Cognate Triggered Language Switching in Dutch-English Bilinguals:

Inhibition and cognate facilitation in a cued language switching experiment

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Abstract

This thesis investigates the influence of cognates on language switching in Dutch-English bilinguals. The aim of this study is to determine whether language-switch direction and a bilingual's L2 proficiency or "L2 background" (i.e. how often participants use English, their L2, outside of an academic context) influence the effect of cognates. Thirty-three Dutch-English bilingual students were divided into four groups based on their L2 (English) proficiency and their "L2 background". These participants performed a cued language switching task with pictures of both cognate and non-cognate words, which had to be named in English or Dutch in accordance to the color cue. The results of this research show: (1) cognate facilitation from L1 (Dutch) to L2 (English) but only in average proficiency participants**;** (2) switch direction influences the performance in the experiment, and possibly inhibits switches from L2-L1 but not in combination with cognates; (3) and similarly, the proficiency and the L2 background of the participant may influence the performance, but not the cognate effect as there was not a significant interaction with the trigger variable. This thesis did not find clear evidence for cognate facilitation in both switching directions; there is only a cognate facilitation effect in the average proficiency group switching from Dutch to English. Cognate status did not have a significant interaction with the response time, whereas switch direction did have a significant interaction. This could suggest that switch direction is influences switching performance more than cognate status in L2 learners.

Key words: bilingualism, cognates, cognate facilitation, inhibition, language switching, picture naming task, trigger hypothesis

1. Introduction

1.1 Multilingualism in the Netherlands

A large portion of the population in the Netherlands would be considered bilingual, or even multilingual, with Dutch as the L1 and English as the L2. According to Education First (an international company which specializes in language training), the Netherlands has the highest level of English (as a second language) proficiency in Europe in 2016 (Education First, 2016). This high level of English as a second language can be explained by the important role of English (as a second language) education in the Netherlands. Children often start English language classes during the last two years of primary education (around the age of 10 to 12 years old) (Edelman, 2010, p.28). In fact, most English learners in the Netherlands have had around eight years of language instruction (Edelman, 2010, p.28).

Dutch speakers in the Netherlands are also exposed to the English language outside of an academic context. One way for any speaker to be exposed to a second language is through "the visibility and salience of languages on public and commercial signs" (Landry & Bourhis, 1997, p. 23), which has been referred to as "linguistic landscape" (Edelman, 2010, p. 1). Aside from the visibility of languages on public signs outside, English is also present in shops, businesses, advertisements sent to one's home, spoken language heard in your neighborhood (Edelman, 2010, p. 8). Globalization is one of the main reasons that the English language is of prominence in the Netherlands (Edelman, 2010, p. 28). Edelman argued that recent waves of immigration and foreign entrepreneurship have resulted in a globalized Netherlands with a diverse "linguistic landscape" (Edelman, 2010, p.27-41).

1.2 Code-switching

Multilinguals or bilinguals, such as the Dutch, have mastered at least two languages through their education and their L2 background as a result of a diverse “linguistic landscape”. When forming a sentence, bilinguals have the option to select linguistic elements from both languages. These languages, which are often separated in speech, can also get mixed in conversation. This mixed use of multiple languages in one coherent utterance is called code-switching (Kootstra, Van Hell, &Dijkstra, 2012, p.797).

Code-switches can occur due to various sociolinguistic factors, such as: where the conversation takes place (e.g.: at home), role-relationship between interlocutors (e.g.: father and daughter), and type of interaction (e.g.: an argument) (Clyne, 1980, p.400). However, this thesis will mostly focus on the linguistic triggers which can also facilitate code-switching.

Translation words have been suggested to be a linguistic trigger for code-switching. Translation words are words which share the same meaning in two languages, but these words do not need to share the same form (Costa & Santesteban, 2016, p.98). For example: the English word *refrigerator* is the translation word of the Dutch word *koelkast*, even if they do not share any orthographical similarities. Sentence (1) has an example of a code-switch from English to Dutch:

(1)	“He	bought	me	a	<u>*ring*</u>	met	een	grote	diamant.”
	He	bought	me	a	ring (Eng.)	with	a	large	diamond (Dut.).

‘He bought me a ring with a large diamond.’

In this example the translation word *ring* (of which the Dutch equivalent is also: *ring*) may have caused the speaker to code-switch from English into Dutch mid-sentence.

1.3 The trigger hypothesis

In his trigger hypothesis Michael Clyne (1967, 1980) suggested that, in the speech of bilinguals, the presence or anticipation of trigger words (such as *ring* in example (1)) can lead to a code-switch into a different language. Clyne elaborated that the trigger words are common to two or more of the bilingual speaker's languages, "either because of their ambiguous affiliation or because the speaker has incorporated elements of one system into the other" (Clyne, 1980, p. 401; Clyne, 2003).

Clyne (2003) discussed four types of trigger words, which are also translation words: (i) lexical transfers, (ii) bilingual homophones, (iii) proper nouns, and (iv) cognates.

(i) Lexical transfers are words from a different language which have become part of the speaker's lexicon. For example 'kijken' (English: to look) in this next example:

(2) "Ich	muss	ab und zu	in einem	Dictionary	<u>*kijken*</u>"
I	have to	every now and then	in the (Ger.)	dictionary (Eng.)	look + inf (Dut.)

'I have to look in the dictionary every now and then' (MTGED 25f)

(Clyne, 2003, p. 163)

(ii) Bilingual homophones are also part of two or more of a bilingual's languages (Clyne, 2003, p. 164). Clyne described bilingual homophones as "items that are common to the two systems of all bilinguals using the respective languages (..) that in the idiolect of some speakers have become common due to [phonetic] convergence" (p.164). In example (3), 'smal' (Dutch, meaning: 'narrow') and English small are both pronounced [smɑl] by the speaker, thus these words are bilingual homophones (Clyne, 2003, p. 164):

(3) "En we reckoned Holland was

And (Du) we reckoned Holland was (En)

too *smal* voor ons. Het was te benauwd allemaal"

Too (En) small for us (Du) It was too oppressive everything

'and we reckoned Holland was too narrow/small for us. It was all too oppressive everything' (MD 198f)

(Clyne, 2003, p.164)

(iii) Proper nouns are often similar in all bilingual's languages, such as personal names and place names. 'Snow white', in example (4) is a proper noun which functions as a trigger word:

(4) "Ik heb gelezen '*Snow White* come home' it's about a winter pet"

I have read (Du) 'Snow white come home' it's about a winter pet (En)

'I have read: "Snow White come home" it's about a winter pet' (MD 101f, second generation)

(Clyne, 2003, p. 165)

(iv) The final trigger word which Clyne (2003) discussed is cognates. Dijkstra, Miwa, Brummelhuis, Sappelli and Baayen (2010) cited a text by Peter Verstegen that consists entirely of Dutch-English cognates:

(5) "Drink gin in restaurant, whiskey in hotel, champagne in bed. Later effect: Oh God, migraine. Tablet in warm water!"

Drink gin in restaurant, whiskey in hotel, champagne in bed. Later effect: Oh God, migraine. Tablet in warm water (both Eng. and Du.)

'Drink gin in restaurant, whiskey in hotel, champagne in bed. Later effect: Oh God, migraine. Tablet in warm water'

(Dijkstra, Miwa, Brummelhuis, Sapelli, Baayen, 2010, p.284; Peter Verstegen)

This sentence is valid in both English and Dutch, because cognates not only share a similar meaning but they are also similar in word form (e.g. *ring* in sentence example (1) and all words in example (5)). Costa and Santesteban (2016) defined cognates as "translation words that are phonologically (and/or orthographically) similar in the two languages of a bilingual (e.g., the Spanish-English pair *tren-train*)" (p.98). Cognates are (i) faster to learn, and less easy to forget, (ii) faster in production, and translation, (iii) "more sensitive to cross-linguistic priming", and (iv) cognates "elicit more similar brain activity between languages" (Costa & Santesteban, 2016, p.98).

Whereas cognates are similar in the two languages of a bilingual, non-cognates are dissimilar (e.g., the Spanish-English pair *barco-ship*) (Costa & Santesteban, 2016, p.98). Non-cognates are translation words that only share their meaning in two languages, and do not have similar orthographic phonological forms (Costa, Caramazza & Sebastian-Galles, 2004, p.1285).

The cognate/non-cognate contrast is only meaningful to bilinguals, according to Costa et al. (2004). The fact that *gat* (English: *Cat*) in Spanish, is also *gat* in Catalan means nothing to a Spanish monolingual speaker (Costa et al., 2004, p.1285). The orthographic-phonological properties of translations are only of significance for bilinguals, in how words are processed in the bilingual's two languages (Costa, Caramazza & Sebastian-Galles, 2004, p. 1285).

Clyne first presented the trigger hypothesis in 1967, which he then developed in a series of research on German-English, and Dutch-English bilingualism in Australia (Broersma & De

Bot, 2006, p. 2). Since his first mention of the trigger hypothesis in 1967, Clyne has reformulated this hypothesis. Clyne's (2003) revised trigger hypothesis suggested that trigger words can facilitate a language switch, whereas in the original trigger hypothesis, Clyne (1967, 1980) argued that trigger words would cause a triggering effect. The difference between triggering (Clyne, 1967; 1980) and facilitating (Clyne, 2003) is the following: Clyne (1980) suggested that trigger words are the main cause of a code-switch. However, in the revised trigger hypothesis, Clyne (2003) acknowledged that there are more factors (aside from trigger words) which can lead to a code-switch. Facilitation, as mentioned in the revised trigger hypothesis by Clyne (2003), can also happen due to structural overlap (of the two languages), convergence of two languages (in other words: two languages become more alike, possibly due to language contact) and lexical similarity (Clyne, 2003, p.159).

1.4 Previous research on cognate facilitation

Broersma and De Bot (2006) were the first to empirically test the original trigger hypothesis (Clyne, 1967; 1980) and Clyne's revised trigger hypothesis (2003) in Dutch-Moroccan speech. In this experiment, they transcribed conversations between Dutch-Moroccan Arabic bilinguals, and marked words as either a trigger word or a non-trigger word according to Clyne's (2003) definition (see section 1.3).

Broersma and De Bot's (2006) research showed that words which immediately followed a trigger word were notably more often codeswitched than words that were following a non-trigger word. Their corpus analysis suggested that "the selection of a trigger word enhances the activation of the lemmas of a non-selected language" (p. 11). Broersma and De Bot's (2006) evidence thus showed that trigger words can also be relevant in an experimental language switching context.

Inspired by Broersma and De Bot (2006), Broersma (2011) has attempted to show experimental evidence for the revised trigger hypothesis in Dutch-English bilinguals by using a language switching experiment. Language switching studies mostly employ the classical task switching paradigm (Broersma, 2011, p. 43). Whereas code-switching (for a definition, see section 1.2) focusses on the mixed use of language in naturally produced speech, language switching focusses on switching between languages induced by an external cue in an experimental setting. Broersma (2011) argued that language switching experiments can uncover any underlying effect of the trigger hypothesis in code-switching:

> "Whereas code-switching research is generally concerned with naturally produced switches in the context of running speech, experimental language switching studies are usually limited to the production of single words and switches are often induced by an external cue rather than internally generated. The strength of language switching experiments, however, is that they allow one to control many variables that would affect code-switching in naturalistic settings, and thus provide a better look at the mechanism underlying the switching than natural data do." (Broersma, 2011, p. 42)

Broersma's (2011) experiment was a picture naming task, with language switches that were indicated by a color cue. She did not utilize all types of trigger words, but she selected cognates for her language switching experiment. Whenever a cognate had to be named in English, the following word had to be named in Dutch and vice versa. Broersma used this design to see whether cognates facilitate a language switch for the word following the cognate. Broersma's (2011) experimental results supported the trigger hypothesis as she found that naming words which followed a cognate had a shorter response time than words which followed a non-cognate control word.

Broersma (2011) then performed the same picture naming task a second time, but this time participants were expected to switch languages freely without a color cue. She found that switches happened more frequently from L1 to L2 than from L2 to L1. Broersma's research thus suggested that triggered switching may be asymmetric. However, Broersma did not control for different participant related factors which may influence the results of the experiment.

Broersma, Carter, and Acheson (2016) separated participants by language proficiency and they found facilitation and inhibition among different proficiency groups. Broersma et al.'s (2016) participants were Welsh-English bilinguals with varying proficiency in both languages. The picture naming task which was used by Broersma et al. (2016) was similar in structure as Broersma (2011), as participants were expected to name pictures according to the colored background. Broersma et al. (2016) formed cognate and non-cognate trials on which the language switch would always take place directly after the cognate or control. They then compared mean naming latencies for cognates and controls and for fillers which followed the cognate and controls.

Broersma et al. (2016) mostly found cognate induced inhibition rather than facilitation. Cognate inhibition entails that a bilingual may react slower in the presence of (or due to) a cognate (Broersma, Carter and Acheson, 2016, p.3). Broersma et al. (2016) found this cognate inhibition in their Welsh-English bilinguals who had English as their dominant language and had to switch into Welsh (their less dominant language). The equal Welsh-English dominance group and the Welsh dominant group showed cognate facilitation, when switching into English, instead (Broersma, Carter and Acheson, 2016, p.1).

Broersma et al. (2016) argued that whether inhibition occurs is dependent on language dominance of the speaker (p.3). Inhibition is often interpreted as evidence that when a bilingual produces words in the less proficient second language (from now on: L2), there is need for a strong inhibition of the mother language (from now on: L1) (Broersma et al., 2016, p.4; Costa & Santesteban, 2004). This inhibition in turn causes a slower response time when switching from L2 to L1. However, when one switches into the L1 not as much inhibition is required from the L2 (Broersma et al., 2016, p. 4). Broersma et al. (2016) thus concluded that language dominance affects the direction of the inhibition effect.

Previous research on the effect of cognates in language switching has found varying results. Cognate facilitation has been found in research related to Clyne's (1980, 2003) trigger hypothesis (Broersma, 2011). On the other hand, a recent finding is inhibition in the presence of cognates as a result of language dominance (Broersma et al. 2016). This thesis will test the revised trigger hypothesis (Clyne, 2003) by executing a mixed picture naming task with color cues (adapted from Broersma, 2011). This study will focus on the effect of cognates on language switching in Dutch-English bilinguals. Furthermore this research will look at additional variables such as switch direction (from cognate to the word following the cognate) and participant related variables (L2 proficiency and L2 background) to see whether these influence the cognate effect in a language switching experiment.

In the present research I have found cognate facilitation but only in the average proficiency group switching from L1 to L2 (from now on: L1-L2). This facilitation is not found in the L2 to L1 (from now on: L2-L1) direction which is why I argue that the trigger hypothesis is not present in this language switching experiment. Switch direction also did not modulate the cognate switch effect, but the switch direction did influence the response time of the experiment independently. Finally, this paper will show that the different L2 background or L2 proficiency did not have a significant interaction with cognates in a language switching task. I argue that language switching experiments are not suited to find the trigger hypothesis, as the null hypothesis has also been found in previous research. Rather, the switch direction causes inhibition switching from L2-L1 in the Dutch-English bilinguals. It is more likely that switch direction and the participant variables influence the response times in language switching experiments.

2. Present study and research questions

For this research a close replica of Broersma's (2011) language switching experiment design will be used (more on this in the methodology section), but to add a new variable, the participants will be divided in groups based on L2 proficiency and L2 background (meaning: how often the participants use and see English outside of an academic context).

Previous research has given little attention to the importance of the proficiency variable, and likewise a participant's L2 background (based on the concept of "linguistic landscape", see section 1.1: Multilingualism in the Netherlands). I am adding this new dimension because there have been conflicting results on the effect of cognates in previous experiments. Broersma et al. (2016) pointed out that language dominance may be a possible explanation, and due to this observation, all participants in this research have Dutch as their dominant language; however their L2 proficiency and/or L2 background may vary. This will allow us to see whether these two participant variables also influence the cognate effect in language switching experiments.

In this thesis I will answer these research questions:

RQ1: Is there evidence for the revised trigger hypothesis in Dutch-English bilinguals?

H1: If the revised trigger hypothesis (Clyne, 2003) is correct, I expect to see faster response times for targets which follow a cognate and slower response times for targets which follow a non-cognate. I expect to find cognate facilitation in both switch directions, which in turn would provide experimental evidence for the trigger hypothesis. This hypothesis was based on Broersma (2011) who has found evidence for the trigger hypothesis in Dutch-English bilinguals (Broersma, 2011, p.53). She found that the presence of cognates facilitates a language switch. Similarly, Broersma et al. (2016) found cognate facilitation in their Welsh dominant and equal dominance groups.

RQ2: Is the effect stronger for L1 to L2 switches than the other way around?

H2: If I find a triggering effect, I expect the effect to be stronger for switches from L1 to L2. Costa and Santesteban (2004) found that L2 learners are more prone to asymmetric switching costs during language switching, especially when switching from the L2 to L1. This means that a switch from L2 to L1 often is slower than a switch from L1 to L2. Costa and Santesteban (2004) looked at L2-learners and Broersma et al. (2016) looked at participants with varying language dominance, and both researches found a slower response time when switching into the L1 (either due to asymmetrical switching costs or cognate inhibition). I expect to find facilitation from L1 (Dutch) to L2 (English), but inhibition from L2 (English) to L1 (Dutch). This means that I expect to see slower response times for a switch from L2 to L1, even if there is a cognate trigger in the L2 position.

RQ3: Do language proficiency and L2 background modulate these effects?

H3: Yes, I expect asymmetrical switching costs in L2-learners with average proficiency and more symmetrical response times for L2-learners with a higher proficiency level. I expect to find that average L2 proficiency group will have faster response times switching from L1 into L2, and slower response times when switching from L2 to L1. For highly fluent bilinguals I expect faster response times when switching from L1 to L2 and L2-L1, with possible inhibition (of the L1) due to the amount of words that have to be inhibited. This is motivated by Costa and Santesteban (2004) who found that L2 learners show asymmetrical switching costs from L2 to L1, where highly fluent bilinguals did not have asymmetrical switching costs (Costa & Santesteban, 2004, p.508; Broersma, 2011). However, in this research I expect to find that highly proficient bilinguals also show asymmetrical switching cost due to inhibitory control and cross language competition, related to the bilinguals' language proficiency and L2 background. According to inhibitory models, bilinguals with a high proficiency level should show more inhibition (Costa & Santesteban, 2004). Bilinguals with a lower L2 proficiency should also make use of inhibition, but to a lesser extent because there are fewer words that need to be inhibited.

3. Background

3.1 Types of code-switching

According to Lipski (1985) there are two types of code-switching: switching at sentence boundaries, and switching within a sentence structure. Bilinguals with a higher second language proficiency level code-switch differently, in comparison to bilinguals with a lower proficiency level (Lipski, 1985). When bilinguals have the ability switch within the clause/sentence, this is an indicator that the bilingual is fluent in both languages (Lipski, 1985). By elaborating on these two types of code-switching, this section will highlight why it is important to distinguish between different groups of bilinguals, because not all bilinguals code-switch in the same manner.

Inter-sentential code-switching (also named: extra sentential (Poplack, 1980, p.602)) consists of switching languages at sentence boundaries, which are often principal discourse boundaries (Lipski, 1985 p. 2). A bilingual can finish a sentence in the first language and then start the next sentence in the other language. An example of inter-sentential code-switching from English to Dutch:

(6) “I was watching ‘Sherlock’ yesterday and I realized I had to do…

I was watching ‘Sherlock’ yesterday and I realized I had to do (Eng.)

my homework. Dus heb ik mijn hond mijn huiswerk laten opeten.”

my homework (En) So had I my dog my homework let eat (Du).

‘I was watching ‘Sherlock’ yesterday and I realized I had to do my homework. So I let my dog eat my homework.’

Intra-sentential language switching is characterized by the smooth flow in between two languages (Lipski, 1985, p.3). Intra-sentential language switching involves switching from L1 to L2 in the middle of a sentence, without any interruptions or any indications of a significant categorical shift (Lipski, 1985 p.2). Lipski (1985) cited Poplack’s (1980) title as an example:

(7) “Sometimes I’ll start a sentence in English *y termino en español*”

Sometimes I’ll start a sentence in English (Eng.) and end in Spanish (Spanish)

‘Sometimes I’ll start a sentence in English and I’ll end it in Spanish’

(Poplack, 1980)

Lipski (1985) argued that a bilingual speaker who has learned a second language in the post-adolescent period will rarely switch spontaneously at an intra-sentential level, even if the bilingual speaks the second language well. Lipski found that this shows the qualitative difference between the two types of code-switching (Lipski, 1985, p, 2). Switching at an intra-sentential level requires a greater proficiency in both languages, because each part of the utterance has to comply with the rules of each spoken language (Zirker, 2011, p.11). Rather than switching at an intra-sentential level, late bilinguals will have more ease switching at an inter-sentential level.

3.2 L2 Background and L2 proficiency

Different types of code-switching are an important predictor of whether a bilingual will switch within the sentence boundary or between sentences. However, proficiency and L2 background are also important variables which influence a bilingual's language performance. Not all bilinguals are balanced bilinguals, nor do all bilinguals utilize their L2 in day-to-day life. For my experiment I will look at two speaker related variables: L2 proficiency and L2 background in relation to language exposure and "linguistic landscape" (for a definition see section 1.1: Multilingualism in the Netherlands). In this section I will highlight that the L2 proficiency variable and the L2 background variable can influence the results language experiments.

