

EFFECT OF WORD ORDER ON COGNITION IN HAITIAN CREOLE AND FRENCH  
SPEAKERS

by

WOODLER MEDNA

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Sponsor: Alexia Toskos, Ph.D.

Second Reader: Stephen Flusberg, Ph.D.

**Abstract**

To what extent does the language we speak affect the way we perceive the world? Some researchers suggest that language has no effect on thought, whereas others suggest that there are important effects of language on thought. The following paper reviews the literature on effects of language on thought, with special attention to effects of vocabulary and metaphor on thought, as well as effects of grammar and word order on thought. Finally, the paper proposes new avenues of research in relation to cross-linguistic differences in noun-determiner patterns. More specifically what are the effects of syntactic differences in noun-determiner placement between Haitian French and Haitian Creole. Do monolingual speakers of Haitian Creole distribute more attention to objects in the world because nouns have a more prominent placement in the noun phrase in Creole than they do in French? Does attention to objects in the world shift when bilingual French-Creole speakers switch between languages?

*Keywords: Syntax, Word-order, Metaphor, Cognition, Haitian Creole*

### **Effect of Word Order on Cognition in Haitian Creole and French Speakers**

Charlemagne famously said, "To speak a second language is to possess another soul."

Diverse cultures from around the world have created unique ways for individuals to communicate. Whether an individual speaks a dialect of Senegalese French to Canadian French or a dialect of South American Spanish to the Spanish spoken in Spain, language changes continuously along with cultural values and practices. Currently, there are 7,139 different spoken languages in the world (Ethnologue: Languages of the World, 2021). Each respective language provides each of its speakers with a unique lens through which they might perceive their surroundings. Could it be that the quirks of the language that an individual speaks affect the way they perceive the world? The present paper will examine the literature on effects of language on thought with the goal of identifying important new avenues for research.

Our ability to think, memorize, judge, and problem-solve, amongst other functions, grants us the ability to plan, imagine, perceive, and, most importantly, communicate with one another in a much more sophisticated communication pattern than other animals. In his book, "The Language Instinct" (1994), Pinker argues that what distinguishes human language from other animal communication is its compositionality. The endless capacity to generate new sentences by combining and recombining sets of words into their "subject," "verb," and "object" roles awards humans the ability to communicate in past-tense, present, future, and metaphorically. The ability to process knowledge and gain comprehension over a single lifetime allowed human language to evolve and differ from other communication methods.

However, some patterns in language are not universal. One way in which languages differ from one another is in the sequence in which words are presented in a sentence. In linguistics, this principle is referred to as syntax. In many languages today, the most common of word orders

are Subject-Object-Verb (SOV) or Subject-Verb-Object (SVO) orders. What distinguishes SOV word-order from SVO word-order is that the verbs are placed last in a sentence when a language exhibits SOV word order (like in Japanese), whereas, in SVO, the verb is placed in the middle of the sentence (like in English). For example, in English a sentence could be seen as “Mary kissed the dog”, whereas in Japanese that same sentence would be “Mary the dog kissed.” In addition to word order, some languages have additional markers that specify the role the words plays in the sentence. For instance, in addition to being an SOV language, there are elements called particles in Japanese (Kim, T., 2018); Particles mark the syntactic role of the word or phrase that they modify. While it is impossible to move the syntactic elements around in English without altering the meaning of the sentence, in Japanese, it is possible. Due to this, an entire phrase, including the particle within a Japanese sentence, can be moved to any other position without losing its role. Even more extreme are languages like Greek that have totally flexible word order because every word is marked for the role it plays in the sentence (Philippaki-Warburton, 2008).

Do these unique patterns in each language represent and perpetuate a particular worldview to speakers of the language? Whorf (1950) perceived languages as a mold into which infant's minds are poured. Unlike Pinker, Whorf hypothesized that language shapes the types of categories people attend to and learn from the world. He proposed that each language represents and preserves a culture's understanding of the world. When learning to speak a language, an individual unwillingly agrees to see and think of the world in the manner in which that language allows them. In Whorf's view, the world can be structured in many ways, and the language we learn as children influences the formation of our particular structure (Brown, 1954). Researchers have studied metaphors and the way people think and reason about abstract topics and argued that language guides specific aspects that we are observing (Slobin, 2003; Whorf, 1950). Landau

and colleagues (2010) stated that language is inherently selective, as in languages choose to encode certain spatial properties while excluding others, in an effort to direct our visual attention accordingly. They also explain that language has a second aspect to it. That is, language can enrich visual-spatial representations; language allows us to travel beyond our spatial system of representation.

