case-markers over those with topic markers in the Broad focus condition, similar to adults. Specifically, adults chose case-marked answers approximately 91% of the time, with topic-marked answers chosen around 9%. Ten-year-old children exhibited a similar pattern, showing a preference for case-markers (95% of the time), slightly more than adults (91% of the time). However, six-year-olds do not appear to have fully acquired the use of case-markers for information structure, as they showed a preference for case-markers only 56% of the time, suggesting that they may be in the delayed stages of developing this preference.

Broad focus for Age 6: Topic (44%) ≈ Case (56%)
Broad focus for Age 10: Topic (5%) < Case (95%)
Broad focus for Adults: Topic (9%) < Case (91%)

Table 7.14 The chi-square test results: Broad focus

Generic Topic	X-squared	df	p value
Age 6	0.4444	1	0.505
Age 10	32.4	1	p < 0.001***
Adults	113.36	1	p < 0.001***

To explore the age differences in the choice between topic markers or case-markers for Broad focus among Korean participants, we conducted a statistical analysis using mixed-effects modeling in the R program (R Core Team, 2012). The dependent variables were the two types of markers in the responses (Topic vs. Case). The independent variable, the main effect, was 'Age' (Age 6 vs. Age 10 vs. Adults), with the Adult group serving as the reference category for 'Age'. The model incorporated random factors for both participants and items.

Case markers for Broad focus – Age 6 (56%): Age 10 (95%): Adults (91%)
Broad focus: Age 6 ≠ Adults; Age 10 = Adults

The examination of the markers for Broad focus revealed a significant 'Age' effect only for the six-year-olds. The detailed statistical results are presented in Tables 7.15.

Table 7.15 The mixed effect model results: Age effect for Broad focus

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	2.4709	0.352	7.02	p < 0.001***
Age 6	-2.2412	0.5645	-3.97	p < 0.001***
Age 10	0.5257	0.8495	0.619	0.536

The results did not align with either prediction 2, which anticipated a preference for nominative case markers for Broad focus in six-year-old children, or prediction 3, which posited no differences among the three age groups.

Six-year-olds do not appear to have acquired the concept of the Broad focus. In contrast, ten-year-olds demonstrated a robust preference for nominative case as an indicator of Broad focus, similar in frequency to adults. This suggests that they have likely acquired an understanding of Broad focus.

7.3.4.2 Individual results

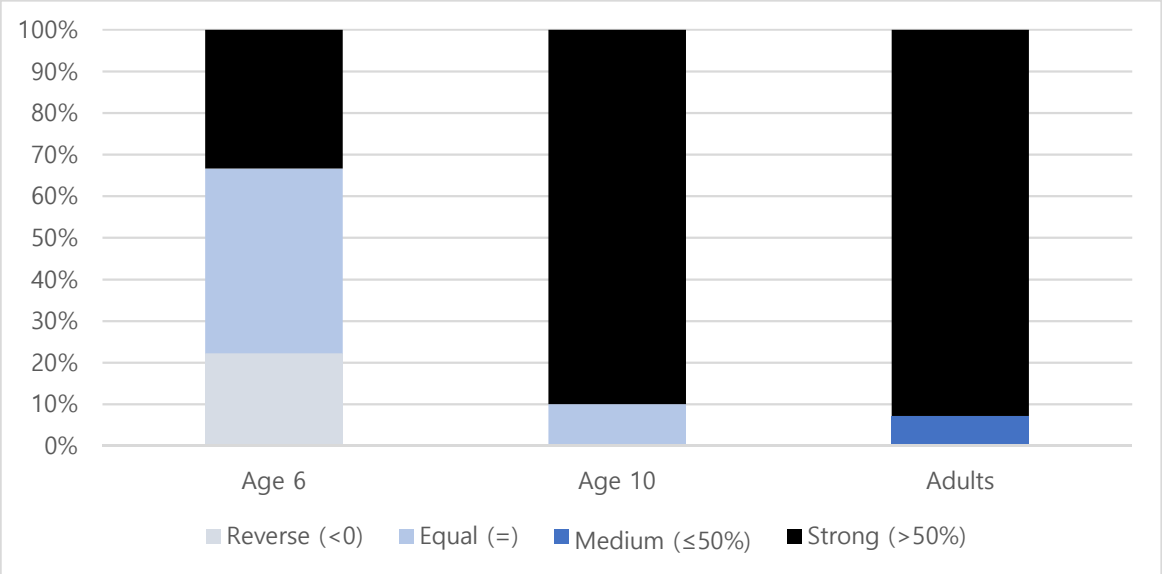


Figure 7.8 Distribution of participant preferences for Broad focus across Age groups

Table 7.16 Summary of participant preferences for Broad focus across Age groups

Broad focus	Age 6	Age 10	Adults
Reverse (<0)	22.22%	0.00%	0.00%
Equal (=)	44.44%	10.00%	0.00%
Medium (≤50%)	0.00%	0.00%	7.14%
Strong (>50%)	33.33%	90.00%	92.86%
Total	100.00%	100.00%	100.00%
Reverse + Equal	66.67%	10.00%	0.00%

The individual results are summarized in Figure 7.8 and Table 7.16 by categorizing participants based on their preferences:

For the Broad Focus condition, these patterns are reversed:

- Reverse (<0): Percentage of participants who chose topic markers more frequently.

- Equal (=): Percentage of participants who selected case markers and topic markers equally.
- Medium (≤50%): Percentage of participants who chose case markers up to 50% more frequently.
- Strong (>50%): Percentage of participants who chose case markers more than 50% more frequently.)

For the Broad Focus condition, significant differences were found only between six-year-olds and adults in the group results, as with the Generic topic. In the individual results, 67% of six-year-olds (12 individuals) exhibited different patterns, whereas no adult participants deviated from the group pattern. Additionally, only 10% of ten-year-olds (2 individuals) selected topic markers and nominative markers equally.

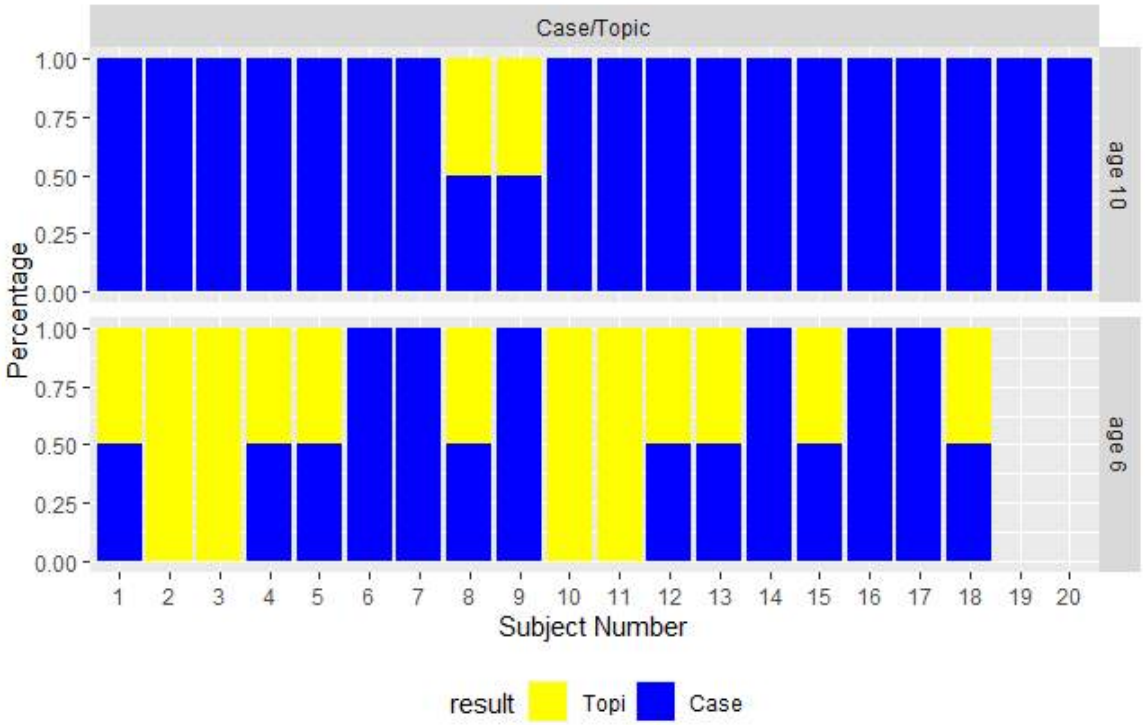


Figure 7.9 Individual results for Broad focus by Age 6 and Age 10 (Topic vs. Case)

Figure 7.9 illustrates the differences between the two child age groups. Given that there were only two items for Broad Focus per participant, this figure provides a clearer understanding of this condition. Among ten-year-olds, only two participants chose one topic marker out of the two items. In contrast, 33% of six-year-olds selected nominative markers for both items, showing a consistent pattern with adults and ten-year-olds.

7.4 Discussion

This study delved into the distinctions between Korean children and adults in their selection of topic markers or case-markers for subjects based on contextual cues during conversations. In previous research conducted by Lee and Cho (2009), it was observed that Korean children began accurately marking subjects with nominative markers for Broad focus or topic markers for Contrastive topics at around 20 months, during the early stages of language acquisition. Although the children infrequently used topic markers for anaphoric and generic topics, they argued that this does not necessarily indicate a lack of understanding of non-contrastive topics. Children displayed sensitivity to topicality, omitting nominals associated with old information before reaching 20 months of age. Consequently, it can be inferred that children grasp the concept of anaphoric topics prior to acquiring Contrastive topics and Broad focus.

Furthermore, it appears that marking subjects with topic markers or nominative case markers is a more straightforward task compared to marking objects with focus markers. This disparity arises because marking focus involves a more intricate combination of morphological and prosodic markers, whereas marking subjects with topic markers or nominative markers solely relies on morphology.

Thus, this study initially hypothesized that six-year-olds would exhibit mastery in their selection of topic and nominative markers, mirroring the preferences observed in adults. The expectation was that six-year-olds would show a consistent preference for topic markers in the case of three topics (Anaphoric, Contrastive, and Generic topics), and for nominative markers in the case of Broad focus, with no discernible age differences.

Contrary to these predictions, the study revealed variations in the behavior of six-year-olds compared to other age groups. Firstly, unlike other age groups, six-year-olds did not exhibit a preference for subjects marked by the topic marker *-(n)un* for Contrastive topics over nominative case markers *-i/ka*. However, they did display a preference for subjects marked by the same topic marker *-(n)un* for the two types of non-contrastive topics, namely Anaphoric and Generic topics, over nominative case markers.

Secondly, Korean six-year-old children displayed a tendency to choose subjects marked by the nominative marker *–i/ka* randomly and did not favor that marker for Broad focus over topic markers while listening to conversations.

Thirdly, six-year-olds chose topic marking less frequently for Generic topics compared to adults, even though they exhibited significant sensitivity to non-contrastive topics (Anaphoric

and Generic). In summary, their development appeared delayed with regard to Contrast and focus (Contrastive topic and Broad focus).

Additionally, even ten-year-olds exhibited some differences in terms of frequency for Contrastive topics, although they generally displayed an adult-like pattern for almost all four types of subjects.

It is noteworthy that six-year-olds did not exhibit a significant preference for contrastive topics and Broad focus, as observed in adults in previous studies. The reasons for this discrepancy may align with those discussed in earlier chapters.

The asymmetry between this study and earlier studies prompts questions about whether these results reflect the availability of underlying pragmatic representations, suggesting early production and late comprehension in the acquisition of subject marking in Korean, or if other factors are at play.

The three potential explanations discussed in the previous chapter (Ch. 4) may be applicable here again: the possibility of misinterpreting the results in this study, the risk of overinterpreting corpus data from previous studies, and the potential impact of external factors such as COVID-19.

Assessing children's comprehension capacities is often more challenging than evaluating their production abilities. Methodological challenges, as highlighted by Höhle et al. (2014) and Hornby (1971), combined with the risk of Type 2 errors (false negatives) due to the small sample size in this study, may contribute to the underestimation of children's comprehension or perception capacities in this research (Chapter 4). An alternative interpretation for these findings revolves around the potential overestimation of the production study, as suggested by Höhle et al. (2014). Cutler and Swinney (1987) posit that the delayed effects observed in children's sentence processing imply that the development of necessary mental structures continues throughout the school-age period. They suggest that a child's early ability to utilize prosody for emphasizing crucial information in language production does not necessarily indicate the presence of underlying pragmatic representations. Instead, it results from a physiological mechanism that instinctively prompts speakers to articulate the more acoustically prominent parts of an utterance they are enthusiastic about, without considering shared knowledge.

All the findings concerning early acquisition of subject marking with topic or nominative markers are derived from corpus data. Since this early occurrence was interpreted as evidence of children's early acquisition, there was little exploration into underlying

pragmatic representations through other experiments. This reliance on observational data alone raises the risk of Type 1 errors, where we might incorrectly conclude that children have fully acquired these markers without verification through experimental methods. Therefore, conducting more finely tuned experiments might reveal delayed acquisition even in production within this domain.

Another potential factor contributing to the delayed development observed in the six-year-olds in my study, compared to their peers in production data, is the impact of COVID-19, as mentioned in the previous chapter. Had the same experiments been conducted before the onset of COVID-19, the results might have been different.

Another noteworthy observation is the discrepancy between the results. Interestingly, delayed development was observed only for Contrastive topics and Broad focus, both of which even Korean-speaking 20-month-old children could produce in Lee and Cho's (2009) study based on their corpus data. In contrast, the same six-year-olds acquired mastery of the two non-contrastive topics. These differences might provide some insights into the stages of language acquisition for these phenomena.

Among the three basic categories of information structure – topic, focus, and contrast – it seems that topic is acquired first, as demonstrated in the previous chapter on focus marking, which highlighted the delayed development observed in six-year-olds.

In summary, the study's results demonstrated both expected outcomes and unexpected variations, emphasizing the intricate nature of information structure acquisition. Methodological considerations and differences played crucial roles in shaping children’s acquisition across various subject types. Further exploration is necessary to gain a clearer understanding of language acquisition in this context.

Chapter 8. General Discussions and Conclusions

This dissertation explores how Korean-speaking adults and children perceive information structure through different types of marking for subjects and objects. The first three chapters focus on how both adults (Chapter 3, Experiment 1) and children (Chapter 4, Experiment 2) perceive focus marking on direct objects, using various markers including the accusative case marker *-(l)ul*, prosodic cues, and null marking.

The subsequent three chapters shift to examining the perception of subject marking, comparing the use of nominative markers *-i/ka* and topic markers *-(n)un* among Korean speakers. This analysis includes both adult participants (Chapter 6, Experiment 3) and children (Chapter 7, Experiment 4). The discussion in these chapters centers on how subjects are categorized and marked according to their functions, focusing on four subject types: anaphoric topic, generic topic, contrastive topic, and broad focus.