According to Kootstra, Van Hell, and Dijkstra (2012, p.802), language proficiency is an important speaker related variable, because flexibility in language usage can aid bilinguals to access linguistic representations. Kootstra et al. (2012) noted that Van Hell and Dijkstra (2002) have found that high proficiency did not result in symmetrical switch costs. Van Hell and Dijkstra (2002) found that trilinguals of Dutch, English, and French, with a low French proficiency responded to cognates equally fast as they did for non-cognates. Opposite to this, the participants with high French proficiency responded faster to cognates than they did to non-cognates. This observation by Van Hell and Dijkstra has lead Kootstra et al. (2012) to conclude that "a minimal level of proficiency is needed for cognate facilitation effects to occur" (Kootstra et al., 2012, p. 802).

Exposure to an L2 is also a factor which influences language acquisition. The term "linguistic landscape" is used to refer to the amount of exposure which a person has to different languages in day-to-day life, for example: at school, on TV, street signs, shops, in businesses, advertisements sent to one's home, or spoken languages in your neighborhood (Dailey, Giles, & Jansma, 2005). Edelman (2010) studied the dominant languages on signs in shopping areas in the Netherlands in the capital Amsterdam, and three rural cities: Leeuwarden, Burgum and Franeker (Edelman, 2010, p.55-61). Edelman found that Dutch was the language most frequently found on signs, and that English was the second most frequently found language, in both the capital and the rural cities (Edelman, 2010, p. 83). The reason why English is often used is because English is a second language in many countries and it can thus be used as a lingua franca in the Dutch multilingual society (Edelman, 2010, p. 84). Edelman argued that, when comparing English to other immigrant languages in the Netherlands (e.g. Turkish), English has a much larger presence in the "linguistic landscape" (p. 124). From this we can conclude that English exposure is quite large in the Netherlands.

As opposed to L2 proficiency, there has not yet been research on cognate language switching which also takes language exposure into consideration. Sharon Unsworth (2013) discussed that amount of exposure affects bilingual language acquisition. She argued that one of the sources of variation in bilingual populations is the amount of language exposure to which people are exposed to as children (Unsworth, 2013, p. 86). Unsworth found that, when monolinguals and bilinguals were matched by age, there were significant differences in language acquisition. However, when bilinguals and monolinguals were matched by their cumulative exposure (of a language) over time, these differences in language acquisition disappeared (Unsworth, 2013, p. 28). Based on this finding, Unsworth noted that instead of matching participants on age, matching participants on language exposure may be a more accurate alternative (p. 28).

3.3 Trigger hypothesis (Clyne, 1980; Clyne, 2003; Broersma & De Bot, 2006)

Cognates are another independent variable which is part of this research. Aside from language proficiency and L2 background (which are participant/related variables), cognates can also influence language switching performance (for a definition of cognates words see section 1.3: The trigger hypothesis). This research focusses on a language switching experiment which looks as the underlying mechanism of the trigger hypothesis. With the trigger hypothesis, Clyne (1980, 2003) argued that cognates, among other trigger words, can facilitate a code-switch in natural speech.

In the following paragraphs this thesis will offer a timeline from Clyne's 'old' trigger hypothesis (1980) to the revised trigger hypothesis (Clyne, 2003; Broersma & De Bot, 2006). This timeline will summarize the developments of the trigger hypothesis, and the underlying research which caused the trigger hypothesis to be updated.

3.3.1 Clyne (1980)

In his code-switching research, Clyne (1980) noted that bilinguals are often subject to code-switching whenever they use a trigger word (for a definition see section: 1.3). Clyne's original trigger hypothesis "predicts that words directly preceding or directly following a trigger word have a greater chance of being code-switched (..). It also predicts that words located between two trigger words have a higher chance of being code-switched" (Broersma & De Bot, 2006, p.7). The "trigger hypothesis" from Clyne's early publications (1967, 1980) implied a direct causal relation; the production of a trigger cognate leads to confusion which in turn leads to a code-switch (Broersma & De Bot, 2006, p. 2).

Clyne (1980) stated that, in the spontaneous speech of 30% of his 600 German-English bilinguals (and likewise 30% of his 200 Dutch-English informants), there are examples of code-switching caused by a trigger word (Clyne, 1980, p. 401). However, at that time, Clyne (1980) mentioned that he had not been able "to identify what makes some people more prone to triggering than others" (Clyne, 1980, p.401).

In his 1980 research on German-English bilinguals, Clyne presented his participants with audio of sentences which had language switches at different boundaries in a sentence (at clause boundary and at a potential trigger word; at clause boundary without a trigger word; at a potential trigger word but not clause boundary; or at neither) (Clyne, 1980, p. 405). Clyne (1980) found that many participants could not remember what part of the sentences was in English or German. Additionally, trigger words did not aid the recall of languages, whereas clause boundary did aid correct recall of the two languages. Based on these results, Clyne concluded that language processing seemingly takes place in a non-language specific manner.

3.3.2 Clyne (2003)

In earlier research (e.g. Clyne, 1967, 1972a and 1980b) Clyne discussed how certain lexical items triggered a code-switch from one language to another (Clyne, 2003, p.162). Clyne (2003) reformulated the old trigger hypothesis, indicating that the effect that cognates have is more facilitating than triggering, because other factors (i.e. sociolinguistic factors, see section 1,2; and structural factors, see section 1.) also play a role in code-switching (Broersma & De Bot 2006, p.2; Clyne, 2003, p.162).

In his 2003 research, Clyne used the term "transversion" to discuss code-switching (p. 159). According to Clyne (2003) trigger words (lexical transfers, bilingual homophones, proper nouns, cognates, for the full definition see section 1.3: Trigger hypothesis) which are part of more than one language may facilitate "transversion" (see section 1.2: Code-switching). Clyne argued that multiple languages are activated in speech planning, and that the unneeded language is inhibited. Clyne (2003) then demonstrated multiple language activation by discussing three types of facilitation; (i) consequential facilitation, (ii) anticipational facilitation; and (iii) a cross between consequential facilitation with a code-switch in between trigger words.

(i) Consequential facilitation follows trigger words:

(8) "You don't see *dat* in Australië"

You don't see (Eng.) that in Australia (Du.)

'You don't see *that* in Australia' (MD 17f)

(Clyne, 2003, p. 174)

In this sentence 'dat' and 'in' are bilingual homophones and cognates in the languages of this person's speech. In example (8) the triggers 'dat' and 'in' trigger the word 'Australië'.

(ii) Secondly, there is facilitation that precedes the trigger, which is called anticipational facilitation (Clyne 2003, p.166), In this example the word '*the'* precedes the trigger 'missions':

(9) "Wir packen alle die alte Kleider, das für *the missions*"

we pack all the old clothes that for (Ger.) the missions (Eng.)

'we pack all the old clothes that for *the missions'*

(Clyne, 2003, p. 174)

In anticipation of 'missions' the word 'the' was code-switched to English instead of German.

(iii) Finally, there is a combination between anticipational and consequential facilitation, where the code-switch is 'sandwiched' between two trigger words (Broersma & De Bot, 2006, p 2), for example:

(10) "Drie, *nou*, *it's Three Double Y R* nennen sie das"

Three now (Du) it's Three Double YR (En) call they it (De)

'three now, it's Three Double YR they call it'(DE/G 22m)

(Clyne, 2003, p. 166)

According to Clyne (2003) the speaker had been speaking in Dutch before this example. In this example 'nou' is a bilingual homophone in Dutch-English. 'Three Double YR' is an English proper noun and 'it's' is facilitated by 'nou'(consequentially) and 'Three Double YR'(anticipationally) (Clyne, 2003, p. 166). Due to the proper noun which is common in all three languages (English, Dutch, and German), it triggers a facilitation into German at the end of the sentence (Clyne, 2003, p. 166).

Clyne (2003) found that these types of code-switching were often present in his research containing bilinguals (German- English, Croatian- English, Dutch-English, Vietnamese-English, Italian-English and Spanish-English) and trilinguals (and Hungarian-German-English, Dutch-German-English) in Australia (Clyne, 2003, p. 234-242). "Lexical transfers are the result of multiple or perhaps non-language tagging of lemmas" (p.211), Clyne (2003) argued. Lemmas are stored in the mental lexicon, and they contain syntactic information. Lemmas are tagged for one language, or multiple languages (e.g. *shops* in example 11 can be tagged for English, Dutch, and German). This tagging gives directions on the correct system morphemes, and on how to encode sounds. If there is a partial integration, this could indicate that a lemma has been tagged for multiple languages (Clyne, 2003, p.211).

(11) "Ik ga, ik moet (A).. dingen van de *shops* einkaufen"

I go, I have to (A).. things from the (Dut.) shops (Eng.) buy+inf (Ger.)

'I go, I have to buy things from the shop'

(Clyne, 2003, p. 163)

Clyne's (2003) study supports a language processing model with joint storage of material from multiple languages of a multilingual. However, in Clyne's model: (i) same-language elements are closely linked, (ii) there is perceptual feedback (meaning: the speaker's perception of their own speech enables them to monitor for errors) from the phonological level to the lemmas, (iii) and finally accessing tone via the initial syllables is possible (which could lead to tonal facilitation) (Clyne, 2003, p.242). Clyne (2003) concluded that: "Transversion (definition: code-switching) facilitation seems to provide evidence for multiple tagging of lemmas and simultaneous planning of languages" (p.242).

3.3.3 Broersma and de Bot (2006)

It has been pointed out by Broersma and De Bot (2006), that the trigger hypothesis from Clyne's earlier works (1967, 1980) is not compatible with the current views on speech production (Broersma & De Bot 2006, p.3). Broersma and De Bot (2006) motivated why the original trigger hypothesis is not accurate using Levelt's (1999) "blueprint of the speaker":

> "Each utterance starts with the message a speaker wants to convey. This message is composed of lexical concepts. Lexical concepts are connected to and activate lemmas, which contain syntactic information, but no information about word form. Upon selection of a lemma, its syntactic information becomes available. This information is used to place the lemma into a surface structure with the other selected lemmas. The surface structure is a representation of the sentence as it will eventually be produced. It contains lemmas in the order in which they will appear in the utterance, but without any information about the form they will take. The word form, containing morphological and phonological information, then becomes available. This information is used for phonetic encoding. During phonetic encoding, all the information that is needed for the production of the

utterance is gathered, resulting in a speech plan. Finally, articulation of the speech plan leads to overt speech. (…) Also note that in a model which only allows for the top-down spread of information, information about the word form is not available until after the positioning of the lemma in the surface structure" (Broersma & De Bot, 2006, p.3).

The old trigger hypothesis as described by Clyne (1980) is not possible in Levelt's (1999) top down model. Clyne's (1980) trigger hypothesis suggested that the surface structure is created before the language choice has taken place, because language choice could be influenced at the surface level (Broersma & De Bot, 2006, p.3). However, according to Levelt's model, the language specific lemmas are selected before they are placed in the surface structure (Broersma & De Bot, 2006, p.3). This means that once the lemma has a place in the surface structure, the language choice for this item has already been made (Broersma & De Bot, 2006, p.3).

Broersma and De Bot (2006) also mentioned a second issue with Clyne's (1980) trigger hypothesis in models that do not allow bottom-up flow of activation. Trigger words are not recognizable as trigger words, because word forms only become available after the lemma is positioned in the sentence structure (Broersma & De Bot, 2006, p.3). Even though trigger words are similar in two languages, because the word form is available at the end of the process, trigger words are not different from any other translation pair (for a definition see section 1.2: Code-switching) at the lemma level (Broersma & De Bot, 2006, p.3).

An adjusted triggering theory was formed by Broersma and de Bot (2006), which presented the idea that the selection of a trigger word may increase the odds of a code-switch. However, different from Clyne's predictions, the adjusted triggering theory predicts that words in a basic clause which contains a trigger word have an increased chance to be code-switched. Basic clauses only contain one main verb, such as 'I began' in example (i), where 'began' is the main verb of this basic clause. Finite clauses, however, contain one finite verb (in other words: a verb with a subject) such as ‘I (subject) began (finite verb) working a lot harder’ in example ii. (Broersma & De Bot, 2006, p.6). Finite clauses can always contain more verbs (such as ‘working’, in ‘I began working a lot harder’), but there is only one finite verb in a finite clause.

(i) *Basic clauses*

“/I began/ working a lot harder/ when I finally decided/ to come to Uni”

(ii) *Finite clauses*

“/I began working a lot harder/ when I finally decided to come to Uni”

(Levelt, 1989, p. 257; Broersma & De Bot, 2006, p.6)

Broersma and de Bot (2006) noted that, even though Clyne (2003)’s data showed that trigger words and code-switches are often found together, there is no evidence that the co-occurrence is not a coincidence (Broersma & De Bot, 2006, p. 2). Broersma and De Bot (2006) were the first to empirically test the original trigger hypothesis and the adjusted trigger theory by manually analyzing self-recorded conversations between three Moroccan Arabic-Dutch speakers, in which the speakers code-switched between the two languages. In this research, sentences were divided in basic clauses and words were manually marked as either a trigger or a non-trigger word. Trigger words were marked using Clyne’s (2003) definition (for the definition see: 1.3: the trigger hypothesis) and most of the marked words were proper nouns (Broersma & De Bot, 2006, p. 8).

The result of Broersma and De Bot’s (2006) corpus analysis suggested that “the selection of a trigger word enhances the activation of the lemmas of a non-selected language” (p. 11). The study showed that words which immediately followed a cognate were notably more often codeswitched than words which were following a non-cognate. Broersma and De Bot (2006) also found that words in a basic clause, which contains a trigger word, have a greater chance of code-switching. This evidence confirms that there is a relation between cognates and code-switching (Broersma & De Bot, 2006, p.10).

The original trigger hypothesis (Clyne, 1967, 1980) and the adjusted triggering theory (Broersma & De Bot, 2006) were both present in the results of Broersma and De Bot's research. Only the original trigger hypothesis can explain instances where adjoining trigger words and code-switches are part of separate basic clauses (Broersma & De Bot, 2006, p.10). As opposed to the adjusted theory which can account for nonadjacent trigger words and code-switches which are part of the same basic clause (Broersma & De Bot, 2006, p.10). Broersma and De Bot (2006) concluded: "The adjusted triggering theory proposes that in situations where the activation levels of two languages are similar enough, the selection of a trigger word may, in some cases, lead to code-switching. In this sense, the presence of a trigger word does not predict a codeswitch (sic.), it only predicts a greater chance of codeswitching (sic.)" (p. 12).

3.4 Bilingual language selection and inhibitory control

In the previous section I discussed Levelt's (1999) top-down language selection model, which Broersma and De Bot used to formulate the adjusted trigger theory (see section 3.3.3: Broersma and de Bot (2006)). Levelt's model suggested that the lemmas are selected before the sentence structure has been formed, and thus the trigger hypothesis is not possible. However, this model was not made to consider bilingual speakers. Aside from Levelt's language selection model, there are language models focused on bilingual language selection which also believe only one language is considered in language planning.

According to language specific models (Finkbeiner, Gollan & Caramazza, 2006) the languages of a bilingual do not compete for selection, and thus inhibition is not needed. These models are called language-specific because, even if both languages are activated; only one of the languages is considered for selection. These models thus claim that words from two languages do not compete for selection, thus there is no inhibition of the other language (Broersma et al., 2016).

Secondly there are language models which do support language competition in bilinguals, and additionally, these models support the multiple language selection needed for the trigger hypothesis. Green and Wei (2013) discussed a cognitive control process model that does consider bilinguals, they argued that “activation from an unfolding conceptual representation leads to patterns of activation in the language networks (i.e., the inventory of items) for the two languages” (Green & Wei, 2013, p. 501). Activation reaches the word form level, even the representation of a language that is not produced (Green &Wei, 2013, p. 501). Green and Wei stated that:

> “Speakers aim to avoid between language interference or inappropriate CS (Sic.: code-switching). To do so they establish a competitive relationship between the schemas for speech production in each language and so restrict entry of non-target language items into the planning layer by suppression of non-target items. By contrast, speakers in CS communities establish a cooperative relationship between their language schemas.” (Green & Wei, 2003, p. 508)

A common view on the bilingual word production process is that whenever bilinguals use one language, the semantic system activates both lexical nodes in the bilingual’s two languages (Costa & Santesteban, 2016; Broersma et al., 2016; Green & Wei, 2003). According to language non-specific models of lexical selection both languages of a bilingual compete with each other (Declerck & Philipp, 2015). These models are called non-specific because in these models, not one, but multiple languages can be activated during lexical selection. Then, following the activation of multiple languages, cross language competition leads to the inhibition of non-selected words (Broersma et al., 2016, p2). Costa & Santesteban (2016) found that this inhibition is in proportion with the level of activation of the lexical items; if there are more items activated, there is need for more inhibition (p. 99). As follows, a low proficient bilingual would require less inhibition in the dominant first language (L1) as the baseline activation of the L2 items is supposedly lower than that of L1 items (Costa & Santesteban,2016, p.99).

Inhibitory control aids bilinguals to select the correct word when two or more languages are activated during lexical selection. This inhibitory control model falls under the language non-specific models of lexical selection (Costa & Santesteban, 2004). It has been argued that inhibitory control depends on the proficiency of the speaker (Costa and Santesteban, 2004). Bilingual speakers may depend on cross-language inhibition to suppress words in their dominant language when speaking in the less dominant language, but not the other way around (Costa & Santesteban, 2004; Broersma et al., 2016, p.11). All translation equivalents are expected to compete during lexical selection but Broersma et al. (2016) note that this competition can be stronger for cognates (p.3).

Inhibitory control inhibits the dominant language in language selection. However, cognates can also cause inhibition in a naming task. Cognate inhibition is found in Acheson et al.’s (2012) research where they found that even though cognates were produced faster, the cognates induced a response conflict in language production (p.134). For this experiment, Acheson et al. (2012) used an EEG (short for electroencephalogram), which is a physiological method that records electrical activity generated by the brain through electrodes placed on the scalp. In their ERN (error-related negativity) EEG experiment Acheson et al. (2012) found that the response conflict is larger for cognates than non-cognates. The extent of cognate facilitation was reduced after naming a cognate compared to a non-cognate (Acheson et al., 2012, p.134). This means that whenever a cognate followed another cognate, the second cognate showed a longer mean speech onset

This response conflict which caused less facilitation for cognates is related to the behavioral adaptation effect, according to Acheson et al. (2012, p. 135-136). The behavioral adaption of production refers to the fact that bilinguals constantly monitor themselves and therefore subsequently adapt their language production behavior when they are faced with multiple ways to say one message, or when they are about to make an error (Acheson et al., 2012, p.131). This has lead them to assume that the "the co-activation of multiple lexical or phonological features produced a form of response conflict" (Acheson et al., 2012, p.134).

3.5 Common findings in mixed picture naming tasks

In language switching experiments, bilingual speakers have to name pictures according to an external cue (such as a different color for a different language). With the use of these language switching experiments, researchers attempt to look at underlying mechanisms of code-switching (e.g.: the trigger hypothesis, cognate facilitation, cognate inhibition), by controlling variables which cannot be controlled for in a natural setting. The current research is also a language switching experiment, which looks at the trigger hypothesis which occurs in code-switching. By looking at previous research with similar designs, one can examine whether it is possible for a language switching experiment to provide experimental evidence for a code-switching related hypothesis. This section will discuss language switching experiments with similar designs, which focus on the same variables as the current research: participant related variables (proficiency), switch direction and cognate triggers.

3.5.1. Costa and Santesteban (2004): Difference between highly proficient bilinguals and L2 learners in language naming experiments

Costa and Santesteban (2004) focused on different proficiency levels which can influence the participants' performance in language naming experiments. They hypothesized that lexical access in bilingual speakers involves inhibitory control and that language switching performance varies depending on the bilingual's proficiency levels (p. 492). They highlighted the importance of including participants of different proficiency levels, because L2 proficiency appears to be one of the most relevant factors in predicting bilingual speech performance (Costa & Santesteban, 2004, p. 494). Costa and Santesteban (2004) found that language intrusions relate to lower language proficiency. Bilinguals with a higher proficiency level have a better inhibitory control, and thus less language intrusions (Costa and Santesteban, 2004, p. 494).

Costa and Santesteban (2004) conducted five experiments to find how L2 learners differ from highly proficient bilinguals in language switching experiments. The first experiment attempted to replicate asymmetrical switching costs in L2 learners. The participants in group one (Spanish people who were learning Catalan as on L2) saw ten pictures of common objects with non-cognate names. The participants in group two (Koreans who were learning Spanish as an L2) saw eight of the same pictures (seen by group one), plus two new pictures. In this experiment, two groups of late L2 learners (Spanish-Catalan and Korean-Spanish learners) had to name pictures common objects with non-cognate names according to the color of the picture (red or blue) (p.495). "Red" indicated a response in Spanish (or Korean for group 2), and "blue" indicated a response in Catalan (or Spanish for group 2). Participants were presented with short sequences, which are referred to as "lists", which were between five and 14 trials long (p. 498). Each participant was presented with 950 trials, half of which had to be named in L1, half in the

L2. Of these trials 70% were non-switch trials and 30% were switch trials (Costa & Santesteban, 2004, p. 495). In the results it can be seen that the switching cost were larger for L1 than for L2 (p. 497). Group one's responses for the non-switch trials were a little faster (but not significant) for L2 compared to L1, whereas the opposite was true for group two. However, the switching costs in switching trials were larger for L1 than for L2.

