# Cognate effects in intra-sentential codeswitching in trilinguals - evidence from a read-aloud task

Annika Schimpff

Supervisor: Prof. Dr. M. Gullberg

Centre for Language and Literature, Lund University

MA in Language and Linguistics, General Linguistics

SPVR01 Language and Linguistics: Degree Project – Master's (Two Years) Thesis, 30 credits

August 2021

# Abstract

This thesis examines the effect of cognates on codeswitching in planned speech production in trilinguals, which has previously been unexplored. Previous studies on cognates and codeswitching have primarily focused on cognate facilitation effects in spontaneous speech in bilinguals. While experimental studies have gradually acknowledged the importance of investigating codeswitching in a sentence context, much research has focused on single word switches. This study focuses on switched NPs preceded by verb cognates (shared between two or three languages) using a read-aloud task to explore whether different cognate status affects switching difficulty in 30 trilingual speakers of German, English and Danish. Three cognate and a control condition were established and compared with each other. Drawing on Li and Gollan´s (2018a) study examining switches in a read-aloud task, the present study coded production for intrusions and hesitation markers as indicators of switching difficulty. The study also examined speech-error corrections as a measure of degree of speech-monitoring. Issues of language dominance and age of acquisition were also considered as potential factors influencing codeswitching difficulty in trilinguals.

The results show that the presence of verbs with different cognate status prior to switches affect production. Triple cognates appeared to facilitate- or at least lower processing difficulty of switches. In contrast, double cognates between German and English caused significantly more hesitation phenomena and intrusions. Further, noncognates also led to switching difficulty. Speech-monitoring was found to be strongest in the control condition, yet focusing on corrections of intrusion errors, the cognate conditions elicited faster detection and correction.

Overall, the study provides grounds for discussion of how cognates affect levels of language activation and language selection in trilinguals, as well as the theoretical frameworks of switching patterns and more general models of bi-/multilingual language processing.

***Keywords****: cognates, codeswitching, read-aloud task, language processing, language activation, speech monitoring, planned speech production*

# Acknowledgements

First and foremost, I want to thank my supervisor Marianne Gullberg for exceptional support throughout the entire process from finding my topic, to finalizing my thesis. I cannot thank her enough for motivating, advising, and encouraging me. Every discussion left me feeling more positive and her wisdom and knowledge continue to inspire me.

Tusind tak, danke, thank you to my friends Helene, Tina, Laura, Andrea, Kathleen, Anders and my partner Mads for brainstorming suitable stimuli for my experiment, providing me with feedback, and piloting my experiment. I am very grateful to all who showed interest in my study and were willing to discuss codeswitching with me over the last year.

Ich möchte mich auch herzlich bei meiner Familie bedanken, dafür dass ihr an mich geglaubt habt, immer ein offenes Ohr für mich hattet und stets die richtigen Worte gefunden habt, um mich aufzumuntern und zu bestärken.

I would also like to express my thankfulness to my professors who taught me during the past two years of the General Linguistics program at Lund University. Special thanks to Jordan Zlatev for helping me organize Danish vouchers for my participants and to Åsa Wikström for helping me sort out my elective courses and assisting me with any study-related matters.

Further, I want to acknowledge Zhexiao Guo for helping me fix any issues with respect to the Language History Questionnaire.

Finally, I am thankful for the companionship and comfort of my bunny Jolle, a constant rock by my side during the writing process and jumping on my lap to gently force me to take breaks.

# Table of contents

# List of figures



# List of tables

# Abbreviations

| | |
|---|---|
| ANOVA | Analysis of variance |
| BIA | Bilingual Interactive Activation |
| BNC | British National Corpus |
| CP | Projection of complementizer |
| CS | codeswitch/ing |
| EWC | English Web Corpus |
| G-D | German-Danish |
| G-E | German-English |
| GDS | German-Danish sub-group |
| GS | German sub-group |
| ICM | Inhibitory Control Model |
| L1 | First language |
| L2 | Second language |
| L3 | Third language |
| LHQ | Language History Questionnaire |
| NP | Noun phrase |
| RHM | Revised Hierarchical Model |
| RMANOVA | Repeated measures analysis of variance |
| SD | Standard deviation |
| VP | Verb phrase |

# 1 Introduction

Codeswitching (CS) is a common phenomenon among bilingual and multilingual speakers. Alternating between languages has been found to be affected by sociolinguistic as well as psycholinguistic factors. Among the psycholinguistic factors that have been discussed as contributing to CS we find the role of cognates as triggers to switching. From a psycholinguistic point of view, cognates are words that share meaning and form between two or more languages (e.g *Mann* 'man'). Clyne (1967, 2003) proposed the "triggering hypothesis", which predicts that codeswitching can be triggered and facilitated by cognates. Multiple studies have found evidence that cognates increase co-activation between languages and subsequently facilitate codeswitches (e.g., Van Assche et al., 2013).