The dissertation addresses several key comparisons through four main questions:

i. Will children demonstrate a pattern similar to that observed in adults concerning focus and topic?

ii. Do children display developmental changes with age regarding focus and topic?

iii. Do Korean children exhibit a comparable ability to distinguish between various types of focus in perception, as observed in production studies?

iv. Are there developmental differences between focus and topic in children?

To answer these questions, I will first summarize the main findings from each section of the study.

8.1 Summary of the main findings

8.1.1 Perception of focus marking (Object)

8.1.1.1 Adults

Korean adults rely more heavily on prosody than on case marking to indicate focus in sentences. In a forced-choice listening task, sentences with prosody marking were rated more favorably in focused conditions (Contrastive focus and New information focus) compared to the non-focused (Non-object) condition, confirming predictions and findings from previous studies. Conversely, sentences with case marking but no prosodic cues were rated similarly

across the two focus types and the non-focused condition, indicating that case marking alone is unlikely to serve as a focus marker.

Additionally, listeners generally preferred prosodic cues over case marking to indicate focus (Prosody > Case). While both focus types favored prosody over case marking, differences emerged between contrastive focus and non-contrastive focus conditions; listeners more often chose prosody in contrastive focus, whereas case marking was selected more frequently in non-contrastive focus. Finally, the analysis revealed significant individual variance, with only half of the participants able to distinguish between contrastive focus and non-contrastive (New information) focus.

8.1.1.2 Children

The study highlights key developmental differences in how Korean-speaking children perceive and select focus markers compared to adults. Six-year-olds did not show a significant preference for prosody as a focus marker and were unable to distinguish between focus conditions (contrastive focus and non-contrastive focus) and the non-focused condition. In contrast, ten-year-olds, like adults, preferred prosody marking in focus conditions and successfully differentiated between focus types, indicating developmental progress.

Despite this progress, ten-year-olds still differed from adults in their handling of non-focused elements. While adults frequently selected null-marked elements in non-focused conditions, ten-year-olds did so much less often. Additionally, a higher proportion of ten-year-olds (80%) struggled to correctly identify deaccented answers for unfocused elements, compared to 36% of adults, highlighting ongoing challenges in perceiving deaccentuation. Furthermore, ten-year-olds chose case marking more frequently than both six-year-olds and adults, regardless of focus type, indicating an overreliance on case marking.

These findings underscore the gradual development of focus perception and the distinct patterns in how children and adults process prosodic and case marking cues.

8.1.2 Perception of subject marking

8.1.2.1 Adults

The study examined how Korean adults choose between topic markers and case markers for subjects depending on the context. The results generally supported the predictions: Korean native speakers preferred the topic marker *-(n)un* for anaphoric, generic, or contrastive topics,

and the nominative case marker *-i/ka* for broad focus. However, there was an unexpected finding regarding the distribution of preferences among the three topic types.

Instead of showing a uniform pattern, the preferences for topic markers varied gradually across topic types: Anaphoric topics (77%) were less preferred than contrastive topics (84%), which in turn were less preferred than generic topics (97%). This gradient distribution contrasts with previous studies that assumed a more categorical approach. These findings suggest that in actual language use, the distribution of topic and case markers is more nuanced and gradient rather than strictly categorical.

8.1.2.2 Children

This study explored how Korean children and adults select topic markers and case markers based on contextual cues in conversations. It was predicted that six-year-olds would show similar preferences to adults, favoring topic markers for anaphoric, contrastive, and generic topics, and nominative markers for broad focus, with no significant age-related differences.

However, the results differed from these predictions. Six-year-olds did not consistently prefer topic markers for contrastive topics as adults did, although they did favor topic markers for anaphoric and generic topics over nominative markers. Additionally, they showed a random selection pattern for nominative markers in broad focus conditions and used topic markers less frequently for generic topics compared to adults. These findings suggest that six-year-olds are still developing their sensitivity to focus and contrast, with ten-year-olds exhibiting a more adult-like pattern but still showing some differences in their responses to contrastive topics. Overall, the study indicates that while children are progressing, their use of topic and case markers evolves gradually, with noticeable developmental delays in handling contrast and focus.

8.2 Developmental paths

Based on the findings, we can outline the developmental trajectory toward adult-like information structure marking for subjects and objects in Korean:

As illustrated in Table 8.1, the acquisition of topics and focus for subjects occurs earlier than for objects. Among subjects, the anaphoric topic is acquired first, with no differences observed across the three age groups. The generic topic follows, with six-year-olds showing variability in frequency of use.

Ten-year-olds demonstrate similar patterns to adults for subjects marked with broad focus and contrastive topic. They also start to differentiate between focus (contrastive and non-contrastive) and non-focus in object marking. In addition, they show proficiency in distinguishing between contrastive focus and non-contrastive focus (New information) in object marking, although there are still differences in frequency compared to adults. This is further supported by individual variance, with a larger proportion of ten-year-olds deviating from adult patterns compared to adults themselves.

Despite these advancements, ten-year-olds still struggle with deaccenting, as shown in Table 8.1. They frequently selected prosodically marked choices for non-focused elements, indicating that full mastery of deaccenting remains a challenge at this stage. Cognitive factors and children's speech rates are the most likely explanations for this (Chapter 4). Research indicates that deaccenting requires an understanding of the listener's mental state, which involves cognitive processes like Theory of Mind, attentional control, and goal maintenance. Since these processes continue to develop throughout childhood and adolescence, they likely contribute to children's difficulty with deaccenting. Additionally, slower speech rates in children, as observed in previous studies, may hinder their ability to dephrase non-focused elements, although it remains unclear whether this directly affects their perception of phrasing.

Table 8.1 Developmental paths to adult-like information structure marking
(√: Acquired; X: Not Acquired; =: No Difference with Adults; ≠: Difference with Adults; Individual Variability refers to the percentage of individuals who showed reversed patterns or no difference)

Types		Age 6	Age 10	Adults
Anaphoric topic (Subject)	Acquired	√	√	Topic > Case
	=Adults	=	=	
	Individual variability	11%	30%	7%
Generic topic (Subject)	Acquired	√	√	Topic
	=Adults	≠	=	
	Individual variability	28%	0%	0%
Broad focus (Subject)	Acquired	X	√	Case
	=Adults		=	
	Individual variability	67%	10%	0%
Contrastive topic (Subject)	Acquired	X	√	Topic > Case
	=Adults		≠	
	Individual variability	50%	30%	4%
Contrastive focus (Object)	Acquired	X	√	Prosody marking
	=Adults		≠	
	Individual variability	56%	35%	18%
Non-contrastive (New information) focus (Object)	Acquired	X	√	Prosody marking
	=Adults		≠	
	Individual variability	67%	30%	14%
Contrastive focus vs. Non-contrastive (New information) focus (Object)	Acquired	X	√	Frequency
	=Adults		≠	
	Individual variability	61%	56%	50%
Deaccenting non-focused elements (Non-object focus) (Object)	Acquired	X	X	Deaccenting
	=Adults			
	Individual variability	83%	80%	36%

8.3 General discussions

The research questions related to compare the age groups are already answered, here in this section, I will summarize the other questions about the asymmetry between perception and production, and the difference between focus and topic.

8.3.1 Perception vs. Production

Six-year-olds in this study show delayed development compared to their peers in production data. For focus marking of objects, Korean children aged four to five in Yang (2017) demonstrated this ability through phonological means, particularly phrasing. For focus and topic marking of subjects, the acquisition occurred even earlier. In research by Lee and Cho (2009), it was found that Korean children began accurately marking subjects with nominative markers for broad focus or topic markers for contrastive topics by around 20 months, during the early stages of language acquisition. However, compared to these production studies, the six-year-olds in this study did not acquire any focus types other than the two non-contrastive topic types: anaphoric and generic topics.

The discrepancy between this study and earlier research raises questions about whether these findings reflect the availability of underlying pragmatic representations—suggesting early production but late comprehension in the acquisition of information structure marking in Korean—or whether other factors are at play. Three potential explanations were discussed in previous chapters (Ch. 4, 7) and are reiterated here: 1) the possibility of underestimating the results in this study, 2) the risk of overinterpreting corpus data from previous studies, and 3) the potential impact of external factors such as COVID-19 (Ch. 4, 7). Therefore, it remains uncertain whether this asymmetry truly indicates early production and late comprehension.

8.3.2 Focus vs. Topic

The acquisition of basic information structure categories appears to follow a sequence where topics are acquired first, with focus markers being acquired later. In this study, all three types of topics and broad focus on subjects are marked morphologically, while the two types of focus on objects are marked prosodically.

First, we compared broad focus on subjects with the two types of focus on objects. Despite differences in their syntactic position and marking methods, these focus types seem to be acquired at a similar developmental stage. Six-year-olds did not acquire any of the three focus types, whereas ten-year-olds did, as shown in Table 8.1. However, ten-year-olds still differed from adults in frequency when marking focus on objects, while they showed no such differences for broad focus. This suggests that broad focus may be acquired earlier than the two object-focused types.

Regarding contrast, both topics and focus can incorporate contrastive elements. When examining contrast, even topic marking revealed some frequency differences between ten-year-olds and adults, indicating that contrastive understanding, whether in topics or focus, continues to develop into later childhood.

8.4 Conclusion

This dissertation has examined the developmental trajectory of information structure marking in Korean-speaking children and adults, with a focus on how subjects and objects are perceived through different markers. The study explored the acquisition of focus and topic marking, analyzing both morphosyntactic and prosodic cues across various age groups.

The findings reveal a clear developmental path in which children gradually acquire adult-like patterns of information structure marking. Six-year-olds exhibited significant delays in their ability to perceive focus marking on both subjects and objects. While these younger children had already acquired non-contrastive topic marking, such as for anaphoric and generic topics, they struggled with the more complex tasks of distinguishing between different types of focus and topics. This delay in comprehension contrasts with previous production studies, where younger children demonstrated earlier acquisition of similar structures. This discrepancy suggests a potential asymmetry between production and comprehension, with early production but delayed comprehension in the development of information structure marking in Korean.

By the age of ten, children demonstrated more advanced skills, closely resembling adult patterns in their ability to perceive focus on objects and differentiate between various focus types. However, they still differed from adults in their handling of non-focused elements and their frequency of marking focus on objects. The challenge of deaccenting non-focused elements persisted even among ten-year-olds, which is likely due to the ongoing development of cognitive processes such as Theory of Mind, attentional control, and speech rate. These findings suggest that while ten-year-olds have made significant progress, full mastery of information structure marking, especially in terms of prosodic cues, may not be fully achieved until later in adolescence.

The study also revealed an interesting sequence in the acquisition of information structure categories: topics are acquired before focus. This order aligns with the broader cognitive and linguistic development of children, where simpler, non-contrastive categories are understood earlier, while more complex, contrastive categories develop later. The study

also noted that while broad focus on subjects is acquired relatively early, more specific focus types on objects, marked prosodically, develop later and with greater variability.

Overall, this research contributes to our understanding of how children acquire the ability to process and mark information structure in their native language. The findings underscore the gradual and multifaceted nature of this development, which involves both cognitive maturation and increasing linguistic experience. Moreover, the study raises important questions about the relationship between comprehension and production in language acquisition, suggesting that these two processes may not always align perfectly. Further research could explore these discrepancies and investigate the factors that influence the rate and sequence of acquiring information structure marking in different linguistic and cultural contexts.

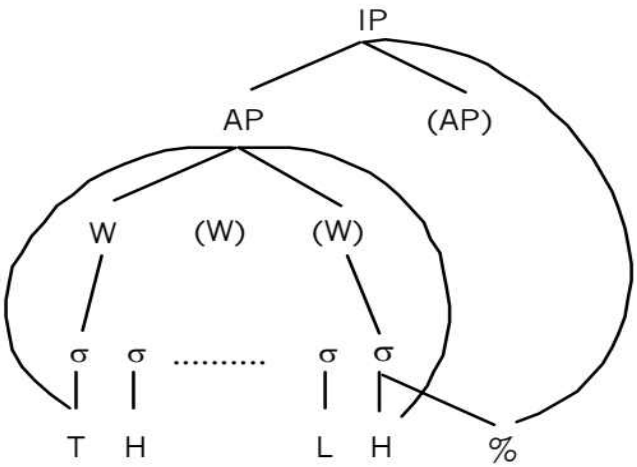
Appendices

Appendix A. K-ToBI (Korean TOnes and Break Indices)

Figure 1 provides a visual representation of the hierarchical organization of prosodic units and tonal affiliations in Korean. Within the intonational framework of Seoul Korean, two distinct prosodic units are defined: the Intonation Phrase (IP) and the Accentual Phrase (AP). Notably, an AP occupies a position smaller than that of an IP but larger than a phonological word, encompassing a lexical element along with a case marker or postpositions.

The distinction between these units is marked by specific tonal features. An IP is characterized by the presence of a boundary tone (%) and final lengthening, signifying a higher-level prosodic boundary. In contrast, an AP is distinguished by a phrasal tone known as THLH THLH (Jun 2000)[16].

The intonational framework of Seoul Korean is elucidated in Figure 9.1, providing a visual guide to this hierarchical organization.



IP: Intonation Phrase; AP: Accentual Phrase
w: phonological word; σ: syllable
T = H, when the AP-initial segment is aspirated or tense; Otherwise, T = L
%: Intonation phrase boundary tone
Figure 9.1 Intonation Structure of Seoul Korean (Jun 2000)

[16] T = tone; H = high, L = Low. T has the value H is the segment is aspirated or tense; it is low otherwise.

Appendix B. Prosodic differences in the stimuli: Prosody vs. Null

Each stimulus was meticulously recorded to emphasize the contrast between the stimuli with prosodic marking (Prosody) and those without it (Null and Case). These strategies were informed by findings from prior studies.

The Prosody version aligns with responses specifically crafted for focused conditions, as demonstrated in previous studies, encompassing contrastive focus or corrective focus. On the other hand, the Null version closely mirrors responses intended for non-focused, broad or neutral focus conditions in earlier research (Jun and Kim, 2007; Lee, 2011; Yang, 2017).

The set of responses were subjected to meticulous prosodic analysis to showcase their distinctive differences, adhering to the established model of Korean intonation outlined by Jun (2000), as illustrated in Figures 9.2 and 9.3.