The second experiment focused on the language switching costs in highly proficient bilinguals. The researchers hypothesized that when the difference between L1 and L2 proficiency is small, a similar degree of inhibition should be applied in speech production, which should lead to similar switching costs in both directions (Costa & Santesteban, 2004, p.497). Twelve native speakers of Spanish with high Catalan proficiency took part in the second experiment, which was similar to the first experiment. The same materials and procedures were used as in experiment one, group one (Costa & Santesteban, 2004, p. 497). This second experiment showed that highly proficient bilinguals have the same switching costs in L1 and L2 (in contrast with the findings from experiment one). The study concluded that when the difference in proficiency between two languages is large, then inhibition is "applied" to the L1 rather than the L2, which then resulted in asymmetrical switching costs (Costa & Santesteban, 2004, p.498).

The third experiment tested symmetrical switching costs in highly proficient Spanish-Catalan bilinguals (from the same population as experiment two, but none of the participants had participated in the second experiment as well). The experiment was similar to the previous experiments but with 40 pictures instead of 10. Ten of the pictures were from experiment 1, and 30 were new (p.499). Each picture appeared once per sequence, and if repeated only showed up with a minimum interval of five pictures (Costa & Santesteban, 2004, p. 499). The results of experiment three mimicked the results of experiment two, because; a switch from L1 to L2 takes the same amount of time as the other way around; and naming responses in L1 are slower than L2 (Costa & Santesteban, 2004, p.499). Costa and Santesteban (2016) argued that the performance of the highly proficient bilinguals is consistent with the concept that language switching entails inhibition of the non-response language. The amount of inhibition depends on the difference in L1-L2 proficiency, and the results for this experiment (so far) agree with the notion that inhibitory control takes influences lexical access in bilinguals (Costa & Santesteban, 2004, p.499).

In the fourth experiment, Costa and Santesteban continued looking at the switching performance of highly proficient bilinguals. The fourth experiment looked at highly proficient bilinguals that switch between their L1 and L3. The same participant population as experiment two and tree was used, which were highly proficient Spanish (L1) Catalan (L2) bilinguals who were learning English (L3) (p. 500). Costa and Santesteban used Spanish Catalan bilinguals which had an English (L3) proficiency compared to the L2 learners from experiment 1. Again, the same materials and procedure as experiment one were used, only this time the task was performed in their L1-L3 (Spanish-English) (p.500). In this experiment the switching performance, which utilized the L1 (Spanish) and L3 (English), was similar to the performance of the previous task which utilized the participants' L1 (Spanish) and L2 (Catalan). Even though the L1 and L2 are the dominant languages, a less dominant L3 did not influence the performance in the experiment. Costa and Santesteban found no asymmetrical switching costs in experiment four, which is unexpected due to the imbalance between the proficiency levels of the L1 and L3. This finding is unexpected because Costa and Santesteban expected that the switching performance would be worse for switches into the L3. They thus concluded that a difference in proficiency levels in the languages does not predict the presence of asymmetrical switching costs (Costa and Santesteban, 2004, p.501).

The final fifth experiment analyzed whether there is an L2 naming advantage due to the lexicalization bias caused by the simultaneous presentation of the language cue and target picture. By putting the language cue before showing the image, Costa and Santesteban attempted to avoid the bias selection towards the non-dominant language. They hypothesized that this change would result in a reduction of the difference in naming latencies between L1 and L2 (p.502). Twenty-four participants of the same population as the second experiment (Spanish speakers with high Catalan proficiency) were recruited and were assigned to two groups. The language cue was shown for 300ms in the shape of a red or a blue circle (p. 502). The first group saw the picture 500ms after the language cue, whereas the other group saw the picture 800ms after the language cue. The results for the fifth experiment did not support the hypothesis, as the difference between L1 and L2 latencies were unaffected by the extra time to prepare the response language. Thus Costa and Santesteban suggested that a selection bias for the L2 is not present in the language switching task (2004, p. 503).

After performing five experiments, Costa and Santesteban (2004) concluded that the switching performance of highly proficient bilinguals is not subject to the same mechanisms as that of L2 learners (p.491). L2 learners showed asymmetrical switching costs, where high proficiency bilinguals did not (Costa and Santesteban 2004, p.508).

Table 1: *A summary of Costa & Santesteban's (2004) experiments*

	Bilingual type	Type experiment	Findings
Experiment 1	Two groups of late L2 learners. Spanish Catalan and Korean-Spanish.	Naming 10 common objects with non-cognate names according to color cue. 950 switch trials, half had to be named in L1, half in L2.	Switching costs larger for L1 than L2
Experiment 2	Twelve native speakers of Spanish with high Catalan proficiency	Same experiment as experiment one (just different bilingual types)	Highly proficient bilinguals have same switching costs in L1 and L2
Experiment 3	native speakers of Spanish with high Catalan proficiency	40 pictures with non-cognate name were used (10 from experiment 1, 30 new)	A switch from L1 to L2 takes the same amount of time as the other way around; and naming responses in L1 are slower than L2
Experiment 4	Highly proficient bilinguals, Spanish (L1), Catalan (L2), learning English (L3)	Experiment 1, performed in L1-L3	No asymmetrical switching costs (unexpected, due to imbalance proficiency). Even though the L1 and L2 are the dominant languages, a less dominant L3 did not influence the performance in the experiment
Experiment 5	Twenty-four native speakers of Spanish with high Catalan proficiency	Show 300 ms language cue before showing picture (one group saw picture 500 ms after language cue, other group saw picture 800 ms after language cue)	The difference between L1 and L2 latencies were unaffected by the extra time to prepare the response language

3.5.2. Broersma (2011) - cognate facilitation

Mirjam Broersma (2011) explored facilitation caused by cognates. Broersma (2011) was the first to experimentally test Clyne's (1980) trigger hypothesis by conducting two experiments. The first experiment was a mixed picture naming task and the second experiment was a free speech experiment, in which the same pictures as the previous experiment had to be named but this time the participants had to decide for themselves when to switch languages. In her first experiment Broersma showed her participants (24 Dutch-English bilinguals who majored in English at university) pictures with a color cue, which indicated in what language the participants had to respond. For each trial the participant was expected to name the picture in the correct language as fast as possible. The experiment was self-paced and the participants had to push a button to go to the next trial. In the experiment Broersma included 24 cognates that were then followed by a non-cognate. The cognates had to act as a trigger for the following non-cognate. Broersma matched control sequences to her cognate sequences. In these control sequences a non-cognate functioned as the trigger word, which in turn was followed by another non-cognate. These control sequences were made to see whether cognates acted as a trigger, by checking the cognate pairs' response times to non-cognate pairs' response times.

Broersma found cognate facilitation in her experiment; the response times on words which were preceded by a cognate were shorter. Furthermore, she argued that there was no inhibition of the L1 because there was no interaction between cognate/non-cognate condition and language switch direction (Broersma, 2011, p. 48). This switching paradigm only showed the ease of switching, not the likelihood of a switch after a cognate, and this motivated Broersma to follow up with a free language switching experiment (p.48).

In the free language switching experiment, Broersma utilized the same procedure as in her first experiment, but this time the participants were instructed to name half of the pictures in Dutch and half in English. Participants had to switch regularly, but this time at free will without a color cue. Here, Broersma found that there were more often switches after a cognate, but only if the start language was the L1 (and thus the switch was into the L2) (Broersma, 2011, p.49). This suggested that the L1 could have been inhibited as the cognates did not lead to facilitation when there is a switch into the L1. Broersma described that the start language thus had “dramatic consequences” for the occurrence of a triggered code-switch (Broersma, 2011, p.53). Finally, Broersma concluded that triggered code-switching may be asymmetric and most likely to involve a switch from L1 to L2 than vice versa (Broersma, 2011, p. 55).

3.5.3. Broersma, Carter and Acheson (2016) – inhibition caused by cognates

In their research, Broersma, Carter and Acheson (2016) have gathered evidence for inhibition in a bilinguals’ production of cognates in a mixed picture naming task. Broersma et al. (2016) suggested that there are two different processes in effect during the lexical selection of cognates. They wrote that there is competition at the lexical-semantic level, as well as facilitation at word form level, which may result in the facilitation obscuring the competition of cross language selection (Broersma et al., 2016, p.3). They argued that the activation of conceptual and form representations spreads to the word form level. The word form of a cognate then activates the word in both languages.

In this research 48 Welsh-English bilinguals took part in a mixed picture naming task in which a color cue indicated the response language. The participants had to name 18 (out of a total of 36) experimental cognates and 18 (also out of a total of 36) experimental controls. This experiment was counterbalanced; meaning half of the participants had to name an item in English, whereas the other half had to name an item in Welsh (Broersma et al., 2016, p.6).

Broersma et al. (2016) first analyzed the naming latencies of the cognates and the controls to distinguish whether there was cognate inhibition (p.7). They found that language dominance affects the direction of the cognate effect. The Welsh dominant (and equal dominance) groups mostly showed cognate facilitation, whereas the English dominant group showed no difference in between cognates and controls. Another finding was that the English dominant group showed inhibition when naming cognate items in Welsh (p. 8). Added to this, Broersma et al. (2016) described the inhibition that they found as a behavioral adaption effect (p.10). The behavioral adaption effect leads to inhibition after cognate production (p.12) (for an explanation of the behavioral adaption effect see section 3.4: Bilingual language selection and inhibitory control).

After looking at the cognate inhibition effect, Broersma et al. (2016) looked at the fillers which follow the cognates and controls. They found longer naming latencies in switch trials (than in non-switch trials) which were symmetrical for English and Welsh (p.9). More importantly, naming latencies for fillers were longer when the preceding trial was a cognate than if the preceding trial was a non-cognate (p. 10). Broersma et al. (2016) argued that this is not an artifact caused by slower response times of the cognate, as the effect is visible in all participant groups (and if it was an artifact, it would only be visible in the English dominant group) (p.10). They argued that this effect may result from "increased cognitive control during the production of cognates (Broersma et al., 2016, p. 11).

Broersma et al. (2016) have found evidence that cognate naming can cause costs rather than benefits, as they found inhibition during cognate production as well as after cognate production (p. 12). They stated that their findings provide evidence for cross-language lexical competition and support lexical selection models that support inhibitory control (see section: 3.4 Bilingual language selection and inhibitory control). They discarded the view that only low-proficient speakers need cross language inhibition, on the contrary, words compete in both languages for highly proficient speakers as well (p.12). This inhibitory control result thus challenges the claims for facilitation caused by cognates.

3.5.4. Costa and Santesteban (2016) - Cognates are not special

Costa and Santesteban (2016) explored the language switching performance of low and high proficient bilinguals. In their mixed picture naming task they wanted to determine whether cognates are ‘special’ by looking at the effect of cognates on switching performance in learners of Catalan and highly proficient Spanish-Catalan bilinguals. The experiment’s design and procedure were the same as Costa and Santesteban (2004) (Costa & Santesteban, 2016, p. 104). Costa and Santesteban selected twenty pictures of common objects, half with cognate names and the other half with non-cognate names. Participants had to name objects according to the color of the picture (red or blue). The response language was counterbalanced across participants. Half of the participants had to respond in Spanish for “red” and in Catalan for “blue”, the other half of the participant received reversed assignments (p.104). Objects could appear in two types of trials: (i) non-switch trials (where the language of response was the same as the preceding trial), and (ii) switch trials (where the language of response was different from the preceding trial) (Costa & Santesteban, 2016, p.104). In the analysis they looked at the cognate status of the preceding word and the cognate status of the target word of both non-switch trials and switch trials.

In the results, Costa and Santesteban (2016) found: (i) the presence of language switching costs for low proficient bilinguals, (ii) a L2 naming delay, (iii) and cognate facilitation (in both L1 and L2) for target pictures which were named frequently (Costa & Santesteban, 2016, p. 115). They replicated L2 proficiency effects as low proficient bilinguals showed asymmetrical switching costs, because switches to L1 were more costly than switches to the L2. As opposed to the high proficient bilinguals who had symmetrical switching costs where the switching costs into L1 and L2 were similar (Costa & Santesteban, 2016, p. 115).

Costa and Santesteban (2016) argued that their findings are “at odds” with the trigger hypothesis proposed by Broersma and de Bot (2006) (see: 3.3 trigger hypothesis). According to the revised trigger hypothesis language switching costs should be smaller (and thus facilitating) after naming a cognate (comparing to a non-cognate). Costa and Santesteban’s results showed that most of the switching costs, of both of their groups of bilinguals, were independent of the cognate status of the targets and preceders (in other words: the word preceding the target) (p. 116). According to their findings L2-proficiency modulates the language switching patterns of bilinguals, and not the cognate or non-cognate status of the pictures (p.118).

Costa and Santesteban (2016) found that cognates do not always facilitate language switching. They suggested that cued language switching tasks may not be the most appropriate task to test the trigger hypothesis (Costa & Santesteban, 2016, p.120). They also added that cognate facilitation/triggering effects are possibly absent in isolated word naming tasks. They argued that triggering effects of cognate words at a lexical level seem limited (Costa & Santesteban, 2016, p.120). Costa and Santesteban (2016) finally concluded that cognates are not as special as previous research argues. They find that, based on the results, language switching tasks are a reliable tool for exploring language switching mechanisms, and that cognates are not “special” because they do not seem to facilitate language switching (Costa & Santesteban, 2016, p.121).

Table 2: *A summary of previous mixed picture naming tasks*

Research	Bilingual type	Experiment type	Found inhibition?	Found facilitation?	Importance of proficiency of bilingual?
Costa and Santesteban (2004)	1- Late L2 learners (Spanish-Catalan and Korean Spanish) 2- Spanish with	Picture naming task with switch trials (for more details, see 3.6.1)	N/A	N/A	Yes, highly proficient bilinguals are not subject to the same mechanisms

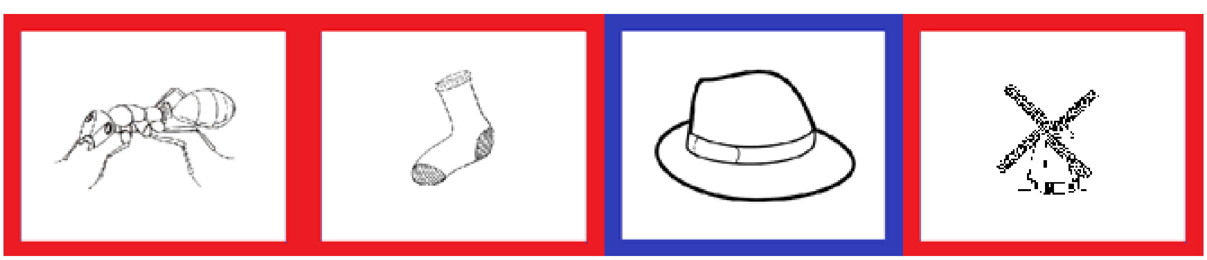
	high Catalan proficiency (used in experiment 2 and 3 and 5) 3- Highly proficient Spanish(L1) Catalan (2) bilinguals who were learning English (L3)				as L2 learners (Costa & Santesteban, 2004, p. 491). L2 learners showed asymmetrical switching costs, highly fluent bilinguals did not.
Broersma (2011)	Dutch-English bilinguals who majored in English at University	Mixed picture naming task, self-paced. Cognates act as trigger for non-cognates. And free speech experiment (participant decide for themselves when to switch)	No, no interaction between cognate/non-cognate condition and language switch direction (Broersma, 2011, p. 48). Suggestion for inhibition of L1 in free speech experiment (Broersma, 2011, p. 49)	Yes, response time on words which were preceded by a cognate were shorter. (Broersma, 2011, p. 48)	N/A
Broersma et al. (2016)	Welsh-English bilinguals	Mixed picture naming task, color cue indicated response language.	Yes, in English dominant group, when naming in Welsh (p.8). And during cognate production and following cognate production (Broersma et al., 2016, p.12)	Yes, for Welsh dominant and equal dominance group.	Language dominance affects direction of cognate effect. Welsh dominant (and equal dominance) showed mostly cognate facilitation.
Costa and Santesteban (2016)	Highly proficient Spanish-Catalan bilinguals	Mixed picture naming task, color cue indicates response language. With non-switch trials and switch trials.	N/A	Yes, cognate facilitation (in L1 and L2) for targets which were named frequently. No, most of the switching costs were independent of cognate status (Costa and Santesteban, 2016, p. 116)	Yes, l2 learners had asymmetrical switching costs, bilinguals had symmetrical switching costs. L2-proficiency modulates the language switching patterns of bilinguals, and not the cognate or non-cognate status of the pictures

4. Method

4.1 Design

This experiment is a picture naming task based on Broersma (2011). In this experiment the participants had to name pictures in English or Dutch, depending on the colored border around the picture. If a picture had a blue border the participants had to name the picture in English, if a picture had a red border the participants had to name the picture in Dutch (see image 1). For every picture the participants had three seconds to respond. After three seconds the first picture would disappear and the next picture would automatically appear. In this experiment I intended to look at the instant retrieval of words in the brain of bilinguals, which is why a fixed time limit was chosen. If a participant was unable to answer within three seconds it could mean that the participant was unfamiliar with the word or phrase, which may influence the results greatly. In this experiment the first independent variable was the cognate or the non-cognate state of the trigger word. The second independent variable wa the switch direction; switching from Dutch to English and from English to Dutch. The third and final variable, were the participant related variables: L2 proficiency and L2 background.

Image 1: *example of a sequence. All of these pictures would appear independently, but always in this fixed order.*



Starter	Trigger (cognate)	Target	Filler
Mier (Dutch)	Sok (Dutch)	Hat (English)	Molen (Dutch)

4.2 Participant Sample

Thirty-tree Dutch students took part in this research. The population for this research was young educated native speakers of Dutch with a medium to high proficiency of English (as a second language) who were recruited at Leiden University. These participants were recruited through Facebook and the friend of a friend method. 27 out of the 33 participants were part of the Humanities Faculty. The other seven participants were from other faculties, and were allowed to participate due to their self-reported, strong affinity with the English language. Out of the 33 participants, 27 participants were female and six participants were male. 25 participants belonged to the 20-23 age range, four belonged to the 19-20 range, and four belonged to the 24-25 age range.

The student selection for this experiment was based on Broersma's (2011) selection. Broersma's (2011) participants were all Dutch students of English at Nijmegen University (p. 45). However, Broersma (2011) did not measure her participants' English proficiency, but she assumed that English students would have a sufficient proficiency in English due to their education (Broersma, 2011, p. 45). This research has selected participants with both medium and high English proficiency level, as different levels of proficiency can influence the results of an experiment (motivated by: Costa & Santesteban, 2004; Costa and Santesteban, 2016; Hell and Dijkstra, 2002; Lipski, 1985). In addition, for this research it was decided not to select only students of English, because the participants will also be divided by their different L2 background (motivated by: Dailey et al., 2005; Edelman, 2010; Unsworth, 2013).

4.3 Participant related variables: proficiency and L2 background

To see whether L2 background and L2 proficiency influence the cognate effect in this experiment, the participants had to be divided into various groups which will be used in the data analysis. For this experiment the participants' proficiency score and L2 background was calculated using the Oxford University English Language Test[1] (to quantify proficiency) and a L2 background questionnaire (Appendix I) (to measure L2 background). These scores were used to divide the participants in groups depending on English proficiency level and on L2 background level.

To calculate the L2 proficiency score for each participant the Oxford University English Language Test[1] was used. This proficiency test consisted of 50 multiple choice questions for which the participant had to select the correct answer. The test calculated the score by adding up the number of correct answers, with a possible minimum score of 0 and maximum score of 50. After getting the participants' scores, the participants were divided in two groups: the average proficiency group (score: 31-45) and the high proficiency group (score: 46 to 50). Of all 33 participants, 18 people were part of the 31-45 average score group and 15 participants were part of the 45-50 high score group. The average score of the Oxford Language test was 44 (43,9 rounded up), the lowest participant score was 31 and the highest participant score was 49.

