The effect of using gestures to learn words in a second language

Using deictic gestures to learn adverbs of place in Spanish

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Author: Rashim Charles

Supervisor: dr. M.W. Hoetjes

Assessor: dr. Laura.J. Speed

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From the start, I knew this would be a challenging endeavor, and I must say, it has not disappointed me. Writing has never been my strongest ability, but as they say: the best learning is achieved when one is struggling with the material (Stigler & Hiebert, 2009). I would add that the right guidance is also essential for successful learning, and with dr. Marieke Hoetjes, I have been fortunate to have such a capable and well-equipped supervisor. I am grateful for her kindness, endless patience, and clear, in-depth feedback.

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Abstract

This study was designed to determine the effect of deictic gestures on learning Spanish adverbs of words. Adverbs of place are words that describe the location of an object. Most languages use these words. However, languages differ in the number of words they use for adverbs of place. For a language learner, acquiring a language that uses more words to describe an action than their native language can present difficulties with learning the second language because they have to create new semantic categories (Ellis, 1994). According to the dual coding theory, learning can be improved by presenting information in different formats (Clark & Paivio, 1991; Paivio & Lambert, 1981). Research has shown that gestures, and especially deictic gestures, can facilitate language learning (Goldin-Meadow, 2005; Huang, Kim, & Christianson, 2019). Therefore, this study looked at the facilitative influence of deictic gestures on learning Spanish adverbs of place. Dutch native speakers with minimal Spanish proficiency participated in the study because the Dutch language has two words (*hier* and *daar*) for adverbs of place while the Spanish language has three words (*aquí, allí,* and *allá*). The study had a training phase whereby one condition received instructions on the Spanish adverbs of place with deictic gestures, and the other condition received instructions that did not include deictic gestures. The participants were then tested on how well they had learned the Spanish adverbs of place by using a location identifying task in which participants looked at a video and had to tell how far an object was from the speaker in the video. The subjects could earn one point for each correct answer, with a total of twelve points. The results pointed out that deictic gestures did not significantly facilitate the learning of adverbs of place in Spanish in this study. A possible ceiling effect had occurred due to participants in both conditions acquiring high scores. Even though this study did not confirm that deictic gestures can influence language acquisition, it might offer insights for companies and institutions that deal with a foreign language and language acquisition.

Introduction

Communicating in a second language has become an increasingly important asset in the current technology-driven society due to the rise in globalization. The workplace is also becoming more diverse and multilingual (Lüdi, Höchle, & Yanaprasart, 2013). More companies are expecting employees to be able to communicate in a foreign language. Nevertheless, acquiring a second language can be a complicated process for individuals due to factors such as motivation (Dörnyei, 1998), intrinsic differences between languages (Ellis, 1994), and how good the level of the native language is of an individual (Sparks, 1993). Therefore, an often-asked question in the domain of second language acquisition (SLA) is how this process can be improved.

According to the dual coding theory, learning can be improved by conveying information through multiple sensory channels (Paivio & Lambert, 1981). Therefore, it can be beneficial for language learning to add non-verbal communication to the verbal aspect of language, for example, in the form of gestures. Gestures are the symbolic movements of the speaker's hands and arms produced during speech (Gullberg, 1999; Kendon, 1972; McNeill, 1992). Gestures have a close relationship with speech, which is another reason why they might be useful in language learning contexts (Gullberg, 2006). Indeed, gestures have been found to facilitate second language vocabulary acquisition (Huang et al., 2019; Macedonia, 2014; Tellier, 2008).

Languages may differ in the number and type of words they use to describe the same thing (Ameel, Storms, Malt, & Sloman, 2005). These differences in semantic categories between languages may cause difficulty when learning a second language (Ellis, 1994). Given that gestures have been shown to facilitate second language vocabulary acquisition, an open question is whether they can also help in second language vocabulary acquisition when there are differences in semantic categories between the native and the second language. Specifically, the focus of this study will be on the acquisition of adverbs of place. Adverbs of place are words which can be used by the speaker to indicate a location of an object, such as ‘here’ or ‘there’. Some languages may have fewer words to describe such locations than other languages. For example, Dutch predominantly uses two words ‘hier’ and ‘daar’, whereas Spanish uses three words to describe these same locations: ‘aquí’, ‘allí’ or ‘allá’.

In the present study, we aim to investigate if producing gestures, specifically deictic gestures which indicate a location (McNeill, 1992), while talking about adverbs of place in a

second language will facilitate the acquisition of these adverbs of place. Can a gesture help Dutch learners of Spanish to distinguish between 'aquí', 'allí' and 'allá'?

Theoretical framework

Challenges in Second language acquisition

Effective SLA has become a central issue in many fields due to an ever-globalizing world (Lüdi et al., 2013). Efficient communication between trading countries is essential, so when communication is difficult due to language barriers, it can negatively affect the trade outcomes (Lohmann, 2011). A majority of the world trade is mostly conducted in English, Spanish, Arabic, or Mandarin (Egger & Toubal, 2016). For most people, these languages are not their mother tongue (L1), and they will have to acquire one of these languages to function in the workplace. Acquiring a second language is difficult, and research has identified a few possible factors that influence this difficulty. One such factor is the native language level of the speaker. Sparks (1993) performed a literature review and concluded that the native language level influences how well a person would acquire a second language. Thus, when a person has phonological problems with speaking and writing in their native language, these difficulties can persist in the second language.