(1) Prosody vs. Null

a. Prosody:	khokkili-ka	LOPOTHU-Ø	chyetapwa
b. Null:	khokkili-ka	lopothu-Ø	chyetapwa
	elephant-NOM	robot-Ø	is looking at
	‘Elephant is looking at a robot		

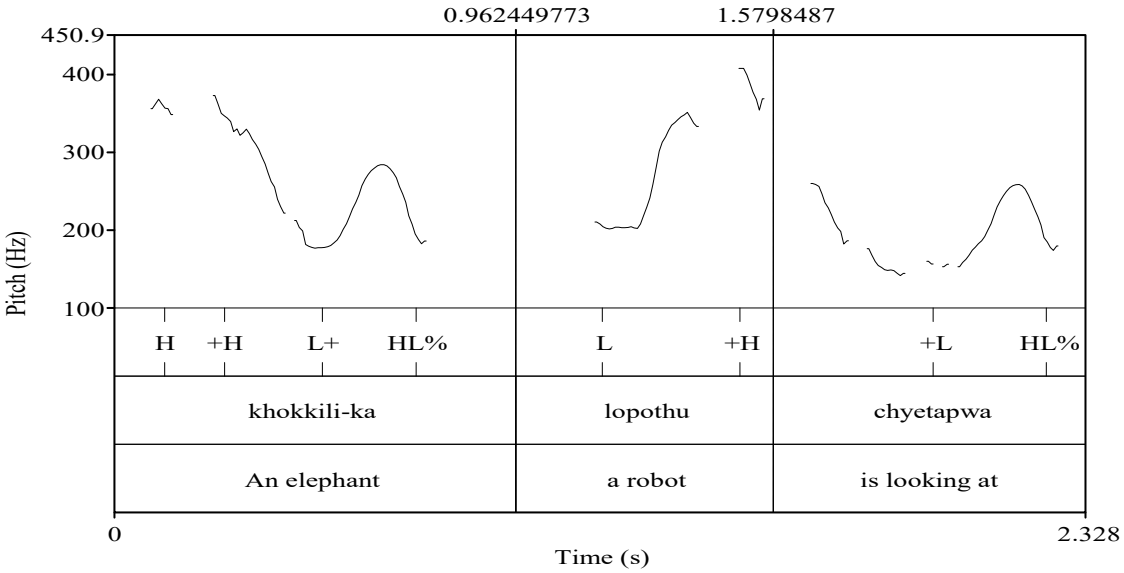


Figure 9.2 An example pitch track of Prosody in (1)

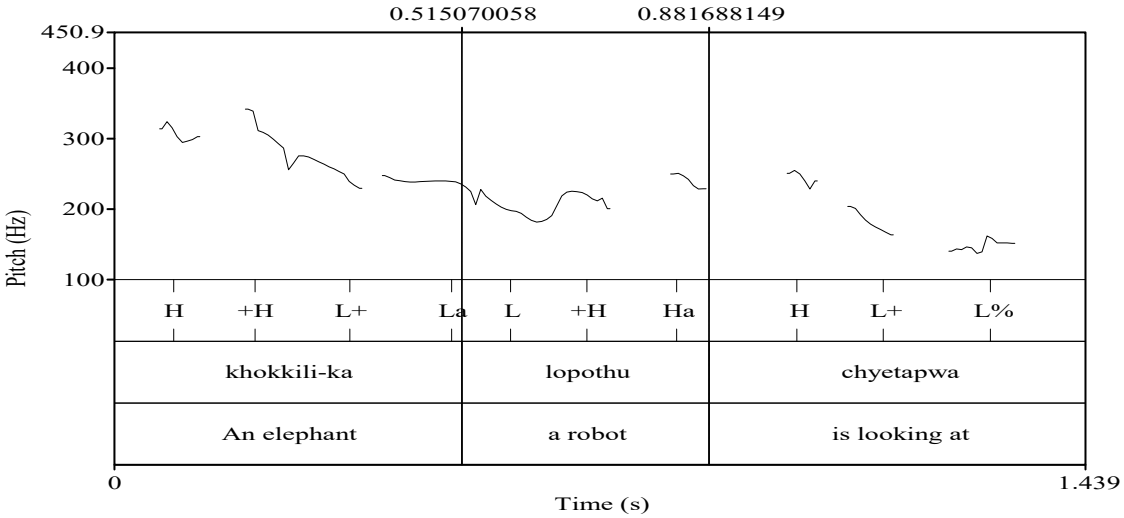


Figure 9.3 An example pitch track of Null in (1)

In the experimental utterance adhering to the intonational pattern in Figure 9.2, an Intonation Phrase (IP) boundary was introduced before the direct object *lopothu* ('robot'). This contrasted with the Null version depicted in Figure 9.3, where such a boundary was absent. The verbs, identified as post-focus elements, underwent dephrasing (i.e., removal of phrase boundaries) for Prosody, whereas no dephrasing occurs for Null and Case.

Upon analyzing the prosodic attributes of the stimuli, notable distinctions emerged. Specifically, the pitch peaks of the direct object exhibited a higher frequency in the Prosody utterance compared to the Null rendition (mean: 379.65 Hz versus 232.60 Hz). Additionally, the duration of the direct object proved lengthier in the Prosody rendition, measuring 0.5159 seconds as opposed to 0.4254 seconds in the Null version. These statistical disparities are succinctly summarized, consistently demonstrating their significance. The pronounced prosodic emphasis on the direct object served to enhance its prominence.

Table 9.1 Summary of Prosodic differences of stimuli

	Prosody		Null/Case	
	Feature	Mean	Feature	Mean
Prosodic Phrasing	IP boundary: Inserted before NP Verb: Dephrased		IP boundary: Not inserted before NP Verb: Not dephrased	
Word duration	Longer	0.5159 sec.	Shorter	0.4254 sec.
Initial-syllable duration	Longer	0.2465 sec.	Shorter	0.1476 sec.
Maximum pitch	Higher	379.65 Hz	Lower	232.60 Hz
Pitch span	Wider	198.32 Hz	Shorter	71.12 Hz

Table 9.2 Statistical Summary of Prosodic differences of stimuli: Word duration

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	0.4254	0.0166	25.677	p < 0.001***
Prosody	0.0906	0.0234	3.865	p < 0.001***

Table 9.3 Statistical Summary of Prosodic differences of stimuli: Initial-syllable duration

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	0.1476	0.0106	13.94	p < 0.001***
Prosody	0.0989	0.0150	6.608	p < 0.001***

Table 9.4 Statistical Summary of Prosodic difference of stimuli: Maximum pitch

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	232.598	7.865	29.57	p < 0.001***
Prosody	147.052	11.122	13.22	p < 0.001***

Table 9.5 Statistical Summary of Prosodic difference of stimuli: Pitch span

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	71.116	8.059	8.824	p < 0.001***
Prosody	127.201	11.397	11.161	p < 0.001***

Appendix C. List of Stimuli for Experiments 1 and 2

No.	Type of focus	Response	Speaker	Robot	Subject	object	verb
1	Contrast	Case/Null	강아지가 우유를 던졌어	아니, 강아지가 양파(를) 던졌어	puppy	onion	throw
2	Contrast	Case/Null	고양이가 양파 그렸어	아니, 고양이가 우유(를) 그렸어	cat	milk	draw
3	Contrast	Case/Null	거북이가 모자를 들었어	아니, 거북이가 감자(를) 들었어	turtle	potato	hold
4	Contrast	Null/Case	곰돌이가 바나나 만졌어	아니, 곰돌이가 로보트(를) 만졌어	bear	robot	touch
5	Contrast	Null/Case	원숭이가 로보트를 잡았어	아니, 원숭이가 자동차(를) 잡았어	monkey	robot	grab
6	Contrast	Null/Case	코끼리가 바나나 쳐다봐	아니, 코끼리가 색종이(를) 쳐다봐	elephant	color paper	look at
7	Contrast	Case/Prosody	강아지가 우유를 던졌어	아니, 강아지가 망고(를) 던졌어	puppy	mango	throw
8	Contrast	Case/Prosody	고양이가 수박 그렸어	아니, 고양이가 과자(를) 그렸어	cat	cookies	draw
9	Contrast	Case/Prosody	거북이가 과자를 들었어	아니, 거북이가 수박(을) 들었어	turtle	watermelon	hold
10	Contrast	Prosody/Case	강아지가 젓가락 던졌어	아니, 강아지가 숟가락 던졌어	puppy	spoon	throw
11	Contrast	Prosody/Case	고양이가 감을 그렸어	아니, 고양이가 복숭아 그렸어	cat	peach	draw
12	Contrast	Prosody/Case	거북이가 자동차 들었어	아니, 거북이가 자전거 들었어	turtle	spoon	hold
13	Contrast	Prosody/Null	곰돌이가 가위를 만졌어	아니, 곰돌이가 모자 만졌어	bear	hat	touch
14	Contrast	Prosody/Null	원숭이가 모자 쳐다봐	아니, 원숭이가 연필 쳐다봐	monkey	pencil	look at
15	Contrast	Prosody/Null	코끼리가 모자를 쳐다봐	아니, 코끼리가 가위 쳐다봐	elephant	scissors	look at
16	Contrast	Null/Prosody	곰돌이가 숟가락 만졌어	아니, 곰돌이가 젓가락 만졌어	bear	chopsticks	touch
17	Contrast	Null/Prosody	원숭이가 로보트를 잡았어	아니, 원숭이가 지우개 잡았어	monkey	eraser	grab
18	Contrast	Null/Prosody	코끼리가 자전거 잡았어	아니, 코끼리가 자동차 잡았어	elephant	car	grab

19	New	Case/Null	강아지가 뭐를 그렸어?	강아지가 자동차(를) 그렸어	puppy	car	draw
20	New	Case/Null	고양이가 뭐 그렸어?	고양이가 지우개(를) 그렸어	cat	eraser	draw
21	New	Case/Null	거북이가 뭐를 들었어?	거북이가 젓가락(을) 들었어	turtle	chopsticks	hold
22	New	Null/Case	곰돌이가 뭐 만졌어?	곰돌이가 가위(를) 만졌어	bear	scissors	touch
23	New	Null/Case	원숭이가 뭐를 잡았어?	원숭이가 연필(을) 잡았어	monkey	pencil	grab
24	New	Null/Case	코끼리가 뭐 쳐다봐?	코끼리가 모자(을) 쳐다봐	elephant	hat	look at
25	New	Case/Prosody	강아지가 뭐를 그렸어?	강아지가 자전거(를) 그렸어	puppy	spoon	draw
26	New	Case/Prosody	고양이가 뭐 던졌어?	고양이가 복숭아(를) 던졌어	cat	peach	throw
27	New	Case/Prosody	거북이가 뭐를 들었어?	거북이가 숟가락(을) 들었어	turtle	spoon	hold
28	New	Prosody/Case	강아지가 뭐 던졌어?	강아지가 수박(을) 던졌어	puppy	watermelon	throw
29	New	Prosody/Case	고양이가 뭐를 던졌어?	고양이가 과자(를) 던졌어	cat	cookies	throw
30	New	Prosody/Case	거북이가 뭐 들었어?	거북이가 망고(를) 들었어	turtle	mango	hold
31	New	Prosody/Null	곰돌이가 뭐를 만졌어?	곰돌이가 색종이 만졌어	bear	color paper	touch
32	New	Prosody/Null	원숭이가 뭐 만졌어?	원숭이가 바나나 만졌어	monkey	banana	touch
33	New	Prosody/Null	코끼리가 뭐를 쳐다봐?	코끼리가 로보트 쳐다봐	elephant	robot	look at
34	New	Null/Prosody	곰돌이가 뭐 만졌어?	곰돌이가 감자 만졌어	bear	potato	touch
35	New	Null/Prosody	원숭이가 뭐를 만졌어?	원숭이가 우유 잡았어	monkey	milk	grab
36	New	Null/Prosody	코끼리가 뭐 쳐다봐?	코끼리가 양파 쳐다봐	elephant	onion	look at
37	Non-obj.	Case/Null	고양이가 양파를 그렸어!	아니, 강아지가 양파(를) 그렸어	puppy	onion	draw
38	Non-obj.	Case/Null	코끼리가 우유 던졌어!	아니, 고양이가 우유(를) 던졌어	cat	milk	throw

39	Non-obj.	Case/Null	곰돌이가 감자를 쳐다봐!	아니, 거북이가 감자(를) 쳐다봐	turtle	potato	look at
40	Non-obj.	Null/Case	원숭이가 로보트 들었어!	아니, 거북이가 로보트(를) 들었어	bear	robot	hold
41	Non-obj.	Null/Case	강아지가 바나나를 그렸어!	아니, 원숭이가 바나나(를) 그렸어	monkey	banana	draw
42	Non-obj.	Null/Case	강아지가 색종이 던졌어	아니, 코끼리가 색종이(를) 던졌어	elephant	color paper	throw
43	Non-obj.	Case/Prosody	곰돌이가 망고를 만졌어!	아니, 강아지가 망고(를) 만졌어	puppy	mango	touch
44	Non-obj.	Case/Prosody	코끼리가 과자 잡았어!	아니, 고양이가 과자(를) 잡았어	cat	cookies	grab
45	Non-obj.	Case/Prosody	고양이가 수박을 쳐다봐!	아니, 거북이가 수박(을) 쳐다봐	turtle	watermelon	look at
46	Non-obj.	Prosody/Case	거북이가 숟가락 쳐다봐!	아니, 강아지가 숟가락(을) 쳐다봐	puppy	spoon	look at
47	Non-obj.	Prosody/Case	원숭이가 복숭아를 잡았어!	아니, 고양이가 복숭아(를) 잡았어	cat	peach	grab
48	Non-obj.	Prosody/Case	강아지가 자전거 잡았어!	아니, 거북이가 자전거(를) 잡았어	turtle	spoon	grab
49	Non-obj.	Prosody/Null	원숭이가 모자를 들었어!	아니, 곰돌이가 모자 들었어	bear	hat	hold
50	Non-obj.	Prosody/Null	코끼리가 연필 그렸어!	아니, 원숭이가 연필 그렸어	monkey	pencil	draw
51	Non-obj.	Prosody/Null	곰돌이가 가위를 던졌어!	아니, 코끼리가 가위 던졌어	elephant	scissors	throw
52	Non-obj.	Null/Prosody	고양이가 젓가락 잡았어!	아니, 곰돌이가 젓가락 잡았어	bear	chopsticks	grab
53	Non-obj.	Null/Prosody	거북이가 지우개를 들었어!	아니, 원숭이가 지우개 들었어	monkey	eraser	hold

