

# Bachelor's Thesis



**What is the effect of imagistic gestures on learning concrete versus abstract nouns in a foreign language?**

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## Introduction

Nowadays, our society is more interconnected than ever and languages from all over the world surround us. Multilingualism is therefore a phenomenon that applies to a large part of our modern population as it refers to “the social context in which more than one language is present” (Gorter, 2006, p. 1). Another definition of multilingualism provided by Schembri and Lucas (2015) holds that an individual or a community is capable of using two or more languages. In Europe alone, more than half of the inhabitants speak more than at least one language (Grosjean, 2010). In order to participate in such a society, learning a foreign language next to one’s mother tongue is highly recommendable and will bring considerable advantages. Research shows, for example, that the speaker who regularly uses a foreign language seems to be stronger in resolving dilemmas (Merritt, 2013), to be faster at multitasking (Merritt, 2013) and to suffer from diseases such as Alzheimer’s at a later date or to a lesser degree (Woumans et al., 2014). According to Bialystok and Martin (2004), the multilingual speaker also appears to be better able to select important information from a stream of data.

In order to master an unfamiliar language, effort is required from the student. Amongst other linguistic aspects, foreign language learners need to obtain an extensive repertoire of vocabulary in order to make appropriate use of a foreign language (Schmitt, 2008). According to Repetto, Pedroli and Macedonia (2017), something that contributes to the learning process of foreign words is the provision of additional information. In their study, they looked at the memorability of specific words in a second language by means of a short enrichment training. According to them, this so-called enrichment can be provided through the use of images or gestures on top of the regular way of teaching words to students, which is for instance providing them with a word list. Also, Shams and Seitz (2008) report in their research on the benefits of multisensory learning that our brains are set up to learn through external enrichment and that such a multisensorial environment would stimulate a better memory than reading or listening only.

As mentioned above, the display of images or the use of gestures are two common enrichment techniques. Nevertheless, when compared with each other, one technique appears to yield better results than the other. Although the study by Mayer, Yildiz, Macedonia and von Kriegstein (2015) into teaching strategies recognizes that both gesture and pictorial learning stimulate the learning process more than the traditional verbal-way of learning, they confirm through their research that the use of gestures is more effective.

The contribution of the use of gestures to learning processes is supported by substantial research (Cook & Goldin-Meadow, 2006; Goldin-Meadow, Kim, & Singer, 1999; Kelly, Barr, Church, & Lynch, 1999; Kelly, McDevitt, & Esch, 2009). For example, the research of Kelly et al. (2009) examined the role of gestures in adult language learning. By means of a within-subjects design, the participants of their research were presented a number of Japanese words, both with and without the use of gestures. Afterwards, they were tested at several points in time. The results showed that foreign language words were learned better and remembered for a longer period of time through the use of gestures. A potential explanation for why gestures help with learning is that they provide for an additional modality as they offer visual information in addition to the verbal information already presented. In this way, gestures can highlight important elements that were initially overlooked (Singer & Goldin-Meadow, 2005). According to Mayer and Moreno (1998), this extra approach to information that is presented ensures that the student will create links between what was already known and what is newly presented, which is a process that is related to learning. Obtaining information in various ways is furthermore in line with the dual-coding approach of Paivio and Desrochers (1980), which will later be discussed in greater detail. In addition, it is possible that by means of gestures the body tries to reduce the randomness of new words and their meaning (Kelly et al., 2009) or that the use of gestures contributes to the conceptualization of the words as stated in the Information Packaging Hypothesis (see Hostetter & Alibali, 2004, for more details). In general, the advantages of these additional physical movements seem to be that they provide fast and accurate access to a larger amount of information and that this information is stored cognitively for a longer period of time (Macedonia & Knösche, 2011).

A question that comes into play here is whether it would be better for a foreign language learner to either only see a gesture or to apply it oneself. If we are to believe researchers like Engelkamp (2001), there is more benefit in involving motor movements during learning. It would therefore be better for a student to carry out the gestures him-or herself. Additional experiments also confirm that self-performance contributes to word recall (Zimmer et al., 2001), word production (Tellier, 2008) and better test results (Mayer et al., 2015).

According to Brookes (2005), the occurrence of gestures depends on the context in which they are placed. Since gestures influence practically all interactions (Gullberg, 2006), a close relationship between speech and gestures seems to be undeniable (Kendon, 1984). Some researchers argue that gestures and speech are equal partners (Krauss, Chen, & Gottesman,

2000; De Ruiter, 2000, 2007; Kita & Özyürek, 2003) and that together, gestures and speech can form a meaningful unit (McNeill & Duncan, 2011). According to Gullberg (2006, p. 104), gestures can therefore be understood as: “symbolic movements related to ongoing talk and to the expressive effort or intention”. This definition of gestures contains the underlying idea that the symbolic movements are typically part of the message that the speaker is trying to communicate to his or her surroundings (Gullberg, 2006).