In contrast, some believe that all languages purvey the same reality and that thought and behavior are independent of a person's language (Cassirer, 1953). Pinker also suggest that there are universals in language. Pinker's view is that people's thoughts and understanding of the world carve out and provide us language. He viewed language as a tool, a tool that helps people convey their ideas and experience to others. Pinker made the argument that words within a language often have multiple meanings, and it is the speaker's molded conception of reality within their linguistic categories that helps them distinguish an abstract sense from a concrete sense. Furthermore, he made the argument that the fact new words are continuously coined within languages disproves the idea that language influence thought. Pinker suggested that we possess a universal ability to convert our thoughts into language, and not the other way around.

Is there a relationship between syntactic word order in language and how salient subjects, actions, and objects are to speakers of that language? The present paper will propose a study based on this question after reviewing the literature on (1) effects of lexicon on thought, (2) general effects of sentence structure on thought, and (3) effects of word order on thought.

### **Effects of Lexicon on Thought**

Thinking for speaking is a term used by Slobin to describe our brain's mental process when expressing thought through language (Slobin, 2003). Slobin explains “thinking for speaking” as cognition playing a dynamic role in tasks where a person is preparing to speak. This

perspective illustrates that language is like a "spotlight". Spotlights are commonly used to shine and bring attention to a specific aspect of a scene in a play. This is different from Whorf's view that language affects thought in a long-term way no matter what task we are doing. Slobin suggests that language should only affect thought in the moment when performing a tasking that involves language. In language, our brain highlights and focuses on essential words in a sentence to direct people's attention to certain objects, properties, or events, making them more likely to be noticed. Furthermore, words can also serve as categorization tools. This allows objects in the world that receive the same label to be perceived as more similar to one another than objects that receive different labels (Winawer et al., 2007).

Other researchers have asked whether language can affect thought even in non-linguistic tasks. Are there cross-linguistic differences in color discrimination even for simple, objective, perceptual discrimination tasks? If so, do these differences depend on the online involvement of language even when the task is not linguistic? In English different shades of blue, whether it be a dark blue like "navy blue" or a lighter shade of blue like "sky blue", are all labeled as just simply *blue*. But in the other languages, such as Russian, the color spectrum is divided and talked about differently. In Russian there are different names for each shade of color on the color spectrum. Lighter blues are referred to as "goluboy," and darker blues are called "siniy." To test whether these different labels affect how speakers of these languages discriminate colors, experimenters Winawer et al. (2007) measured English and Russian speakers' reaction time when presented with different colors. In a simple, objective, perceptual task, participants were simultaneously presented with three color squares arranged in a triad. All stimuli involved (i.e., the three color squares) remained in full view of the participants until they responded. For each stimulus, participants were asked to state which of the two bottom color squares was perceptually identical

to the square on top. The fact that the stimulus was present until the participant responded, allowed subjects to make their decisions with a strong sense of confidence, without having to worry and focus on memory demands. Results showed that Russian speakers were faster at recognizing and differentiating similar colors when they crossed the goluboy / siniy boundary than were English speakers, but English and Russian speakers were equally fast at making color discriminations when they did not straddle a category boundary. English speakers show the same advantage when they are asked to judge whether two colors are different from one another when they cross the green / blue boundary in English (Winawer et al., 2007). Because each language talks about color differently, that evidently allows them to each perceive color differently as well.

If words in language can affect concrete, perceptual judgments about color, can they also affect our ability to make judgements about abstract domains that have even more room for interpretation? The use of metaphoric language to talk about abstract domains helps us reason and understand unfamiliar information by drawing on familiar areas and concrete ideas we already experience (Lakoff & Johnson, 1980). These metaphorical judgments give us flexibility in the way we represent and embody specific experiences from information that we do have first-hand concrete experience with.