Moreover, Dörnyei (1998) and Gardner, Lalonde, and Moorcroft (1985) identified motivation and attitude as essential factors influencing SLA. Dörnyei (1998) argues that from the beginning, motivation is directly or indirectly involved in the process of SLA and that high motivation can compensate for deficiencies in a person's natural ability to learn a language. However, not being able to learn a language correctly can affect confidence and create anxiety. These difficulties could influence motivation and induce more anxiety towards learning a foreign language (Horwitz, Horwitz, & Cope, 1986). Thus, learning a second language is difficult and therefore the question is how this process can be facilitated.

Dual Coding theory

The dual coding theory (DCT) entails that learning can be improved by presenting information to the brain through different sensory channels (Paivio & Lambert, 1981). The brain is seen as a highly specialized processing organ that consists of different areas with specific functions that separately process information from the surrounding environment (Pinker, 2003). The different brain areas, coined the *society of mind* by Minsky (1988), collaborate to create a fuller interpretation of the external surroundings. The process by which the different brain areas transform information is called *encoding*. According to the

DCT, learning can be improved by taking advantage of how the brain encodes by presenting information through the different sensory channels that lead to the different brain areas (Clark & Paivio, 1991). Namely, through the visual channel, also called the visuospatial sketchpad, and the auditory channel, which is also referred to as the auditory loop (Anderson, 2005). That the two channels can take up information independently and still function parallel to each other has been shown in experiments in which a participant is asked to perform two tasks simultaneously (Lasry & Aulls, 2007). When both tasks are of visual or auditive nature, the participant will not complete both tasks simultaneously. However, when one task is auditory and the other visual, participants can complete both tasks (Lasry & Aulls, 2007). Providing information through different sensory channels can allow a person to simultaneously process more information on a topic and potentially facilitate learning.

In language learning, the DCT would suggest that learning can be improved by providing information about an aspect of language in both a visual and a verbal form. For a foreign language learner, knowing the verbal aspects of a second language is not always enough to facilitate the effective use of the second language in complex social interactions (Shumin, 2002). Non-verbal aspects should, therefore, also be taken into account when acquiring a second language (Shumin, 2002). Therefore, the visual aspect presented next to auditory information during SLA could be a non-verbal aspect of language, such as gestures.

Gestures

Gestures are commonly known as the non-verbal hand and arm movements that a person makes while speaking, and that also forms part of the message that a speaker tends to communicate (Gullberg, 2006). Kendon (2004, p. 7) describes a gesture as a "visible action when it is used as an utterance or part of an utterance". These definitions of gestures exclude functional actions such as stirring a cup of tea, self-regulators or symptomatic movements such as scratching (Ekman & Friesen, 1969), proxemics or "personal space"(Hall et al., 1968), posture (Bull, 1987), and blushing or pupil dilation.

The definitions given above encompass various types of movements, ranging from speech-accompanying gestures to gestures produced by speakers of a sign language (McNeill, 1992). In the current study, the focus will be on speech-accompanying, or co-speech gestures, which will be called gestures for short. McNeill (1992) distinguishes four often used types of co-speech gestures: iconic, metaphoric, beat, and deictic. Deictic

gestures will be used in the current study.

Iconic gestures have a close link to the semantic content of speech and are used to illustrate a concrete event or object by displaying aspects that are also presented in speech (McNeill, 1992). In his book McNeill (1992) gives the example of the upward rising hand gesture made during the utterance “he tries going upside the pipe this time”, which illustrates the upward trajectory that is explained in the utterance. Metaphoric gestures are similar to iconic gestures in that they are used to present imagery, however, the difference is that metaphoric gestures are used to illustrate abstract concepts (McNeill, 1992). An example of such a gesture is the heart-shape formed with the hands when saying to someone that you love them. Beat gestures are simple up and down hand movements that move accordingly to the rhythm of a speech, in the same manner, that a metronome does with music. According to Krahmer and Swerts (2007), beat gestures accentuate which parts of speech are important.

Deictic, or pointing, gestures are the movements predominantly produced by the fingers but can also be produced by other body parts such as the chin, elbows lips, or head. Deictic gestures are used to point towards a certain location or refer to an object (concrete or abstract) (Kita, 2009; McNeill, 1992). Deictic gestures are often used to locate something and are, according to Kita (2003), seen as foundational building blocks of human communication, for several reasons. First, pointing gestures are used inevitably in day-to-day human interaction. Pointing gestures can even be used during utterances that mention things that are distant in time, by pointing in the space in front of the speaker (Kita, 2003). Second, the use of pointing gestures is a unique human behaviour that separates humans from primates just as the use of language does. Even though there are primates that show pointing-like gestures, they are not quite the same as human pointing gestures. The pointing like gestures is only seen in some great apes species that live in human captivity or that were nursed by humans during their first few years (Krause, 1997). Third, pointing gestures can, apart from pointing out vectors (straight lines), also be used to create iconic representation (Kita, 2003). This is done by tracing a shape or movement trajectory (Kita, 2003). Fourth, pointing gestures are one of the first communicative tools that infants acquire, even before the first words are spoken (Tomasello, Carpenter, & Liszkowski, 2007). Once the first word is spoken, it is often in conjunction with a pointing gesture. Additionally, the explanation that a caretaker has of an object at which an infant is pointing acts as an important cue for learning

the connection between a word and its referent (Tomasello et al., 2007). That an infant's first spoken word is often produced together with a pointing gesture also shows that gestures have a close relationship with speech.