Much of the research pointing at the faciliatory effects of cognates have examined codeswitches in spontaneous language production (e.g Lijewska & Chmiel, 2015; Rosselli et al., 2014). A recent study by Li and Gollan (2018a) tested whether cognates facilitate switches in planned speech using a read-aloud task. Their study showed that cognates led to more intrusion errors, indicating increased dual-language activation. Therefore, cognates were associated more with cross-language interference than facilitation. However, they found that intrusion errors with cognate targets were corrected more rapidly than noncognates. Thus, while cognates caused more switching difficulty, speech error monitoring appeared to be facilitated by cognates.

Inspired by Li and Gollan´s (2018a) study, the present study aims to investigate whether cognates preceding switched noun phrases (NPs) in planned, connected speech cause more switching difficulty than noncognates. Additionally, the study will focus on trilingual speakers and thus distinguish between double and triple cognates shared between three typologically related languages. More specifically, using a read-aloud task, the present study will manipulate cognate status of words preceding a switch to investigate how cognates affect switch cost as well as error-detection in German, English and Danish. While Li and Gollan´s (2018a) study focused solely on phonological overlap, this study will select verb cognates that also involve orthographic overlap,

due to the typological proximity of the three languages. The issue of language dominance and age of acquisition will also be considered, since previous studies have shown that these factors may play a key role in codeswitching (Bultena et al., 2015; Li & Gollan, 2018a).

# 2 Background

## 2.1 Codeswitching – terms and definitions

Codeswitching is a phenomenon unique to bilingual and multilingual individuals and refers to the alternation of two or more languages in a single conversation (Basnight-Brown & Altarriba, 2007). This linguistic behaviour can be illustrated in the following example[1] 1 from a conversation between two bilingual Spanish-English speakers, taken from the Codeswitching Map Task corpus (Beatty-Martínez et al., 2017):

*(1) I was like, si me hacen una pregunta de how would I say this. I wouldn't be able to say it si me están haciendo consciously say it.*
'I was like, if they ask me a question on how I would say this. I wouldn't be able to say it if they are making me consciously say it.'

MacSwan (2000, p.38) describes codeswitching as a speech style "in which fluent bilinguals move in and out of two (or more) languages". With the increase of multilingualism, a growing body of literature has sought to examine codeswitching behaviour in both adults and children (Basnight-Brown & Altarriba, 2007). Subsequently, various definitions have been proposed and led to the introduction of multiple terms to distinguish between different types of language contact. Some definitions draw on formal aspects, while others are primarily concerned with functional features (Stavans & Swisher, 2006).

Gumperz (1967) first introduced the term *codeswitching* by referring to it as a discourse strategy applied by bilingual speakers. Hence, Gumperz (1967) recognised codeswitching as a phenomenon used by competent speakers of two languages. This important characteristic of competence has often been neglected and overshadowed by associating codeswitching with disfluency in both or one of the languages (see section 2.1.1).

[1] Spanish is underlined in the codeswitched example and its translation in the English translation below.

Notions of *codeswitching* and *codemixing* are commonly used interchangeably, however, differences have been specified in previous research (Altarriba & Santiago-Rivera, 1994). Originally, codemixing was defined as alternating between languages within a single sentence (intra-sentential), as seen in example 2 (French-Arabic):

*(2)* J'ai *joué avec* *il-ku:ra*[2]
'I have played with the ball' (Belazi et al., 1994, p.227).

This contrasts with codeswitching between languages across sentence boundaries (inter-sentential) as a result of situational change regarding the topic or interlocutors of a conversation (Altarriba & Santiago-Rivera, 1994; Basnight-Brown & Altarriba, 2007; Sridhar & Sridhar, 1980). Example 3 illustartes inter-sentential codeswitching:

*(3) The route was identical to the one of the coffee. I used the countries in the labels. Despois deseñei o mapa.*
'The route was identical to the one of the coffee. I used the countries in the labels. Then, I designed the map' (San Isidro & Lasagabaster, 2019, p.346).