Further studies by Boroditsky (2000) have shown that spatial metaphors for time shape the way people reason about time. In the study it was shown that there are two types of metaphorical spatial perspectives that people use to talk about time, the first being the "ego-moving" perspective, where people think about themselves as physically moving forward in time toward events in the future, and the second being the "time-moving" perspective, where people think of themselves as being fixed in the present while events in time move toward them from

the future. In the experiment, participants were primed with items depicting self-movement or the movement of other objects toward the self. Then participants had to read an ambiguous temporal sentence, such as "Next Wednesday's meeting has been moved forward two days", and instructed to indicate which day the meeting had been rescheduled. This sentence is considered ambiguous because depending how a person views it, the meeting could be on Monday or Friday. Results showed that abstract domains such as time are indeed shaped by metaphorical mappings and framing of words. Of all the participants primed in the ego-moving frame of reference, 73.3% thought that the meeting was on Friday, and 26.7% thought it was on Monday. Participants primed in the object-moving frame of reference showed the reverse bias, with 30.8% of the participants thinking the meeting was on Friday, and 69.2% thinking the meeting was on Monday.

The use of metaphor is deemed pervasive in mass communication and everyday linguistic exchanges. Previous research on metaphorical framing found that when a positive metaphor is used to evaluate a topic, a more positive attitude is evoked in a person than when a negative metaphor is used to evaluate something (Boroditsky, 2000). Expanding upon this, Ottati (1999) focused on a different type of persuasion effect: motivation. The authors of this article propose that metaphorical language influences the level of motivation an individual puts forth in a persuasive conversation, if the metaphorical vehicle being used to convey the message about the topic resonates with the listener. In two separate but comparable experiments, the researchers examined the effect of sports metaphors in communication when a strong or weak literal argument is accompanied by a filler sentence containing either a sports metaphor ("If you want to play ball with the best... ") or a semantically equivalent literal expression ("If you want to work with the best... "). It was hypothesized that arguments containing sports metaphors would



increase processing among individuals who like sports and decrease processing among individuals who dislike sports. Results found that in the literal condition, the effect of argument strength was substantial among participants who dislike sports and minimal among participants who like sports. Whereas the metaphorical conditions showed that the argument strength effect was small among participants who dislike sports and extremely large among individuals who like sports. These results yield significance because they illustrated that metaphors do in fact affect motivation. Participants who liked sports or had sufficient knowledge of sports were more inclined to argue their opinion on whether college seniors should be required to complete a thesis requirement before graduation than participants who did not like sports. Based on these findings, language does seem to affect cognition; when an individual resonates with a specific topic, they are more motivated and involved in the conversation than a conversation in which they do not resonate with the topic.

Other work has shown that metaphors in language may influence how people reason about solutions to complex problems. Unlike previous research on metaphorical framing, which focused on the persuasive and motivational effect of metaphors, Thibodeau & Boroditsky (2011) examined metaphor as a framework for perceiving and formulating opinions on social or political matters. In particular, they examined what role metaphors play when someone is reasoning about crime. In a five-part study, participants were split into two separate experimental groups and presented an article describing a city's crime problem. In group A, crime was referred to as a virus infecting the city, compared to group B, where crime was referred to as a beast ravaging the city. After reading the article, participants in each group were asked to come up with a solution to the crime problem mentioned in the article. Results showed that participants who were given crime as a beast metaphorically were more likely to suggest harsher and stricter

punishment than participants who were given the crime as virus framing. These results support the idea that language influences cognition, when the participants read crime as a virus they systematically perceived and viewed crime as something that could be solved and cured with careful attention, somewhat like a vaccine which is a solution for killing viruses. Similarly, when they read crime as a beast, systemic solutions for dealing with a beast come to mind, like caging.