In order to achieve their communicative goals, gestures are used in many different ways (Kendon, 1997). According to Brookes (2005, p. 2074-2075), the various functions of gestures can be summarized as: “substantive, interactive and structural-discoursal”. First of all, gestures perform a substantive function as their use contributes to visualizing parts of conversations (Brookes, 2005). By showing what is being said according to the person performing the gestures, additional and specified meanings are provided for (Kendon, 1997); for instance, how speakers look at their own sayings (Kendon, 1995, 2000). Gestures therefore can change the content of the spoken word or add information to it (Kendon, 1997). Secondly, gestures have an interactive function as they help in leading interactions (Brookes, 2005). Gestures can be used, for example, to divide the attention of the various participants in the conversation (Heath, 1992). Likewise, the use of gestures also contributes to the interaction between teacher and student when they try to enlarge the vocabulary of the student together (Belhiah, 2013; Smotrova & Lantolf, 2013). In the latter situation, gestures are used by means of the trial and error method with the aim of improving the student's understanding of words. Lastly, the use of gestures fulfils a structural-discoursal function as gestural movements structure the information that is communicated to the environment (Brookes, 2005; Halliday, 1985).

Since there are numerous functions, not every gesture serves the same purpose. Among other things, this has to do with the type of gesture (Gullberg, 1998, 2006). One commonly used classification of gestures is that of McNeill (1992) which consists of four different types of gestures: beat, pointing, iconic and metaphoric gestures. Beat gestures, to begin with, are those gestures that go along with the rhythm of speech (McNeill, 1992). The movements produced here consist of two phases; one can think about the up and down movements of the hand, for example. Beat gestures often help to emphasize the important parts in an utterance (Hoetjes, 2015; Krahmer & Swerts, 2007). Subsequently, there are gestures that are used to indicate the location of places, things, or people. These gestures are referred to as pointing or deictic gestures (McNeill, 1992). According to Hoetjes (2015), the performance of pointing gestures is possible in several ways, using not only the hands but also

other body parts. However, in her study into the communicative use of the hands it is stated that for the vast majority of cases pointing is performed by the hand(s) or the arm(s). According to McNeill (1992), both beat and pointing gestures can be classified as non-imagistic gestures as they do not reflect the meaning of what is being said during speech. However, getting to know the meaning of newly learned words in a foreign language is important so that the student can apply them in daily conversations. The gestures that contribute to this learning process will have to encompass or stimulate the meaning of the words. In the current research, emphasis will therefore be placed on imagistic gestures that have “a close formal relationship to the semantic content of speech” (McNeill, 1992, p. 78). The first type of gesture that falls into this category are iconic gestures. These gestures are used to present concrete aspects of the spoken text. The other category are metaphoric gestures. These gestures differ from iconic gestures in that they do not represent something concrete, but rather something abstract (McNeill, 1992). Metaphoric gestures often serve the purpose of turning these abstract concepts that are difficult to grasp into something more concrete.

The difference in concreteness is central to considerable research into foreign language learning. Up to now however, research has mainly focused on the acquisition of concrete words in a foreign language, leaving a gap in the investigation for abstract words (Macedonia & Knösche, 2011). One of the few studies that does take abstract words into account is that of De Groot and Keijzer (2000). In their research, they examined at, amongst other things, the role of word concreteness in learning the vocabulary of a foreign language. Their experiment had a between-subject design with the word-type variable concreteness as a between-subjects factor. All participants of the experiment had to undergo the same learning procedure (word-association procedure). Afterwards, the participants had to take one of two possible tests: a productive test or a receptive test. Recall and retrieval time were also looked at. A week later, there was a retest. The result appeared to be that in a foreign language concrete words are easier to learn and less likely to be forgotten than abstract words. A possible explanation for this can be given by the dual-coding approach to bilingual memory of Paivio and Desrochers (1980). This approach assumes that both concrete and abstract words are stored in the verbal system, but that concrete words can also be found in the image system. The representation of concrete words in an additional system seems to bring considerable advantages in terms of learning verbal information and its representation. Another explanation for the superior performance of concrete words compared to abstract words in foreign language vocabulary learning may be given by the context availability ratings, since concrete words in memory

representations contain more information than the representations of abstract words (De Groot & Keijzer, 2000). This vast amount of available information offers new concrete words to be learned more possibilities to be remembered in a foreign language.