Gestures and speech

Compared to other gestural movements, speech-related gestures are the least language like, yet they are most related to language and speech because people mostly gesture during speech and not during silence (Gullberg, 2006). Furthermore, gestures and speech typically express closely related meaning and do this quite simultaneously (Kendon, 1972; McNeill, 1992). Therefore, it has also been said that they are two sides of the same coin (Kelly, Özyürek, & Maris, 2010). McNeill (1985) has argued that the close symbiotic relationship between gestures and language is because gestures originate from the same psychological structure as speech. This is seen in the case with children that suffer from disfluency in the form of stuttering. They will experience stuttering while speaking but also while performing their gestures (Mayberry & Jaques, 2000). Moreover, even children who have been born blind and have never seen any forms of gestures in their lives, develop and execute gestures while speaking (Iverson, Tencer, Lany, & Goldin-Meadow, 2000). Thus, it has been suggested that gestures are the product of the same process that creates speech (see Wagner, Malisz, & Kopp, 2014, for more details).

Different theoretical models have been proposed over the years that attempt to explain the role that gestures have during speech (Wagner et al., 2014). The models can be divided into two different perspectives. From one point of view, it has been considered that gestures have more of a facilitative role towards speech and are therefore seen as secondary to speech. This is the case with the Lexical Retrieval Hypothesis, which proposes that producing a gesture during speech facilitates the retrieval and generation of the phonological form of an utterance (Rauscher, Krauss, & Chen, 1996). In other words, gestures aid during speech production by helping the speaker find the right words (Rauscher et al., 1996). The other point of view considers gestures to be an equal partner of the same process as that of speech production (Kendon, 2007). One such hypothesis is the Information4 Packaging Hypothesis that considers that gestures play a role during the beginning phase of an utterance creation and are therefore seen as more equal to speech (Kita, 2000). Although the models and hypotheses differ in the way they propose that speech

and gestures relate, in general, the models and hypotheses agree that there is a close relationship between speech and gesture (Wagner et al., 2014).

Influence of gestures on learning

As suggested by some speech-gesture models, gestures can have a facilitative role in speech production (Goldin-Meadow & Wagner, 2005). Moreover, hand gestures produced during speech influence how a message is understood by the listener (Goldin-Meadow & Wagner, 2005; McNeill, Cassell, & McCullough, 1994). Gestures could, therefore, also facilitate learning. It has, for example, been argued that teachers who encode the information about the topic they are explaining in their gestures provide an added source of input for the learner (Beattie & Shovelton, 1999; Cassell, McNeill, & McCullough, 1999), in line with the previously discussed dual coding theory. This effect is exemplified in work undertaken by Kelly, Manning, and Rodak (2008), in which the possibility that gestures could aid learning of school-aged children was researched. The authors found that the children who received instructions with gestures in their mother tongue (L1) had a better recall of detail in a verbal way than those children who received instructions without gestures. Other research by Flevares and Perry (2001) has looked at possible effects that non-spoken representations, such as gestures, can have on explaining mathematical concepts. The results showed that gestures could successfully aid the student in comprehending mathematical concepts. The authors do point out that for effective learning to occur, the gestures must match and reinforce the instruction. Similar research by Valenzeno, Alibali, and Klatzky (2003) investigated whether pointing and tracing gestures could improve students' effective learning of an abstract concept such as symmetry. The students were pre-school children, and during the experiment, they got to see one of two videotaped lessons on the concept of symmetry. Afterward, the students had to take a test in which they had to judge the symmetry of six items. The results showed that the students who saw the instruction video with pointing and tracing gestures had a better posttest score than those who saw the instruction video without deictic and tracing gestures. According to the authors, deictic and tracing gestures aid learning by linking abstract verbal sentences to the concrete environment (Valenzeno et al., 2003).

The finding that gestures can help with the learning process applies to mathematics and symmetry but is also relevant for SLA. Tellier (2008) compared the effectiveness of gestures and pictures in aiding second language vocabulary learning. Students had to

memorize words of a second language with gestures (which were iconic in this study) or pictures. The findings showed that the words that were accompanied by gestures were memorized significantly better than words accompanied by pictures. Another research by Huang et al. (2019) found that deictic gestures can also aid in learning words in a second language. These authors concluded that deictic gestures could aid learning words in a second language from the research results. Thus, gestures can aid learning, and, more specifically, deictic gestures can facilitate second language vocabulary learning. An open question is whether this means that gestures can also help in second language vocabulary acquisition when languages differ in the number of words they use to describe the same thing. In other words, can gestures also play a role in the acquisition of semantic categories?

Semantic categories

People differ in how they conceptualize the world, partly due to the differences in the number of words in languages available to verbalize certain concepts, actions, or describe particular objects (Ameel et al., 2005). For example, in the study conducted by Ameel et al. (2005), French and Flemish monolingual speakers of Belgium descent were shown pictures of 74 objects that resembled a bottle or a jar in the American English language. Of the 25 objects called *fles* by Belgian monolingual speakers of Flemish (Dutch), 13 of these objects were named as *bouteilli,* and ten were named as *flacon* by Belgian monolingual speakers of French. The results showed that the two languages differ in the manner that bottles are categorized and consequently named. For a language learner, these differences may cause problems when learning the language.