There is also research conducted by Casasanto et al. (2008) showing that sometimes the metaphor in language affects cognition in different ways across different contexts. In a study analyzing the way people talk about similarity, “close” in appearance vs. “far apart” in appearance, researchers tested to see if there is a psychological relationship between similarity and spatial proximity. The experiments tested for three things: effects of spatial proximity on similarity judgments about linguistic stimuli, effects of spatial proximity on similarity judgments about nonlinguistic stimuli, and effects of spatial proximity on perceptual versus conceptual similarity judgments about line drawings of objects. In three different experiments, participants were presented pairs of words or pictures on a computer screen at varying physical distances and asked to rate how similar the stimuli were to each other. In Experiment 1, participants were tested on abstract nouns' similarity in meaning when they appeared closer together on the screen versus farther apart. Results found that spatial proximity does influence similarity judgments, but the results also uncovered that the type of judgment the participants had to make affects the direction of the effect. Closer stimuli were rated *more* similar, in accordance with the metaphors in language, during conceptual judgments of words or line drawings of objects, but they were rated as *less* similar during perceptual judgments of faces and line drawings of objects. The difference in judgment type to presented stimulus is evident that language does affect thought patterns, especially for abstract thinking, but it does not entirely shape cognition. Effects of

proximity on perceptual judgments may be related to non-linguistic perceptual biases.

In recent years, researchers have examined whether consistence differences across different language affect how speaker think more generally. Does the way we talk about time affect the way we think about it? For example, in English, a person might say, "The meeting was pushed forward a couple of days" or "The end of the semester is around the corner." These metaphors treat time as if it moves on a horizontal plane. In English, vertical metaphors such as "The meeting was pushed up two days" and "We hand down knowledge from generation to generation" are also present. However, these are not as common or systematic. Like English, Mandarin has horizontal metaphors for time, but it is also prevalent to talk about time vertically, in a similar way that mimics reading a calendar. When reading a calendar, time goes from top to bottom, and so do Mandarin metaphors. In Mandarin, people say *sha'ng ge yue*, which roughly translates to "UP month," or in non-spatial terms, "the previous month." It is also acceptable to say *xia` ge yue,* which translates to "DOWN month," meaning "the following month." In one study, researchers Fuhrman et al. (2011) examined how the metaphors used to talk about time in Mandarin and English affect our perception of time. In a non-linguistic task, using photographic stimuli, participants would see a picture of a partially completed event on a computer screen, such as a half-peeled banana, followed by a picture of a later or earlier point in this same event, such as the whole banana or the empty banana peel. Participants were then instructed to decide whether the second picture presented showed a conceptually earlier or later time point than the first picture. Results showed that English speakers had no effect in response direction when responding vertically, but Mandarin speakers did. Mandarin speakers were much faster at responding to questions in the typical direction (top-to-bottom) than the atypical direction (bottom to top).

### Effects of Sentence Structure on Thought

One aspect of grammar that an individual must master when learning to speak a language is morphosyntax. Morphology is the study of words and their rules of formation. Research has shown that grammatical gender, an element of morphosyntax, plays a role in guiding children's attention to different objects in the environment. In Spanish, for example, when referring to a noun, a word such as "la" or "el", the feminine and masculine forms of "the," must precede the target word. It could be that a native speaker of a language that uses a grammatical gender system may benefit in on-line sentence interpretation than speakers of a language that does not have a grammatical gender system. To investigate this possibility, Lew-Williams & Fernald (2007) tested the effect of determiners such as *el* and *la* on a processing of a spoken sentence as it unfolds over time in Spanish-speaking children from monolingual homes. The researchers wanted to know whether children could use the determiner to guide their attention to the correct picture faster. In the experiment, participants were presented with an audio and visual stimulus. The audio stimuli were simple Spanish sentences ending in familiar object names, such as "*Encuentra la pelota,*" which means "find the ball". The visual stimuli included colorful digitized pictures resembling the objects. The researchers measured how long it took children to move their eyes to the named object. In the first half of the experiment, participants were presented with pictures of objects from the same grammatical gender categories. For the other half, they were presented with objects belonging to different grammatical gender categories. The result showed participants were faster at identifying the correct object when the two pictures on the screen belonged to different grammatical gender categories. Using the gender marking (*la*, *el*, *los*, & *las*) preceding the noun, children were able to narrow down the options in real-time,

allowing for a quicker reaction time.