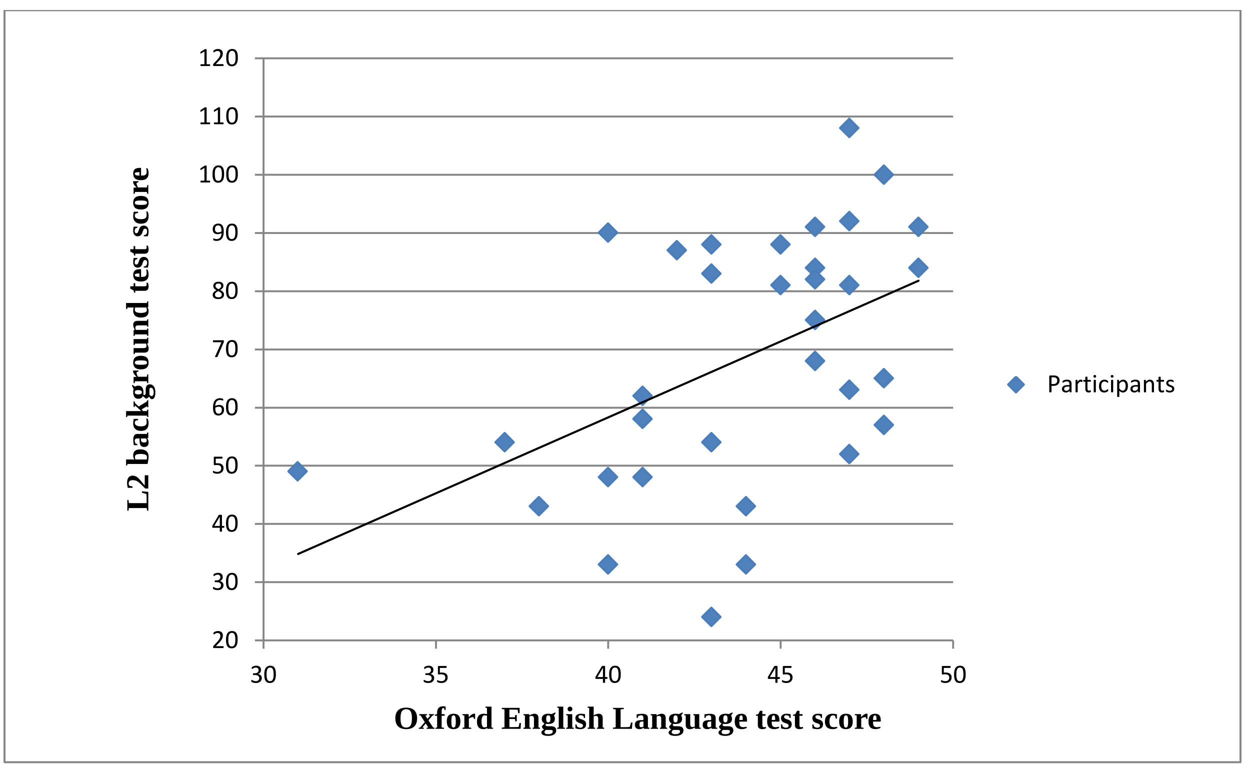
A background questionnaire (designed in Qualtrics) was used to quantify the attitude of each participant towards English as a second language. This questionnaire consisted of questions related to the L2 background of each participant (see Appendix I). Participants were asked how often they see and use English in their day to day lives. They were also asked to describe their attitude towards the English language. In this survey the participants received scores for their responses to the questions. If a participant answered a question with a positive attitude towards English (as a second language), they were awarded 5 points for that question. If a participant acknowledged that they have an equal preference for English and Dutch, they would get 3 points. If a participant indicated that they prefer Dutch, they received 0 points. By adding the points

[1] http://www.lang.ox.ac.uk/tests/tst_placement_english.html

from each question the L2 background score was calculated. The lowest possible background test score was 0, the highest possible score was 115. The participants' scores ranged from 24 to 108. With a score from 0-64 a participant would be part of the 'low' group, with scores from 65-115 a participant was part of the 'high' group. The average score of all participants is 68.45. Of the 33 participants, 17 participants were part of the low L2 background group and 16 participants were part of the high L2 background group. The L2 background test scores relate to the third hypothesis, as I expect that participants with a high L2 background test score will show a faster response time than participants with a low L2 background test score. I also expect that proficiency and L2 background score will be related.

The L2 background test scores and the proficiency test scores for each participant are presented in a scattergram (Graph 1). This scattergram was made to see whether there is a correlation between the two participant-related variables.

Graph 1: *Background test and Oxford English Language test correlation*



This scattergram shows the L2 background test results on the vertical axis (minimum score by a participant: 24 points, maximum score: 108) and the Oxford English Language Test (also: proficiency test, minimum score by a participant: 31, maximum score: 49 points) result on the horizontal axis. We see that there is a degree of association between the results of the proficiency test and the L2 background test. This means that people with a high English proficiency often had a high L2 background test score. A strong linear relation was observed between the results of the Oxford English Language Test and the L2 Background Survey, Pearson correlation = .478, p= .005 (2-sided).

The scattergram shows a lower positive correlation with one visible outlier at the utmost left side. The table shows that this participant was an outlier based on the Oxford English Language Test data. Based on this information the participant's data was not included in the data analysis, seeing that this participant was not part of the target participant group (students with an average or high English proficiency). After taking this participant from the research data this experiment was left with data for 32 participants. After the removal of the outlier there were 16 people in the low background test score group and 16 people in the high background test score group. Additionally, 17 people were part of the average proficiency score group and 15 participants were part of the high proficiency score group

4.4 The material

Forty-eight pictures of common objects and animals, 24 with cognate and 24 with non-cognate names were selected (see Appendix II). All of the chosen stimuli for this research were singular nouns. The selection of the stimuli words was based on previous research (Costa & Santesteban, 2004; Broersma, 2011; Broersma et al., 2016). A large part of the stimuli images originate from The International Picture Naming Project (Bates et al., 2000) website and the remaining pictures were retrieved from Google. The stimuli were all black line drawings on a white background which was surrounded by either a blue or a red border to indicate the response language. The image selection and presentation was similar to Broersma (2011, p. 44). However, Broersma’s black line drawings were directly displayed onto the language cue (either a green or red background) (Broersma, 2011, p.44), whereas for this experiment the color cue was a frame around the image.

In the trial phase, all stimuli pictures were discussed with 3 native English speakers (From Scotland, Australia and the USA) and four Dutch native speakers to establish whether the chosen images were representative of the target word. These native speakers were asked to name the picture with a word which they most associated with the picture. If multiple natives had difficulties with one picture, the picture had to be updated. According to the native speakers’ feedback some images were switched to a more distinct visual representation, to avoid confusion for the participants of the experiment

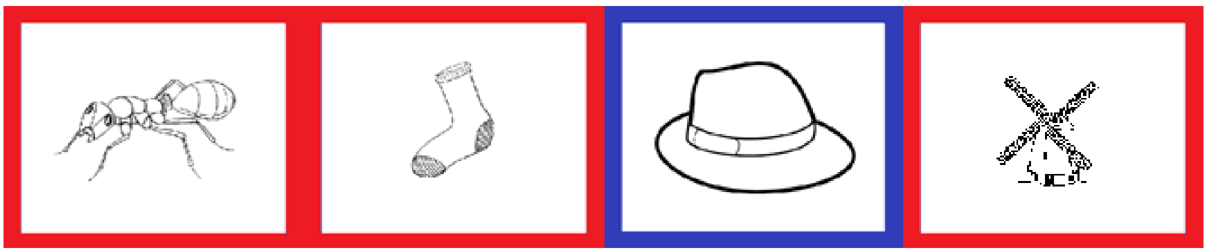
4.4.1 Target sequences

There were two types of sequences in this experiment: the target (cognate/non-cognate) sequences, which were used for the analysis, and the filler sequences, which were used as distractors. This section will first elaborate in target sequences and the criteria for target sequences. At the end of this section, there will be a short explanation on filler sequences.

A target sequence, in this experiment, consisted of four pictures and thus four words that had to be named. All of the pictures in a sequence had specific functions. The first word was a non-cognate starter. The second word would always be a cognate trigger or a non-cognate control, called: ‘trigger’. The third word was a non-cognate called the ‘target’ word, which always contained the language switch.

The starter and the trigger word always had to be named in the same language, and the target always had to have the language switch (e.g. if the starter and the trigger were named in Dutch, the target had to be named in English). All these images were shown one by one in this fixed order (see image 2 for a demonstration).

Image 2: *a demonstration of a cognate sequence*



Starter	Trigger (cognate)	Target	Filler
Mier (Dutch)	Sok (Dutch)	Hat (English)	Molen (Dutch)

For image two the correct response would be the Dutch: “mier” (English: Ant), picture two is a cognate, for which the correct response is the Dutch: “sok” (English: Sock). The third picture is the target word, which contains a language switch, and the correct response is: “hat”. The fourth picture is a filler word, which was added to avoid lingering trigger effects. The filler language was random. In this case, the correct response is: “molen” (English: windmill). The filler word has been added to make sure that the first three words of the target sequence will not be followed directly by another sequence without having a distractor in between. The four words within the sequence had a fixed order, this means that word one, two, three, and four always appeared in sequential order. However, the sequence sets were randomized for every experiment. This means that a participant could get multiple cognate/non-cognate sequences following each other.

4.4.2 Cognate selection

Cognates were used in the second position of target sequences (see image 2: “sok”). These cognates have been selected according to a strict definition. Cognates have a broad definition in previous research and for a general definition of cognate and non-cognates, please refer back to section 1.3: The trigger hypothesis. Cognates are translation words which appear in both languages of a bilingual (Clyne, 1980; Clyne, 2003). For this experiment, cognates had to follow two important properties, they had to be: (i) similar phonologically, (ii) and similar in meaning in the languages of a bilingual (in this case Dutch-English).

A maximum of two phonemes could vary in the phonological traits between the cognates from both languages. For example the Dutch /ˈɑpəl/ (*appel)* and the English /æp.əl/ (*apple)* or the Dutch /bot/ *(boot)* and the English /boʊt/ (*boat),* the word forms are similar but not exact replicas, however phonologically these pairs are the nearly the same. The cognates that were used in this experiment were never longer than two syllables. The two syllable rule was influenced by Costa and Santesteban (2016) who also only used cognates and controls of mono-or-disyllabic nature. However, in this research mono-and-disyllabic words were not matched to each other, as opposed to Costa and Santesteban (2016).

Semi-cognates were not used as triggers. Semi-cognates differ either phonologically or in word form in between languages, but are they still share the same meaning. An example of semi-cognates would be the Dutch /ˈtafəɫ/ (*tafel*) and the English /ˈteɪbəl/ (*table*). These words are similar and would be considered cognates according to some researches. However, the different pronunciation could distract participants, and obscure data. For this research it was decided to avoid these semi-cognates in all target sequences for which data was recorded and tested.

4.4.3 The frequency controls for the triggers and the targets

Word form frequency was controlled in this experiment for all cognate/non-cognate target frequencies, because word frequency influences response times in psycholinguistic tasks regardless of cognate or non-cognate status. Controlling frequencies was done to avoid having high frequency cognates and low frequency cognates, as naming latencies for low-frequency words are slower compared to words with a high-frequency meaning. If the frequencies were not similar for cognates and non-cognates it would be questionable whether a difference in response time is due to either the word frequency or the cognate/non-cognate status (Shatzman & Schiller, 2004, p. 168).

The target cognate/non-cognate sequence stimuli words were matched by word form frequency according to the CELEX[2] database (Appendix II). These frequency numbers indicate a per million frequency of every word form.

Table 3: *example of frequencies per word (per million)in English*

Starter		Trigger		Target	
Belt	364	Ring	628	box	704
Fairy	196	Apple	315	rabbit	189
Branch	961	Bell	493	pig	320

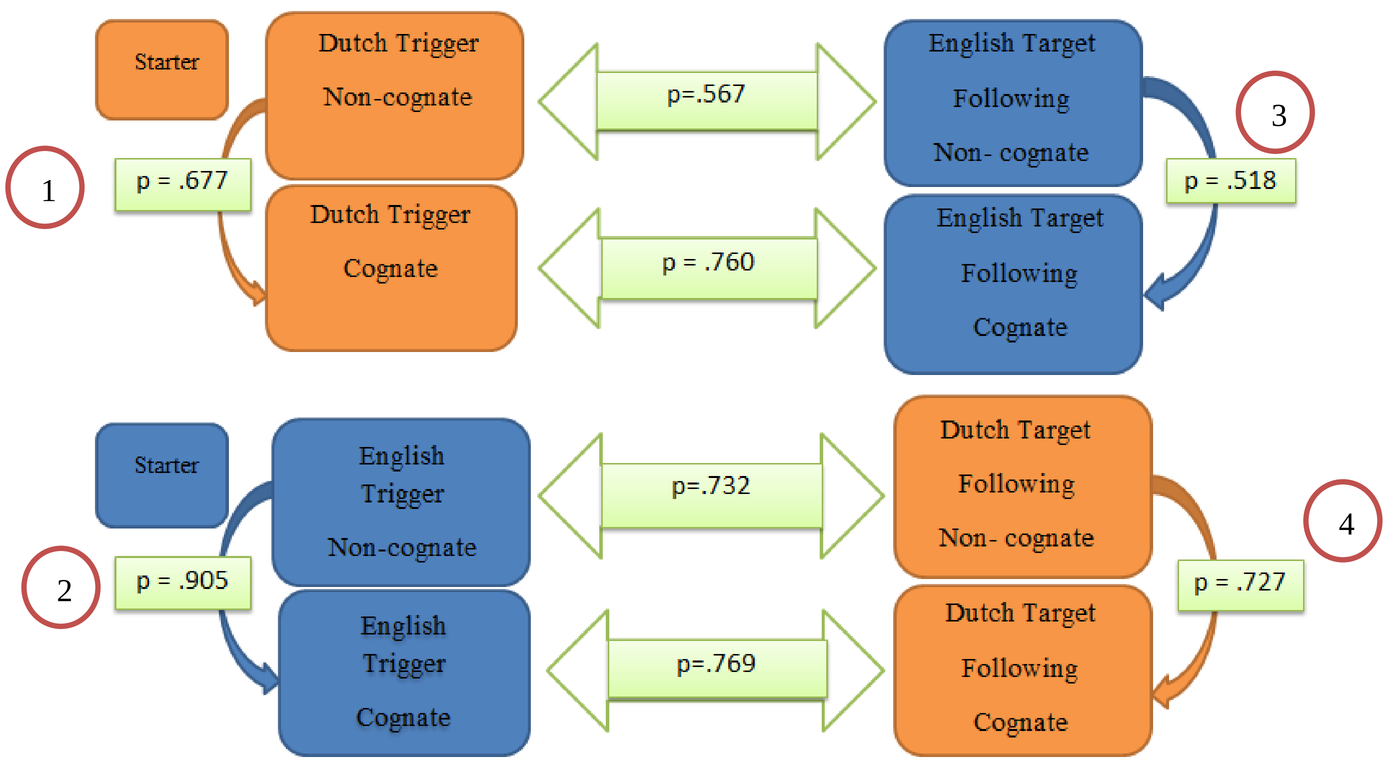
All words used in this experiment were checked in CELEX for their word form frequency in both English and Dutch (Appendix II). The word frequencies were then put through a t-test between word groups to make sure that all groups of words were matched in frequencies (for example: trigger word frequencies were compared to target word frequencies). These t-test were done to ensure that the frequencies of these word groups are similar to each other, so that any

[2] http://celex.mpi.nl/

significant result in the experiment cannot be attributed to a discrepancy in the word form frequencies.

Image 3 and 4 show a summary of the p-values of the t-tests. The inferential data for the t-test comparing trigger groups and the t-test data comparing target groups will be presented to accompany the picture. The remaining t-test data will not be discussed in detail, but the t-test data can be found in appendix IV. All of the t-test results in this section yield a p of 0.507 or higher (see image 3 and image 4), and this indicates that the two groups which were compared do not differ in a statistically significant way.

Image 3: *All p-values for word-form frequency t-tests (various directions)*

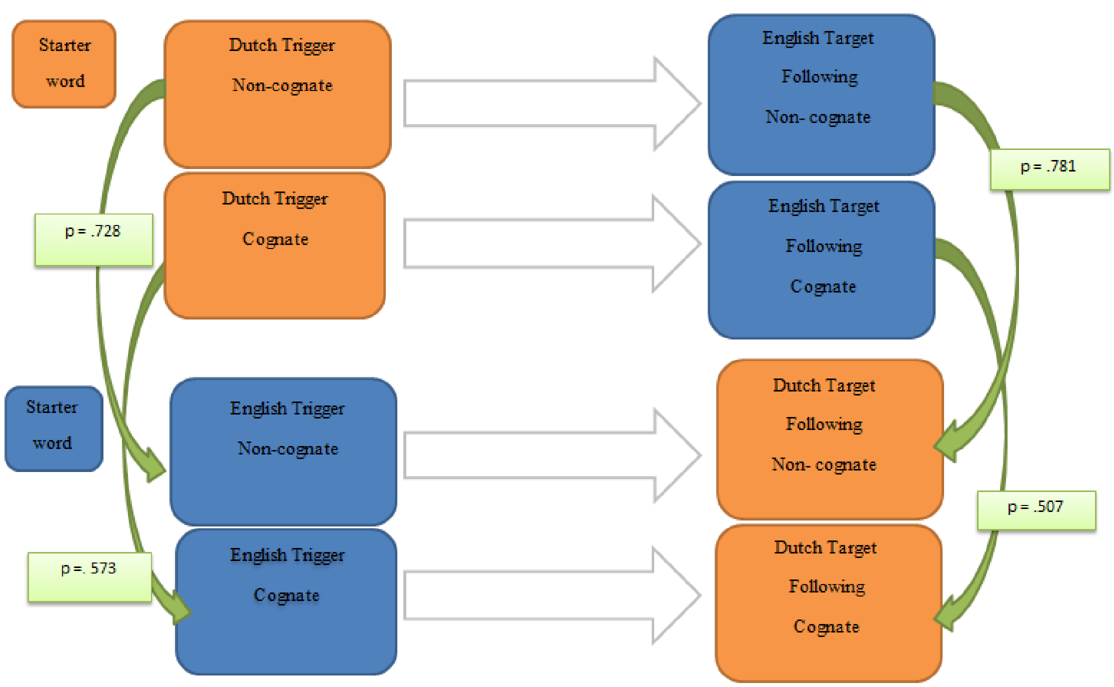


There was not a significant difference in Dutch cognates triggers frequencies (M=1731, SD=3307) and Dutch non-cognate triggers frequencies (M=1286, SD=1538) conditions; t(22)= .422, p = .677(see the number 1, in image 3). The English cognate trigger frequencies were then compared to the English non-cognate control trigger frequencies (see the number 2, in picture 3). There was not a significant difference in English cognates trigger frequencies (M=1136, SD=1427) and English non-cognate trigger frequencies (M=1063, SD=1568) conditions; t(22)= .121, p = .905.

There was not a significant difference in English target frequencies preceded by a cognate (M=1391.08, SD=1892.139) and the English target frequencies preceded by a non-cognate (M=989.08, SD=956.561) conditions; t(22)= .657, p = .518 (see the number 3, in image 3). There was not a significant difference in Dutch target frequencies preceded by a cognate (M=1001.50, SD=655.369) and the Dutch target frequencies preceded by a non-cognate (M=870.17, SD=1106.476) conditions; t(22)= .354, p = .727(see the number 4, in image 4).

Additionally, t-tests were made comparing in between languages. For these p-values please refer to image 4, and to appendix IV for the t-test data tables. Again, all data has a p>.507, which shows that the word form frequencies were similar for the tested groups.

Image 4: *t-test results in-between languages*



4.4.4 Filler sequences

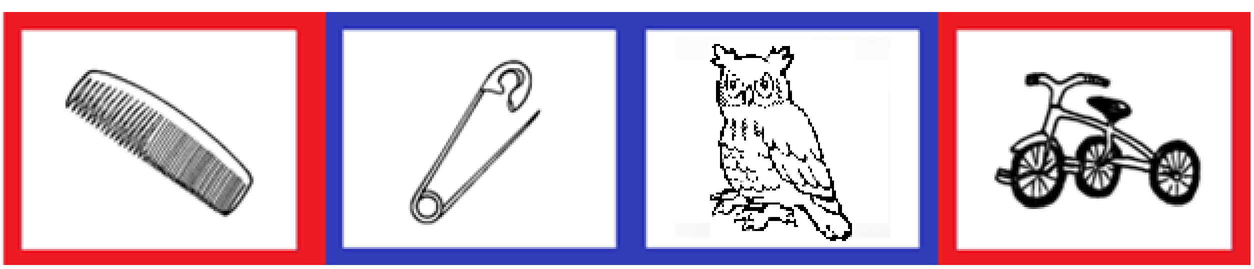
The filler sequences were all remaining sequences aside from the target-sequences. The filler sequences were made to distract the participant from the goal of the experiment (similar to the use of fillers in Broersma, 2011). The filler stimuli were all randomly chosen words which did not fit in the cognate/non-cognate target sequences (Appendix V).

There has not been controlled for the length, frequency or difficulty of the filler words. Semi-cognates were used in some filler sequences to distract the participants from the task. The only prerequisite was that whenever a filler sequence contained a semi-cognate this could not be placed at the end of the filler sequence. Placing a semi-cognate at the end of the filler sequence would risk a triggering effect following this semi-cognate, which was an unwanted effect.

Table 4: *Example filler sequence*

Word 1	Word 2	Word 3	Word 4
Kam (English: Comb)	Safety pin	Owl	Driewieler (English : tricycle)

Image 5: *a visual representation of table 9, a filler sequence*



For the filler sequences the response language was randomized. This means that there was a possibility of a language switch in this sequence (see image 5), however this switch is not part of the relevant data of this research, it was meant to confuse the participants about the task. To randomize the response language for the filler words the ‘RANDBETWEEN’ function of

Excel was used to generate a list of the numbers 0 and 1. If the number 0 appeared the word had to be named in Dutch, if the number 1 appeared then the picture would have to be named in English. All filler sequences were of equal length as the target sequences (four words).