Muysken (1997, 2000), who prefers the term codemixing[3], differentiates between three distinct types of codemixing: (a) insertion (b) alternation, and (c) congruent lexicalization. Insertional CS refers to contexts, where a constituent, typically consisting of a noun or noun phrase, is inserted from the guest language. This process is viewed as akin to borrowing, the difference being that instead of a single lexical item, several items (belonging to one constituent) may be inserted into a given structure. Inserted words are most commonly content words (nouns, adjectives, verbs). In Muysken´s (2000) framework, the term alternation is similar to CS. However, while CS has been referred to as switching between as opposed to within sentences, Muysken (2000) emphasises that alternation may take place inter- and intra-sententially. Contrary to insertions, alternation may be recognised by increased length and complexity of the mixed structures. Further, a variety of

[2] The switched phrase is underlined in this example and all following examples.

[3] Muysken (2000) advocates using the term code-mixing instead of codeswitching. In his opinion, only one of the three processes of code-mixing can be referred to as codeswitching (alternation). Code-mixing, to him, is a more neutral term, allowing different types of mixing (including borrowing and interference), while the *switching* is too specific to the alternation type of mixing languages.

elements may be alternated, including function words, adverbs and discourse particles (Muysken, 2000). In examples of alternation and insertion, both languages remain relatively separate. Congruent lexicalisation, finally, denotes "a situation where the two languages share a grammatical structure which can be filled lexically with elements from either language" (Muysken, 2000, p.6). As such, congruent lexicalization is mostly observed between related languages, although the grammatical structures of sentences may not necessarily be fully shared. In contrast to alternation and insertion, there is no default language, since the lexical elements of two languages are inserted into a shared grammatical structure. In congruent lexicalization, mixing of any lexical categories is common and multi-constituent mixing is possible due to a shared syntactic structure between the languages. Muysken (2000) shows that classifying examples of mixing found in real speech data according to one of the three processes may not always be straightforward.

Codeswitching is often distinguished from other language contact phenomena, such as borrowing, code-shifting (Silva-Corvalán, 1983) and transfer (Müller et al., 2015; Poeste et al., 2019). *Borrowing* is a process in which single lexical items are included in an otherwise monolingual conversation (Grimstad, 2017). A requirement for borrowing is that a conversation is led using a default language, also coined the recipient language, and the borrowed items (guest words) are inserted from the so-called donor language (Grimstad, 2017; Grosjean, 1995). Specifically, borrowing has primarily been used with respect to lone donor-language words or word-stems (Grimstad, 2017). Many researchers agree that "borrowings are completed processes of language change" (Grimstad, 2017, p.3), meaning that borrowings are established and cannot be spontaneous (Haspelmath, 2009; Myers-Scotton, 1993). Consequently, and unlike codeswitching, borrowing cannot be classified as multilingual discourse (Haspelmath, 2009). There is an existing debate regarding whether or not borrowings originate as codeswitches (Myers-Scotton 1993, 2002; Thomason, 2003), and further distinctions of individual processes involved in borrowings have been proposed (Poplack, 1980; Muysken, 2000, 2013; Stammers & Deuchar, 2012).

*Code-shifting* (unlike codeswitching) has been said to be primarily motivated by the speaker´s own comfort and as having no social function (Silva- Corvalán, 1983). Silva- Corvalán (1983) has outlined the main functions of code-shifting as (1) filling in memory lapses (2) compensating for

the lack of certain lexical items or syntactic structures (3) clarifying a message or making it more precise, and finally (4) evaluating a message. Hence, code-shifting is more closely related to language use of unbalanced individuals or language learners.

In the same vein, the term *language transfer* has often been associated with language learning contexts (Müller et al., 2015). Transfer can be exemplified in instances of speakers using the syntactic structure of one language (e.g the first language) and the language code of another language (e.g the second/third language) (Poeste et al., 2019). Typological proximity between languages may impact on transfer (Poeste et al., 2019). This kind of transfer can have a positive, faciliatory effect or cause interference when acquiring a language that is typologically related to one of the speaker's mastered language/s (Flynn et al., 2004; Poeste et al., 2019). Contrary to codeswitching, transfer focuses on the appropriation of formal features between different languages (Flynn et al., 2004).