The use of grammatical gender, found in Spanish, French, and many other languages globally, is one of the more difficult elements morphosyntax to master. Results from previous studies on first and second language learning showed that young children learning a language with grammatical gender not only make fewer gender agreement errors than do older language learners, but they also take advantage of gender-marked words in real-time to interpret spoken sentences more rapidly (Lew-Williams & Fernald, 2007). Continuing with this topic, Lew-Williams & Fernald (2010) analyzed the efficiency in which adults learning to speak Spanish (L2) compared to native Spanish speakers (L1) were able to use gender-marked articles to interpret familiar nouns. In three separate experiments, L1 and L2 speakers were presented with a recorded sentence consisting of a simple frame (Encuentra, 'Find,' or ¿Dónde está, 'Where is'), followed by one of eight article– noun pairs, half feminine and half masculine (la pelota, 'ball,' la Galleta, 'cookie,'). Extending upon their earlier study involving Spanish-learning children and their monolingual Spanish-speaking parents, in this experiment, participants were also tested in the same eye-tracking procedure used to monitor the time course of children's sentence interpretation. For each trial, L1 and L2 participants were presented with a picture showing two objects with either the same or different grammatical gender name. At the same time, they heard a Spanish sentence referring to one of the objects. Each time this happens, reaction time was calculated for how fast it took them to look at the proper object if they weren't already looking at it. Native Spanish speakers (L1) showed that they used informative gender-marked articles to facilitate word recognition more efficiently in real-time compared to English speakers learning to speak Spanish. Depending on how the sentence was framed and presented, English-speaking adults could also take advantage of gender-marked articles in ways that resembled Native

Spanish speakers, allowing them to respond faster in specific gender trials. For example, when a noun followed a single article form, non-native Spanish speaker were less successful at judging which object the voice was alluding to on similar and different gender trials. However, after they were repeatedly primed with new nouns using informative articles, non-native Spanish speakers were able to process and exploit gender markings at a faster rate. Using the newly learned word and its preceding gender mark article, L2 speakers were able to identify the correct object more quickly on different gender trails than on same gender trails.

If people use grammar in real time to guide attention to different aspects of their surroundings, can language-specific patterns in grammar lead to general differences in what people attend to? For example, research on agentive language has shown that active versus passive sentence constructions in a language affect blame and punishment (Fausey & Boroditsky, 2010). Previous research conducted on agentive language has shown that when a person uses an active voice to describe an event caused by someone, more blame will be placed on the agent of the accident than when a passive voice is used (Fausey & Boroditsky, 2010). Similarly, a separate study examined eyewitness testimony in relation to memory of an event (Fausey & Boroditsky, 2010). In this experiment, English speakers and Spanish speakers were asked to describe intentional and accidental events. In a separate set of subjects, participants' memory for the agent of an accident was measured. Results showed that English and Spanish speakers both described intentional events similarly, using mostly agentive language, for example, "She popped the balloon." However, when it came to accidental events English speakers used more agentive language than Spanish speakers, for example "the balloon popped". Spanish speakers were also less likely than English speakers to correctly identify accidental events agents, but they were equally likely to remember the agents of intentional events.

In addition to agentive language, grammatical aspect in language has also been shown to influence how children and adults perceive and talk about events. Aspect is a grammatical category that expresses how an action, event, or state, denoted by a verb, extends over time. Aspect can determine whether a verb represents an ongoing action, a completed action, or the outcome of an ongoing action. In a cross-linguistic study on the development of narrative abilities in Spanish and English, researchers Slobin and Bocaz (1988) found that children who grew up learning Spanish were more likely to use grammar coding for the end state of an event than English speakers. In an experiment constructed to see how English and Spanish speakers differ in the way they speak of an event, children aged 3-11 who grew up learning English or Spanish were asked to narrate a picture storybook, "Frog, where are you" (Mayer 1969). The storybook displayed a plot but no verbal text. The actions focus on a boy whose pet frog has escaped. Each picture showed a variety of adventures the boy and his dog must encounter before finally finding his frog at the end. To prevent bias in story-telling, the experimenter refrained from presenting prompts with a verb. Results show that Spanish grammar does direct children's attention towards the boundaries of events in time. The difference in verbal systems shows that when talking about an event, Spanish-speaking children are more likely to attend to and describe the path or end state of an event than English-speaking children, who are more likely to describe *how* something happened or how objects move through space. This would be an example of how patterns in language can affect language for speaking in online ways.