4.5 Procedure

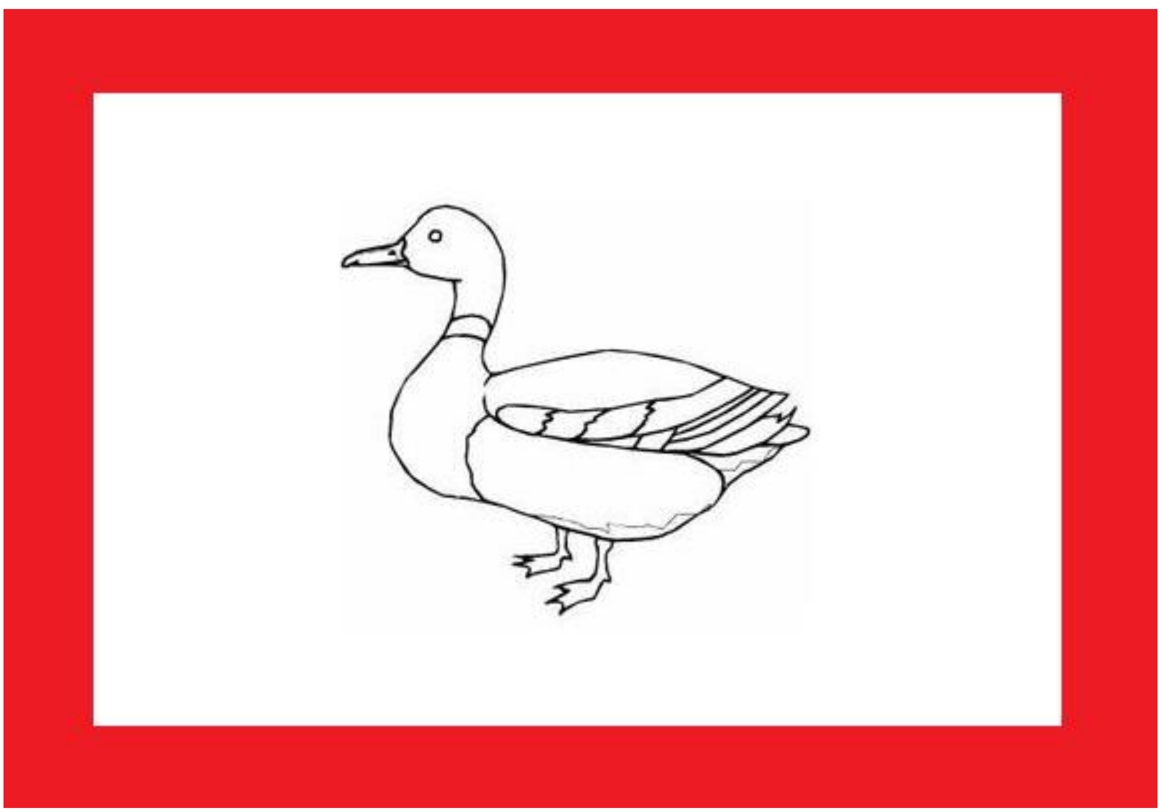
The participants were found through Facebook and through connections with previous participants (also known as snowball sampling or friend of a friend approach). All the participants of this experiment were non-paid volunteers. A sweet treat was offered as compensation for the participant’s time.

Before the start of the experiment the participants all received an information sheet with information on the experiment. The basic task was described to the participants, but the research goal of the experiment was not explicitly named so the participants would not be influenced in their responses. After the participants had read the information sheet they were asked to sign a consent form to allow the usage of the data for the experiment. Before the participants entered the recording booth, they had an opportunity to ask questions and received a short oral explanation in addition to the information sheet.

The participants were tested one by one in a soundproof recording booth which had a computer screen, a keyboard, and a microphone. The participants were instructed to name pictures as quickly and accurately as possible, according to the colored border around the picture. Before the start of the experiment the participants were asked to speak into the microphone to make sure that sounds would be registered properly. The experiment then started with a written introduction (see: Appendix VIII) which, again, reminded the participants to name items according to the colored border on the screen, and to name the items as clearly and as fast as possible within the three second time limit. After the written introduction there were two trial sequences so the participants could get used to the speed of the experiment. Once the trial had finished the participants started the real experiment.

During this experiment the participants had three seconds to name the images according to the color indication. Every three seconds a picture with a colored border would appear on the screen. The participant was told that when a picture had a red border they had to reply in Dutch, and when a picture had a blue border the participant had to reply in English. The participants were told to name the pictures whenever the picture was still on the computer screen. If a participant had failed to name a picture whilst it was on screen, they were expected to continue with the next picture trial (without still attempting to name the previous trial). Image 1 shows a demonstration of what a participant would see on the computer screen. For this trial the correct response would be the Dutch word “eend” (English: duck).

Image 6: *Demonstration of the experiment*



4.6 Data analysis method

The analysis of the data will focus on the effects found in Broersma (2011), Broersma et al. (2016, p.13), and Costa and Santesteban (2016). The main points of interest are the fixed effects of the cognate condition (whether the trigger is a cognate or a control word) and the language of the target (which was named in Dutch or English) and whether there are differences related to a participant's L2 proficiency and L2 background.

There were 33 participants who participated in the experiment. Before the data analysis, it was decided to remove the 33rd participant based on their performance during the Oxford proficiency test (see section 4.2: participant sample). According to the correlation test (graph 1, section 4.2) the 33rd participant was an outlier, based mostly on their proficiency score. To ensure that all participants were part of the same sample, it was decided to not use the 33rd participant's data in the analysis.

Of all data that was collected a selection was made to create a set of valid data to analyze. Firstly, the response times for cognate/non-cognate target sequences were filtered out. Response times from filler sequences were not used in this research. Following the cognate/non-cognate target sequence selection, only sequences with a correct response for both the trigger word (the cognate/non-cognate) and for the target (the word following the trigger, which contained the language switch) were used in this analysis. If either the trigger or the target were incorrect, the whole sequence was marked invalid. All audio files from all participants were checked for incorrect responses and marked correct or incorrect.

Within the remaining the cognate/non-cognate trigger target sequences, all the response times were filtered. Any response time slower than 200ms was deemed invalid. This is motivated by Hauk et al. (2012) who state that humans need at least 200ms to give a response (Hauk, Coutout, Holden, & Chen, 2012). Out of a total of 2310 cognate/non-cognate target sequences, 1160 valid cognate/non-cognate sequences target were left for 32 participants.

In the results section I will present data primarily in descriptive terms, with t-tests and ANOVAs as an indication on whether the data is significant. T-tests were done on data by divided the different variables: cognate/non-cognate condition, switch direction (L1-L2 or L2-L1), and finally participant groups (L2 background and L2 proficiency). After the t-test data I will present ANOVA data. ANOVAs were also made, because ANOVAs consider the effect of each individual variable and the interaction of these factors with the response time (and additionally, how these factors influence each other).

The same response times (from now onward: RT) were analyzed multiple times due to the different variables which I expect to influence the RT. This double analysis was done to see whether different data grouping will yield different results.

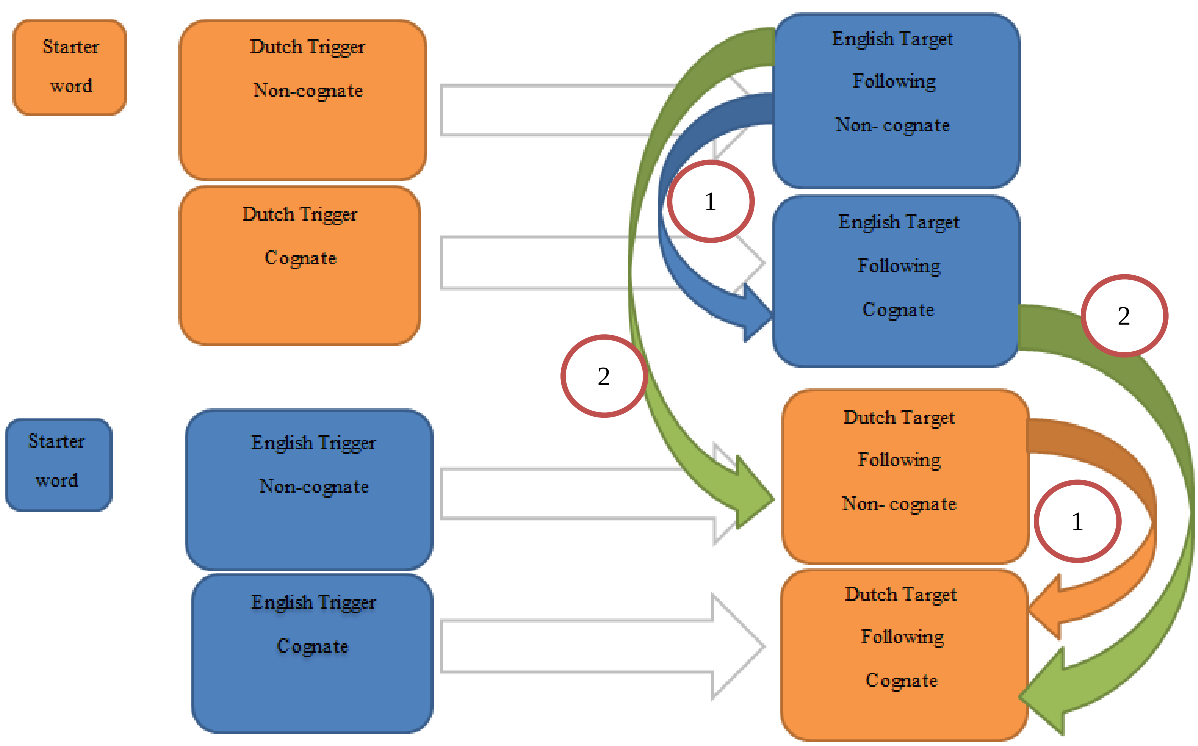
5. Results

This section shows the analysis of the response times of the target stimuli (which follow the cognate/non-cognate and which contain a language switch). The first variable that is discussed is the cognate or non-cognate status of the trigger which preceded the target (see image 7 below, number 1) (inspired by Broersma, 2011). This is related to hypothesis 1, in which I hypothesized that there will be a faster response time for targets that follow a cognate, than targets which follow a non-cognate.

Secondly, the results will focus on of switch direction from trigger to target (L1-L2 or L2-L1), to see whether the switch direction influences the response time (see image 7, number 2). In hypothesis 2, I hypothesized that switches from L1 to L2 were going to be faster. Additionally, switches from L2 to L1 are expected to be slower.

Finally, the results on the influence of the participants' proficiency and L2 background on the triggering effect of cognates will be discussed. In hypothesis 3 it was hypothesized that there will be asymmetrical switching costs in L2 learners with average proficiency and more symmetrical response times for L2-learners with a higher proficiency level. Furthermore, according to hypothesis 3 I expect to find that L2 learners will have faster response times switching from L1 into L2, and slower response times when switching from L2 to L1. For highly fluent bilinguals I expect similar response times when switching from L1 to L2 and vice versa

Image 7: *A visual representation: which response times are going to be compared? Number 1 is the t-test for cognate/non-cognate status of the trigger, preceding the target. Number 2 is the t-test comparing the influence of switch direction on the trigger's response time.*



In these results there will be a focus on results with a $p<0.05$. If there is a low probability ($p<0.05$), the null hypothesis can be rejected, and this indicates that the groups are not similar and that there may be a measureable effect. If there is a high probability ($p>0.05$), it confirms the null hypothesis, it means that there is no difference between two groups (and so they may be part of the same sample).

In this section RT3 is used to refer to the response time of word 3, the target word following a cognate or non-cognate trigger that contains a language switch (for a visual reference, see image 1). This thesis only discusses the response times of the targets which follow a cognate or a non-cognate control. In the upcoming tables, it will be indicated what the switch direction was from the trigger to the target (of which the response time is presented). Whenever a table or graph presents the response time for a target named Dutch, it will say “L2-L1”. L2-L1 means that the cognate (or control) had to be named in the L2, and the target for which response times were documented had to be named in L1. Only the target’s response time is used (in this example, L1).

5.1 Cognates VS Non-cognate Controls

These results are the collective results from all of the 32 participants. The analysis addresses the effect of cognate or non-cognate condition of the trigger word (the word which precedes the target) and the switch direction from trigger to target word. If hypothesis 1 is correct, the results will show a faster response time for targets which follow a cognate and a slower response time for targets that follow a non-cognate.

Additionally, this section will also look at the effect of switch direction on the response time. If hypothesis 2 is correct, there will be faster response times for switches from L1-L2, and slower response times from L2-L1.

Graph 2: *The median of response times divided by switch direction and cognate or non-cognate status of the word preceding the target*

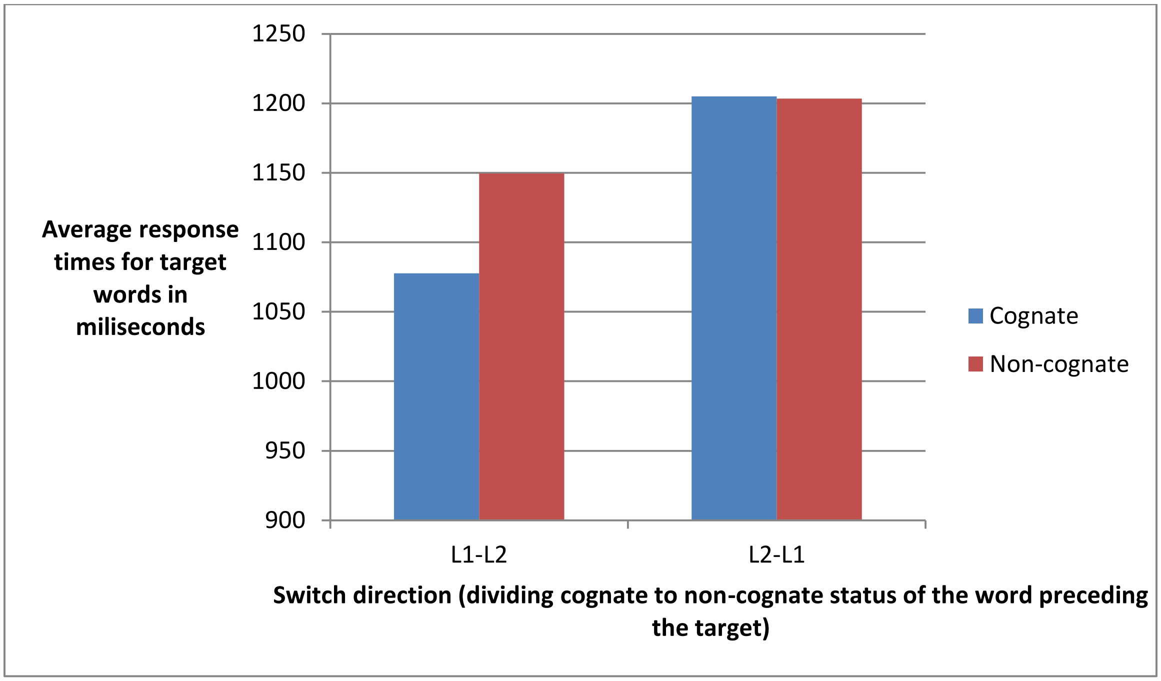


Table 5: *Median response times in milliseconds and standard deviation of graph 2 data*

Direction		Trigger	*M*	*SD*
L1-L2	RT3	Cognate	1077.70	315.097
		Non-cognate	1149.62	352.782
L2-L1	RT3	Cognate	1205.05	381.312
		Non-cognate	1203.41	352.522

Graph 2 and table 5 show that targets preceded by a cognate (blue, 1077.40ms) were named faster than targets preceded by non-cognates (red, 1149.62ms), but only when there was a switch from L1 to L2. Switching from L2 to L1, there was a similar response time for targets preceded by cognates and non-cognates (median response time for cognates: 1205.05ms and for non-cognates 1203.41ms).

An independent-samples t-test was conducted to compare RT3 (target response time) with triggers in cognate and in non-cognate condition (see: Appendix VI, table 1), along with the switch direction. There was a significant difference in the response time for RT3, direction L1-L2 in cognate condition (M=1077.70, SD=315.097) and non-cognate condition (M=1149.62, SD=352.782) conditions; t(593)=-2.625, p = .009. This result suggests that whenever a Dutch (L1) cognate precedes the English (L2) target word, the response of the target word is positively influenced by the presence of the cognate word. This finding provides support for hypothesis 1.

However, there was not a significant difference in the scores for RT3, direction L2-L1 in cognate condition (M=1205.05, SD=381.312) and non-cognate condition (M=1203.41, SD=352.522) conditions; t(563)= .053, p = .958. This result does not support hypothesis 1, as there was no significant result between response times for Dutch targets preceded by either an English cognate or non-cognate.

5.2 Oxford proficiency test

This section will discuss the t-test data according to the Oxford English Language test groups. The participants have been divided in the average proficiency (17 participants) and the high proficiency groups (15 participants, see section: 4.3 Participant related variables). In this passage the thesis will focus on hypothesis 3: which predicts asymmetrical switching costs in L2-learners with average proficiency and more symmetrical reaction times for L2-learners with a high proficiency level. First the data will be presented divided by switch direction. Then another graph will be presented which again looks at the data in combination with the proficiency results, but this time the data will be divided by cognate or non-cognate status of the trigger.

Again, in the tables and graphs "L1-L2" indicates the switch direction, this means that the target (RT3) was named in the L2 and was preceded by a trigger word in the L1. Only the target's response time (in this case L2) is used in the analysis.

Graph 3: *comparing median* response *times, switch direction and proficiency groups*

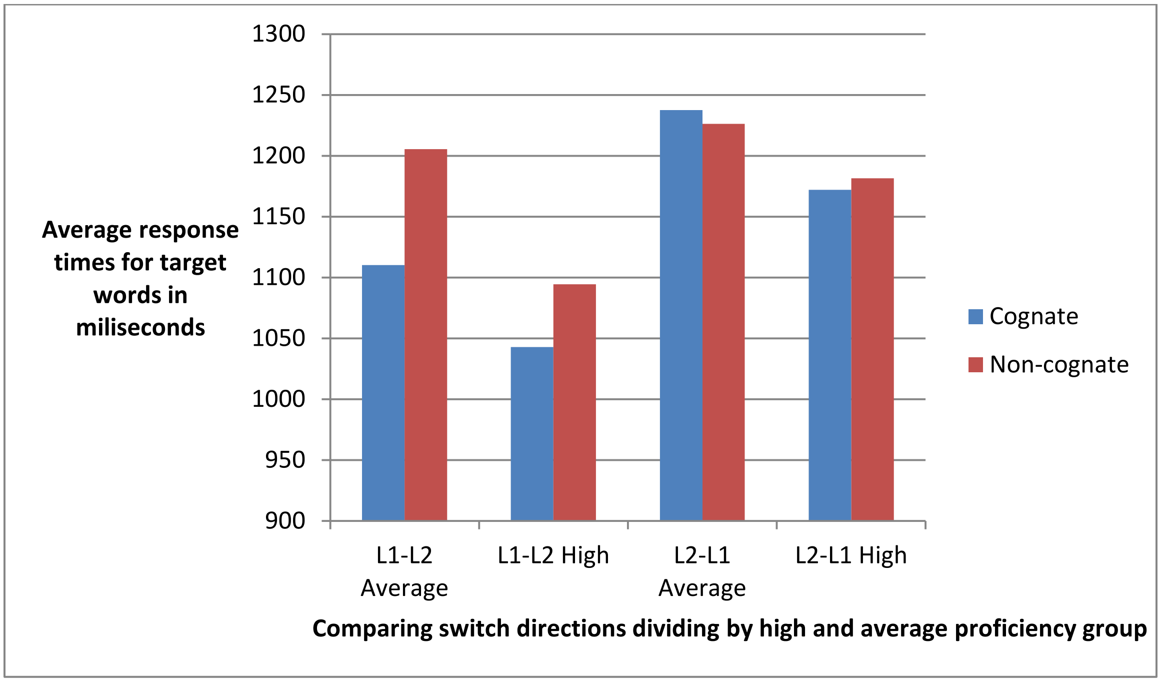


Table 6: *median and standard deviation of response times, divided by switch direction and proficiency groups*

Direction	Groups		Trigger	*M*	*SD*
L1-L2	AV	RT3	Cognate	1110.11	331.870
			Non-cognate	1205.39	371.915
	H	RT3	Cognate	1042.81	293.041
			Non-cognate	1094.26	324.692

L2-L1	AV	RT3	Cognate	1237.64	345.417
			Non-cognate	1226.09	349.223
	H	RT3	Cognate	1171.98	413.207
			Non-cognate	1181.51	355.502

This time the participants have been divided, focusing on the trigger effect within two proficiency groups. The AV groups refers to the average proficiency group, the H group refers to the high proficiency group (according to the Oxford language test results). In graph 3 there are faster response times for cognates in both the average proficiency (1110.11ms) and the high proficiency group (1042.81ms), when switching from L1 to L2. Switches from L2-L1 were more costly for both the average and the high proficiency groups even when there was a cognate trigger before the target. When comparing groups, the high proficiency group is faster in responding than the average proficiency group. Similar to the average proficiency group, the high proficiency group only shows an obvious faster response time for words following a cognate when there is a switch from L1-L2.

There was a significant result in the scores for the average proficiency group switching from L1-L2 (L1-L2 Average) in the cognate condition (M=1110.11, SD=331.870) and non-cognate (M=1205.39, SD=371.915) conditions; $t(301)= -2.352$, $p = .019$ (appendix VI, table 2). In contrast, none of the remaining data yielded significant results. All results for L2-L1 and the L1-L2 switch for the high group did not have a significant result in cognate and non-cognate condition (see appendix VI, table 2). This suggests that all data was similar except for the L1-L2 switch direction by the average proficiency group. Hypothesis 1 was partially supported, as there are significant results for cognate facilitation from L1-L2 for the average proficiency group. Hypothesis 2 was supported, because the results from L2-L1 were not significant, whereas the results from L1-L2 were significant. This suggests that switch direction matters. Hypothesis 3 was not supported by these findings, as there were no significant results for the high proficiency group.

After dividing the results by switch direction, this section will focus on dividing the data based on cognate/non-cognate status of the preceder and the Oxford Language Test groups. These tests were made to test hypothesis 2: does switch direction modulate the effects (of cognates).