Another expression to be clarified is *translanguaging*, denoting both a practice that multilinguals engage in, and the idea that there are no boundaries between codes, but instead only one fluid language with different features that an individual draws on depending on the context (Lewis et al., 2012b). Translanguaging is often viewed as a pedagogy allowing individuals to use all of their linguistic resources in order to make meaning, foster and scaffold learning, and promote a deeper understanding (William, 1994; Cenoz & Gorter, 2015). It has also been suggested that translanguaging may be defined as the process of meaning-making, shaping experience and gaining understanding and knowledge through the use of two or more languages (Lewis et al., 2012a, b).

Lastly, the notion of *language switching* comprises a paradigm more closely related to psychology (Broersma et al., 2020). Language switching focuses on externally generated switches, while codeswitching studies typically focus on internally motivated (spontaneous) switches (Gullberg et al., 2009). Typically, language switching studies focus on single word responses as opposed to switches occurring in sentence contexts (Broersma et al., 2020). Hence, codeswitching refers to switches produced in conversational language and thus either within or between sentences (Broersma et al., 2020). Differences between the two paradigms apply not only to the methods used, but also the strategies used by a speaker and subsequently the psycholinguistic processes

(Broersma et al., 2020; see section 2.2.1). However, experimental studies on both language switching and codeswitching may use methods with externally induced switching cues (Gullberg et al., 2009). Especially when examining the comprehension of codeswitches, language switching techniques are unavoidable (Gullberg et al., 2009). The challenge here is to ensure that switches prompted by language switching methods can be compared to natural codeswitching data (Gullberg et al., 2009). At the same time, it is important to understand that the replication of naturalistic data can only be approached by using elicitation methods. Instead of evaluating which technique or approach is intrinsically the "better" one, the questions a study seeks to answer should be central, and the method chosen accordingly (Gullberg et al., 2009).

> The tension between naturalistic, ecologically valid approaches and more artificial, controlled, experimental techniques should be recognized but also be embraced as a source of complementary information rather than as a false dichotomy between "good" and "bad" approaches to the study of CS. (Gullberg et al., 2009, p.22).

As the above quote clarifies, methods typical for either of the approaches should not be viewed as competitors, but as valuable tools to examine either of the two paradigms: language switching and codeswitching.

In this paper, the term codeswitching (CS) will be adopted as a general term to describe the phenomenon of using more than one language in a single sentence or discourse.

### 2.1.1 Codeswitching as a marker of (in)competence

Early research on CS put forward the view of CS as a reflection of an individual´s incompetence in one or both/multiple language/s (Genesee, 1989; Weinreich, 1953). From the monolingual´s point of view, CS has long been viewed as improper use of either of the languages and even as "an insult to the monolingual's own rule-governed language" (Grosjean 1982, p.146). CS was mainly viewed as a strategy used to compensate for lacking vocabulary or expressions in the target language (Deuchar & Quay, 2000; Genesee, 1989). In addition to the supposed absence of grammatical and lexical knowledge, it was claimed that CS corresponded to a bilingual´s

pragmatic incompetence (Vihman, 1985). It was also assumed that CS indicated confusion and therefore a speaker´s inability to differentiate between two or more language systems (e.g the Unitary Language System Hypothesis; Köppe & Meisel, 1995; Redlinger & Park, 1980).

Multiple studies have challenged these assumptions and found no evidence for an undifferentiated syntactic, lexical, phonological, and pragmatic development in bilinguals (Nicoladis & Genesee, 1997). Many studies have demonstrated that, contrary to previous belief, CS may emphasize a bilingual´s competence of two or more languages (e.g., Yow et al., 2018). Yow et al. (2018) found a positive correlation between Mandarin-dominant English bilingual´s frequency of CS and syntactic complexity used in Mandarin. As such, codeswitching signalled an increase of competency in the weaker language (Mandarin) and may therefore be seen as "as a platform to aid the development of their languages" (Yow et al., 2018, p.1084). Multiple studies reveal the complexity of a bilingual´s CS and their competence to use CS appropriately in different contexts (Chung, 2006; Vu et al., 2010; Yow et al, 2018). Further, studies have shown that in a monolingual context, bi-, tri-, and multilinguals rarely codeswitch, signalling their competence to behave monolingually when appropriate (Poeste et al., 2019).