### **Effects of Word Order on Thought**

One understudied syntactical structure in language that may affect patterns of thought is word order. Research on word order shows that syntactical order of words in a language is a huge influencer on the way speakers shape and represent information. In a study involving word

order, researchers intended to study the relationship between people's actions when trying to communicate non-verbally to the order in which words are spoken in a language (Chee So, Goldin-Meadow, Mylander, & Ozyurek, 2008). Participants of four languages (English, Turkish, Spanish, and Chinese) were asked to perform two nonverbal tasks: a communicative task and a non-communicative task. In the first task, people (10 English speakers, 10 Turkish speakers, 10 Spanish speakers, and 10 Mandarin speakers) were asked to describe a series of vignettes displayed on a computer screen. The vignettes displayed 36 different motion of events. Using only their hands and not their mouths, the participants had to describe the interaction happening between a real object and a person or an animated toy and an object. For the second task, participants reconstructed the same events using sets of transparent pictures. Participants were instructed to reconstruct the event by stacking the transparencies one by one onto a peg to form a single representation of the event. The purpose of this task was to see and test whether speakers would extend the ordering patterns of their languages not only to the visual situations but also to a non-communicative situation. Results showed that the word order speakers used in their everyday speech did not influence their nonverbal behavior. Instead, speakers of all four languages used the same order when communicating in nonverbal tasks: subject, object, verb. This suggests that word order may not influence thought, and that there might be a universal default ordering for non-verbal communication.

That said, other research has found evidence of the influence of word order on thought, particularly with respect to the order of nouns and adjectives in sentences. Today, most spoken languages are classified as either prenominal (such as English or German) or postnominal (such as Portuguese or Italian). In a prenominal language, the adjectives of that language usually come before the nouns they modify, whereas in postnominal languages, the nouns usually precede the



adjectives. In a cross-linguistic study analyzing memory and perception of English and Portuguese speakers, researchers Percy (2009) found that nouns generally carried more weight for Portuguese speakers (who use adjectives postnominally) when making judgments than English speakers (who use adjectives prenominally). In the study, participants were presented with several items that varied in noun- and adjective-designated attributes (shape and color; e.g., blue square). Participants were then asked to name which item they recognized from before and which two items they believed were closely related. The results showed that Portuguese participants judged noun-matched items to be more similar than English participants, whereas, for adjective-matched items, the opposite was found. These results suggest language does, in fact, direct people's attention to the attributes of objects that are featured more prominently in the sentence. Other research suggests that postnominal markers can facilitate category learning generally, whereas prenominal markers for superordinate nouns can facilitate learning subordinate nouns (Hoppe et al., 2020).

Research on syntax as it relates to word order shows that word order in a language shapes memories in speakers. In a cross-linguistic study measuring short-term and working memory in Left Branched (LB) and Right Branched (RB) languages, Armici et al. (2019) found that the word order of our native language not only predicts the way we remember words but also other non-linguistic stimuli. Right-branched languages place the most important element in a phrase first, and all other qualifiers come afterward (e.g., Italian, Khmer (Cambodia), Oshiwambo (Namibia), and Northern Thai). Left-branched languages place the most important element in a phrase last, and all other qualifiers come beforehand (e.g., Japanese, Korean, Khoekhoe (Namibia), Sidaama (Ethiopia)). For each language, people were instructed to perform in three working memory and three short-term memory tasks, containing sets of 2–9 numerical, spatial,