54	Non-obj.	Null/Prosody	거북이가 자동차 만졌어!	아니, 코끼리가 자동차 만졌어	elephant	car	touch

Appendix D. List of Stimuli for Experiments 3 and 4

No	Type of subject	Response	Speaker A	Robot
1	Anaphoric	Case/Topic	호랑이가 브로콜리를 던졌어?	응, 호랑이(가/는) 브로콜리 던졌어
2	Anaphoric	Case/Topic	고양이가 헬리콥터 그렸어?	응, 고양이(가/는) 헬리콥터 그렸어
3	Anaphoric	Case/Topic	강아지가 공을 들었어?	응, 강아지(가/는) 공 들었어
4	Anaphoric	Case/Topic	강아지가 사과쥬스 마셨어?	응, 강아지(가/는) 사과쥬스 마셨어
5	Anaphoric	Case/Topic	고양이가 된장찌개를 잡았어?	응, 고양이(가/는) 된장찌개 잡았어
6	Anaphoric	Topic/Case	거북이가 뭐 그렸어?	거북이(가/는) 동그라미 그렸어
7	Anaphoric	Topic/Case	강아지가 뭘 잡았어?	강아지(가/는) 딸기우유 잡았어
8	Anaphoric	Topic/Case	거북이가 뭐 던졌어?	거북이(가/는) 불자동차 던졌어
9	Anaphoric	Topic/Case	코끼리가 뭘 그렸어?	코끼리(가/는) 컵 그렸어
10	Anaphoric	Topic/Case	코끼리가 뭐 잡았어?	코끼리(가/는) 공 잡았어
11	Contrastive	Case/Topic	거북이랑 고양이랑 뭘 그려?	거북이(가/는) 동그라미 그리고 고양이(가/는) 로보트 그려
12	Contrastive	Case/Topic	코끼리랑 곰돌이랑 뭐 던져?	코끼리(가/는) 바나나 던지고 곰돌이(가/는) 모자 던져
13	Contrastive	Case/Topic	강아지랑 곰돌이랑 뭘 만져?	강아지(가/는) 바나나 만지고 곰돌이(가/는) 모자 만져
14	Contrastive	Case/Topic	코끼리랑 곰돌이랑 뭐 잡아?	코끼리(가/는) 연필 잡고 거북이(가/는) 책 잡아
15	Contrastive	Case/Topic	너구리랑 코끼리랑 뭘 먹어?	너구리(가/는) 쿠키 먹고 코끼리(가/는) 망고 먹어
16	Contrastive	Topic/Case	원숭이랑 고양이랑 뭐 먹어?	원숭이(가/는) 계란말이 먹고 고양이(가/는) 빵 먹어
17	Contrastive	Topic/Case	강아지랑 너구리랑 뭘 그려?	강아지(가/는) 세모 그리고 너구리(가/는) 동그라미 그려
18	Contrastive	Topic/Case	곰돌이랑 강아지랑 뭐 던져?	곰돌이(가/는) 연필 던지고 강아지(가/는) 공 던져
19	Contrastive	Topic/Case	강아지랑 곰돌이랑 뭘 마셔?	강아지(가/는) 사과쥬스 마시고 곰돌이(가/는) 물 마셔
20	Contrastive	Topic/Case	호랑이랑 코끼리랑 뭐 들었어?	호랑이(가/는) 헬리콥터 들고 코끼리(가/는) 브로콜리 들었어
21	Generic	Case/Topic	코끼리에 대해 말해줄래?	코끼리(가/는) 코(가/는) 길어
22	Generic	Case/Topic	장미에 대해 얘기해 줄래?	장미(가/는) 가시가 있어
23	Generic	Case/Topic	얼룩말에 대해 얘기해줄래?	얼룩말(이/는) 줄무늬가 있어
24	Generic	Case/Topic	토끼에 대해 말해줄래?	토끼(가/는) 귀가 길어
25	Generic	Case/Topic	기린에 대해 말해줄래?	기린(이/는) 목이 길어
26	Generic	Topic/Case	물고기에 대해 말해줄래?	물고기(가/는) 물에 살아
27	Generic	Topic/Case	수박에 대해 말해줄래?	수박(이/는) 씨가 많아

28	Generic	Topic/Case	고양이에 대해 말해줄래?	고양이(가/는) 수염이 있어
29	Generic	Topic/Case	긴꼬리 원숭이에 대해 말해줄래?	긴꼬리 원숭이(가/는) 꼬리가 길어
30	Generic	Topic/Case	웜뱃에 대해 말해줄래?	웜뱃(이/는) 네모난 똥을 싸
31	Broad focus	Case/Topic	무슨 일이 일어나고 있어?	아기공룡(이/는) 호랑이한테 밀렸어
32	Broad focus	Case/Topic	무슨 일이 일어나고 있어?	아기돼지(가/는) 호랑이한테 안겼어
33	Broad focus	Case/Topic	무슨 일이 일어나고 있어?	고양이(가/는) 얼룩말 안았어
34	Broad focus	Topic/Case	무슨 일이 일어나고 있어?	토끼(가/는) 닭 쫓아가
35	Broad focus	Topic/Case	무슨 일이 일어나고 있어?	얼룩말(이/는) 물개 쳐다봐
36	Broad focus	Topic/Case	무슨 일이 일어나고 있어?	늑대(가/는) 돼지 밀었어

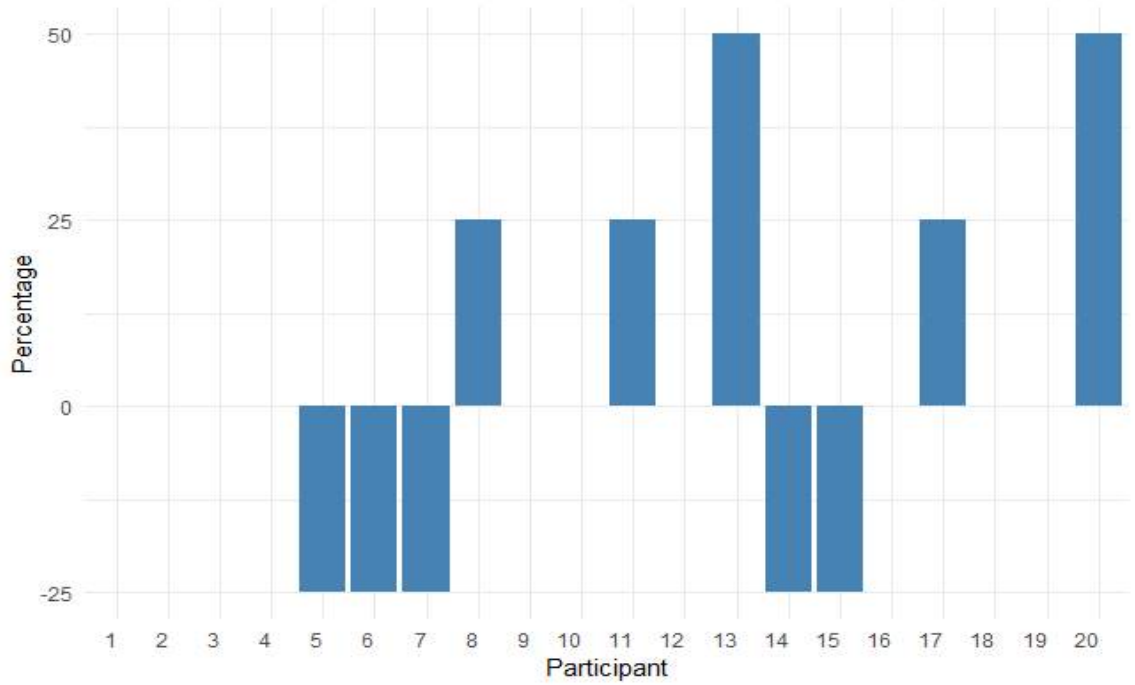
Appendix E. List of stimuli for pure fillers

No.	Speaker	Robot
Practice 1	무슨 일이 일어나고 있어?	거북이가 토끼를/토끼랑 놀아.
Practice 2	고양이가 뭐 해?	고양이가 뱀을/뱀이 잡았어.
Practice 3	무슨 일이 일어나고 있어?	호랑이를/호랑이가 헬리콥터 잡았어.
Filler 1	얼룩말이 뭐 해?	기린한테/기린을 따라가
Filler 2	고양이가 뭐 해?	코끼리/코끼리는 씻어줘
Filler 3	기린이 뭐 해?	양을/양도 때렸어
Filler 4	두더지가 뭐 해?	소 쳐두봐/쳐다봐
Filler 5	양이 뭘 해?	돼지를/돼지도 씻어줘
Filler 6	개구리가 뭘 해?	양 밀었어/밀었어
Filler 7	원숭이가 뭘 해?	곰 안았어/안었어
Filler 8	원숭이가 뭘 해?	얼룩말한테 당근 먹였어/먹였어
Filler 9	무슨 일이 일어나고 있어?	얼룩말이 아기사자를/아기사자가 쫓아가고 있어.
Filler 10	무슨 일이 일어나고 있어?	개구리가/개구리한테 양 밀어.
Filler 11	무슨 일이 일어나고 있어?	너구리가/너구리한테 물개를 안았어.
Filler 12	무슨 일이 일어나고 있어?	캥거루가 코알라한테/코알라를 밀고 있어.
Filler 13	무슨 일이 일어나고 있어?	까마귀가 병아리한테/병아리 쫓고 있어
Filler 14	무슨 일이 일어나고 있어?	낙타도/낙타가 뱀 물었어.
Filler 15	무슨 일이 일어나고 있어?	토끼가/토끼한테 닭 따라가
Filler 16	무슨 일이 일어나고 있어?	고양이가 여우를/여우도 씻어줘
Filler 17	무슨 일이 일어나고 있어?	고양이가 뱀/뱀도 잡았어.
Filler 18	무슨 일이 일어나고 있어?	강아지한테/강아지가 말 안고 있어.

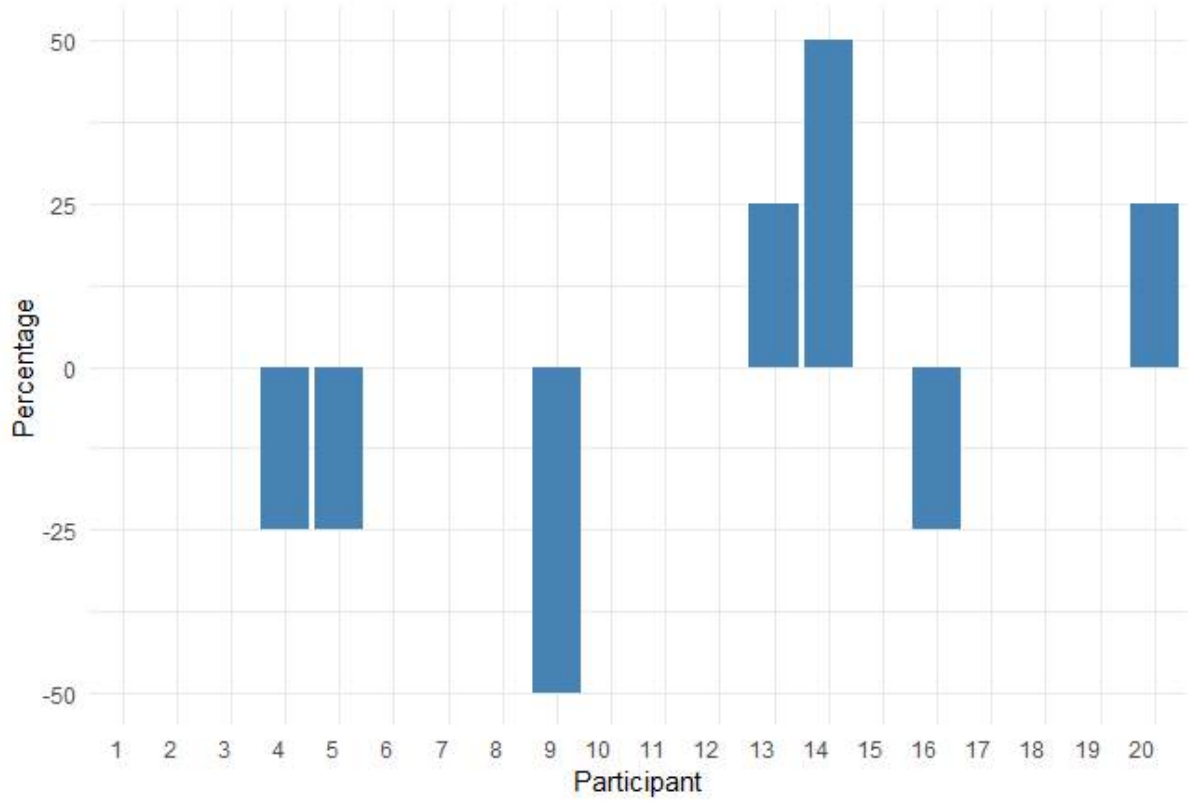
Appendix F. The graphs of individual results

1. Experiment 2, Age 10

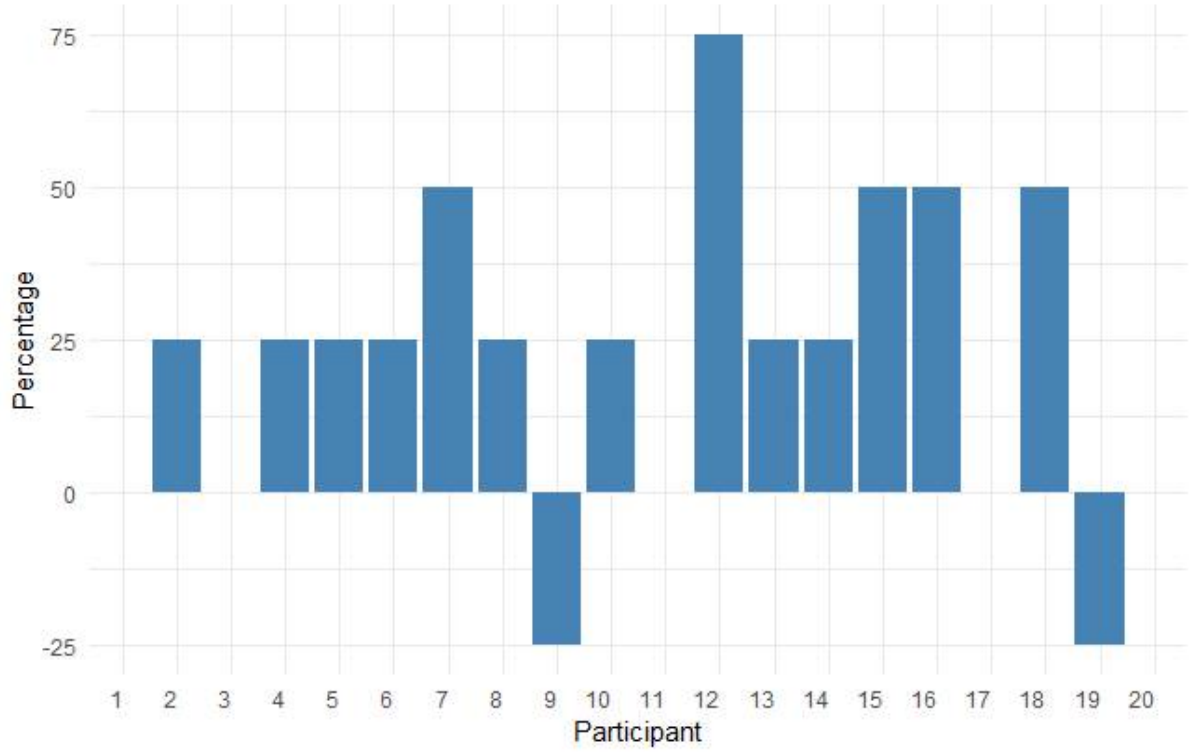
1) Case vs. Null: Contrastive focus – Non-object focus