A language learner's second language may have more or fewer semantic categories (words) to describe an object compared to their native language, such as is shown in the study by Ameel et al. (2005). The previous study showed that differences in categories exist with objects such as bottles. However, differences in the number of categories between languages can also occur with semantic constructions such as placement events. Placement event is how a language describes an event in which a person relocates an object, and languages can differ in the number of words and depth of information to describe the placement event (Bowerman, Gullberg, Majid, & Narasimhan, 2004). Stockwell, Bowen, and Martin (1965) have looked at how placement events are described differently between languages and argue that these differences can cause difficulty when learning another language. Indeed, it has been found that the difference between languages in the number of

words available to verbalize certain concepts, objects, or actions can cause difficulties when learning (Ellis, 1994; Stockwell et al., 1965).

According to the hierarchy of difficulty theory by Ellis (1994), difficulty with language learning can occur due to the difference in the number of words used for a semantic category between the first language (L1) and the second language (L2). Moving from an L1 with, for example, two words to describe something to an L2 with three words to describe the same thing can cause the most amount of difficulty that an L2 learner experiences. On the other hand, for a speaker with an L1 with three words to describe something, it should be easier to understand the words used to describe the same thing for an L2 that has fewer semantic categories. According to Ellis (1994) new language learners experience the least amount of difficulty when the L1 and L2 languages are equivalent in the number of words used for a semantic category or to describe an action (e.g. English *to sit* and Dutch *zitten*).

The current study

Although we know that gestures can facilitate vocabulary learning, it is not clear if this also means that gestures can aid semantic categories' acquisition. However, given that gestures can facilitate vocabulary learning in a second language, it is feasible that they may also play a role in the acquisition of semantic categories. One semantic category that has not been researched yet in this context is how locations are described, using adverbs of place. Adverbs of place are the words that allow a speaker to communicate more precisely the location where an action took place or where an object occurs. Different languages may use a different number of adverbs of place, with different meanings. Dutch, for example, has three adverbs of place (*hier/daar/daarginds*). However, *daarginds* is a word that is barely used in the current Dutch language. Only *hier* and *daar* are used predominantly by native Dutch speakers. However, the Spanish language has three adverbs of place (aquí/allí/allá) that are all often used. Taking into account Ellis' (1994) hierarchy of difficulty and the difference between adverbs of place in different languages, it can be difficult for native speakers of certain languages to learn a second language with more adverbs of place. No research to date has looked at the possible facilitative role that gestures, specifically deictic gestures, can have when learning adverbs of place if the second language has more adverbs of place than the native language. Deictic gestures have been shown to facilitate learning (Valenzeno et al., 2003) and aid with learning concepts in a second language. This research

looks at the role that deictic gestures may play in acquiring adverbs of place for Dutch native speakers who are learning Spanish. This study has the following research question.

To what extent do gestures influence the learning of adverbs of place in a second language?

Based on the dual coding theory and previous findings that gestures have a close relationship with speech and can, therefore, facilitate language learning, the following hypothesis has been formulated:

When deictic gestures accompany auditory language, the ability to learn adverbs of place in Spanish will be better than when deictic gestures do not accompany the auditory language.

Method

Materials

The independent variable was Gestures and was manipulated by creating two conditions: one without deictic gestures and one with deictic gestures. Participants were randomly assigned to one of the two conditions, with each condition containing six three to five-second videos, which were shown to the participant. The videos that were used during the experiment were identical and only differed in the Spanish sentence that was used and whether deictic gestures were shown or not.

The videos were recorded in an empty room with a white background. A non-native Spanish male speaker who was very proficient in Spanish looked into the camera while saying one of the Spanish sentences (see below). The Spanish sentences produced by the speaker in the videos were in the present tense, contained four words, had a figurative object, and had one of the three Spanish adverbs of place (*Aquí, Ahí,* and *Allá*). The sentences' figurative objects were simple Spanish words to ensure that the sentences were not too complicated for the participants to understand. The figurative object could be close by the speaker (*Aquí*), further away (*Ahí*), or very far away (*Allá*).

The experiment consisted of a training phase and a testing phase. In the training phase, the participants viewed a slide with a definition of adverbs of place and the Dutch translations of the three Spanish adverbs of place. The Spanish adverbs of place were translated as follows; *aquí* was translated as *hier*, *ahí* was translated as *daar*, and *allá* was

translated as *daarginds*. Every adverb of place was accompanied by two of the six example videos, illustrating the respective adverb of place. The videos showed the participant how the adverb of place could be used in a sentence. By adding two examples, the participants had more opportunity to learn the adverbs of place and decreased the chance that participants would guess during the testing phase.

In the Gesture condition, the speaker performed the deictic gesture when the adverb of place was said. When *aquí* was said (close by), the speaker pointed to a spot that was a meter to the side of his feet (figure 1). In the case of *ahí (*further away*),* the speaker executed a deictic gesture on shoulder height when *ahí* was said (figure 2). The moment that *allá* (very far away*)* was said, the speaker executed a deictic gesture above his shoulder height (figure 3). In the without gesture condition, the speaker would look at the camera with the arms at his side while communicating the sentence.