Both the dual-coding approach as the context availability ratings thus support the finding of De Groot and Keijzer (2000) that in a foreign language concrete words are remembered to a larger extent than abstract words. However, additional empirical evidence for their finding is lacking. In order to gain more certainty, the current research will also examine the role of word concreteness in the learning process of a foreign language and the hypothesis is that concrete words will be remembered more than abstract words in a foreign language.

In addition, the recent research by Macedonia and Knösche (2011) was the first to investigate the impact of the use of gestures on learning both concrete and abstract words in a foreign language. In their research, a within-subjects design was chosen to which twenty German speakers were subjected, each of whom were shown 32 audio-visual transitive sentences from an artificial language. All sentences contained both concrete and abstract words. For sixteen of the 32 sentences, the actor on screen performed a corresponding gesture. Afterwards, memory performance was tested daily, with regard to factors as word category (noun, verb and adverb) and concreteness (in general and within each word category).

One finding of the study by Macedonia and Knösche (2011) was that, both for concrete and abstract words, the use of gestures generally leads to a better memory of foreign vocabulary information than learning without the use of gestures. This finding is in line with the aforementioned studies that showed the benefit of gesture use in the learning process. The research of Macedonia and Knösche (2011) therefore shows promising results. However, it is one of the only studies to date that has included both concrete and abstract words in relation to foreign language learning by means of gestures, as a result of which the role of word type in this area has not yet been examined in depth. More research is therefore needed and the current study would like to contribute to this. The second hypothesis will therefore be that participants in a condition where gestures are used will remember more words (both concrete and abstract) of a foreign language than participants in a condition where the use of gestures is absent.

As previously mentioned, word category was taken into account in the research of Macedonia and Knösche (2011) in order to examine its influence on memory performance. For this current study, it is important to determine which word category to focus on, so that differences in word categories cannot be a factor that influences the effect on memory.

Macedonia and Knösche (2011) found that under the same training conditions, nouns were remembered better than verbs and adverbs. Therefore, nouns will be used in the current research.

For this specific word category, Macedonia and Knösche (2011) found that concrete nouns were remembered considerably more than abstract ones when the use of gestures was included in the learning process. Although the dual-coding approach and the context availability ratings would also provide a feasible explanation in this case, Macedonia and Knösche (2011) indicated in their research that the difference could be due to the fact that concrete nouns have a closer connection with the senses and therefore provide for a better linguistic representation when gestures are used (Barsalou, Simmons, Barbey, & Wilson, 2003). Still, more empirical evidence will be needed on this finding as well. Therefore, it is expected that through the use of gestures in the learning process more concrete nouns will be remembered than abstract nouns.

In general, both the study by De Groot and Keijzer (2000) and that of Macedonia and Knösche (2011) take a unique approach by taking not only concrete words but also abstract words into account when examining foreign language vocabulary learning. The results obtained by them are therefore promising as they provide for new insights into the field. However, as both studies are pioneers, there is a need for scientific support on the role of word concreteness in combination with the use of gestures when the vocabulary of a foreign language needs to be learned. The present research would like to contribute to this and will therefore focus on the effect of imagistic gestures on learning concrete versus abstract nouns in a foreign language.

## **Method**

### *Materials*

The experiment of the current study contained two independent variables consisting of two levels each. The first one was type of word, which consisted of the levels: concrete and abstract words. The second independent variable was gesture. Here, there was one level in which gestures were present when showing the different types of words and one in which gestures were not present.

The stimulus material consisted of two videos, each of which was played on a digital screen. The videos were shown to an audience consisting of native Dutch speakers who had to learn words from the Vietnamese language. The difference between the two videos lied in the

presence of gesture use. In one video, the different types of words were accompanied by gestures performed by a native speaker of Vietnamese who was featured in the video. The gestures were carried out only using the arms and hands (see Appendix 1, Figure 1; more information about the gestures below). In the other video, the same speaker did not perform any gestures when speaking. In the latter situation, the speaker was visible on the screen while keeping her arms and hands at her side (see Appendix 1, Figure 2).

In both videos, eight Vietnamese words and their Dutch translation were presented. The presentation of the words and their corresponding meaning was done according to the method used in the experiment conducted by Kelly et al. (2009, p. 317). Following their lead, the speaker first named the Vietnamese word and then explained its meaning in Dutch. Just like Kelly et al. (2009), the speaker did this twice per Vietnamese word. Between each explanation of a single word there was an interval of .02 seconds between repetitions, for example ‘‘Máy bay betekent vliegtuig. Máy bay betekent vliegtuig’’. In the condition with gestures, the corresponding gesture was shown during the entire presentation of each of the Vietnamese words and their explanation. The participants thus saw the gesture twice per word.