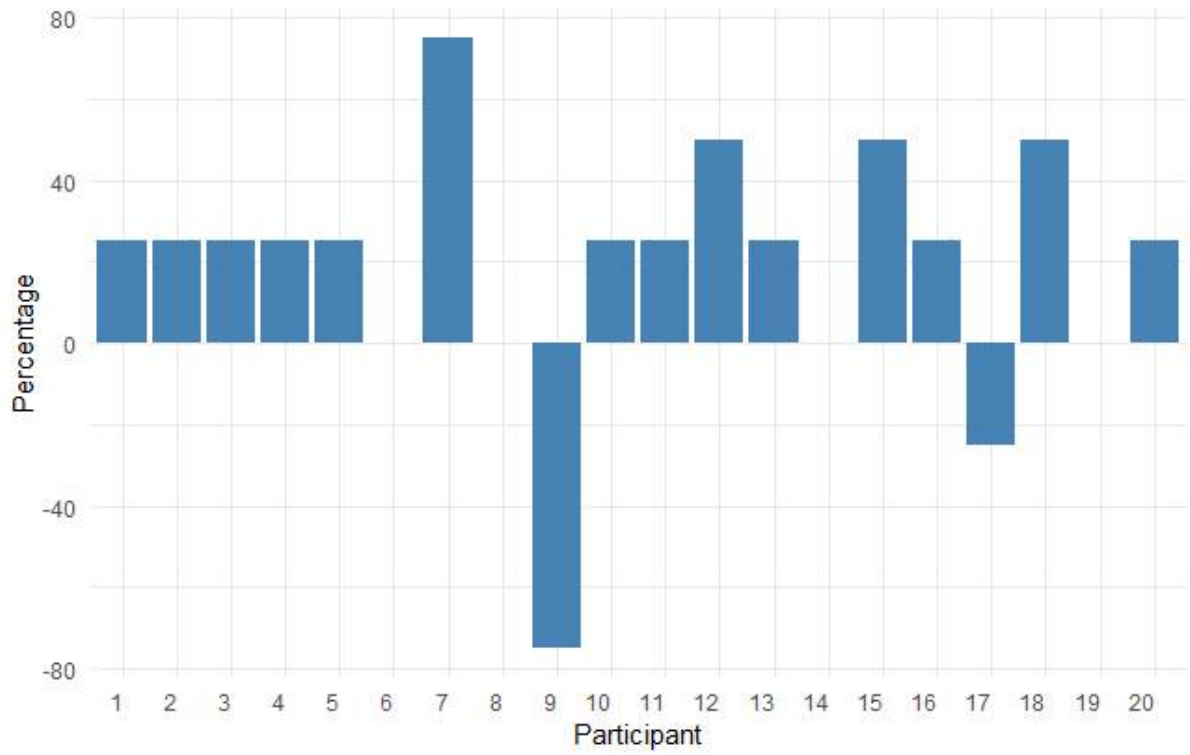
2) Case vs. Null: New information focus – Non-object focus



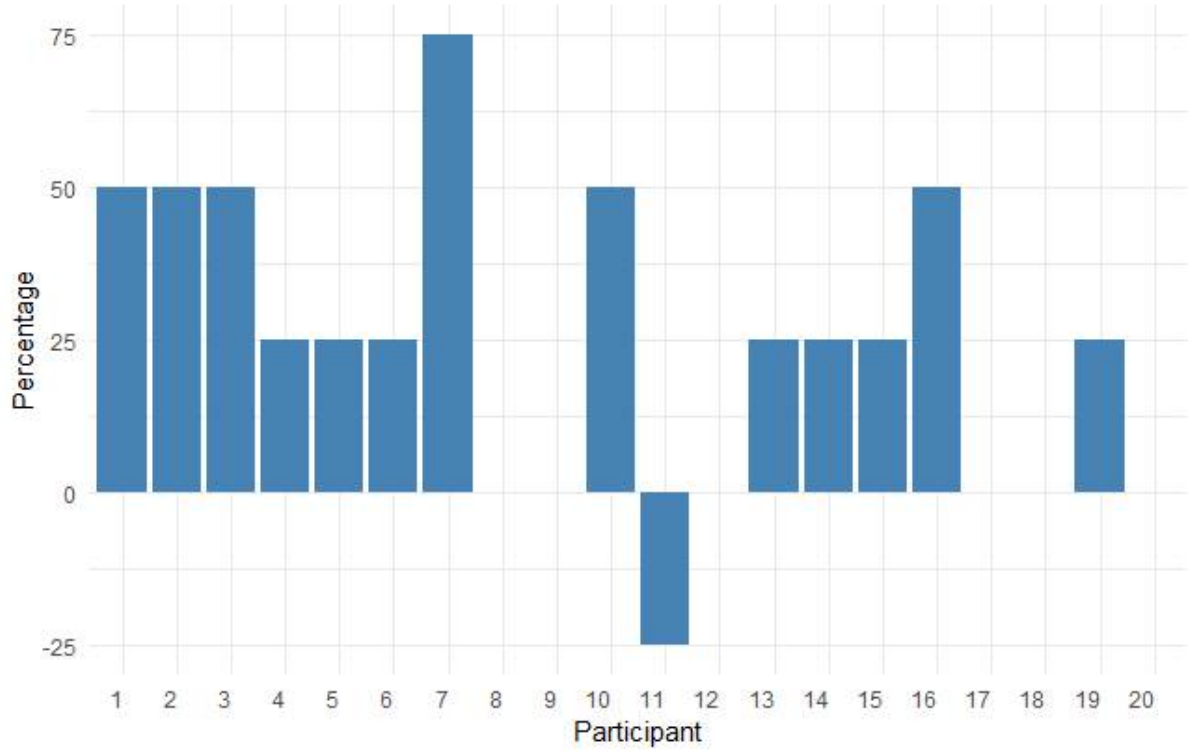
3) Prosody vs. Null: Contrastive focus – Non-object focus



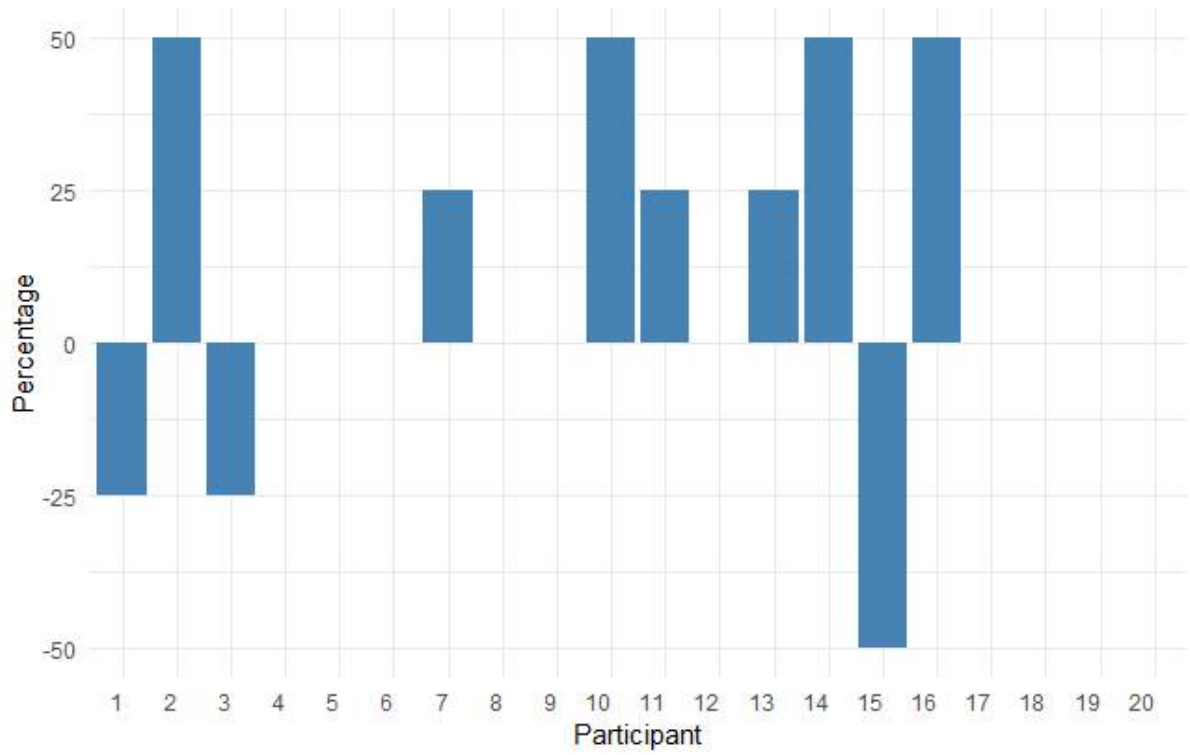
4) Prosody vs. Null: New information focus – Non-object focus