Research into bilingual and multilingual communities emphasizes the relevance of CS as a useful communicative strategy (Bullock & Toribio, 2009; Grosjean, 1982; Tay, 1989). Linguistic creativity unique to multilinguals, specifically CS, can be viewed as a communicative device allowing individuals to convey a message effectively (Tay, 1989). For example, CS may signal various social functions (Alhourani, 2018; Tay, 1989). Alhourani (2018) highlighted social functions such as change of topic, the expression of feelings, the showing off of language skills, and quoting someone´s speech. Furthermore, CS serves as a marker of social status and identity, and cultural belonging (Bullock & Toribio, 2009; Parafita Couto & Gullberg, 2019; Tay, 1989). Familiarity plays a significant role, since speakers often claim to primarily codeswitch when conversing with friends and family (Grosjean, 1982; Zentella, 1999). However, in multilingual contexts, codeswitching can also be a common practice in formal settings (Baker & Wright, 2017). Certain topics may prompt a speaker´s code choice, either because the topic appears more appropriate in one language or because an individual is more familiar with specialized terms in a particular language (Kim, 2006). It is important to note that speakers may unconsciously switch,

and communicative intent may not always be clear or socially meaningful (Bullock & Toribio, 2009; Tay, 1989). The psycholinguistic implications of CS will be discussed in the following section.

Despite the growing literature highlighting the positive aspects of CS, negative aspects and subsequently attitudes associated with CS persist (Berthele, 2012; Bhatia & Ritchie, 2004). By questioning bilinguals about their attitude toward CS, Grosjean (1982) found that many associated it with negative feelings and poor linguistic performance. Some bilinguals reported to avoid CS completely, while others stated that they selectively codeswitch depending on their interlocutors, formality and the conversational setting (Grosjean, 1982). Unsurprisingly, individuals who have grown up in a multilingual environment have been found to have a more positive attitude towards CS (Dewaele & Wei, 2014). In fact, in many multilingual societies, monolingual discourse is the exception, while CS constitutes the norm (Grosjean, 1982; Baker & Wright, 2017). The relationship between speakers' attitudes towards CS and their own behavior remains an active area of research (e.g., Badiola et al., 2018; Montes-Alcalá, 2000; Parafita Couto et al., 2014; Redinger, 2010; Suurmeijer et al., 2020).

## 2.2 Processing of codeswitches (in production)

Psycholinguistic approaches to CS in production have considered lexical aspects (Costa & Santesteban, 2004; Meuter & Allport,1999) and sentential aspects (Declerck & Philipp, 2015; Kootstra et al., 2012). In both areas, the key issue is whether CS is costly to processing. Findings from lexical processing using the language switching paradigm, tend to show that it is. For sentence production, the picture is more complex. It has been suggested that CS in natural conversations does not always cause processing cost, in fact, speakers may switch in order to avoid cost (Gollan & Ferreira, 2009; Kleinman & Gollan, 2016). Hence, it is important to distinguish between externally prompted switches studied in experimental (laboratory) settings, and internally motivated CS in everyday conversation (Kleinmann & Gollan, 2016). Switches occurring in a sentence context allow us to examine the processing of CS more effectively (Broersma et al., 2020;

Gullberg et al., 2009). While studies focusing on inter- or intra-sentential switches may still be externally induced, they reflect distinct processes from single word switching experiments. In other words, CS in natural conversations is nearly impossible to capture in experimental settings, yet experiments focusing on CS in sentences can provide more comparable data to natural settings.

### 2.2.1 Models of language activation and language selection in CS

Lexical access and the question of how bilinguals select the appropriate language for competing lexical items has been subject to many psycholinguistic studies (Basnight-Brown & Altarriba, 2007; Finkbeiner et al., 2006; Grosjean, 1995; La Heij, 2005). As suggested by Green (1998) a link between language representation in the bilingual´s brain and bilingual language selection exists, and several models have endeavoured to capture and explain this complex process (Basnight-Brown & Altarriba, 2007).

Kroll and Stewart (1994) proposed the *Revised Hierarchical Model* (RHM), a frequently cited model, depicting bilingual language representation. The model distinguishes between lexical and conceptual levels and assumes separate lexicons for each language (Kroll & Stewart, 1994). The model mainly applies to late, unbalanced bilingual speakers and captures the acquisition process of a second language (Kroll & Stewart, 1994). The RHM suggests that the weaker language (L2) relies on lexical mediation through the more dominant language (L1), until the L2 is advanced enough to directly access meaning (Kroll & Stewart, 1994). The model can, however, be adjusted to changes in dominance and more balanced bilinguals (Kroll & Stewart, 1994). Over the years, studies have addressed weaknesses and faults in the RHM, specifically with respect to the assumption that in order to access meaning of L2 words, the L1 serves as a mediator (Kroll et al., 2010).