Graph 4: *The median response times, cognate/non-cognate condition response times divided by proficiency groups (AV- average proficiency, HIGH- high proficiency group)*

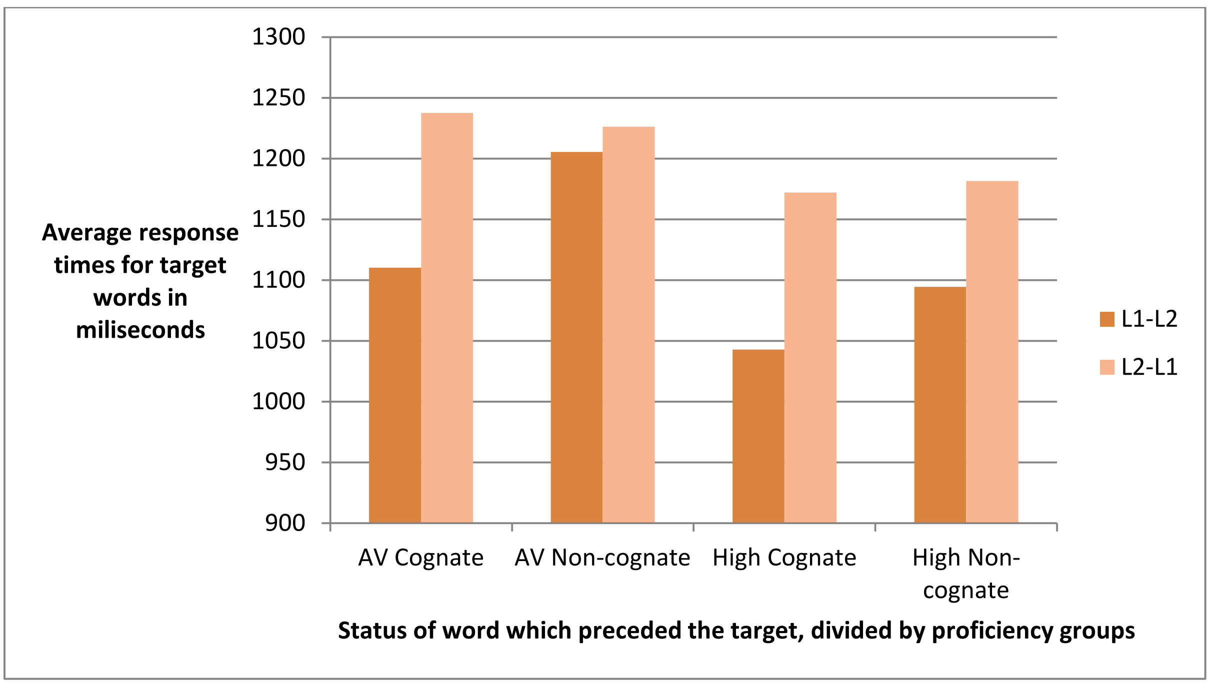


Table 7: *response times (in milliseconds) divided by proficiency groups*

	Trigger		Direction	*M*	*SD*
AVERAGE	Cognate	RT3	L1-L2	1110.11	331.870
			L2-L1	1237.64	345.417

	Non-cognate	RT3	L1-L2	1205.39	371.915
			L2-L1	1226.09	349.223
HIGH	Cognate	RT3	L1-L2	1042.81	293.041
			L2-L1	1171.98	413.207
	Non-cognate	RT3	L1-L2	1094.26	324.692
			L2-L1	1181.51	355.502

In graph 4 the median reaction times for targets preceded by cognates or non-cognates are compared in both switch directions. The average proficiency group has a faster response time for targets preceded by a cognate when switching from L1-L2 (1110.11ms), and a slower response time from L2-L1 (1237.64ms). Similarly, the high proficiency group also shows a faster response for targets preceded by a cognate when switching from L1-L2 (1042.81ms, compared to L2-L1 with 1171.98ms). Furthermore, the response time with the L1-L2 switch direction were faster for all groups than response times switching from L2-L1, regardless of proficiency level or cognate/non-cognate status of the word preceding the target. The L2-L1 switch direction looks more costly as its responses are slower.

There was a significant result in the scores for the average proficiency group in cognate condition from L1-L2 (M=1110.11, SD=331.870) and L2-L1 (M=1237.64, SD=345.417) conditions; t(307)= -3.301, p = .001(appendix VI, table 3). This suggests that there is a difference between the response times preceded by a cognate in either L1 or L2 respectively. This may suggest that there is a relevance of the switch direction on the response time, and this thus supports hypothesis 2.

In the high proficiency group we can find a similar pattern relating to the switch direction (appendix VI, table 3). There was a significant result in the high proficiency group in cognate condition from L1-L2 (M=1042.81, SD=293.041) and L2-L1 (M=1171.98, SD=413.207) conditions; t(293)=-3.058, p=.002. This again suggests a large difference between the results in both switch directions. This finding supports hypothesis 2, as this result provides evidence that switch direction influences the cognate effect. Finally there was a significant result in the high proficiency group in non-cognate condition from L1-L2 (M=1094.26, SD=324.692) and L2-L1 (M=1181.51, SD=355.502) conditions; t(279)=-2.143, p=.033. Again, this result supports hypothesis 2. It is striking to see that the high group showed the most significant results in terms of switch direction. In both cognate and non-cognate condition the switch direction is of high significance in the high proficiency group. When we look at the low proficiency group only the switch direction in cognate condition is of significance.

5.3 L2 Background test

In this section all 32 participants have been grouped by their L2 background test score. The low group consists of 16 participants; the high group also consists of 16 participants. These L2 background groups were not the same groups as the proficiency groups made for this research; however these groups were both made from the same participant sample. This L2 background division was made to see whether participants with a high background test score (this means, participants who acknowledge that they frequently see or use English in their "linguistic landscape") have faster response times than people with a low background test score (hypothesis 3).

Similar to the previous section, this section will first divide the data by L2 background score and switch direction. With this division the results focus on the effect of the cognate/non-cognate status (hypothesis 1), and the differences between the L2 background groups (hypothesis 3). Following this selection, the results will focus on the effect of switch direction (hypothesis 2).

Graph 5: *Comparing* response *times between cognate and non-cognate switching from L1 to L2 or L2 to L1, between background test groups (low score VS high score)*

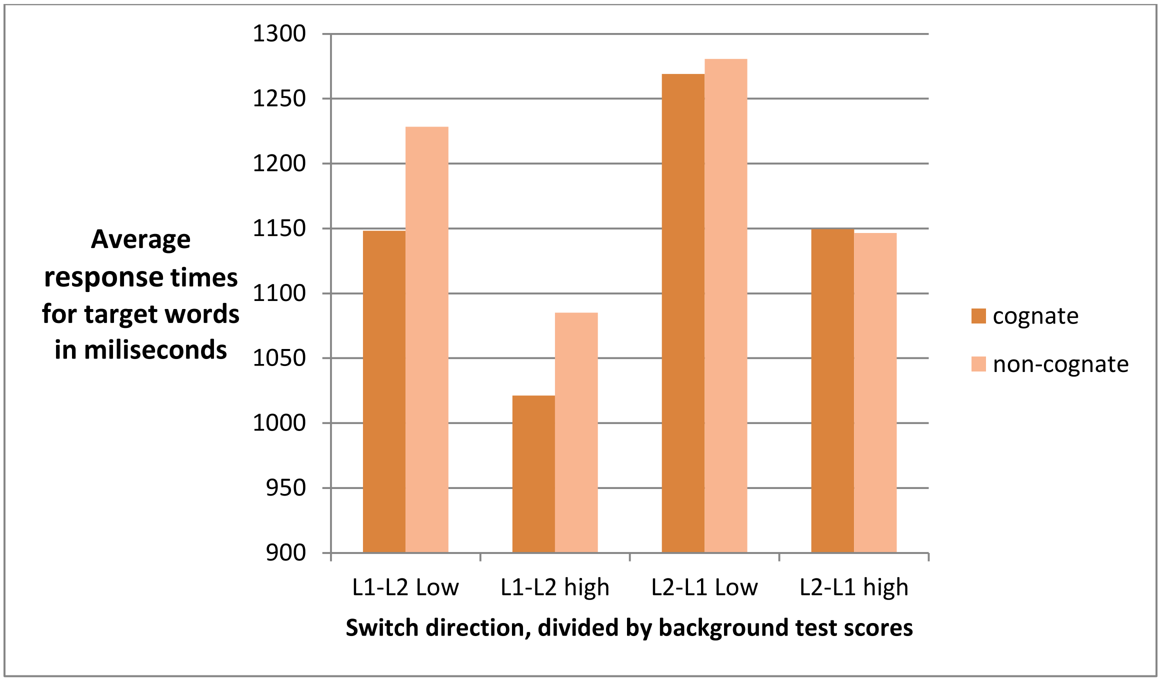


Table 8: *t-test with a subdivision by background test results and switch direction*

Direction	Groups		Trigger	*M*	*SD*
L1-L2	Low	RT3	Cognate	1148.25	345.272
			Noncognate	1228.47	401.419
	High	RT3	Cognate	1021.18	276.902
			Noncognate	1085.15	293.351
L2-L1	Low	RT3	Cognate	1269.16	406.518
			Noncognate	1280.55	375.747
	High	RT3	Cognate	1149.54	350.032
			Noncognate	1146.38	323.808

In graph 5 (and table 8) there is no large difference between the reaction times, regardless of cognate/non-cognate status, switch direction or L2 background groups. The low L2 background group has slightly faster response times from L1-L2, 1148.25ms for targets preceded by a cognate compared to 1228.47ms for targets preceded by a non-cognate. Similarly, the high L2 background group also has slightly faster response times for targets preceded by a cognate (1021.18ms) as opposed to targets preceded by a non-cognate (1085.15ms). The data with a switch from L2-L1 was similar for both the low and the high L2 background test groups.

There was a marginally significant result in the scores for the low background test score group switching from Dutch to English in cognate condition (M=1148.25, SD=345.272) and non-cognate condition (M=1228.47, SD= 401.419) conditions; t(264)= -1.752, p = .081 (appendix VI, table 4). What this means is that this result can be considered marginally significant. The ideal p should be below .05, so the p=.081 is too high, but the low p may still hint at an occurrence in the results. Aside from the low group switching from Dutch to English there are no significant results in this table. The high score group showed a p=0,43 for the Dutch to English direction which is not relevant. Similarly, both the low and the high background test score show a low significance for the response times switching from English to Dutch (p=.818 and p=.934 respectively). All these data do not support hypothesis 1 or hypothesis 3.

After dividing the results by switch direction, this section will focus on dividing the data based on cognate/non-cognate status and the L2 background test groups. These tests were made to test hypothesis 2: switch direction is expected to modulate the effects (of cognates).

Graph 6: *Looking at influence on cognate or non-cognate status, dividing by low background test score VS high background test score*

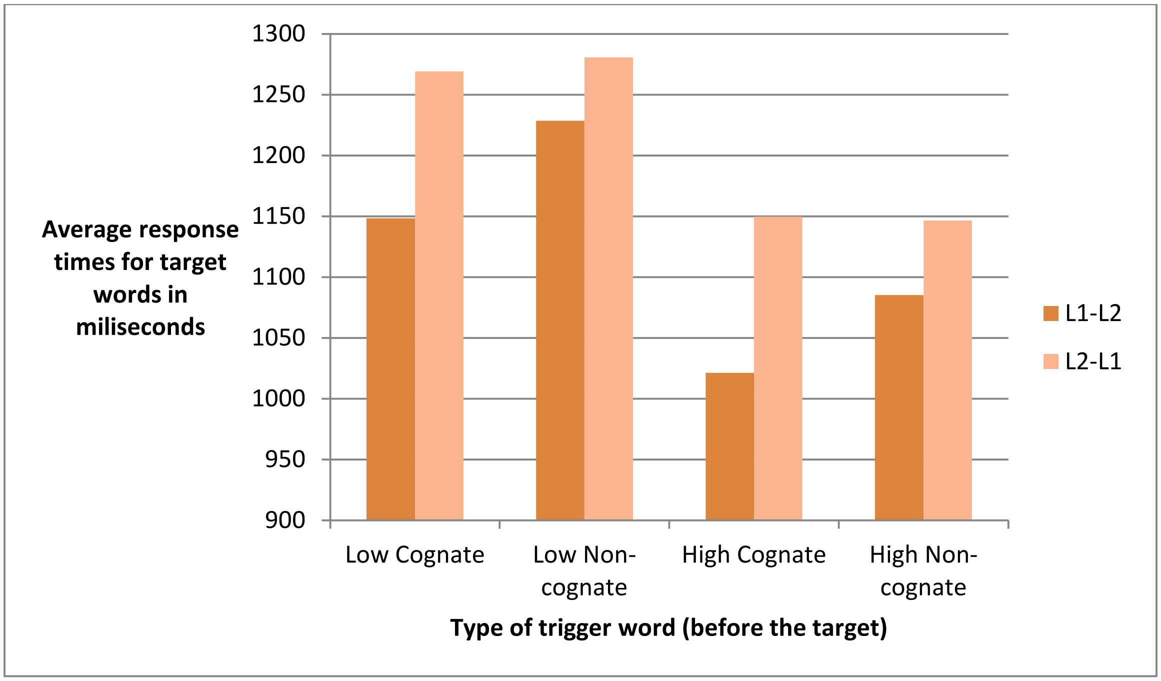


Table 9: *distinguishing between switch direction between the L2 background test groups*

	Trigger		Direction	*M*	*SD*
LOW	Cognate	RT3	L1-L2	1148.25	345.272
			L2-L1	1269.16	406.518
	Non-cognate	RT3	L1-L2	1228.47	401.419
			L2-L1	1280.55	375.747
HIGH	Cognate	RT3	L1-L2	1021.18	276.902
			L2-L1	1149.54	350.032
	Non- cognate	RT3	L1-L2	1085.15	293.351
			L2-L1	1146.38	323.808

Graph 6 shows the effect of targets preceded by cognates in both directions, divided by low and high L2 background test groups. For the low background score group there is a small difference between targets preceded by a cognate switching from L1-L2 (1148.25ms) and L2-L1 (1269.16ms). Switches into the L1 (L2-L1) are similar, the low cognate L2-L1 (1269.16ms) and the low non-cognate L2-L1 (1280.55ms) are nearly identical in median response time. For the high background score group, the largest difference can be seen between cognate L1-L2 (1021.18ms) and cognate L2-L1 (1149.54ms). In graph 6, all response times from L2-L1 were slower than the response times from L1-L2, regardless of cognate/non-cognate status.

There was a significant result in the scores for the low L2 background test score group in cognate condition in L1-L2 (M=1148.25, SD=345,272) and L2-L1 (M=1269.16, SD=406.518) conditions; $t(272)= -2.662$, $p = .008$ (appendix VI, table 5). This again suggests that there is a significant difference between switch directions, even if there is a cognate, and this supports hypothesis 2. There was also a significant result in the high background test score group in cognate condition in L1-L2 (M=1021.18, SD=276.902) and L2-L1 (M=1149.54, SD=350.032) conditions; $t(278.906)=-3.719$, $p<0.000$(appendix VI, table 5). The results for low L2 background participants in non-cognate condition and the high L2 background participants in non-cognate condition were insignificant (see: appendix VI, table 5).

These results support hypothesis 2, as language switch direction seems to influence the ease of naming the target. However, these results do not support hypothesis 1, as there is a difference for target response times preceded by cognates depending on the switch direction.

Below is a summary of al significant t-tests of section 5.1 until section 5.3. These are the t-tests with a $p<0.05$ so it can be said that differences between data groups are significant. The t-tests found significant results for:

(i) L1-L2 switch direction, comparing cognate and non-cognate condition (appendix VI, table 1). This supports hypothesis 2.

(ii) L1-L2 switch direction, for the average proficiency group, comparing cognate to non-cognate condition (appendix VI, table 2). This result partially supports hypothesis 1, hypothesis 2 was supported as well.

(iii) Average proficiency group, in cognate condition, comparing results for switch directions (appendix VI, table 3). This result supports hypothesis 2.

(iv) High proficiency group, in cognate condition, comparing results for switch direction (appendix VI, table 3). This result also supports hypothesis 2.

(v) High proficiency group, in non-cognate condition, comparing results for switch direction (appendix VI, table 3). This result also supports hypothesis 2.

(vi) Low L2 background test group, in cognate condition, comparing switch direction (appendix VI, table 5). This result also supports hypothesis 2.

(vii) High L2 background test group, in cognate condition, comparing switch direction (appendix VI, table 5). This result also supports hypothesis 2.

5.4 Factorial ANOVA

In the previous section the t-tests show whether there is a significant difference between groups of data. For example, the t-tests look at the difference between the response times of targets preceded by a cognate and response times of targets preceded by a non-cognate. With a low probability ($P<0.05$) result from the t-tests, it is possible to reject the null hypothesis, which suggests that there is a measureable effect between two groups.

ANOVAs do not look at the differences between data groups, but ANOVAs compare means across two or more independent variables. A factorial ANOVA has two or more independent variables that split the sample in multiple groups. The factorial ANOVA analyses effect of these independent variables on the dependent variable.

In this thesis there is one dependent variable: the response time, and four independent variables: switch direction, cognate/non-cognate status of the word preceding the target, the L2 background score of the participant, and the L2 proficiency score of the participant. By running a factorial ANOVA I will answer RQ3: Do language proficiency and L2 background modulate the effect of the cognate/non-cognate status (i.e. do these variables influence the response time)? To answer this question, I will look at the interactions of different independent variables with the response time (the dependent variable). These results will also focus on $p<0.05$, because this means that the result is significant.

A three-way mixed ANOVA was conducted on the influence of three independent variables (switch direction, trigger word, background test score) on the response time. Switch direction included two levels (switching from L1-L2, switching from L2-L1), trigger word included two levels (cognate, non-cognate) and L2 background test score also included two levels (low score, high score). The main effect for trigger word yielded an F ratio of $F(1, 1152)= 3.110$, $p=.062$, indicating that the effect of trigger words was only marginally significant, between cognate triggers($M=1136.31$, $SD=352.618$) and non-cognate triggers ($M=1177.38$, $SD=353.356$).

The main effect for switch direction yielded an F ratio of F(1, 1152)= 19.751, p<.001, indicating that the effect for switch direction was significant, L1>L2 (M=1110.21, SD=334.302) and L2-L1(M=1204.22,SD=366.645). The main effect for L2 background test score yielded an F ratio of F(1, 1152)= 41.284, p<.001, indicating that the effect for L2 background test was significant, low (M=1228.41, SD=384.327) and high (M=1097.77, SD=314.882). The interaction effect between trigger and switch direction was insignificant, F(1, 1152)= 2,777, p=,096. Furthermore, all the remaining interactions (trigger and L2 background, switch direction and L2 background, trigger and switch direction and L2 background) were also insignificant with p>.05 (appendix VI, table 6) .

These results do not fully support hypothesis 1, 2 or 3. Hypothesis 1 is partially supported by this ANOVA because the trigger variable only has a marginally significant interaction with the response time. Hypothesis 2 is not supported by this ANOVA because there is no significant interaction between the trigger variable and the switch direction variable (thus, there is no motivation to believe that the switch direction can influence the cognate effect). Finally, hypothesis 3 is not supported by this ANOVA because there is no significant interaction between the L2 background and the trigger variable, and so there is no evidence that the L2 background modulates the trigger effect. There are significant single interactions of switch direction and L2 background with the response time. However these do not support hypothesis 2 either, as the present research was interested of the effect of switch direction on the trigger variable.

Following the ANOVA with the L2 background variable, a three-way mixed ANOVA was conducted on the influence of the L2 proficiency (see appendix VI, table 7). The main effect of trigger words yielded an F ratio of F(1,1152)=3,110, p=.078, indicating that the effect was marginally significant, cognate (M=1136.31, SD=352.618) and non-cognate (M=1177.38, SD=353.356).The main effect for switch direction yielded an F ratio of F(1, 1152)= 19.748, p<.001, indicating that the effect for switch direction was significant, L1>L2 (M=1110.21, SD=334.302) and L2>L1(M=1204.22, SD=366.645). Similar to the other variables, proficiency score also included two levels (average score, high score). The main effect for proficiency yielded an F ratio of F(1, 1152)= 12.375, p<.001, indicating that the effect for proficiency was significant, average (M=1190.55, SD=351.838) and high (M=1120.97, SD=351.863). The interaction effect between trigger and switch direction was marginally significant, F(1, 1152)= 3.286, p=.070. All the remaining interactions: trigger words and proficiency; switch direction and proficiency; and trigger words, switch direction and proficiency, were insignificant (appendix VI, table 7).

This three-way ANOVA does not support hypothesis 1, as there was no significant interactions of the trigger variable (only a marginally significant one). Hypothesis 3 was not supported by this ANOVA because there was no significant interaction between the trigger variable and the L2 background variable. However, hypothesis 2 was partially supported by these results, as there is a marginally significant result (P=0.070) for the interaction between trigger and switch direction. Hypothesis 2 was not supported either, as there was no significant interaction between trigger and switch direction.

The t-tests from section 5 found significant results comparing groups, mostly related to switch direction. The ANOVAs support the t-test evidence as the most significant interaction found in the ANOVAs is the single interaction between switch direction and the response time. This means that there is a significant difference between RT switching from L1-L2 or from L2 – L1. However, the ANOVA has shown that there is no significant evidence for hypothesis 2. To find evidence for hypothesis 2, the trigger and switch direction variable should have a significant interaction. The ANOVAs both found a marginally significant interaction (p=.096 and p=0.07) between the trigger and switch direction variable. However, the marginally significant interaction between trigger and switch direction does show a non-significant trend in the predicted direction.

The proficiency variable and the L2 background test both have single significant interactions with the response time according to the ANOVAs. However, this does not support any of the hypotheses. These single interactions signify that there is a difference between RT for average and high proficiency, and a difference between RT for low and high L2 background. With the t-tests results I did not focus on the significance of results based solely on proficiency or L2 background, because for this research I am only interested in the effect of these participant related variables on the cognate trigger effect.