5) Prosody vs. Case: Contrastive focus – Non-object focus

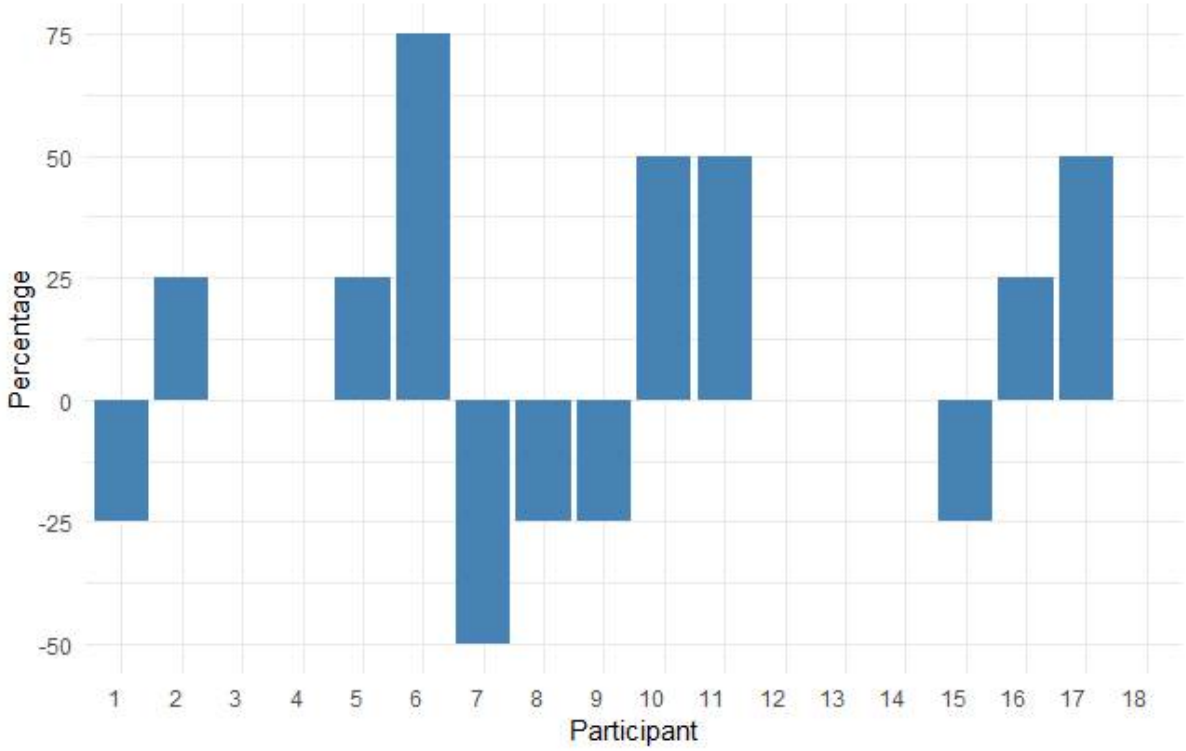


6) Prosody vs. Case: New information focus – Non-object focus

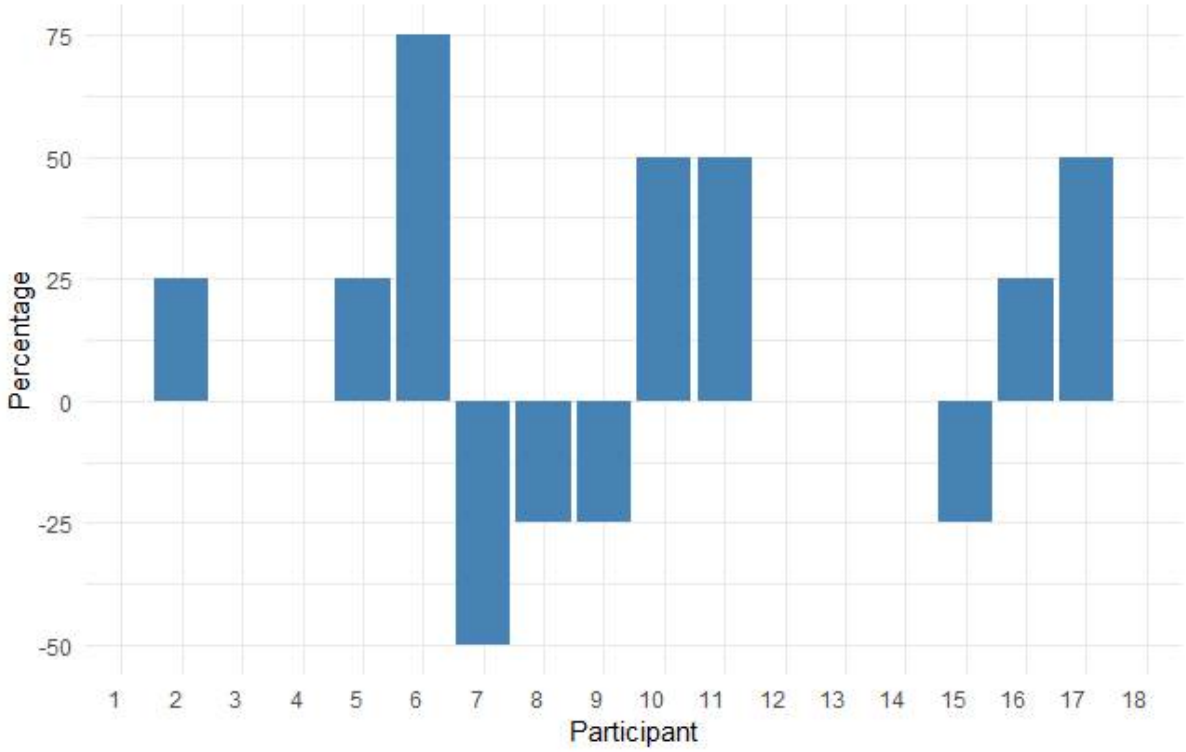


2. Experiment 2, Age 6

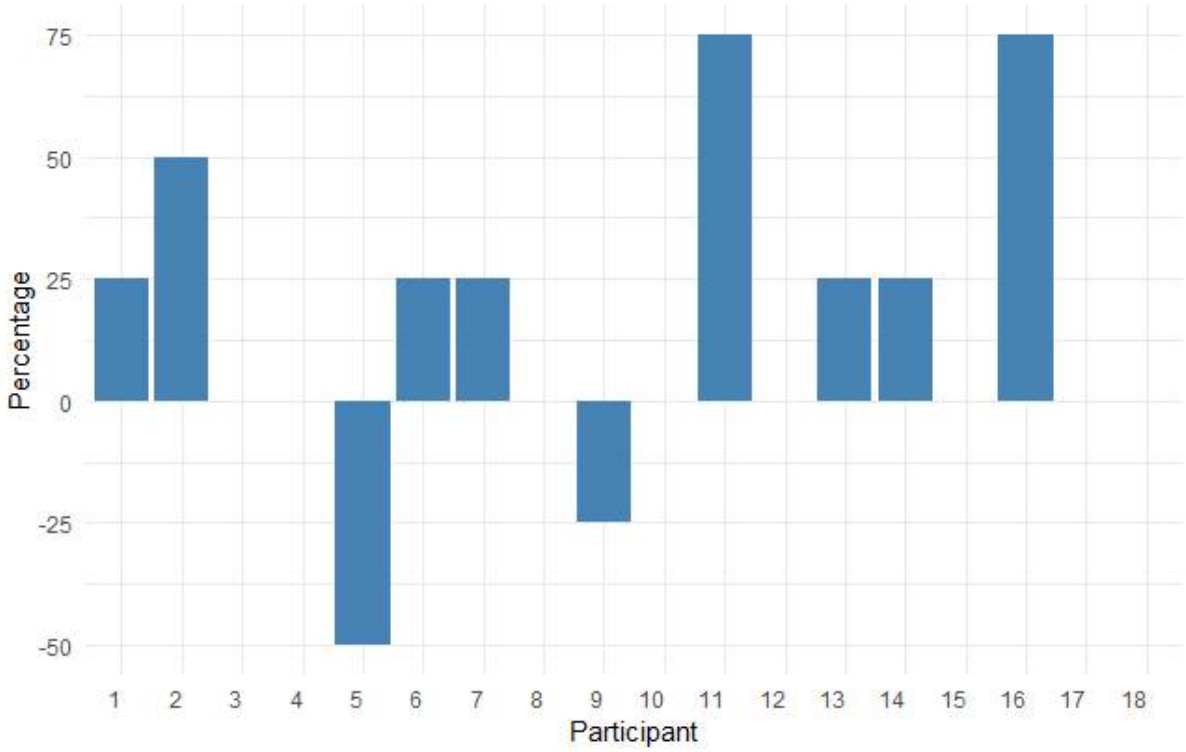
1) Case vs. Null: Contrastive focus – Non-object focus



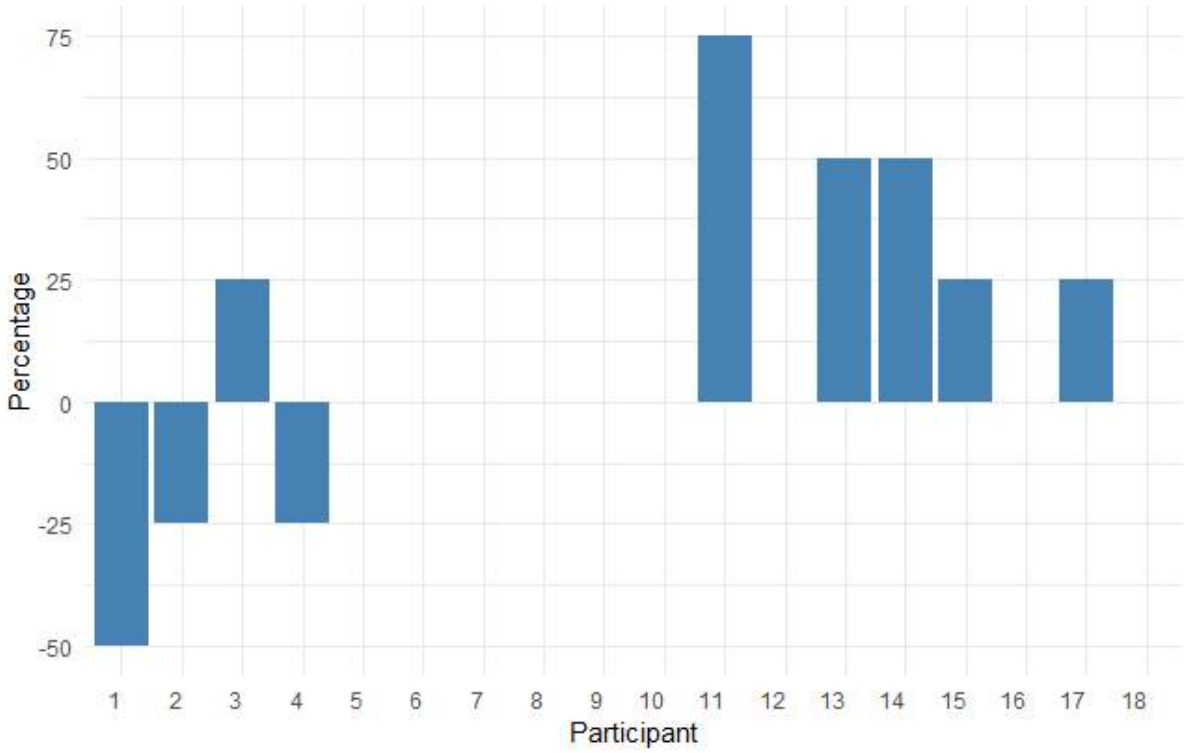
2) Case vs. Null: New information focus – Non-object focus



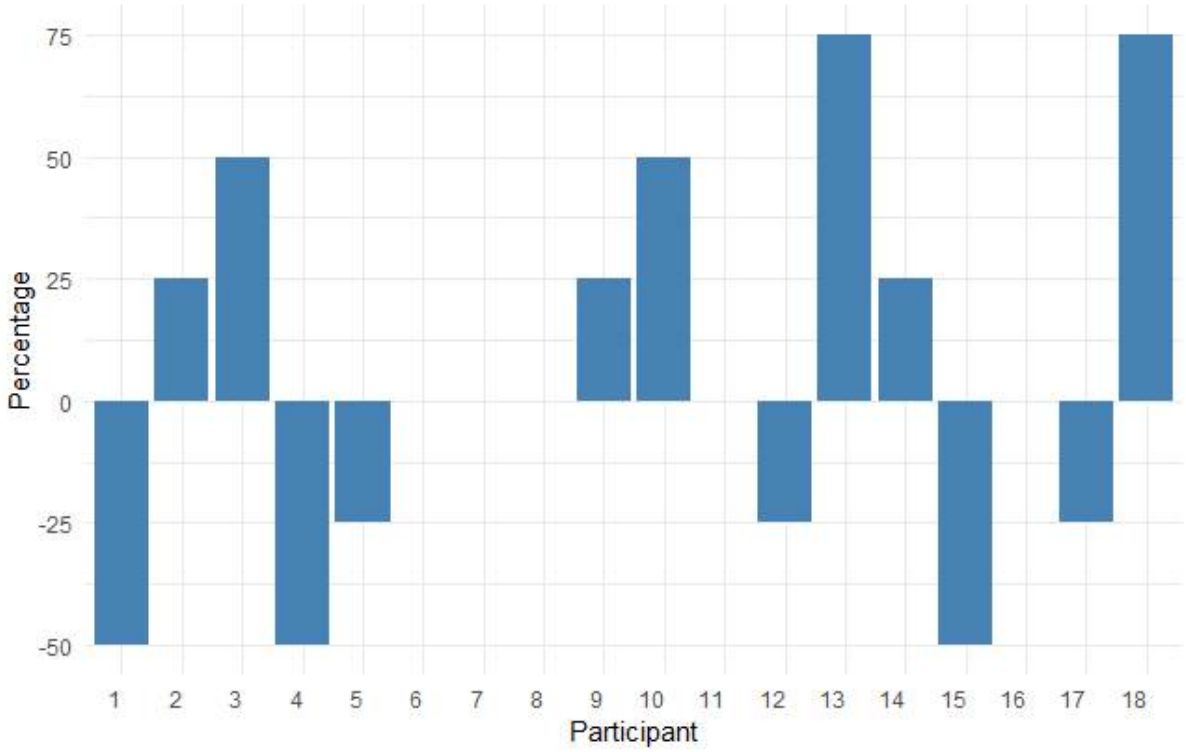
3) Prosody vs. Null: Contrastive focus – Non-object focus



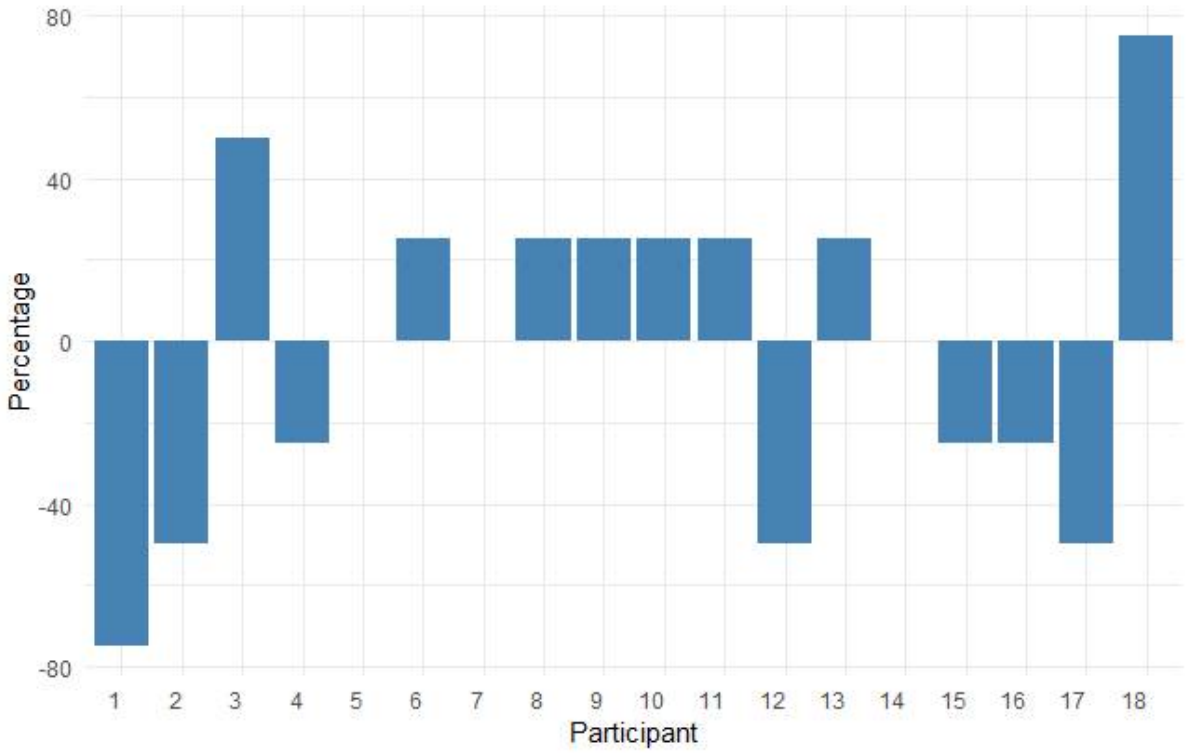
4) Prosody vs. Null: New information focus – Non-object focus