In each video, the same words were presented, half of which were concrete and half of which were abstract. All of the words presented were randomly arranged for creating the videos. In both of the videos, this order was maintained. Furthermore, each of the words and their corresponding explanation appeared audio-visually on the screen. This means that in addition to the word and its explanation being physically present on the screen underneath the speaker, they were also produced by the speaker.

For this study, the selection of concrete and abstract nouns was based on previous research. Nouns were selected whose concreteness had already been scientifically proven and for which a suitable gesture was conceivable. In their research, Brysbaert, Stevens, De Deyne, Voorspoels and Storms (2014) presented a ranking of thirty thousand Dutch words based on their concreteness. From this list, eight different Dutch nouns were chosen whose meaning was believed to be readily expressible through the use of gestures. Of these eight nouns, four were considered more concrete than abstract (vliegtuig – airplane; bril - glasses; snor - moustache; kom - bowl) and four were considered more abstract than concrete (begrip – understanding; donatie – donation; waarschuwing – warning; procedure - procedure). In Table 1, one can see the Dutch nouns, their English and Vietnamese translations and the corresponding levels of concreteness.



Furthermore, the selection process ensured that the different words that were chosen were equal in length and frequency, so that these factors would not affect the results. As in the research of Macedonia and Knösche (2011), the translation of each word chosen was checked for its length so that all of them consisted of two syllables. This was done in order to make sure that all the words to be learned would have an approximately equal level of difficulty.

The SUBTLEX-NL database compiled by Keuleers, Brysbaert and New (2010) was used to determine how often the chosen words occur. This document contains the frequency of 44 million Dutch words from film and television subtitles and the results for the chosen words in this study can also be found in Table 1. All of the frequencies were below one hundred per million words. For one of the chosen words, however, the frequency is missing. This concerns the word *bowl* of which the Dutch equivalent can be used both as a noun and as a verb. The SUBTLEX-NL database only provided information about *bowl* as a verb, which is why this frequency could not be used for the current research.

Table 1. Means and standard deviations (between brackets) for the level of concreteness (according to Brysbaert et al., 2014; (1 = abstract, 3 = as much concrete as abstract, 5 = concrete) and frequency per million words (according to Keuleers et al., 2010)

Dutch Noun ( <i>English translation</i> )	Vietnamese Translation	Level of Concreteness n = 75 <i>M (SD)</i>	Frequency (per million words)
Vliegtuig (airplane)	máy bay	4.80 (.77)	89.92
Bril (glasses)	kính mắt	4.87 (.52)	24.49
Snor (moustache)	râu mép	4.80 (.56)	9.95
Kom (bowl)	cái bát	4.60 (.91)	NA
Begrip (understanding)	kiến thức	1.53 (.83)	13.97
Donatie (donation)	ủng hộ	2.47 (1.25)	2.74

Procedure (procedure)	quy trình	2.20 (1.37)	11.82
Waarschuwing (warning)	cảnh báo	2.47 (1.25)	21.84

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Some of the chosen words could also be found in other research into concreteness in combination with the use of gestures. For example, in Macedonia, Müller and Friederici (2011) the authors drew up a list of 92 concrete nouns which were subsequently supported by gestures. This list included the noun airplane. Also, Macedonia and Knösche (2011) have examined the abstractness of nouns in relation to gestures. From their study, it became clear that gestures could be used for the nouns: understanding, donation and warning.

However, it still had to be determined what kind of gestures would be suitable for the words in the current research. Therefore, a pre-test was conducted in which a small group of ten people were asked whether the gestures suggested by the current researchers were suitable or not. During the consultation that preceded this pre-test, different kinds of gestures were proposed by the researchers from which a selection was made subsequently. These gestures consisted of different kinds of movements, all of which were produced by both arms and hands. First of all, there were several movements that ended in a static position. This was, for example, the case with the word 'airplane' where the hands were moved towards the shoulders and then placed in a horizontal static position at shoulder height. Another type of movement was produced in a continuous way, as with the word 'procedure', in which the arms rotated continuously around each other.

If according to the participants in the pre-test the Dutch noun and the proposed gesture corresponded, the gesture was retained for the experiment. If it was thought that correspondence was absent, the participants were asked what would, in their opinion, be a more suitable gesture and then the word with gesture were reconsidered. The final results showed a majority of agreement between the participants of the pre-test and the percentages can be found in Table 2.