6. Discussion

This thesis reported a language switching experiment, which tested the revised trigger hypothesis (Clyne, 2003). According to this hypothesis triggers may facilitate a code-switch in natural speech. I utilized a language switching experiment to control for variables that would affect switching in naturalistic code-switching settings. I explored the language switching performance of Dutch-English bilinguals in a cued picture naming task, in which I controlled for three variables: (i) the cognate/non-cognate status of the word preceding a language switch; (ii) the switch direction from cognate/non-cognate to the target word; and (iii) the L2 proficiency and L2 background of the participants. Firstly, I hypothesized that I would find a cognate facilitating effect in words preceded by cognates, which would cause a quicker response time after cognates and thus evidence for the trigger hypothesis (hypothesis 1). Secondly, I expected to see a stronger cognate effect when switching from L1 to L2 because switches from L2 to L1 are known to be more costly (hypothesis 2). Finally, I expected that language proficiency and L2 immersion would modulate the effects of cognates in this experiment (hypothesis 3).

RQ1: Is there experimental evidence for the revised trigger hypothesis in Dutch-English bilinguals?

At the beginning of this thesis I hypothesized that I would find evidence to support the trigger hypothesis. This evidence would be visible through faster response times after cognates than after non-cognates, in both L1-L2 direction and L2-L1 direction. By manipulating the cognate status of the word preceding the target, I tried to find evidence for hypothesis 1.

Unexpectedly, cognates were not shown to always facilitate a language switch. In this research I found that the interaction of the trigger (cognate/non-cognate) variable with the response time was insignificant. This finding is unexpected, as the results showed faster response times for words following cognates, yet in the t-tests results I found that many of these results were insignificant due to a $P>.05$. There was one result in the average proficiency group which supported cognate facilitation, however this result was only found in the L1-L2 switch direction. Additionally, all of the cognate response times from the L2-L1 switch direction were insignificant. The data of this experiment only showed cognate facilitation in one switch direction and this suggests that there is no evidence supporting the trigger hypothesis in Dutch-English bilinguals.

Clyne's (2003) trigger hypothesis entails that cognates (and other trigger words) can possibly facilitate code-switching. The most likely reason why this research did not find experimental evidence for Clyne's (2003) hypothesis is due to the additional factors which can influence facilitation. In earlier research, Clyne (1980) argued that cognates always trigger a code-switch. However, in his more recent research, Clyne (2003) noted that aside from lexical factors, additional factors such as sociolinguistic factors (e.g.: where the conversation takes place, role-relationship between interlocutors, and type of interaction) and structural factors (e.g.: the structural overlap of two languages, and convergence of two languages) also influence code-switching. The present research could not control for these sociolinguistic and structural factors, as these factors only occur in natural speech.

This experiment was largely based on Broersma (2011), who studied Dutch-English bilinguals, and her results contrast with the results in this research. In her first experiment Broersma found significant cognate facilitation for words following a cognate, however the difference between the cognate and the non-cognate condition was very small (91ms). An explanation why the results for this research differ from Broersma's findings is that this research did not compare all cognate triggered response times to all non-cognate triggered response times. In this research I always compared targets which were preceded by a cognate/non-cognate not only between target conditions, but also between switch directions and (i.e. response time of a target preceded by a cognate in L1-L2 direction VS the response time of a target preceded by a cognate in L2-L1 direction). In a footnote, Costa and Santesteban (2016) stated that they got in contact Broersma (2011) to discuss her findings, as her study was the first that explored switching costs of targets preceded by the production of cognates and non-cognates (p. 120). In their correspondence, Broersma (2011) warned Costa and Santesteban (2016) that the preliminary results from her research are possibly not reliable as the results changed as more participants were added (Costa & Santesteban, 2016, p. 120).

Another explanation for not finding the trigger hypothesis in this experiment is that language switching tasks are not suited to find evidence for the trigger hypothesis. This assumption has previously been discussed by Costa and Santesteban (2016), who argued that cued language switching experiments may not be the most appropriate way to test the trigger hypothesis. Costa and Santesteban (2016) elaborated that experimental evidence on code-switching for the occurrence of triggering effects has often showed null effects (p. 120). This null-effect can be explained by the difference between language switching and code-switching. Whereas code-switching focusses on the mixed use of language in naturally produced speech, language switching focusses on switching between languages induced by an external cue in an experimental setting. It is possible that various external variables (such as Clyne's (2003) sociolinguistic factors and structural factors) which are missing in language switching, are an important factor in finding the trigger hypothesis. It is likely that language switching experiments are only a reliable tool to find language switching mechanisms (Costa & Santesteban, 2016).

Similarly, previous language switching studies have found contradictory effects in language switching experiments similar to this one (facilitation in Broersma, 2011; and inhibition in Broersma et al., 2016). Costa and Santesteban argued that the most favorable evidence for cognate facilitation (and the trigger hypothesis) has been found in natural conversation context (p. 120), such as Broersma and De Bot (2006). According to the current study's results and previous findings, I would also argue that evidence for the trigger hypothesis is absent in language switching experiments.

RQ2: Is the effect stronger for L1 to L2 switches than the other way around?

I hypothesized that the facilitating effect was going to be more visible for switches from L1 to L2. I also expected to see slower response times for a switch from L2 to L1, even if there is a cognate trigger in the L2 position (hypothesis 2).

Dividing the data by switch directions allowed me to see whether the results were significantly different for switch directions. The cognate response times for L2 to L1 were longer than the L1-L2 response times for cognates, but only the L1-L2 direction yielded significant results. This suggests that switch direction modulates an effect in combination with cognates. However, switch direction only shows a marginally significant interaction with the cognate variable. This result indicates that there is a marginally significant result towards the expected hypothesis (faster cognate effects from L1-L2 and slower cognate effects from L2-L1); however this result does not provide evidence for the influence of switch direction on the cognate effect.

There is no evidence that switch direction influences the cognate facilitation effect, but switch direction possibly influences the language switching performance of bilinguals. The results show that switch direction had a single significant interaction with the response time of this experiment. The ANOVA results suggest that switch direction influences the response times, regardless of cognate or non-cognate status. However, this result is unrelated to the hypothesis as this research was only interested in the effect of switch direction on cognate facilitation.

This research did not find cognate inhibition of the L2 when switching from L1-L2. On the contrary, the response times for the L1-L2 direction were faster (especially in cognate condition) than switches from L2-L1. This could suggest that switching from the dominant language (in this case Dutch, the L1) does not require inhibition. Broersma (2011) also argued that there was no inhibition of the L1 because there was no interaction of the trigger and the switch direction. This research only found a marginally significant interaction between cognate/non-cognate trigger and switch direction, which is a similar result to Broersma (2011). Contrary to Broersma (2011), Broersma el al. (2016) found inhibition when switching from the dominant language, English, (in this case, the L1) into the less dominant language, Welsh (in this case, the L2). They argued that this costly switch from L1-L2 is due to a behavioral adaption effect. If the cognate was inhibited, the word following the cognate would also show signs of inhibition (Broersma et al., 2016). The cognate/control response times are important in Broersma et al.'s (2016) finding, as these controls are used to see whether cognates affect response times. If controls have the same response times as the cognates, then the inhibition of the cognate follower would not be a result of the cognate but of something else (e.g. word difficulty). In this research I did not look at the response times of the cognates/non-cognate controls, which is why I cannot determine whether my research would support Broersma et al.'s (2016) findings.

The most likely reason why switch direction does not modulate the cognate facilitation effect is that the switch direction variable independently influences performance more strongly than the cognate variable. The single significant interaction of switch direction with the response time is a finding which supports this claim. This interaction suggests that switch direction influences language switching performance, and that it individually influences response times even if there are other variables which influence the response time.

The observation that switch direction influences switching performance is not new. Costa and Santesteban (2004) have argued for asymmetrical switching costs for L2 learners, because switching into the dominant language is more difficult than switching into the less dominant language (p. 504). Switching performance was different for highly proficient bilinguals and L2 learners in Costa and Santesteban (2004). They argued that highly proficient bilinguals inhibit both their languages to the same degree, which would mean that switching costs are similar for both directions (Costa & Santesteban, 2004, p.505). However, the present research did not find more symmetrical switching costs for highly proficient bilinguals as both average and highly proficient bilinguals show asymmetrical switching costs. The reason for these conflicting findings is that in this research I likely found bilinguals with a similar proficiency level to Costa and Santesteban’s (2004) L2 learners.Costa and Santesteban (2004) found that L2 learners have asymmetrical switching costs, and highly fluent bilinguals have symmetrical switching costs. Since I found asymmetrical switching costs for both my average and high proficiency group, it is possible that both my participant groups belong to Costa and Santesteban’s (2004) L2 learners group.

RQ3: Does language proficiency and L2 background modulate these effects?

I hypothesized that I would find asymmetrical switching costs in my average proficiency group and more symmetrical switching costs for the high proficiency group. The average L2 proficiency group was expected to have faster response times switching from L1 into L2, and slower response times when switching from L2 to L1. The high L2 proficiency group was expected to have fast response for both switch directions. Finally, I expected to see an interaction between the trigger and the L2 proficiency or the L2 background score (hypothesis 3).

By looking at the median response times of the participants, I found asymmetrical switching costs for both the average and the high proficiency group. Both proficiency groups showed faster response times for L1-L2 direction, and slower response times for the L2-L1 direction. As mentioned earlier in the discussion of research question 2, this research did not find asymmetrical switch costs relating to different participant groups. This asymmetrical switching finding is supported by Kootstra et al. (2012) who found that high proficiency did not result in symmetric switching costs. Kootstra et al. (2012) argued that participants need a minimal level of proficiency for cognate facilitation to occur. This would mean that, even though a participant has a high level of proficiency, the participant will still have asymmetrical switching costs.

This finding seems to contradict Costa and Santesteban's (2004) findings, as they found that low proficient participants had asymmetrical switching costs whereas high proficient participants had symmetrical switching costs. An explanation for these asymmetrical switching costs could be that, the high proficiency group of this research only has the proficiency level of Costa and Santesteban's (2004) L2 learners, and not the proficiency level of Costa and Santesteban's highly proficient bilinguals. These results do not support my hypothesis, because both the average and the high proficiency groups show asymmetrical switching costs.

This is the first study, to my knowledge, to utilize the L2 background of the participant as a variable in a cued language switching experiment. I argued that this variable was an additional factor that would influence language switch performance. However, the data did not show evidence that L2 background modulates the cognate effect. There were some significant results for the L2 background participants, in the low and high groups when comparing the effect of cognate status in both switch directions. Yet this result only confirms that the switch direction influences the language switching performance. There has not yet been research on the effect of L2 background on cued language switching. Unsworth (2013), who served as a motivation for this participant variable, discussed that different L2 exposure could influence second language acquisition which in turn results into variation of skills in a bilingual population. After looking at the results I can only conclude that L2 background does not influence the cognate effect. The L2 background does however have a positive correlation with L2 proficiency, which is supported by

Unsworth (2013). This suggests that a high L2 background correlates with a high L2 proficiency score.

Finally, there were the significant single interactions of L2 proficiency and L2 background with the response time. This interaction effect indicated that the impact on response time of one variable (e.g. average L2 proficiency) depends on the level of the other variable (e.g. high L2 proficiency). This finding suggests that participant variables also influence the response time, without any interaction of other variables (trigger word and switch direction). Costa and Santesteban (2016) also found that participant proficiency is one of the factors which affect language switching performance of bilinguals, while cognate status does not (p.118).

Costa and Santesteban (2004) argue that aside from L2 proficiency, L2 age of acquisition may also be a relevant variable (p. 507). They argue that their high proficient bilinguals do not perform differently because of their proficiency, but rather because they started learning English earlier in life (Costa & Santesteban, 2004, p. 507). Age of acquisition was one of the questions that was part of the L2 background survey in this research, however all participants (except one) acquired English later in life (around the age of 12, at high school). This is a possible explanation why the different groups of participants show similar switching patterns in this experiment. For future research, there should be more attention to the combination of early language acquisition and language proficiency and how these two influence language switching.

6.1 Limitations and suggestions for future research

Although this research has found the answers to the hypothesis, there were some unavoidable limitations. The first limitation related to the first hypothesis in this research is related to the effect of cognates on the targets. From this research it is not clear whether cognate inhibition leads to facilitation or inhibition of the word following a cognate. Previous research has found both cognate facilitation (Broersma, 2011) and cognate inhibition on the word following the cognate (Broersma et al., 2016). For future research I would advise to take a closer look at variables influence facilitation or inhibition of the word following a cognate, for example switch direction or participant proficiency.

In this research Dutch-English bilingual students were tested to look at the effect of cognates on switching. However, all participant groups showed asymmetrical switching costs, with insignificant response time data interaction between the participants’ language proficiency and/or L2 background and the cognate/non-cognate status. Previous research has suggested that early L2 acquisition (which is part of the L2 background) can influence the responses of participants. Future research should focus on the effect of L2 acquisition on high proficient bilinguals’ language switching performance.

The final limitation which could relate to the current results is that this research could not control for other variables which can facilitate code-switching (such as sociolinguistic factors and structural factors in natural speech according to Clyne, 2003). The variables which can also facilitate code-switching are only present in natural conversation context. It could be possible that the trigger hypothesis resurfaces when future research focusses on language switching on a sentence level. For future research I would advise to pair experimental evidence (such as Broersma, 2011; Costa & Santesteban, 2016; or my own) to free speech experiments, such as Clyne (1980). In this free speech experiment, one could present participants with audio of sentences containing trigger words, which are also part of the language switching experiment (such as Broersma, 2011; Costa & Santesteban, 2016; or my own). However, contrary to Clyne’s (1980) design, switches should not take place after the trigger word. Instead, switches should take place at random places in the sentences. Then the participants have the task to repeat the sentences with the code-switch in the same sentence location as in the audio sample. Clyne (1980) has already found that switching within sentence boundaries were difficult to remember for participants. It would be interesting to see whether the participants will choose to switch after the trigger word, if they have forgotten where the original switch took place in the sentence structure.

Future research should continue to focus on the effect of translation words on the natural speech of bilinguals. It would be interesting to see whether the use of a single translation word can prime a less fluent L2 speaker to involuntarily code-switch. For example, if an English speaker is in an English conversation with a low proficient Dutch-English, inserting random Dutch translation words may trigger the low proficient Dutch-English bilingual. E.g. if the English speaker asks: “Can I have a look at these *tegels* (English: ‘tiles’)”. In this example the English speaker happens to know the Dutch word for ‘tiles’, and they use the Dutch translation of the word. It is possible that the usage of the Dutch (in an English conversation) it may trigger the Dutch-English bilingual if their English (L2) is not that good. This translation trigger word could then lead the Dutch-English bilingual to briefly switch into Dutch, even if the rest of the conversation was in English.

7. Conclusion

Before this research, there has not yet been experimental evidence which looked at the trigger hypothesis in a cued language switching experiment with average and high proficiency bilinguals who have a low or high L2 background. This research has found asymmetrical switching comparing switches from L1-L2 and L2-L1, in average and high fluent Dutch-English bilinguals (Costa & Santesteban, 2004; Costa & Santesteban, 2016). The results from this thesis show that average proficiency bilinguals show cognate facilitation, but only when switching from L1 to L2. Otherwise, cognates do not seem to facilitate language switching. This research has also found inhibition when switching from L2 to L1. However, this inhibition was likely caused by the switch direction (L2-L1), and not by the presence of cognates.

The results from this research can enable future researchers to pay attention to the influence of different participant related variables on inhibition and facilitation due to cognates. The issue at hand is still how cognates can facilitate the speech of bilinguals, as there seems to be multiple suggestions that cognates are not as facilitating as previous research has argued (Costa & Santesteban, 2016). The influence of participant proficiency and L2 background on language switching experiments with cognates thus remains a topic which should to be explored further. With regard to cognates specifically, the participant variables do not seem to interact, yet these participant related variables may influence language switching (or code-switching) by themselves.

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Appendix I: L2 Background test (including scores)
Minimum score: 0 points
Max score: 115 points

Basic questions (no points)
What is your name?
What is your age?
What studies do you do?

(1)Heb je in een Engelstalig land geleefd (langer dan 3 maanden)? (have you lived in an English speaking country for over 3 months)
0 Ja (yes) – 10 points
0 Nee (no)- 0 points

(2) Wanneer ben je begonnen met Engelse les? (when did you start English classes)
0 Basisschool (elementary school) – 10 points
0 Middelbare school (high school)- 5 points
0 Universiteit(university)- 0 points
0 Anders(other) (points depend on answer)

(3)Welke taal spreek je in je dagelijkse leven? (what language do you speak in your daily life)
0 English
0 Dutch
0 Other
If English is one of the selected options: 10 points

(4) Geef aan hoeveel je de onderstaande talen spreekt (how much do you speak these languages- in percentages)
English: …%
Dutch: … %
Other: …%
If English is 40% or higher - 10 points,
If English is 20 to 40% - 5 points
If English lower than 20% - 0 points

(5)In welke taal krijg jij op het moment les? (in what language do you get classes)- multiple answers possible
0 Dutch
0 English
0 Other
If English is one of the answers 10 points

(6)Hoe vaak lees je boeken of teksten in het Engels (in je vrije tijd)? (Do you often read books in English in your free time)
Alleen maar! (all the time) – 10 points
Vaak (often) – 8 points

Soms (sometimes) – 4 points
Nooit (never)– 0 points

(7) Hoe vaak kijk je een Engelstalige film/TV zonder ondertiteling (in je vrije tijd) (how often do you watch TV/film in English without subtitles)
Alleen maar! (all the time) – 10 points
Vaak (often) – 8 points
Soms (sometimes) – 4 points
Nooit (never)– 0 points

(8) Name the top 5 people you speak to in a day, and state the language in which you communicate
If 1 person they speak to in English 2 points
If 2 person they speak to in English 5 points
If 3 person or more speak to in English 10 points

(9)Gebruik je wel eens Engelse woorden in plaats van Nederlandse woorden, in Nederlandse zinnen? (do you ever use English words instead of Dutch words in Dutch sentences?)
0 Ja, heel vaak (yes, very often)- 10 points
0 Soms (sometimes) – 5 points
0 Nooit (never) – 0 points

(10) Wanneer gebruik je Engelse woorden in een Nederlandse context? (when do you use English words in a Dutch context)
0 Vrij, wanneer ik er zin in heb (I use it freely, when I feel like it) – 10 points
0 Stopwoord (as an expletive) – 0 points
0 Als ik iets in het Engels heb gelezen/gezien (when I've read/seen something in English) – 5 points

Do you agree with these statements?
(11)Ik gebruik Engels alleen op de universiteit(I only use English at university)
Oneens (disagree)- 5 points
Otherwise- 0 points

(12) Ik vind dat ik goed Engels kan (I think my English is good)
Eens(agree) – 5 points
Otherwise – 0 points

(13) Ik vind het leuk om Engels te spreken (I like to speak English)
Oneens (disagree) – 0 points
Eens (agree)- 5 points

Appendix II: Word frequencies (English and Dutch)

ENGLISH COGNATE SEQUENCES

starter word		cognate		target word	
lemon	233	crab	80	Bag	1098
king	1598	ball	1664	Key	1255
tree	1293	nest	237	money	7226
snail	46	boat	1000	Bird	752
chick	34	clock	637	Bat	155
duck	73	pizza	28	Dog	1233
belt	364	ring	628	Box	704
fairy	196	apple	315	rabbit	189
branch	961	bell	493	Pig	320
ant	69	sock	48	Hat	950
cloud	536	bed	4376	bottle	1479
bucket	237	bus	1155	dress	1332
cherry	83	arm	1860	plane	815
axe	127	bomb	500	shark	246
bone	478	heart	2597	rooster	10
monkey	162	ladder	238	plate	656
peacock	52	zebra	12	Map	541
caterpillar	32	piano	466	Bull	378
letter	2166	lamp	381	flower	476
broom	116	book	4832	Bike	149
unicorn	12	foot	1753	snake	251
squirrel	63	fork	215	thumb	401
tie	343	cat	739	desert	666
seagull	18	pear	44	carrot	45
AVERAGE	387.1667		1052.957		888.625

DUTCH TRANSLATION COGNATE SEQUENCES

starter word		cognate		target word	
citroen	397	krab	77	Tas	1371
koning	3674	bal	886	sleutel	1481
boom	2227	nest	809	Geld	11691
slak	67	boot	2085	vogel	1489
kuiken	41	klok	1118	vleermuis	132
eend	500	pizza	53	hond	4546
riem	568	ring	1017	doos	951
fee	73	appel	304	konijn	429
tak	780	bel	807	varken	436
mier	59	sok	88	hoed	1314
wolk	630	bed	12052	Fles	3133
emmer	564	bus	1473	Jurk	1422
kers	41	arm	4439	vliegtuig	1577

bijl	322	bom	518	Haai	59
bot	246	hart	7773	Haan	520
aap	490	ladder	506	Bord	1622
pauw	193	zebra	29	kaart	2240
rups	53	piano	643	Stier	446
brief	4817	lamp	873	bloem	634
bezem	113	boek	10577	Fiets	1768
eenhoorn	23	voet	4069	slang	761
eekhoorn	57	vork	425	Duim	1070
das	231	kat	2081	woestijn	779
meeuw	159	peer	190	wortel	542
AVERAGE	680.2083		2203.833		1683.875