5) Prosody vs. Case: Contrastive focus – Non-object focus

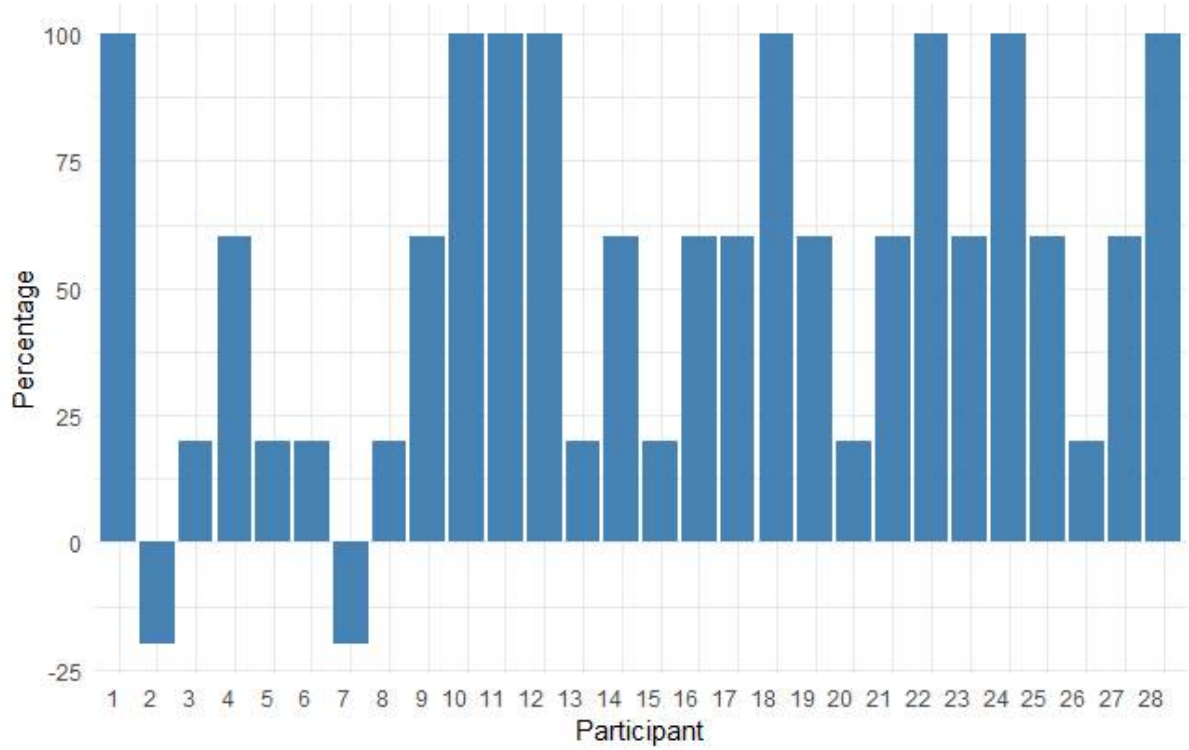


6) Prosody vs. Case: New information focus – Non-object focus

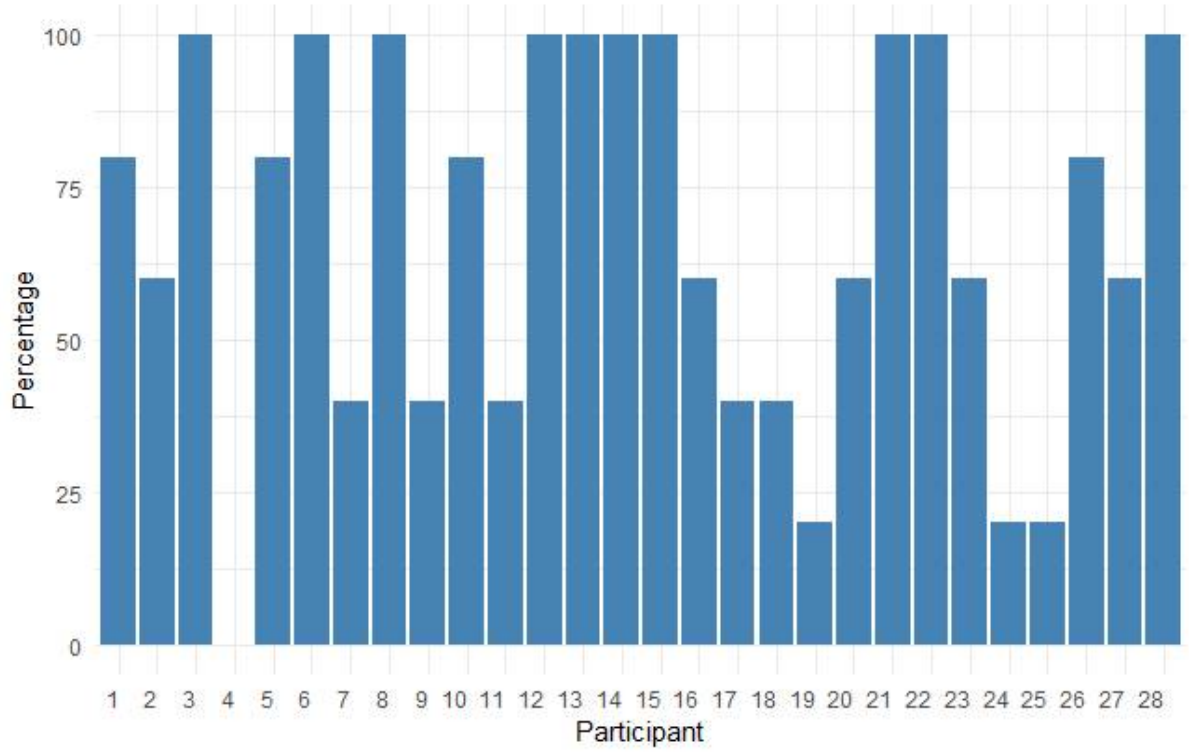


3. Experiment 3, Adults

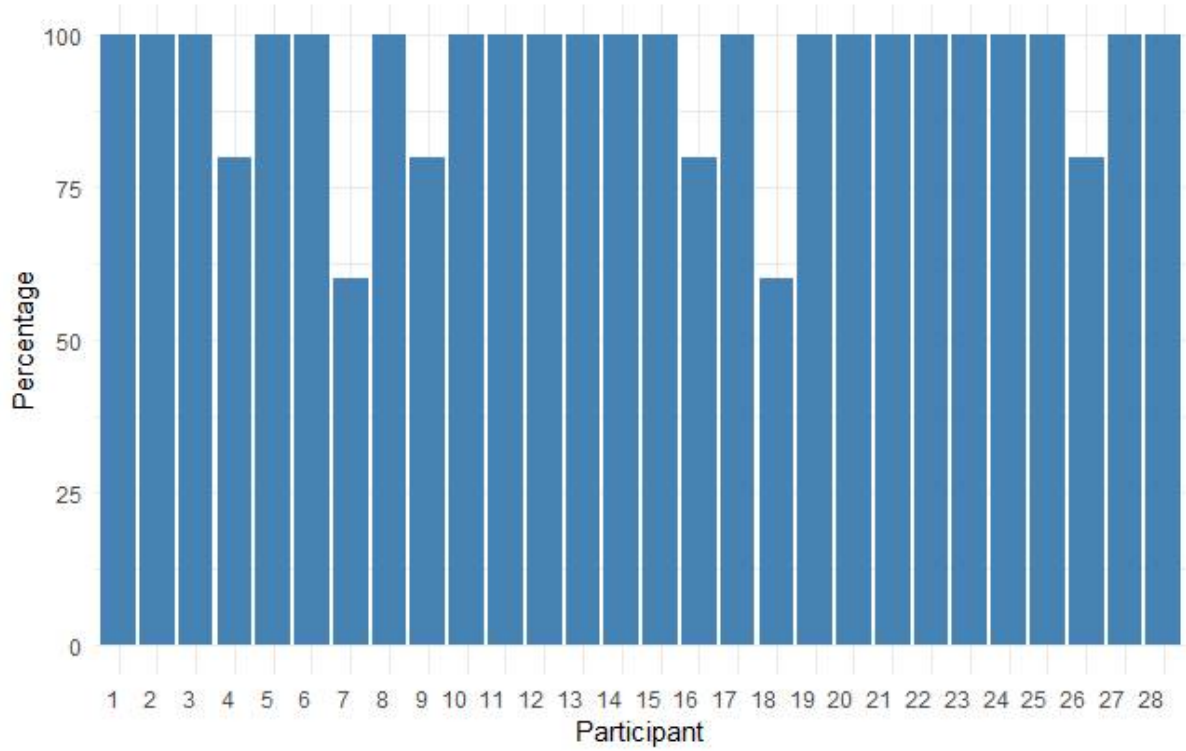
1) Anaphoric topic: Topic marker – case marker



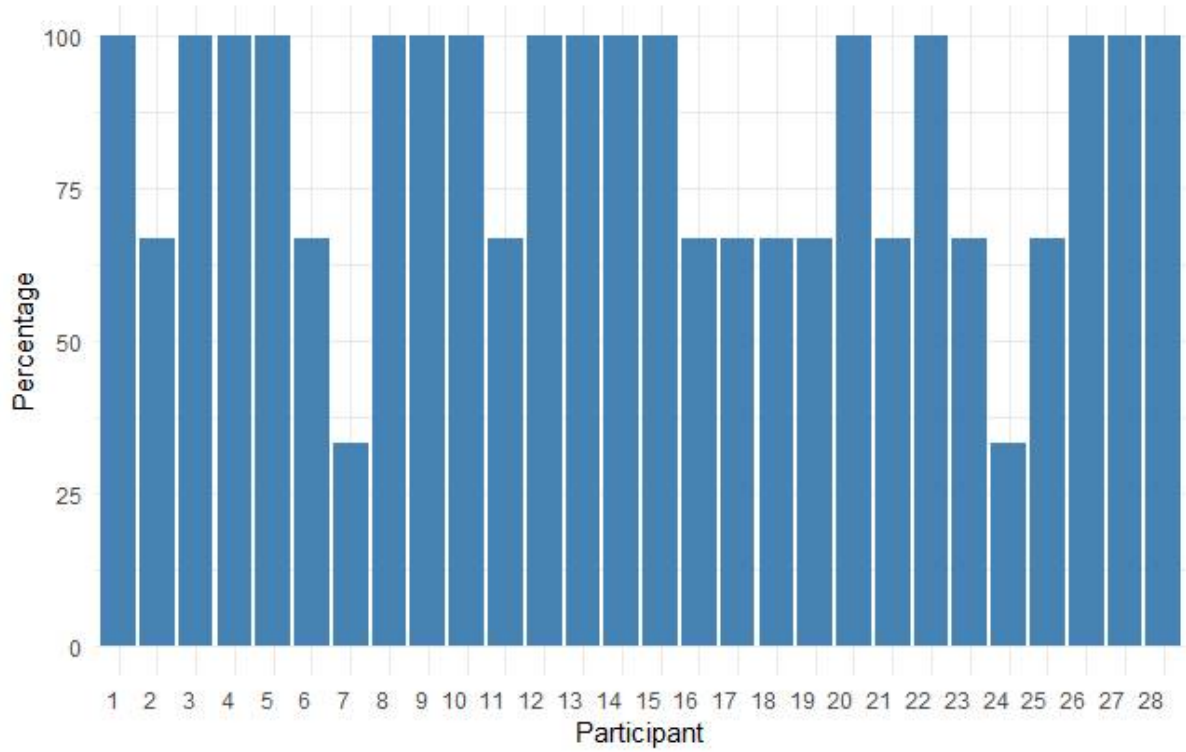
2) Contrastive topic: Topic marker – case marker