Table 2. Percentages of the agreement between pre-test participants for the correspondence between the Dutch noun and the proposed gesture

Dutch Noun	Agreement with proposed gesture (%)	Dutch Noun	Agreement with proposed gesture (%)
Vliegtuig	100	Begrip	80
Bril	100	Donatie	100
Snor	100	Procedure	60
Kom	100	Waarschuwing	60

At last, the videos and the other parts of the experiment were merged via the online platform Qualtrics so that it could be distributed to a larger audience and be opened on other electronic devices.

### *Participants*

Native Dutch speakers, irrespective of gender, were approached to participate in the experiment. A criterion for selection was that participants did not have any prior knowledge of the Vietnamese language. Also, participants were required to be sixteen years of age or older. Data from people who did not meet these requirements were removed from the study.

A total of 116 participants participated in the research, 36 of whom were men (31%), 80 of whom were women (69%). The average age of the participants was 26 years ( $SD = 12.50$ ). The minimum age was 16 and the maximum age was 64. Participants from all levels of education in the Netherlands were present: from secondary education (14.7%) to a university master's degree (14.7%). The most common level was the bachelor's degree at university level (49.1%). Bachelor students from HBO also participated (13.8%). Other levels of education also occurred, such as MBO and postmaster's (7.8%).

All of the participants were randomly divided between the two gesture conditions of the experiment. 62 people were exposed to the video in which the speaker performed gestures.

An independent samples t-test showed that there was no significant difference between participants that saw a video with gestures and participants that saw a video without gestures with regard to mean age ( $t(111.02) = .06, p = .956$ ). The mean age for participants in the

gesture condition ( $M = 25.76$ ,  $SD = 12.41$ ) did not differ significantly from the mean age for participants in the no gesture condition ( $M = 25.89$ ,  $SD = 12.72$ ).

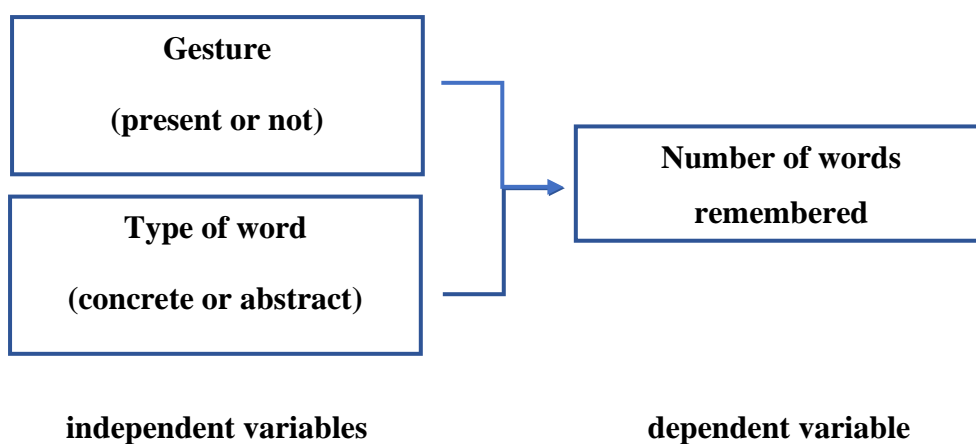
Furthermore, a Chi-square test showed that there was no significant relation between gender and the gesture condition to which the participant was randomly assigned ( $\chi^2(1) = .25$ ,  $p = .617$ ). Both men and women were therefore equally divided over the different conditions.

Lastly, a Chi-square test showed that there was no significant relation between educational level and the gesture condition to which the participant was randomly assigned ( $\chi^2(4) = 3.43$ ,  $p = .488$ ). All types of education were therefore equally divided over the different conditions. In both conditions, a bachelor's degree at university level was the most frequent level.

### *Design*

This study had a mixed design. The between-subject variable was the independent variable *gesture*, which means that one part of the participants saw the video where gestures were present and the other part saw the video where gestures were absent. The within-subject variable was the independent variable *type of word*, which means that all participants learned both concrete and abstract nouns. This choice has been made because it provided for more statistical power.

This study examined the effect of the independent variables *gesture* and *type of word* on the dependent variable *number of words remembered*. An overview of the relationship between the different variables in this study can be found in Figure 1.



*Figure 1.* Analytical model. The figure shows the relationship of the independent variables (gesture + type of word-) and their levels to the dependent variable (number of words remembered)

### *Instruments*

In order to find out the number of correctly remembered words, the free recall test (Engelkamp & Dehn, 2000) used in the study by Kelly et al. (2009) was digitally taken by all of the participants. As testing took place immediately after the learning process, the focus for this experiment was on the short-term memory of the participants.