As an improvement on the RHM, Green (1998) introduced the *Inhibitory Control Model* (ICM). While the RHM is a developmental model, predicting how the lexical mediation will change over time, the ICM addresses how competing lexical items are selected depending on the speaker´s intentions (Green, 1998).

Similar to the RHM, the ICM depicts a language independent conceptualizer that is driven by the speaker´s linguistic goal. In contrast to the RHM, the ICM represents both languages in one single store as opposed to two separate ones. Each lexical item is associated with a language-specific lemma (Roelofs et al., 1998). Hence, each lemma has a language tag (e.g L1 and L2) that affects the lemma activation (Green, 1998a). According to the ICM, linguistic stimuli activate all languages known to a speaker and once it is clear which language is relevant, the other language (default or guest language) is inhibited (Green, 1998a). In the case of sentential CS, changing between different language schemas and managing inhibitory processes, particularly regarding language tags, result in costs (Green, 1998a). In CS, more than one language is active, resulting in cross-language competition between lemmas and the associated language tags. More activated lemmas are expected to be more inhibited and switching back into a language that is strongly suppressed (L1 for unbalanced bilinguals) creates more cost, reflected in longer processing times (Green, 1998). Hence, depending on proficiency or stronger activation of a language, switching direction may also affect the processing cost (Basnight-Brown & Altarriba, 2007; Green, 1998a; Reynolds et al., 2016).

Nonselective activation of both languages has also been proposed by other models, such as the computer-simulated model of *Bilingual Interactive Activation* (BIA and BIA +) (Dijkstra & van Heuven, 1998). Much evidence has been collected supporting the theory of non-selective lexical access (Caramazza & Brones, 1979; de Groot et al., 2000; Kroll & Dijkstra, 2001). In this view, words competing for selection activate both languages even when only one language is required. With the increase of activation in both languages, inhibitory processes for the language that is not being used increase too (Green, 1998b). As such, inhibition for balanced bilinguals is assumed to be greater than for unbalanced bilinguals (Green, 1998b). Since the activation of the more dominant language is stronger, a greater magnitude of inhibition is necessary and thus switching from the less dominant (L2) to the more dominant language (L1) will take more time than switching from L1 to L2 (Basnight-Brown & Altarriba, 2007; Green, 1998a). In line with the ICM, several studies have confirmed this asymmetrical contribution of lexical switching cost (Jackson et al., 2001; Macizo et al., 2012; Meuter & Allport, 1999). However, more symmetrical switching cost has been reported for bilinguals who are equally proficient in both languages (Costa & Santesteban, 2004).

### 2.2.2 Facilitating CS factors (factors that may decrease switch cost)

It has become apparent that the processing of CS depends on a variety of linguistic and extralinguistic variables, such as a speaker´s motivation to- and experience with CS (Kleinman & Gollan, 2016). When bilinguals switch because a word or expression is more accessible in another language, it has been reported that switch cost can be eliminated (Kleinman & Gollan, 2016). Thus, engaging in accessibility-driven CS can abolish top-down processing effects that are commonly reported in experimental studies (Gollan & Ferreira, 2009; Kleinman & Gollan, 2016). In natural settings, this is assumed to be the case since bilinguals easily and fluently switch between languages in natural conversations. On the other hand, even in naturalistic contexts, switching has been found to modulate processing, particularly associated with speech planning (Fricke et al., 2016). Although intentional CS may give rise to an increased processing cost, it may simultaneously be more effective with respect to a speaker´s intentions than remaining in the same language.

In psycholinguistic studies examining CS, switch cost usually originates due to persisting inhibition (Green, 1998a). In typical CS production experiments, participants are cued to switch languages, which causes top-down processing cost (Declerck & Philipp, 2015). There are a number of factors that may reduce switch cost in production. Previous studies have indicated that language preparation may decrease switch cost (Costa & Santesteban, 2004; Fink & Goldrick, 2015). That is, if a speaker can prepare for a CS or predict when to switch, the processing of switches may be facilitated (Fink & Goldrick, 2015). Declereck et al. (2013) conducted a study investigating whether switch costs could be abolished if bilinguals were informed in advance about when to switch languages. Although predictable responses reduced switch cost, it was found that switch cost could not be eliminated (Declerck et al., 2013).