ENGLISH NON COGNATE SEQUENCES

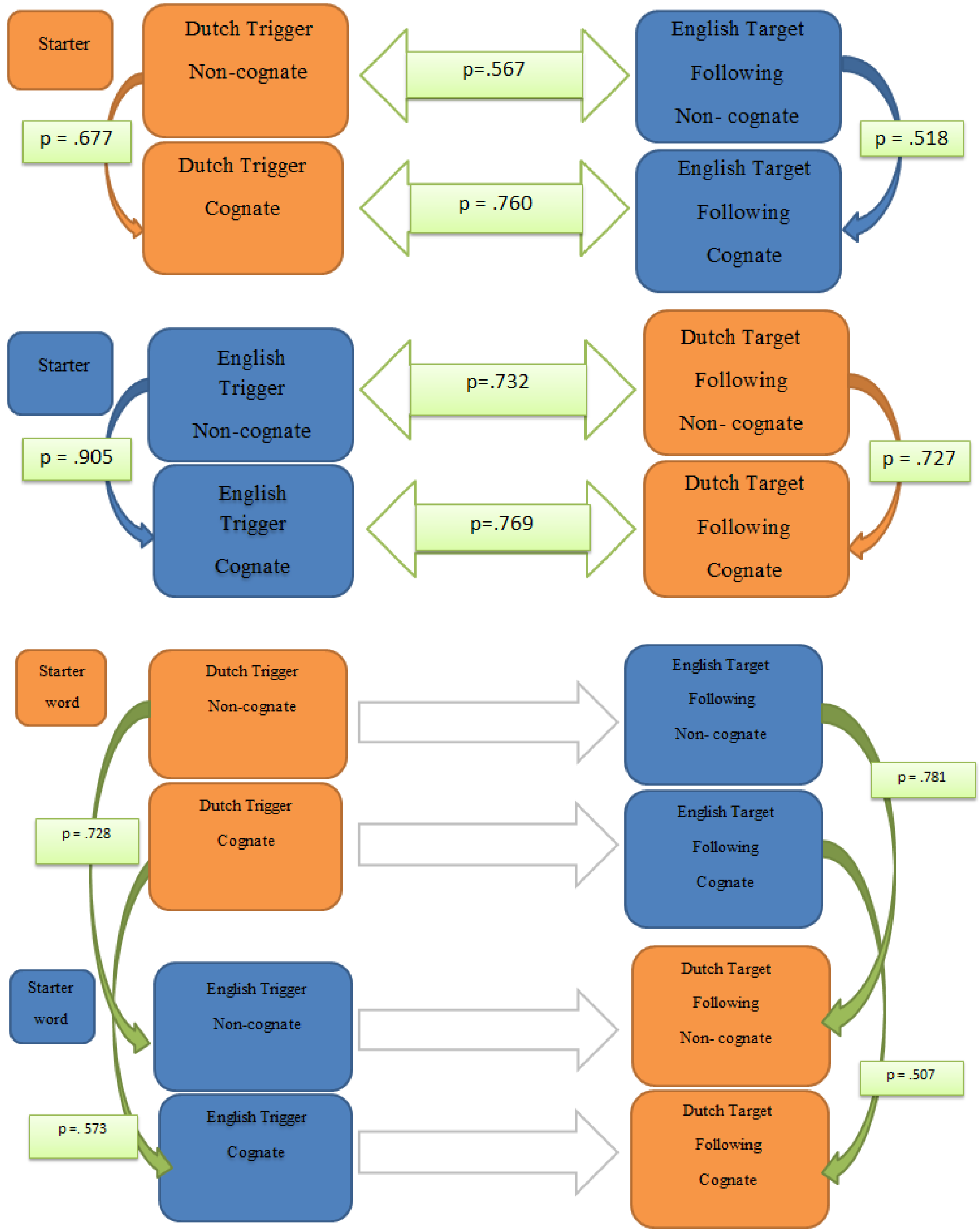
starter word		non cognate word		target word	
bra	88	seesaw	12	Coin	132
eel	79	log	134	candle	140
dragon	135	pocket	1003	Egg	661
mop	38	ghost	351	tooth	233
cake	375	chair	1840	glasses	571
whistle	140	chest	778	window	2372
flute	44	tear	72	present	2686
butterfly	88	gun	1138	Eye	2284
pool	584	knife	635	wing	573
hippo	13	skeleton	150	horse	1518
witch	279	frog	74	curtains	438
shovel	57	scarf	142	Tap	261
swing	252	pencil	276	turkey	173
moose	7	corn	429	Lion	152
bow	164	queen	889	bridge	1034
straw	397	church	2844	square	890
rope	552	rocket	142	drum	134
slide	153	lettuce	115	feather	95
rain	1255	fire	2626	dentist	115
drill	109	peanut	49	spoon	201
nail	180	toe	162	donkey	162
shoelace	6	car	4944	stairs	789
sword	237	umbrella	203	Fish	1438
pineapple	44	spider	73	strawberry	50
AVERAGE	219.8333		795.0417		737.8261

DUTCH TRANSLATION NON COGNATE SEQUENCES

starter word	non cognate word	target word

beha	166	wip	39	Munt	356
paling	188	stam	846	Kaars	403
draak	298	zak	2776	Ei	1134
dweil	86	spook	313	Tand	511
taart	341	stoel	4957	Bril	1347
fluitje	125	borst	2973	Raam	4759
fluit	201	traan	182	cadeau	569
vlinder	193	geweer	1357	Oog	7251
zwembad	586	mes	1396	vleugel	639
nijlpaard	36	geraamte	139	Paard	4211
heks	464	kikker	184	gordijn	647
schep	47	sjaal	270	Kraan	425
schommel	75	potlood	443	kalkoen	84
eland	20	mais	344	Leeuw	641
strik	101	koningin	1699	Brug	1720
rietje	94	kerk	7184	vierkant	234
touw	1072	raket	224	trommel	608
glijbaan	23	sla	337	Veer	90
regen	2259	vuur	3898	tandarts	517
boor	69	pinda	10	Lepel	480
spijker	200	teen	314	Ezel	330
veter	55	auto	7000	Trap	3803
zwaard	527	paraplu	320	Vis	1917
ananas	94	spin	236	aardbei	18
AVERAGE	305		2277.652		1406

Appendix III: Wordfrequency visual aid



Appendix IV: Wordform frequency t-tests

Table 1: *cognate VS non-cognate triggers*

Triggers	*N*	*M*	*SD*	*Sig*	*T*	*p*
Dutch cognate VS	12	1731	3307	. 422	22	. 677
Dutch non-cognate	12	1286	1539			
English cognate VS	12	1136	1427	.121	22	.905
English non-cognate	12	1063	1568			

Table 2: *cognate VS non-cognate triggers in between languages*

Triggers	*N*	*M*	*SD*	*Sig*	*T*	*p*
Dutch cognate VS	12	1731	3307	. 572	22	. 573
English cognate	12	1136	1427			
Dutch non-cognate VS	12	1286	1538	.352	22	.728
English non-cognate	12	1063	1568			

Table 3: *comparing targets preceded by a cognate and a non-cognate, word form frequencies*

Targets	*N*	*M*	*SD*	*Sig*	*T*	*p*
Dutch preceded by cognate VS	12	1002	655	.354	22	.727
Dutch preceded by non-cognate	12	870	1106			
English preceded by cognate VS	12	1391	1892	. 657	22	. 518
English preceded by non-cognate	12	989	957			

Table 4: *comparing targets preceded by a cognate or a non-cognate, in between languages*

Targets	*N*	*M*	*SD*	*Sig*	*T*	*p*
Dutch preceded by cognate VS	12	1002	655	-. 674	22	. 507
English preceded by cognate	12	1391	1892			
Dutch preceded by non-cognate VS	12	870	1106	-.282	22	.781
English preceded by non-cognate	12	989	957			

Table 5: *triggers compared to targets in word form frequencies*

Trigger VS target	*N*	*M*	*SD*	*Sig*	*T*	*p*
Dutch non-cognate trigger VS	12	1286	1538	.568	22	. 567
English target	12	989	957			
Dutch cognate trigger VS	12	1731	3307	.309,	22	.760
English target	12	1391	1892			
English non-cognate trigger	12	1063	1568	.348	22	.732
Dutch target	12	870	1107			
English cognate trigger	12	1136	1427	.298	22	.769
Dutch target	12	1002	655			

Appendix V: Complete wordlist (cognate/non-cognate sequences AND fillers)

Starter	Trigger	Target	Filler
lemon	crab	Bag	diamond
king	ball	Key	handcuffs
tree	nest	Money	hot air balloon
snail	boat	Bird	swiss army knife
chick	clock	Bat	wheat
duck	pizza	Dog	wheelbarrow
belt	ring	Box	eagle
fairy	apple	Rabbit	mountain
branch	bell	Pig	backpack
ant	sock	Hat	fireman
cloud	bed	Bottle	globe
bucket	bus	Dress	rollerskate
cherry	arm	Plane	sunflower
axe	bomb	Shark	trafficlight
bone	heart	Rooster	window
monkey	ladder	Plate	cross
peacock	zebra	Map	barrel
caterpillar	piano	Bull	bathtub
letter	lamp	Flower	beaver
broom	book	Bike	calendar
unicorn	foot	Snake	scissors
squirrel	fork	Thumb	notebook
tie	cat	Desert	peach
seagull	pear	Carrot	grenade
non-cognate seq			
bra	seesaw	Coin	coffin
eel	log	Candle	pacifier
dragon	pocket	Egg	finger print
mop	ghost	Tooth	hourglass
cake	chair	Glasses	tape measure
whistle	chest	Window	asparagus
flute	tear	Present	sewing machine
butterfly	gun	Eye	fireplace
pool	knife	Wing	stilts
hippo	skeleton	Horse	chicken
witch	frog	Curtains	firetruck
shovel	scarf	Tap	jumprope
swing	pencil	Turkey	stove

moose	corn	Lion	branch
bow	queen	Bridge	caravan
straw	church	Square	clover
rope	rocket	Drum	vase
slide	lettuce	Feather	fly
rain	fire	Dentist	dove
drill	peanut	Spoon	triangle
nail	toe	Donkey	hopscotch
shoelace	car	Stairs	stapler
sword	umbrella	Fish	coach
pineapple	spider	Strawberry	ponytail

filler	filler	Filler	filler
phone	remote control	Microwave	banjo
watch	treasure chest	Mask	desert
(hair)brush	vacuum cleaner	Astronaut	fishingpole
couch	giraffe	Pumpkin	lighthouse
bread	banana	Windmill	mailbox
comb	safetypin	Owl	tricycle
well	wheelchair	Elephant	squid
deer	dragonfly	Mouse	acorn
leopard	dresser	Finger	whale
blouse	refridgerator	Alligator	soap
computer	rocking chair	Castle	toothbrush
dancer	otter	Diver	pcmouse
sun	table	Dolphin	crown
moon	fox	Wig	tongue
cobweb	gorilla	Football	tshirt
arrow	tiger	Train	desk
bee	turtle	Fence	hammock
beard	wellies	Bagpipe	playingcards
beetle	goggles	Piggybank	keyboard
bandaid	kettle	Barn	washingmachine
helmet	camel	Braid	mug
accordion	baby carriage	Chick	earring

Appendix VI: t-test result tables and ANOVA tables

Table 1: *t-test testing cognate, non-cognate condition*

Direction		Preceder	*N*	*M*	*SD*	*Sig*	*T*	*P*
L1-L2	RT3	Cognate	326	1077.70	315.097	.191	-2.625	.009
		Non-cognate	269	1149.62	352.782			
L2-L1	RT3	Cognate	278	1205.05	381.312	.363	.053	.958
		Non-cognate	287	1203.41	352.522			

Table 2: *Results t-test grouped according to the Oxford English Language Test. AV= the average proficiency group, H= the high proficiency group*

Direction	Groups		Trigger	*N*	*M*	*SD*	*Sig*	*T*	*p*
L1-L2	AV	RT3	Cognate	169	1110.11	331.870	.177	-2.352	.019
			Non-cognate	134	1205.39	371.915			
	H	RT3	Cognate	157	1042.81	293.041	.681	-1.423	.156
			Non-cognate	135	1094.26	324.692			
L2-L1	AV	RT3	Cognate	140	1237.64	345.417	.640	.279	.781
			Non-cognate	141	1226.09	349.223			
	H	RT3	Cognate	138	1171.98	413.207	.112	-.209	.835
			Noncognate	146	1181.51	355.502			

Table 3: *t-test on switch direction between the two proficiency groups*

	Trigger		Direction	*M*	*SD*	*Sig*	*T*	*P*
AVERAGE	Cognate	RT3	L1-L2	1110.11	331.870	.611	-3.301	.001
			L2-L1	1237.64	345.417			
	Non-cognate	RT3	L1-L2	1205.39	371.915	.701	-.476	.634
			L2-L1	1226.09	349.223			
HIGH	Cognate	RT3	L1-L2	1042.81	293.041	.001	-3.058	.002
			L2-L1	1171.98	413.207			

Non-cognate	RT3	L1-L2	1094.26	324.692	.263	-2.143	.033
		L2-L1	1181.51	355.502			

Table 4: *A t-test with a subdivision by background test results*

Direction	Groups		Trigger	*M*	*SD*	*Sig*	*T*	*P*
L1-L2	Low	RT3	Cognate	1148.25	345.272	.247	-1.752	.081
			noncognate	1228.47	401.419			
	High	RT3	Cognate	1021.18	276.902	.480	-2.029	0.43
			noncognate	1085.15	293.351			
L2-L1	Low	RT3	Cognate	1269.16	406.518	.691	-.230	.818
			noncognate	1280.55	375.747			
	High	RT3	Cognate	1149.54	350.032	.404	.083	.934
			noncognate	1146.38	323.808			

Table 5: *T-test distinguishing between switch direction between the background test groups*

	Trigger		Direction	*N*	*M*	*SD*	*Sig*	*T*	*P*
LOW	Cognate	RT3	L1-L2	145	1148.25	345.272	.191	-2.662	.008
			L2-L1	129	1269.16	406.518			
	Non-cognate	RT3	L1-L2	121	1228.47	401.419	.791	-1.044	.297
			L2-L1	122	1280.55	375.747			
HIGH	Cognate	RT3	L1-L2	181	1021.18	276.902	.006	-3.719	.000
			L2-L1	149	1149.54	350.032			
	Non- cognate	RT3	L1-L2	148	1085.15	293.351	.228	-1.746	.080
			L2-L1	165	1146.38	323.808			

Table 6:*Mixed ANOVA results looking at interactions between BGtest (L2 background test), trigger type (cognate or non-cognate) and switch direction (L1-L2 or L2-L1)*

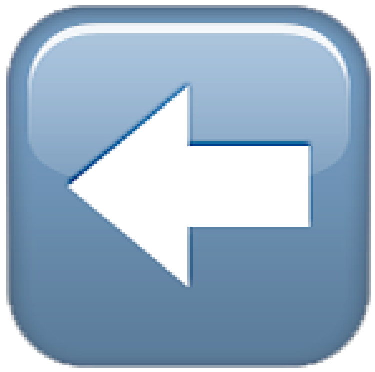
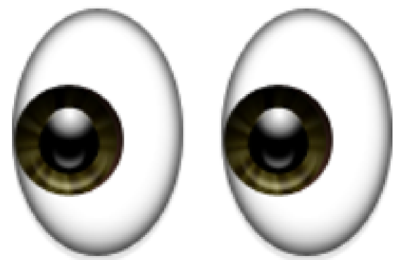
Source	Df	F	Sig.
Trigger	1	3.490	.062
Switch direction	1	19.751	.000
Bgtest	1	41.284	.000
trigger * direction	1	2.777	.096
trigger * Bgtest	1	.143	.706
direction * Bgtest	1	.041	.839
trigger * direction * Bgtest	1	.000	.983
Error	1152		
Total	1160		

Table 7: *Mixed ANOVA results looking at interactions between proficiency score, trigger type (cognate or non-cognate) and switch direction (L1-L2 or L2-L1)*

Source	Df	F	Sig.
Trigger	1	3.110	.078
Switchdirection	1	19.748	.000
Proficiency	1	12.375	.000
trigger * direction	1	3.286	.070
trigger * Proficiency	1	.077	.782
switchdirection * Proficiency	1	.691	.406
trigger * direction * Proficiency	1	.626	.429
Error	1152		
Total	1160		

Appendix VII: Recruitment flyer

Heb jij *good eyes?*

Who? Ben jij een student jonger dan 25 jaar, is Nederlands jouw moedertaal en spreek je ook een beetje Engels? Dan zoek ik jou!

What? Een experiment waarbij je plaatjes bekijkt. Je mag níet kleuren blind zijn! Maar je mag wel een bril of lenzen dragen.

Where? Lipsius 1.04, het EEG lab.

When? In overleg, dus kan ook tussen je lessen door! (doordeweeks in mei)

How long? 35 minuten (ruim gerekend)

Appendix VIII: Written introduction to experiment task

This introduction was also accompanied by an oral explanation before the participants entered the booth of the experiment. The participants were told to reply as fast as they could, and to only name the picture in front of them (so e.g. if the participant had skipped a picture, they were expected to continue with the next without still naming the skipped picture)

Scherm 1:Welkom bij dit experiment! (druk op spatiebalk)

Scherm 2: Straks krijg je plaatjes te zien met een gekleurde rand. Deze plaatjes moet je benoemen aan de hand van deze gekleurde rand.

Plaatjes met een blauwe rand benoem je in het Engels.

Plaatjes met een rode rand benoem je in het Nederlands.

Je hebt 3 seconden om een plaatje te benoemen, na 3 seconden word je automatisch naar het volgende plaatje gebracht.

Scherm 3: Eerst een test, je krijgt nu 6 plaatjes te zien. Probeer deze plaatjes te benoemen in de juiste taal.

(trial run)

Scherm 4: Goed gedaan! Druk op de spatiebalk om het echte experiment te starten. Hierna heb je de spatiebalk niet meer nodig. (druk op spatiebalk)

(The introduction was written in English, but I will provide an English translation)

Screen 1: Welcome to this experiment! (press space to continue)

Screen 2: You will see pictures with a colored border. You are expected to name these pictures according to the color of the border.

Pictures with a blue border have to be named in English.

Pictures with a red border have to be named in Dutch.

You have 3 seconds to name a picture, after 3 seconds you will go to the next picture automatically.

Screen 3: First there is a test, you will see 6 images. Try to name these pictures in the correct language.

(trial run)

Screen 4: Well done! Press the spacebar to start the real experiment. Once you've started the experiment you will not need the spacebar anymore. (press spacebar)

Appendix IX: List of glosses

(1) "He bought me a *ring* met een grote diamant."

He bought me a ring (Eng.) with a large diamond(Dut.).

'He bought me a ring with a large diamond.'

(2) "Ich muss ab und zu in einem Dictionary *kijken*"

I have to every now and then in the (Ger.) dictionary (Eng.) look + inf (Dut.)

'I have to look in the dictionary every now and then' (MTGED 25f)

(Clyne, 2003, p. 163)

(3) "En we reckoned Holland was

And (Du) we reckoned Holland was (En)

too *smal* voor ons. Het was te benauwd allemaal"

Too (En) small for us (Du) It was too oppressive everyting

'and we reckoned Holland was too narrow/small for us. It was all too oppressive everything' (MD 198f)

(Clyne, 2003, p.164)

(4) "Ik heb gelezen '*Snow White* come home' it's about a winter pet"

I have read (Du) 'Snow white come home' it's about a winter pet (En)

'I have read: "Snow White come home" it's about a winter pet' (MD 101f, second generation)

(Clyne, 2003, p. 165)

(5) "Drink gin in restaurant, whiskey in hotel, champagne in bed. Later effect: Oh God, migraine. Tablet in warm water!"

Drink gin in restaurant, whiskey in hotel, champagne in bed. Later effect: Oh God, migraine. Tablet in warm water (both Eng. and Du.)

"Drink gin in restaurant, whiskey in hotel, champagne in bed. Later effect: Oh God, migraine. Tablet in warm water".

(Dijkstra, Miwa, Brummelhuis, Sapelli, Baayen, 2010, p.284; Peter Verstegen)

(6) "I was watching Sherlock yesterday and I realized I had to do…

I was watching Sherlock yesterday and I realized I had to do (Eng.)

my homework. Dus heb ik mijn hond mijn huiswerk laten opeten."

my homework (En) So had I my dog my homework let eat (Du).

'I was watching Sherlock yesterday and I realized I had to do my homework. So I let my dog eat my homework.'

(7) "Sometimes I'll start a sentence in English *y termino en español*"

Sometimes I'll start a sentence in English (Eng.) and end in Spanish (Spanish)

'Sometimes I'll start a sentence in English and I'll end it in Spanish'

(Poplack 1980)

(8) "You don't see <u>*dat*</u> in Australië"

You don't see (Eng.) that in Australia (Du.)

'You don't see <u>*that*</u> in Australia' (MD 17f)

(Clyne, 2003, p. 174)

(9) "Wir packen alle die alte Kleider, das für <u>*the missions*</u>"

we pack all the old clothes that for (Ger.) the missions (Eng.)

'we pack all the old clothes that for <u>*the missions'*</u>

(Clyne, 2003, p. 174)

(10) "Drie, <u>*nou*</u>, <u>*it's Three Double Y R*</u> nennen sie das"

Three now (Du) it's Three Double YR (En) call they it (De) 'three now, it's Three Double YR they call it'(DE/G 22m)

(Clyne, 2003, p.

166)

(11) "Ik ga, ik moet (A).. dingen van de *shops* einkaufen"

I go, I have to (A).. things from the (Dut.) shops (Eng.) buy+inf (Ger.)

'I go, I have to buy things from the shop'

(Clyne, 2003, p. 16)