In the free recall test, each of the learned Vietnamese words appeared visually on the screen in a random order with underneath it a bar where the participants could put in the corresponding Dutch translation that they thought was correct. This means that the words were tested passively and on one occasion. Participants were allowed to take as long as they needed to give a translation for each of the Vietnamese words and it was also possible for them not to fill in anything if they could not remember a corresponding translation. For the answers that were filled in, a correct answer was encoded as 1 and a wrong answer was encoded as 0. Correct spelling was not taken into account as a criterion. After the completion of the whole experiment, the answers of the participants were checked by two coders to see which of the eight words were correctly remembered. The interrater reliability of the variable 'number of words remembered' was near perfect:  $\kappa = .98$ ,  $p < .001$ .

### *Procedure*

The participants of the study were approached via social media with the request to assist in the graduation process of five students of the International Business Communication programme at Radboud University. In the accompanying message it was mentioned that the experiment would take about ten minutes in total. Afterwards the participants were thanked for taking part in the study.

Before the start of the experiment, participants were offered a written introduction explaining what was expected of them and what would await them (for complete instructions, see Appendix 2).

The general introduction was followed by a questionnaire in which the participants shared their demographic data (age, educational level, gender and mastered languages).

At the start of the experiment, each participant was randomly assigned to one of the two conditions. The experiment started with the word learning process. In both conditions the task of the participants was to learn as many words as possible (Macedonia & Knösche, 2011). It was communicated to them that it was not going to be an easy task and that careful listening and watching was important. In addition, it was also pointed out to them that the video should

not be paused in the meantime. In the condition without gestures, the participants were asked to repeat the word out loud after the presentation of the word by the Vietnamese speaker (for complete instructions, see Appendix 3). For the condition where gestures were used by the speaker, the participants were asked to reproduce not only the word but also the corresponding gesture (for complete instructions, see Appendix 4).

In line with the procedure followed by Macedonia and Knösche (2011), the participants in the gesture condition had five seconds after each performance of the speaker to simultaneously repeat the word and reproduce the gesture. In the condition without gestures, the participants also had five seconds at their disposal for solely repeating the word.

After having received the vocabulary training, all of the participants were subjected to the free recall test discussed earlier. In total, the entire experiment took an average of eight minutes to complete.

#### *Statistical treatment*

In order to see if there was a main effect of gesture, if there was a main effect of type of word, and if there was any interaction between the two, a repeated measures ANOVA was used. In this statistical test, type of word served as repeated factor and gesture as between-subjects factor.

## **Results**

It was hypothesized that more concrete words would be remembered than abstract words when learning a foreign language. Furthermore, it was assumed that participants in a condition with gesture use would remember more words of a foreign language than participants in a condition where the use of gestures is absent.

A repeated measures analysis for type of word as within subject factor and gesture as between subject factor showed a significant main effect of type of word ( $F(1, 114) = 22.90, p < .001$ ), such that concrete words ( $M = 1.79, SD = 1.02$ ) were correctly remembered to a larger extent than abstract words ( $M = 1.24, SD = 1.08$ ). The first hypothesis could therefore be confirmed. However, no significant main effect was found for gesture ( $F(1, 114) = .79, p = .375$ ). Whether a condition contained gestures ( $M = 1.45, SD = .98$ ) or no gestures ( $M = 1.59, SD = 1.10$ ) did not affect the number of words remembered (see Table 3). Therefore, the hypothesis that words are remembered to a larger extent by means of gesture use had to be rejected.

Table 3. Means and standard deviations for gesture and type of word in function of number of words remembered (0 = minimum, 4 = maximum)

	Video	Mean	Standard Deviation	N
Number of concrete words	With gesture	1.87	.90	62
	Without gesture	1.70	1.14	54
	Total	1.79	1.02	116
Number of abstract words	With gesture	1.03	1.06	62
	Without gesture	1.48	1.06	54
	Total	1.24	1.08	116

Another hypothesis was that more concrete nouns would be remembered than abstract nouns in a condition where gestures were present. A significant interaction effect between type of word and gesture was found ( $F(1, 114) = 7.73, p = .006$ ), with the difference between the two types of words only found among participants in the gesture condition ( $F(1, 61) = 32.29, p < .001$ ). In this condition, the number of concrete words remembered ( $M = 1.87, SD = .90$ ) was higher than the number of abstract words remembered ( $M = 1.03, SD = 1.06$ ). There was no difference between the two types of words for participants in the condition without gesture ( $F(1, 53) = 1.78, p = .188$ ). For them, the number of concrete words remembered ( $M = 1.70, SD = 1.14$ ) did not differ significantly from the number of abstract words remembered ( $M = 1.48, SD = 1.06$ ). The last hypothesis could therefore be accepted.