A further factor that has been reported in language switching studies, is the speaker´s experience and frequency of use of CS (Beatty-Martínez & Dussias, 2017; Parafita Couto & Gullberg, 2019). As with any other linguistic (and non-linguistic) task, experience can shape and positively affect ease of processing (Beatty-Martínez & Dussias, 2017; Parafita Couto & Gullberg, 2019). Beatty-Martínez and Dussias´s (2017) study comparing codeswitchers with non-codeswitchers in three

experimental tasks demonstrated that codeswitchers produced more switches and exhibited smaller switching cost than non-codeswitchers. It is proposed that bilinguals that are frequently exposed to CS exhibit different language control processes and strategies than bilinguals who rarely find themselves in codeswitching contexts (Beatty-Martínez & Dussias, 2017). This can be explained by the *Control Processes Model* (CP model; Green & Wei, 2014, 2016). The CP model predicts that language control mechanisms for bilinguals in monolingual and bilingual contexts differ for bilinguals in dense codeswitching contexts (Green & Wei, 2014, 2016). Subsequently, bilinguals experiencing and using less CS, undergo more cross-language competition (competitive control state), when selecting between languages. Frequent codeswitchers, on the other hand, experience more cooperative control states.

> "…while a competitive control state exploits the resources of a single language and requires a narrow focus of attention, a cooperative control state involves a broad focus of attention based on whether resources are recruited from one language or both" (Beatty-Martínez & Dussias, 2017, p.187).

Hence, depending on a bilingual's experience with- and exposure to- CS, different control states may be at play influencing the processing of switches in language production (and comprehension).

### 2.2.3 Location of codeswitches

In a sentence context, the location of a switch has also been subject to much discussion with regards to whether and how it may affect processing of CS (cf. Suurmeijer et al., 2020). By analysing switch patterns in natural language corpora, scholars have attempted to establish and model the rules governing CS. However, it has been noted that solely relying on corpora may not be sufficient, since counterexamples have been demonstrated in studies using various techniques (Gullberg et al., 2009).

Specifically, it has been debated if "switching is preferred between elements which do not hold a government or functional head relation" (Suurmeijer et al., 2020, p.2). Theories such as the

*Functional Head Constraint* posit that producing switches between a head and its complements are unlikely (Belazi et al., 1994). Several early studies challenged this assumption by showing evidence that switching within constituents (e.g within NPs) occur frequently (e.g., Sankoff & Poplack, 1981) and do not negatively impact on reading time and comprehension (Dussias & Courtney, 1994).

Parafita Couto and Gullberg (2019) examined NPs between three language pairs in conversational corpora (Welsh-English, Spanish-English and Papiamento–Dutch) looking at how simple NPs (determiners, nouns), and complex NPs (determiners, adjectives, nouns) were mixed between the languages. The majority of the mixed NPs were of the simple kind across the three language pairs. Mixed complex NPs overall consisted of determiners from the dominant languages (Welsh, Spanish and Papiamento) and adjective-noun clusters from less dominant languages (English and Dutch; cf. also Myers-Scotton, 2000). Other patterns were rare, indicating that there are clear frequency patterns of mixing. Such patterns should have implications for CS processing with locations found more frequently in spontaneous switching being easier to process experimentally than switches occurring in less frequent switch locations.

### 2.2.4 The role of cognates in codeswitching

Much previous research on CS has examined the facilitation and/or interference effects of cognates. Cognates are words that share orthographic, semantic, and phonological features across languages, and often stem from the same etymological origin. In linguistics, especially historical linguistics, the etymological origin of cognates is central, even if the form has changed and is no longer quite so similar. However, from a psycholinguistic perspective, the similarity of form and meaning between cognates is key. An example of a noun cognate would be *house* in English and *Haus* in German, also shared in many other languages (e.g., Swedish, Danish, Norwegian and Dutch).

Cognates have been found to be processed more quickly and efficiently in bilinguals, also referred to as the cognate facilitation effect (e.g., Rosselli et al., 2014). Cognates also seem to be learnt faster by second language learners, as lexical transfer between a speaker´s L1 and L2 may facilitate

learning (Rosselli et al., 2014). Further, greater frequency of cognates due to the overlapping representation in the brain, has been found to lead to faster recognition and production of cognates than noncognates (Strijkers et al., 2010). Therefore, the frequency and facilitation effect are interconnected. Both effects support coactivation models, suggesting that cognates activate both (all relevant) languages. In light of the ICM, when cognates are processed, the inhibition of the non-target language is lowered.