or word stimuli. For each trial (numerical, spatial and word), participants were instructed to recall and repeat a set of stimuli through different methods. For the word based short term memory (STM) task, participants were instructed to recall a series of pictures out loud as they were presented to them. Immediately afterwards they were instructed to recall them out loud in the same order they had appeared. For the numerical STM task, participants were again asked to recall a set of numbers on the screen and just like the previous task, recall them in the order they were presented. Finally for the spatial STM task, participants were instructed to observe a series of matrixes on the screen and then recall the position of each red square in the same order they had appeared. In contrast, for the working memory (WM) word task, participants were instructed to recall a series of pictures out loud as they were presented to them, but instead of immediately repeating them back out loud like the STM task, participants were presented with a distractor task before the question and then asked to recall then words back out loud in the order they were presented to them. For the numerical WM task, participants were presented with a varying number of blue circles, blue squares and green circles. Participants was instructed to count out loud the number of blue circles amongst the other figures presented as a distractor. This time participants were ask to recall out loud the number of total images presented to them along with the number of blue square presented in the series. Finally for the spatial WM task, participants were instructed to observe the series of  $4 \times 4$  matrixes on the screen, assess aloud whether the  $8 \times 8$  symmetry matrixes were symmetrical or not (i.e. distracting task), and then asked to recall the position of each matrix presented in the correct order in a coding sheet instead of speaking them out loud. There was no significant effect of branching on short-term memory. However, participants were better at recalling initial stimuli in LB languages compared to RB languages. In contrast, RB language participants were better at recalling final stimuli compared to LB

languages. These results suggest that language does predict the way we remember and process information. The practice of having to remember qualifiers that precede the important word in a phrase trains people to attend to and maintain early information in memory, and vice versa.

### **Proposed Avenues of Research**

We have looked at the effect of word order on thought in relation to how information and memories are shaped in a speaker. We have also examined metaphors and sentence structure within languages and the influence they have on shaping thought patterns across cultures, but there is not much research on how noun-determiner patterns in language affect what people attend to or learn about in their environments. Determiners are words like “a”, “an”, and “the” that do not stand by themselves. In most languages, these words come before a noun when speaking or writing. Previous research has documented word order patterns in French-lexified Antillean creoles such as Haitian Creole and St. Lucian Creole (Klein et al., 2003). These languages have postnominal determiners. Could there be an effect of noun-determiner order on attention in languages where a noun is placed before vs after the determiner in the phrase? Specifically, the present paper proposes new research on the effects of syntactic differences in noun-determiner placement between Haitian French and Haitian Creole. In Haitian French noun phrases, like in English, the determiner comes before the noun (e.g., “Le livre”). However, in Haitian Creole, the determiner comes after the noun (“Livre la”). Do monolingual speakers of Haitian Creole distribute more attention to objects in the world because nouns have a more prominent placement in the noun phrase in Creole than they do in French? Does attention to objects in the world shift when bilingual French-Creole speakers switch between languages?

In the proposed study, we would measure attention using an eye tracker. Normally when people explore a scene, their visual attention falls on the people in the scene, and then,

secondarily, on objects in the scene. We would ask whether monolingual Creole speakers are naturally faster than monolingual French speakers to turn their attention to objects because of the more prominent placement of nouns in Creole. We would test this by comparing French and Creole speakers' eye fixations across scenes like in Figure 1 where a person is either present or not present. Scan patterns across these two images should look more similar to each other for Creole speakers than for French speakers if Creole speakers are really more likely to attend to objects. In a surprise memory test, we would test whether Creole speakers had better memory for details of the objects in the images compared to French speakers. For example, would Creole speakers be more likely than French speakers to notice a color change in the book being grasped by the person in Figure 1?



*Figure 1. Example eye tracking stimuli in the proposed studies.*

Then we would test whether accompanying language would have different effects on scan patterns and object memory of these two pictures if it were in French versus Creole in bilingual speakers. For example, would the sentence “he took the book” shift attention to the book more strongly if it were spoken in Creole compared to French, again because the noun placement is more prominent in Creole and could shift attention to the object more quickly as a result. In the event that there is a difference between French and Creole speakers, this proposed study would help us to better understand how word order helps Creole speakers shift attention to

objects. If there is no apparent difference between speakers on the eye tracking measure in this proposed study, then that would suggest that noun-determiner order in a sentence may not be salient enough to result in long-term effects on attention in Creole speakers compared to French speakers. However, Slobin's thinking for speaking argument suggests that language is a spotlight used to shine and bring attention to a specific things we want to convey (Slobin, 2003), so this leaves open the possibility that language might affect attention and object perception in a language production task. By studying cross-linguistic effects within a single Haitian culture, we can begin to isolate and examine effects of noun-determiner order on thought.

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