Figure 1 The deictic gesture that was produced when aquí (close by) was being said

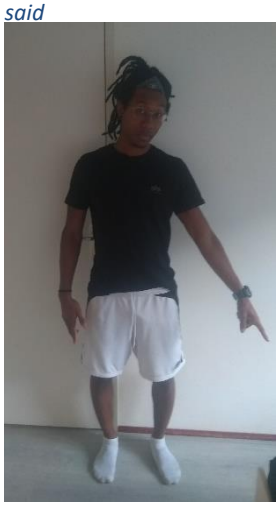


Figure 2 The deictic gesture that was produced when ahí (further away) was being said

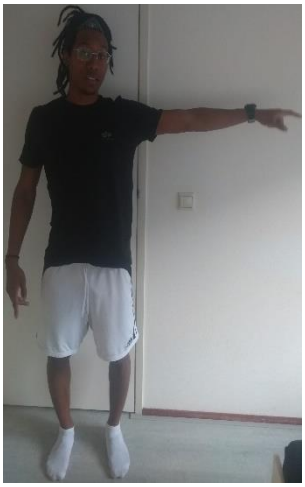
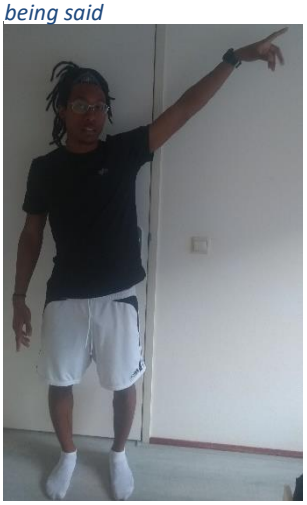


Figure 3 The deictic gesture that was produced when aAllá (very far away) was being said



The six Spanish sentences used during training with the corresponding Dutch and English translations (which are provided for the readers' convenience but were not provided to the participants) were as followed:

El conejo está aquí (Het konijn is hier/ The bunny is here)

El árbol está aquí (De boom is hier/ The tree is here)

La pelea está allí (Het gevecht is daar/ The fight is there)

La tienda está allí (De winkel is daar/ The store is there)

La casa está allá (Het huis is daarginds/ The house is there)

El coche está allá (De auto is daarginds/ The car is there)

Subjects

Ninety native Dutch speakers who could not understand, speak or write in Spanish participated in this study. The participants were asked to rate their Spanish fluency with four questions because it was important for this research that the subjects had no or low proficiency in Spanish. The first question asked whether the participant could speak Spanish (yes/no). The three questions that followed were self-assessment questions on their Spanish speaking, writing, and understanding level. The participant could place a rating between one and ten for each question, with one being that the person had no writing, reading, or listening skill in Spanish and a ten meaning that the person was very skilled in one of the three domains. The sum total of the three questions was used as the proficiency level of a participant. For the data analysis, the participants who answered yes on whether they could speak Spanish were left out. Many participants (86) reported that they were fluent in a second language besides their native Dutch language. The most common second language was English, with 83 participants.

Of the 90 participants, 41 (45.6%) were male, 49 (54.4%) were female, with a mean age of 28 years old (M= 27.91, SD= 12.12, range 18-95 years old). A Chi-square test showed no significant relation between Gesture condition and gender (χ^2 (1) = 1.66, p = .197). An independent samples t-test showed no significant effect of Gesture on age (t (88) = .35, p = .570). The participants that got the instructions with Gesture (M = 28.66, SD = 11.21) were shown to have a higher age than the participants who received instructions without Gesture (M = 27.20, SD = 13.03), but the difference was not significant. The lowest educational level finished was secondary school, and the highest was 'WO master.' The secondary school was the most frequent, with 35 (38.9%) participants. A Chi-square test showed no significant relationship between Gesture condition and the participants' educational level (χ^2 (4) = 6.89, p = .142).

Design

A between-subject design was used for this research. The participants were split into two groups, with each group being exposed to one of the two experimental conditions. The

participants were randomly assigned to one of the conditions. Depending on the condition, participants received training on Spanish adverbs of place, which included examples that either showed pointing gestures or not.

Instruments

How well the participants had learned the adverbs of place was measured during the testing phase with the dependent variable accuracy of object location. The accuracy of the object location was how accurate a participant was in determining the object's location. With the result of this variable, it was possible to determine whether participants had learned the meaning of three Spanish adverbs of place. The dependent variable was tested by having the participants answer a multiple-choice question after each of the twelve video clips. During the testing phase, twelve videos, including the sentences from the six videos used during the training phase, were displayed. The video depicted the same speaker as in the training phase. A non-native Spanish male speaker who was very proficient in Spanish looked into the camera while saying one of the Spanish sentences (see below). The Spanish sentences produced by the speaker in the videos were in the present tense, contained four words, had a figurative object, and had one of the three Spanish adverbs of place (*Aquí, Ahí,* and *Allá*). However, compared to the training phase, the speaker did not perform any deictic gestures in the video clips of neither of the two conditions.

By including the six sentences used during the training phase in the testing phase, it was possible to see if participants recognized the sentences, and this ensured that the test did not become too difficult. The six new sentences introduced during the testing phase were meant to test whether the participant had learned the differences between the adverbs of place when placed in new sentences. Furthermore, the six new sentences made it possible to test if participants could apply the knowledge learned during the training phase. Thus, excluding the possible effect that participants merely remembered the sentences from the training phase.