## Conclusion and discussion

The aim of the current research was to investigate the effect of imagistic gestures on the learning of both concrete and abstract foreign nouns. Concreteness in relation to the learning of a foreign vocabulary by means of gestures is a theme that has been the subject of little research to date, especially when looking at the abstractness of words. Studies by De Groot

and Keijzer (2000) and Macedonia and Knösche (2011) are among the few that have focused on learning both concrete and abstract foreign words with the use of gestures and therefore reported that further research was needed in this area.

In the study by De Groot and Keijzer (2000), it was found that concrete words were remembered more than abstract words in a foreign language. In order to find more empirical support for this finding, the first hypothesis of the current research was that, when learning a foreign language, more concrete than abstract words would be remembered. The results found were in line with those of De Groot and Keijzer (2000) and can be explained by previous literature. For example, as stated in the dual-coding approach to bilingual memory, concrete words may be remembered to a larger extent because they are rooted in more cognitive systems than abstract words and are therefore more accessible when they need to be retrieved (Paivio & Desrochers, 1980). Furthermore, the context availability ratings also state that concrete words have a wider availability of information in memory than abstract words and can therefore be remembered more easily (De Groot & Keijzer, 2000).

The second hypothesis of the current research was based on the research of Macedonia and Knösche (2011) and stated that participants in a condition with gestures would remember more words of a foreign language than participants in a condition without gestures. The results, however, suggest otherwise. In the current research, participants in the condition with gestures did not differ significantly in the number of remembered foreign words than participants in the condition without gestures. Therefore, the second hypothesis had to be rejected. A possible explanation for this finding can be found in the research of Kelly and Lee (2012). According to them, gestures contribute to the learning of foreign language words as long as the language to be learned is perceived by the student as phonetically easy. It is concluded by them that if the phonetic demands of a foreign language to be learned are too high for a student, gestures and speech do not go hand in hand when learning the foreign vocabulary. Since Vietnamese is in few respects similar to Dutch, learning Vietnamese could have been too difficult for the participants of the present research, which would explain the absence of a link between gestures and speech.

Finally, in order to answer the research question *What is the effect of imagistic gestures on learning concrete versus abstract nouns in a foreign language?*, it was examined whether there would be an interaction effect between the independent variables Gesture and Type of word. The hypothesis was that more concrete words would be remembered in a condition where gestures were present (Macedonia & Knösche, 2011). The results of the current research support this hypothesis. A significant interaction effect showed that when



gestures were used, concrete words were remembered significantly more than abstract words. In the condition without gestures, no significant difference was found between the number of concrete and abstract words remembered. According to Barsalou et al. (2003), the finding that gestures do have an influence on the extent to which concrete and abstract words of a foreign language are remembered, can possibly be explained by the close relationship between concrete words and the senses. As the student synchronizes gestures, the senses are more active, which in turn leads to an improved linguistic representation for concrete words. Since no gestures were used in the other condition, the senses were less active here, which may explain why no difference was found here in the memorization of concrete and abstract words.

In conclusion, there is a significant effect of imagistic gestures on the learning of concrete and abstract nouns in a foreign language, in such a way that with the use of these gestures concrete words are remembered significantly more than abstract words. Without the use of gestures, this effect does not seem to be present and therefore there is no significant difference between the number of concrete and abstract words remembered.

## **Future research**

Based on limitations of the current research and on the lack of empirical evidence in research into the use of gestures when learning concrete and abstract words in a foreign language, several opportunities for further research have been formulated.

Due to unforeseen circumstances, the current experiment had to be conducted online, which has led to some potential shortcomings. For instance, because the participants of the experiment were located in an environment where they could not be observed by the researchers, it was not possible to check whether the participants in the gesture condition actually performed the gestures themselves. Furthermore, it remains unclear whether the words were repeated out loud by the participants in both conditions. Both repeating the words and carrying out the gestures were essential actions in the research and the possibility that they were not carried out might have had an influence on the results. In order to avoid such shortcomings in the future, it is therefore advisable that the participants are located in a controlled environment. Consider, for example, a classroom setting.