3) Generic topic: Topic marker – case marker

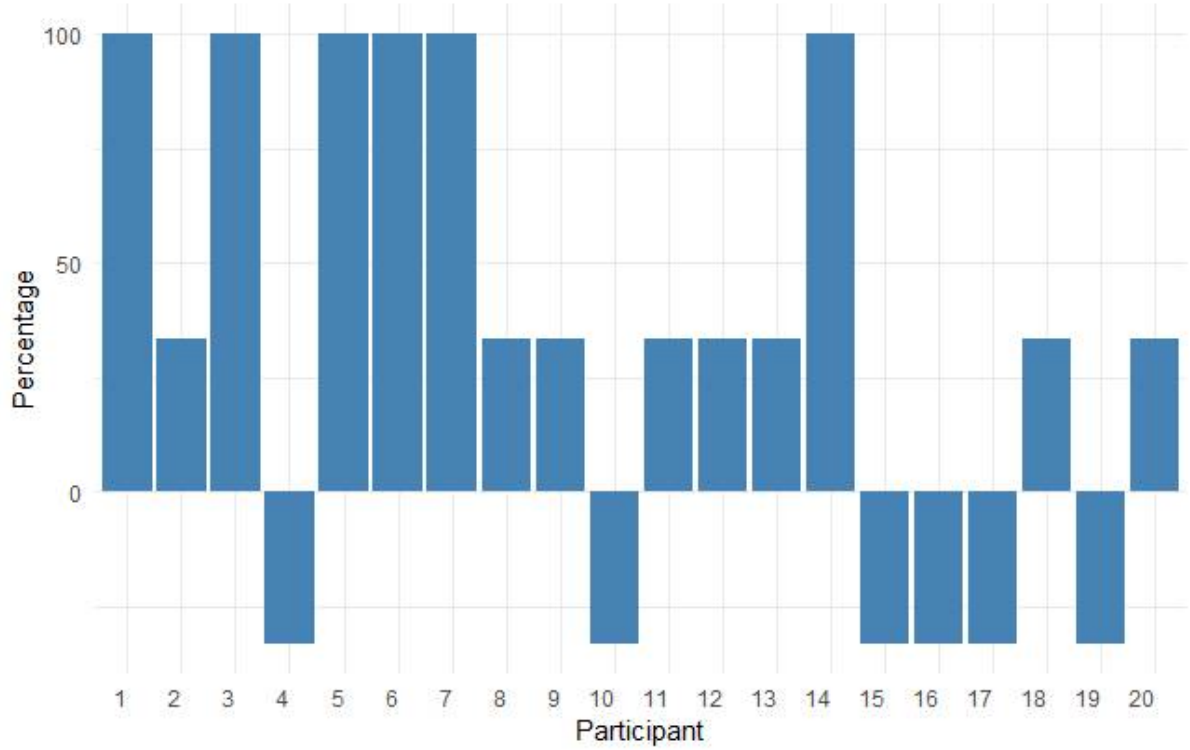


4) Broad focus: Case marker – Topic marker

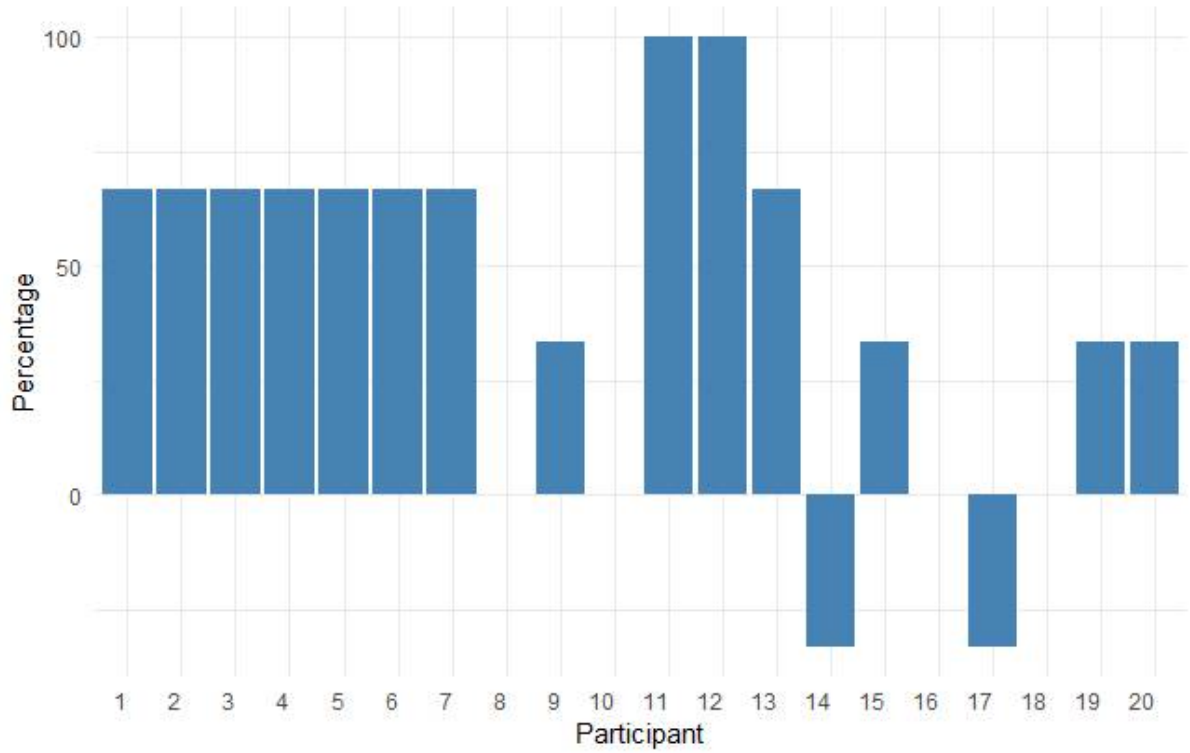


3. Experiment 3, Age 10

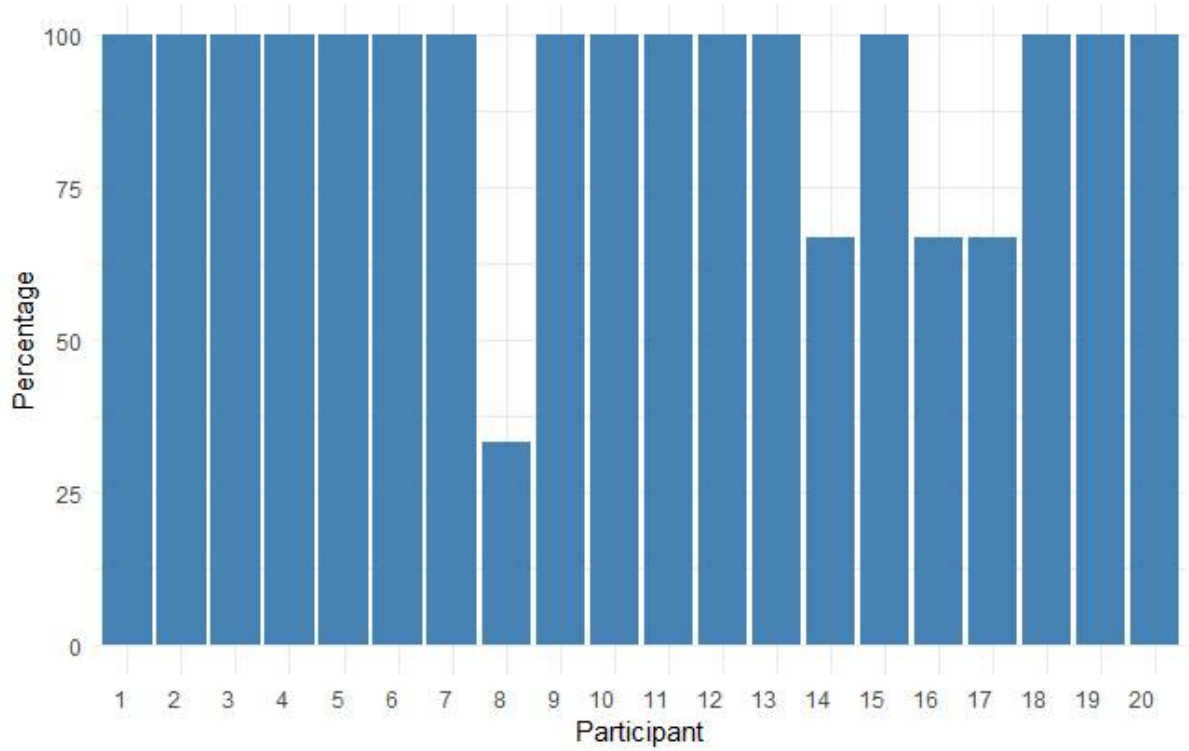
1) Anaphoric topic: Topic marker – case marker



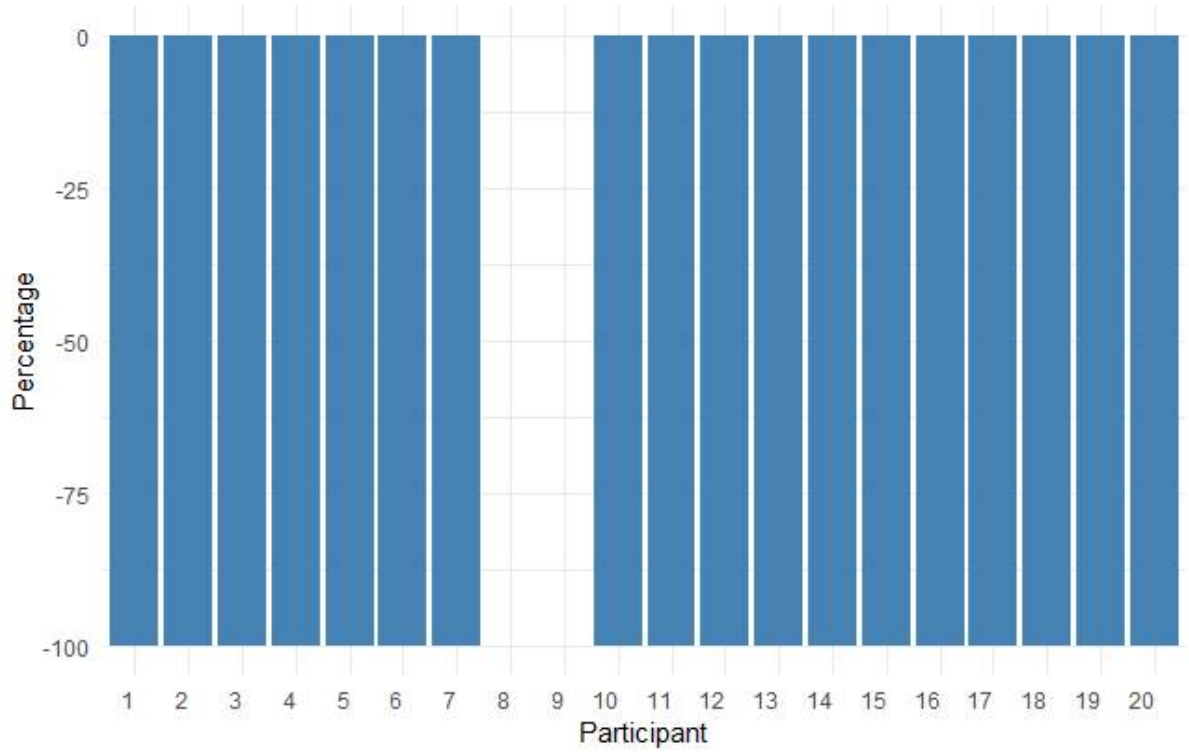
2) Contrastive topic: Topic marker – case marker



3) Generic topic: Topic marker – case marker

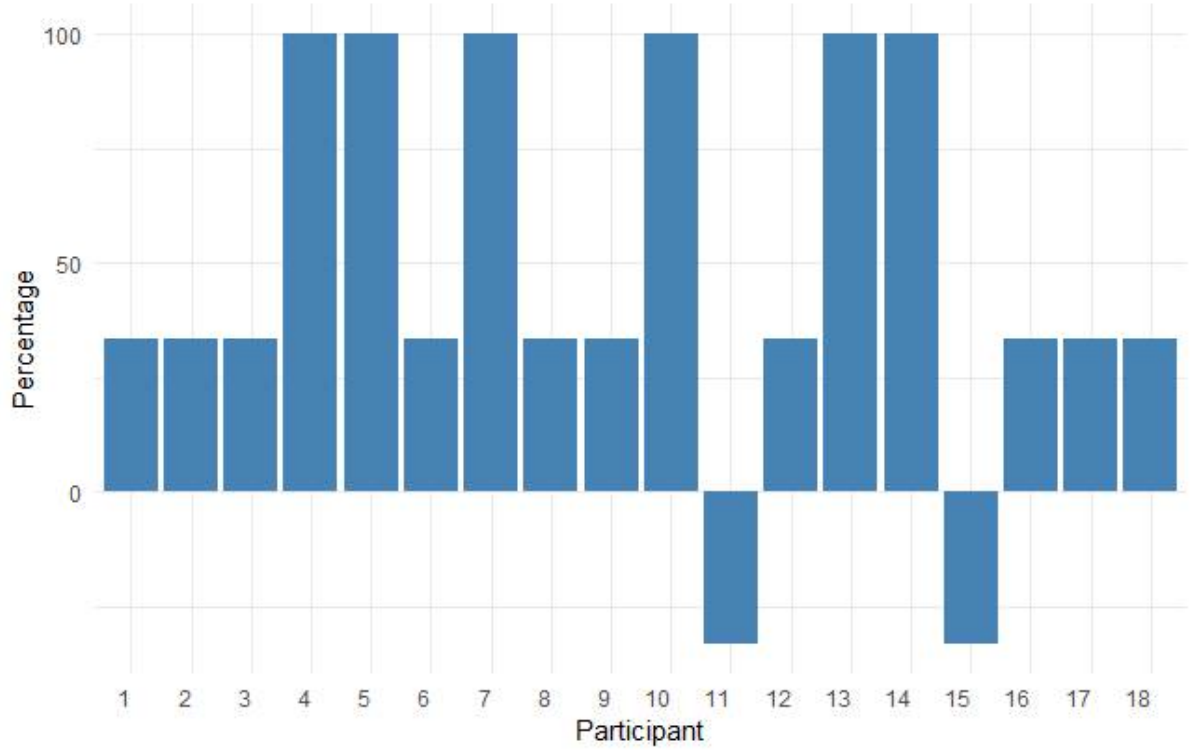


4) Broad focus: Case marker – Topic marker

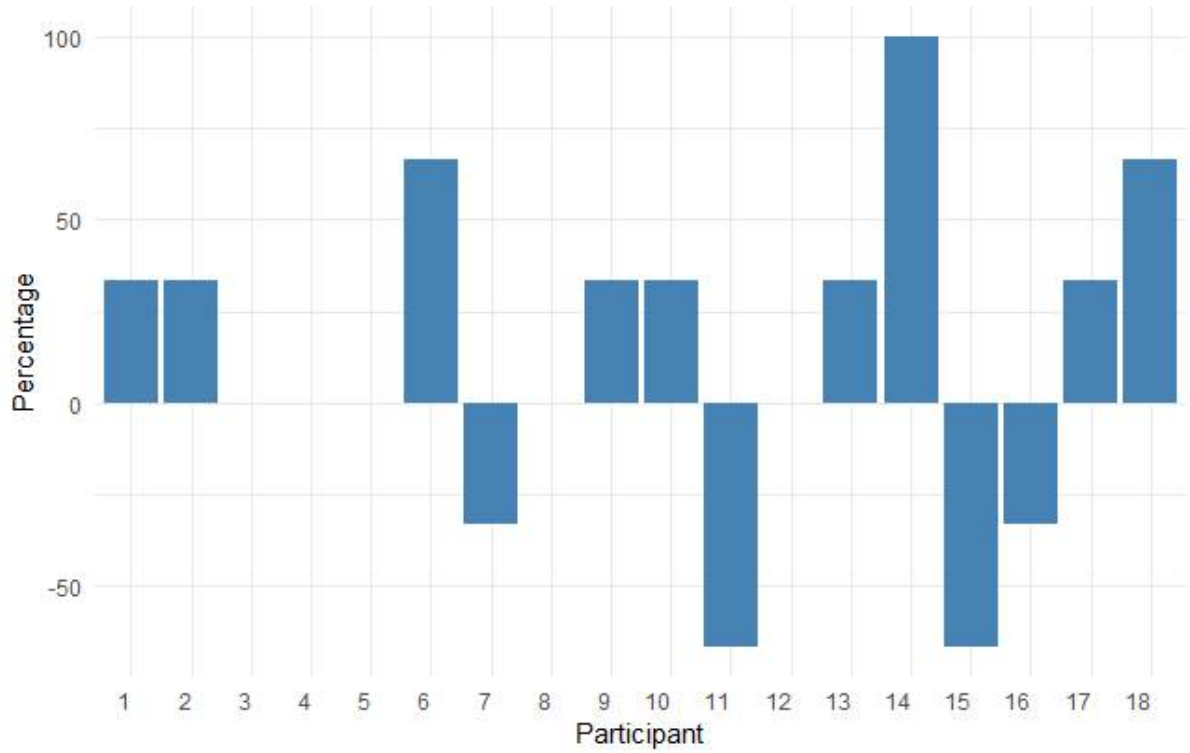


3. Experiment 3, Age 6

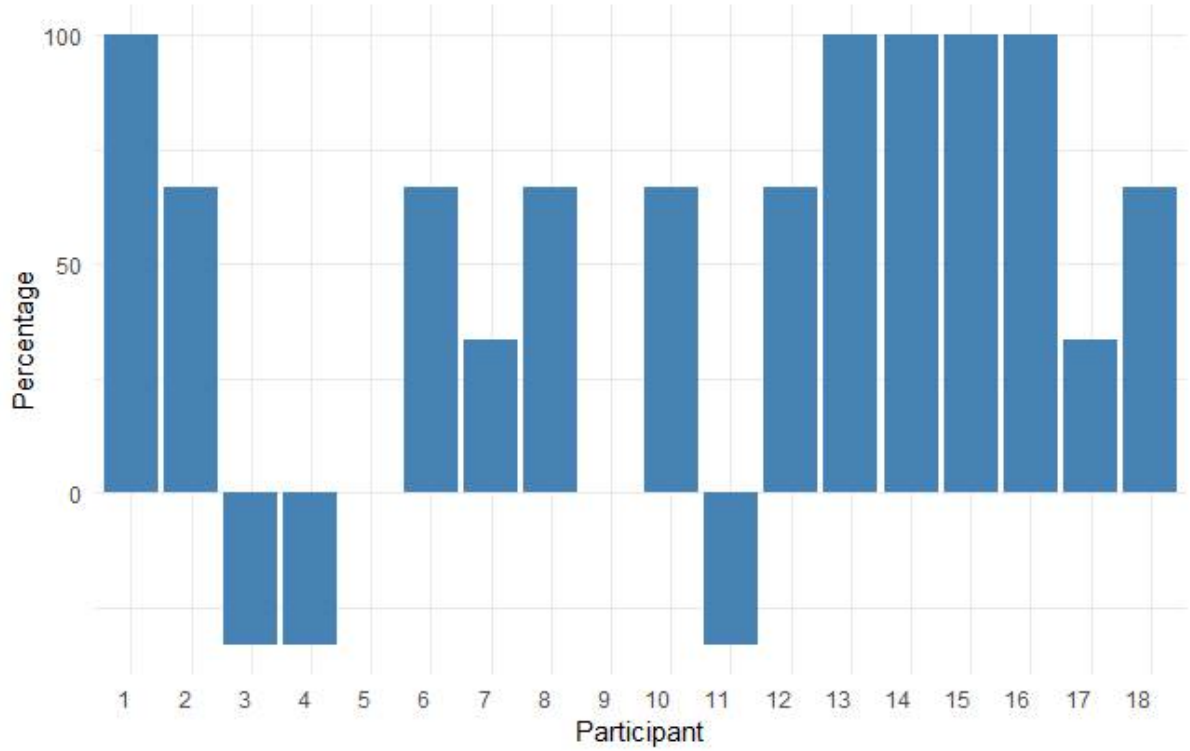
1) Anaphoric topic: Topic marker – case marker



2) Contrastive topic: Topic marker – case marker



3) Generic topic: Topic marker – case marker



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