The twelve Spanish sentences used in the testing phase videos, with the corresponding Dutch and English translations (which are provided for the readers' convenience but were not provided to the participants) were as followed:

El conejo está aquí (Het konijn is hier/ The bunny is here)

El árbol está aquí (De boom is hier/ The tree is here)

El dinero está aquí (Het geld is hier/ The money is here)

La llave está aquí (De sleutel is hier/ The key is here)

La pelea está allí (Het gevecht is daar/ The fight is there)

La tienda está allí (De winkel is daar/ The store is there)

La sofa está allí (De bank is daar/ The couch is there)

El congreso está allí (Het congres is daar/ The congress is there)

La casa está allá (Het huis is daarginds/ The house is there)

El coche está allá (De auto is daarginds/ The car is there)

El parque está allá (Het park is daarginds/ The park is there)

La silla está allá (De stoel is daarginds/ The chair is there)

The question was shown to the participant after watching each of the twelve video clips contained three possible multiple-choice answers, and both the question and answers were in Dutch because the participants were native Dutch speakers. The three answer options were the Dutch translation of the Spanish adverbs of place that were shown during the training phase. The word *daarginds* is very similar in meaning to *daar,* but for this research was used as a third translation for the three Spanish adverbs of place. Due to the similar meaning, Dutch still has two categories for adverb of place, and participants still needed to create a new category for the Spanish adverb of place. The word *daarginds* was used as a different translation to explain the difference between the Dutch and Spanish adverbs of place. Not doing and merely stating that the Dutch language does not have a word for *allá* might have made understanding the meaning of the Spanish adverbs of place too challenging for Dutch participants. The questions asked where the object was in relation to the speaker. The question and answers that were given after each video were as followed:

Question: Hoe ver is het object van de spreker? (How far is the object from the speaker?)
Answers:

1. Hier
2. Daar
3. Daarginds

Participants could get between zero and twelve points for the twelve questions during the testing phase. When the correct answer was chosen, the participant would get one point. If that the wrong answer were given, the participant would get zero points for the question.

Procedure

Many of the participants were recruited through the personal network of the researcher. The rest of the participants were recruited through survey exchange websites such as SurveySwap and SurveyCircle. The survey could be accessed through a Qualtrics link and done on a PC, tablet, or phone. Before the participants could start with the experiment, a consent form had to be digitally signed by the participant by clicking on the *agree* button.

After reading instructions about the experiment, the participant could continue with the training phase. During this phase, the three Spanish adverbs of place were explained to the participant. The first slide consisted of a textual explanation, and the following slides showed the six video examples.

The participant had to fill in six demographic questions regarding their age, gender, education level, Spanish comprehension level, and other languages that they could speak between the training and testing phases. The questions were placed between the training and testing phases because the six example sentences in the video clips from the training phase were also used during the testing phase. By adding time between the two phases, it increased the chance that participants had to apply the knowledge gathered during the training phase instead of relying on memory to answer the six repeating sentences correctly. Therefore, the likelihood of measuring whether participants learned the meaning of the Spanish adverbs of place was heightened.

After filling in the demographic questions, the participants could start with the testing phase. First, a slide was shown that briefly explained what was expected of the participant during the testing phase. Once the instructions were read, the participant could start with the test. The order in which the twelve videos were shown was randomized for each participant. Each video could be seen once, and after each video, the same multiple-choice question (as discussed above) was presented. The participant got to choose one of the three possible answers. Only when the question was answered could the participant continue with the next video by clicking the arrow on the screen's right bottom.

Finally, the participants were thanked for taking part and were offered the possibility to receive more information about the research once it was concluded.

Statistical treatment

For the chi-square analyses and independent sample t-tests, IBM's SPSS Statistics (version 26) was used. A chi-square analysis was used to see whether there was a relation between the Gesture condition and the number of correct answers (accuracy of object location). The data were also analyzed using a t-test for independent samples to test whether there was an effect of Gesture condition on mean number of correct answers.

Results

A Chi-square test showed no significant relationship between the use of deictic gesture and accuracy of object location (score) (χ^2 (10) = 8.93, p = .539). Table 4 shows how the participants' total score was divided for the condition with gestures and the condition without gestures. The top row shows the possible scores that a participant could get. The two rows below show for each condition how many participants got that particular score. For example, one participant in the gesture condition and two participants from the without gesture condition had six answers correct. Table 4 also illustrates that many participants, in both conditions, had (almost) all answers correct.

Table 4. The score distribution of all 90 participants per condition

			Score (number of correct answers)												
			1	2	3	4	5	6	7	8	9	10	11	12	**Total subjects**
Condition	With gestures	Count	1	0	1	1	1	1	2	0	2	1	10	24	**44 (100%)**
	Without gestures	Count	0	1	1	2	3	2	0	0	0	3	8	26	**46 (100%)**
Total			**1**	**1**	**2**	**3**	**4**	**3**	**2**	**0**	**2**	**4**	**18**	**50**	**90**

An independent t-test that was performed on the mean number of correct answers showed no significant effect of gesture on the accuracy of the object location score (t (88) = .35, p = .724). Participants who received the instructions with gestures (M = 10.43, SD = 2.75) were shown to have a higher mean score than those participants who received the instructions without gestures (M = 10.22, SD = 2.98). However, the difference was not significant.

To rule out that Spanish proficiency played a role in the results, the chi-square analysis and t-test were also executed on datasets that applied a stricter criterion on the Spanish proficiency level. The strictest criteria removed the data of all 29 participants who were considered to be relatively fluent in Spanish (an accumulated score for Spanish proficiency that was eight or higher). However, the results were the same in the sense that also for the smallest dataset, there was no relation between deictic gesture condition and number of correct answers and no effect of gesture on the mean number of correct answers.

Conclusion

This thesis pursued the following main question: To what extent do gestures influence the learning of adverbs of place in a second language? This paper tried to answer this question by examining whether deictic gestures could have a facilitative influence on learning new semantic categories for Dutch native speakers who were learning adverbs of place in Spanish.