Furthermore, it might be important for future research to pay attention to the phonetic demands of the foreign vocabulary to be learned. A foreign language that is not easy to relate to a student's mother tongue may, when pronounced, come across as strange because of its sound and composition (Macedonia & Knösche, 2011). This so-called bizarreness

(Engelkamp, Zimmer, & Biegelmann, 1993) appears to have a negative impact on the relation between gestures and speech, in such a way that it could make the use of gestures irrelevant to the learning process. In the future, therefore, if one looks at learning concrete and abstract words from a foreign vocabulary by means of gestures, it is important that the phonetics of the words to be learned are not too difficult for the student.

A final practical limitation of this study is that participants were tested immediately after learning the words. In their results section, Macedonia and Knösche (2011) speculate on the basis of previous research (Baraduc, Lang, Rothwell, & Wolpert, 2004; Shadmehr & Holcomb, 1997) that the use of gestures might take time to actually have an influence on memory. Therefore, when testing newly learned words directly after the learning process, the accompanying gestures may not yet have had any influence. It may therefore be difficult to determine whether the results of the current study can actually be traced back to the use of gestures or whether it is related to the learning ability of the student. However, as in the study by Macedonia and Knösche (2011), this is a speculation and further research into the time it takes for gestures to produce an effect on memory will be necessary. Performing a post-test might already help in this respect.

## **Implications**

Based on the findings of the current research, some implications can be formulated. Although it was believed that the use of gestures would make it possible to remember more words in a foreign language, no additional evidence for this has been found in the current research. However, confirmation was found for the result of De Groot and Keijzer (2000) that concrete words were remembered more in a foreign language than abstract words. In addition, confirmation was also found for the result of Macedonia and Knösche (2011) that when gestures are used during the learning process, concrete words are remembered better than abstract words in a foreign language. The current research therefore shows that a practical implication is that teaching a pupil concrete words is a good starting point for creating a basic knowledge of foreign vocabulary. An advice to language teachers is to let the student make use of gestures while learning concrete words, as they seem to stimulate the learning process. However, it is important to keep in mind that in order to use a foreign language properly, it is important to have knowledge of both concrete and abstract words and therefore abstract words will have to be learned at some point.

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## List of appendices

### Appendix 1. Example of a word presentation in both conditions



*Figure 1.* Example of the presentation of the word bowl in the gesture condition



*Figure 2.* Example of the presentation of the word bowl in the no gesture condition



## Appendix 2. General instructions

Dear participant,

We are five students who are studying International Business Communication at Radboud University and we are currently writing our bachelor thesis. Your participation in our research is highly appreciated.

For the general interest of the research, it is essential that during the experiment you find yourself in a quiet environment in which it is possible to concentrate. The research will start with an online questionnaire. This questionnaire will contain several demographic questions, for example about your age and gender. After that you will be shown a video. In order to watch the video, it is important that you use equipment that allows you to watch the video with sound. The last part of the research will be a language test. The research will take about 10 minutes in total.

You are volunteering to take part in this research. Therefore, you can stop your participation and withdraw your consent at any time during the survey. You do not have to indicate why you are withdrawing. It is also possible to have your research data deleted up to two weeks after participation. You can do this by sending an e-mail to ...@student.ru.nl. You can also contact us via this e-mail address if you have any questions or objections. All of the questions you answer in the research will be anonymous. The anonymized research data will be available to other scientists for at least 10 years. If we share data with other researchers, they cannot be traced back to you. All of the information collected will only be used for datasets, articles and presentations related to this research.

By clicking on the button '**Agree, proceed with questionnaire**' you indicate that you:

- Have read the information above
- Voluntary participate in this research
- Are 16 years of age or older

Thank you in advance for your participation.

Kind regards,

Trang, Hilde, Trix, Sanne and Kim

- Agree, proceed with questionnaire
- Do not agree, I do not want to participate in this investigation

### **Appendix 3. Instructions for the word learning process in the no gesture condition**

You will now see a video in which you will hear and see 8 Vietnamese words with the corresponding Dutch translation. Each word will appear twice and then 5 seconds of rest will follow. In these 5 seconds we would like to ask you to repeat the word out loud. The intention is that you will learn as many Vietnamese words as possible. Please turn on your sound loudly and do not pause the video.

Note: This is not an easy test, so listen and watch the video carefully.

#### **Appendix 4. Instructions for the word learning process in the gesture condition**

You will now see a video in which you will hear and see 8 Vietnamese words with the corresponding Dutch translation. Each word will appear twice and then 5 seconds of rest will follow. In these 5 seconds we would like to ask you to repeat the word out loud while performing the corresponding gesture. The intention is that you will learn as many Vietnamese words as possible. Please turn on your sound loudly and do not pause the video.

Note: This is not an easy test, so listen and watch the video carefully.