The importance of learning a second language has increased with the growing global economy. However, learning a second language can be challenging (Dörnyei, 1998; Sparks, 1993), especially when the foreign language differs in the number of words used to describe actions or objects from the learner's native language. The differences in semantic categories can cause learners to experience difficulty with language learning, according to the hierarchy of difficulty theory by Ellis (1994). According to the dual coding theory, instructors can improve learning by presenting information in different modalities, such as visual and audio (Clark & Paivio, 1991; Paivio & Lambert, 1981). One such visual form can be gestures and especially deictic gestures due to the close relation with speech. Indeed, research has shown that deictic gestures can facilitate second language learning (Huang et al., 2019). Therefore, this study used deictic gestures to visualize adverbs of place, next to the auditory narration of the adverbs of place. Based on the dual coding theory and previous findings that gestures have a close relationship with speech and can, therefore, facilitate language learning, the following hypothesis was formulated: When auditory language is accompanied by deictic gestures, the ability to learn adverbs of place in Spanish will be better than when deictic gestures do not accompany the auditory language.

The experiment was conducted through an online survey in which the participants had to answer multiple-choice questions after looking at twelve short video clips in which a speaker described the location of an object using a four-word Spanish sentence that included one of the three Spanish adverbs of place. In the twelve video clips, the speaker did not use deictic gestures. The meaning of adverbs of place was explained beforehand, during a training phase. Participants in the Gesture condition received the explanation with video examples that contained deictic gestures, and the without Gesture condition group received the explanations with video examples that did not contain deictic gestures.

Contrary to expectations, this study did not find a significant difference in learning outcomes between the condition with the deictic gesture and the condition without the

deictic gesture. In both conditions, participants had a high amount of correct answers. Thus, in this study, deictic gestures had no significant facilitative influence on learning adverbs of place in Spanish and therefore did not support the hypothesis.

Discussion

Based on the hierarchy of difficulty by Ellis (1994), Dutch native speakers should have encountered difficulty learning Spanish adverbs of words due to the differences between the languages in the number of words used for the semantic category “adverbs of place.” Research by Huang et al. (2019) has shown that deictic gestures facilitate language learning in a second language. However, the current study's findings do not support the previous research hypothesis that deictic gestures can facilitate language learning in a second language. The results point out a possible ceiling effect due to the high scores that participants got on the test in both the conditions with deictic and without deictic gestures. How this ceiling effect might have occurred will be discussed in the following paragraph.

The facilitative effect of deictic gestures

A possible explanation for the test's high scores is that the influence of deictic gestures on learning is not as strong as previous findings by Huang et al. (2019) have suggested. This previous study has shown that deictic gestures can aid in vocabulary learning of a second language. However, these studies' results may not translate to a Spanish word such as adverbs of place. The words that participants had to learn in the previous studies were from the English language. Participants might benefit from deictic gestures for learning English words, but the influence of deictic gestures might not be as impactful for the Spanish words.

The difference in semantic categories

Another possible explanation for the reason why in the present study there was no effect of deictic gesture on the acquisition of the Spanish adverbs of place is that the difference of adverbs of place between Dutch and Spanish in this study may not have been so big and thus required participants less effort to make new categories. In the Spanish language, three words (*aquí, allí,* and *allá)* are used for the adverbs of place, while the Dutch predominantly use two words (*hier* & *daar*). The word *allá* does not have a direct translation in Dutch. However, during the training phase in this study, participants were shown a translation for each Spanish adverbs of place. The word *daarginds*, an old Dutch word that is not commonly used in the current Dutch society, was used as a rough translation to explain the meaning of *allá* to the participants. By adding *daarginds* to the first part of the training phase,

participants might have experienced less difficulty creating a new category because the same amount of Dutch and Spanish words were shown during the training phase. In both conditions, participants had a majority of the twelve questions correct. Therefore, measuring whether deictic gestures might have had an added benefit in learning the Spanish adverbs of place was compromised.

In future research, a possibility is to use another category of Spanish words that differ in the number of words than Dutch. In this study, an old Dutch word (*daarginds*) that roughly translated to the Spanish word (*allá)* was used to explain the meaning of *allá*. Even though it was not a commonly used word, participants who had some knowledge of the word could have experienced less difficulty creating a new category because they were reminded of the meaning of *daarginds*. However, if there are no old words that can function as rough translations, participants will be more likely to face challenges because they have to create new categories when the second language has more words for a semantic category than the native language (Ellis, 1994). When the participants are challenged to create a new category, the scores might be lower because the difficulty is increased, thus removing any possible ceiling effect. With no ceiling effect, measuring the facilitative effects of deictic gestures is possible.

Training phase design

Another possible explanation for the fact that gestures did not affect the learning of Spanish adverbs of place, is that the study might have been too easy for the participants due to the training phase's design. As a result, a ceiling effect occurred because most of the participants in both conditions had high scores during the testing phase, making it difficult to measure the possible effect of deictic gestures. The design of the training phase in both the condition with deictic gesture and the one without deictic gesture might have explained the Spanish adverbs of place to such an extent that the test was easy for the participants, and they consequently performed very well. The training phase was designed to explain the Spanish adverbs of place in two parts in both conditions. The first part of the training phase presented the information in the form of a Dutch text (the native language). The text defined what adverbs of place are and the three words used in the Spanish language for adverbs of place. Moreover, the Dutch translations for each Spanish adverb of place were accompanied by a short explanation of whether the word is used for nearby, far away, or very far away objects. The second part of the training phase presented two visual examples, in video form,

that showed how the adverbs of place are used in a sentence. The only difference being that the condition with gesture included a deictic gesture during the second part of the training phase. Based on the dual coding theory by Clark and Paivio (1991), simultaneously presenting the explanation concerning Spanish adverbs of place in a verbal and visual form could have improved learning. However, it could be that the textual explanation in the first part of the training phase offered sufficient explanation for the participants. The Dutch translations of the Spanish adverbs of place might have given the participants too much information. What might have made the test easy and subsequently resulted in participants in both conditions getting many correct answers.

A suggestion for future research could be to alter the training phase's design so that less information is presented to the participants. There are different ways that the design can be altered to achieve this result. First, text and video explanations can be split into different conditions. In one condition, a subject will only see information in the form of text, and in the other condition, the subject will get information about the Spanish adverb of place in the form of a video. Applying such a design might make it possible to measure whether the explanation containing only text gives sufficient information, leading to participants having many correct answers. Second, future research could look at adapting the first part (textual information) of the training phase by removing the Dutch translations of the Spanish adverbs of place shown after the definition of adverbs of place. Therefore, it might cancel out the ceiling effect and make it possible to measure the influence of the deictic gesture. The third design suggestion is to implement changes in the second part of the training phase by reducing the number of example videos per Spanish adverb of place. The current study used two example videos for each one of the Spanish adverbs of words in both conditions. By removing one video example, there will be less information about the use of the Spanish adverbs of place for the participant. The reduced amount of information might increase the test's difficulty and lower the scores during the testing phase. With lower scores, the ceiling effect can be removed, allowing better measurements of deictic gestures' possible influence.

The last suggestion for future research does not look at removing information from the training phase but rather at targeting the number of time participants have during the training phase by adding a time restraint. The training phase in the current study was self-paced. Furthermore, was it possible to replay the example videos during the training phase.

In line with the cognitive load theory by Sweller (1988), which encompasses that learning can be affected by the amount of extraneous cognitive load, future studies can disable the possibility to replay the example videos and implement time constraints to increase the extraneous cognitive load. By disabling replay and adding a time restraint, cognitive load can be increased which in turn increases the difficulty of the experiment. An experiment with an increased difficulty can lead to participants achieving lower scores during the testing phase, thus reducing the ceiling effect. This, in turn, can enable better measurement of the possible influences of deictic gestures on learning Spanish adverbs of place.

Participants

Finally, the ceiling effect might have been caused by the fact that the test could have been easy for the participants due to their high educational level. Many participants (48.9%) had either finished HAVO/VWO and were now attending HBO or the university. Another majority had also finished a university bachelor's diploma. Having a high educational level could influence how well a participant can learn the material in this study. Furthermore, many highly educated students get Latin, French, or some Spanish during high school. Participants may therefore have some knowledge of Roman languages and therefore have (unconsciously) recognized more Spanish. These two factors could explain the high scores, with 80% of the participants scoring ten or higher out of the maximum score of twelve. However, it is not sure if the education level of the participant influenced the high test score. To rule out that the educational level's influence was a coincidence, future research can perform additional analysis to examine the different educational levels' test performance. In this study, these analyses were not possible because there were not equal amounts of participants for each educational level.

Moreover, many of the participants indicated that they were fluent in two languages or more. Earlier research by Grey, Sanz, Morgan-Short, and Ullman (2018) has found that being able to speak multiple languages can play a role in learning a new artificial language (brocanto2). The authors mention that the evidence supports those raised bilingual instead of those who become bilingual at an older age. It could be that the test scores in both conditions were high because of the many bilinguals that participated in the study. However, participants were not asked at what age they became bilingual, and this study did not search for bilinguals with a background in specific languages. Therefore, it is not sure whether or to what extent being bilingual influences the ability to learn an aspect of a new language, such

as Spanish adverbs of place. Thus, a follow-up study is needed to compare subjects raised as bilinguals in specific languages to those who became bilingual later in life with the same specific set of languages. It is necessary to search for bilingual participants fluent in the same set of languages to create homogenous groups that can be compared.

In summary, this thesis contributes to the knowledge of non-verbal deictic gestures' influence on learning aspects of a new language. No prior study has looked at the effects of deictic gestures on learning Spanish adverbs of place. In this study, many of the participants received a high score during the testing phase, which resulted in a possible ceiling effect. Therefore, making it difficult to measure whether the use of deictic gestures during videos that exemplified the Spanish adverbs of place had a facilitative influence on learning the Spanish adverbs of place. In the discussion section, a few possible explanations were given for the resulting ceiling effect. The amount of information given during the training phase or the lower perceived difficulty of learning Spanish adverbs of place for Dutch participants might have resulted in the test being easy. It could also be the case that deictic gestures do not have a strong facilitative influence on learning words in a second language. Furthermore, it could be that the high number of participants with a high level of education resulted in high scores on the test.

Nevertheless, further research is needed to understand deictic gestures' influence on learning words in a second language. Whilst this study did not confirm that deictic gestures can influence language acquisition, it might offer some insight for companies and institutions that deal with a foreign language. Companies that are considering launching their products in foreign markets can use these results to design the product instructions. According to this study results, deictic gestures are not necessary to inform or instruct the target audience. Finally, language learning institutions can use this study's findings to understand better how language acquisition. Thus, possibly improving the quality of language learning tools and lessons.

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