Cognates have also been found to facilitate and possibly trigger codeswitching (Clyne, 2003; Dijkstra et al., 2010). Drawing on corpus-based, natural language data Clyne (1967, 2003) proposed the *Triggering Hypothesis*. Clyne argued that bilingual/multilingual individuals select words based on lexical availability and that form-meaning similarity across languages should increase availability. By examining corpora and spoken language data, various studies have demonstrated that CS are indeed often preceded by cognates (Broersma, 2009; Broersma et al., 2020; Kootstra et al., 2012, 2020). This supports the idea of increased language activation of the non-selected language, which may, in turn, increase the likelihood of a codeswitch (Clyne, 2003).

The occurrence of cognates is obviously strongly linked to the typological relatedness between languages. Related languages often share a large number of cognates extended to all word categories. Nevertheless, cognates may also be shared between typologically unrelated languages, typically as borrowings (Broersma & De Bot, 2006). Hence, languages with different orthographic systems may share cognates that are phonologically and semantically similar (Li & Gollan, 2018a).

The original Triggering Hypothesis relies on the idea that language selection takes place at the surface level. This claim has been challenged by current bilingual speech models, prompting Broersma and De Bot (2006) to expand on Clyne´s (1967, 2003) theory, by considering psycholinguistic aspects. As such, the adjusted triggering hypothesis argues that language choice occurs at the lemma level, prior to placing a lexical item in the surface structure (Broersma & De Bot, 2006).

Most evidence in favour of the Triggering Hypothesis stems from real speech data found in corpora of language contact capturing natural conversations between bilinguals (Broersma et al., 2009; Broersma & De Bot, 2006; Broersma et al., 2020; Clyne, 1967, 2003). In experimental settings,

codeswitching has primarily been examined in (spontaneous) language production. In this context, cognates also appear to enhance codeswitching behaviour (Kootstra et al., 2012; 2020). Specifically, Kootstra et al. (2012) investigated whether the presence of cognates in two primed sentence production experiments increased the tendency to codeswitch. For highly proficient bilinguals (but not low proficient bilinguals) it was found that cognates facilitated priming of codeswitches in a sentence context. In a more recent study, Kootstra et al. (2020) implemented two dialogue game experiments and showed that participants were more likely to codeswitch when describing pictures involving cognates. However, this was only the case if the confederate had codeswitched previously. Hence, while the study supports the Triggering Hypothesis, interactive alignment appears to have played an equally crucial role with respect to codeswitching frequency. Overall, the correlation between increased co-activation of languages and the production of codeswitches is highlighted (Kootstra et al., 2020).

A recent study focusing on codeswitching and cognate status in a read-aloud task (planned and connected speech) demonstrated that cognates did *not* facilitate codeswitches (Li & Gollan, 2018a). In fact, participants produced more intrusion errors for cognates than for noncognates (Li & Gollan, 2018a). Intrusion errors refer to "the selection of the right word but in the wrong language" (Li & Gollan, 2018a, p.924). Previous studies have revealed that intrusion errors occur significantly more frequently for function words than for content words (Gollan & Goldrick, 2018). This is specifically true for single word switches; whole-language switches decreased function word intrusions, but not content word errors (Gollan & Goldrick, 2018). Intrusion errors indicate increased dual-language activation and subsequent competition in language selection (Li & Gollan, 2018a). Therefore, Li and Gollan (2018a) conclude that cognates did not facilitate, but rather interfered with codeswitches within the premises of their study.

However, participants detected and self-corrected errors more rapidly when the switched word was a cognate (Li & Gollan, 2018a). Li and Gollan (2018a) distinguished between full-intrusion and mid-error correction rates. The former refers to corrections after having produced a full intrusion, while the latter describes corrections made during the production of the error. As such, mid-error corrections point to a quicker and therefore more efficient speech-monitoring. Mid-error corrections occurred significantly more often for cognate targets than noncognates, but no

differences were observed for corrections of full intrusions. Hence, cognates accelerated the monitoring processes. This implies a stronger monitoring of speech initiated by increased co-activation and cross-language competition (Li & Gollan, 2018a). This suggestion aligns with the Conflict Monitoring Hypothesis, which claims that increased response competition simultaneously leads to stronger monitoring and error detection (Nozari et al., 2011). Li and Gollan (2018a) also observed a reversed dominance effect, evident by the fact that Mandarin-dominant speakers of English produced more intrusion errors for target words in Mandarin than in English. This is consistent with the Inhibitory Control Model, (Green, 1986, 1998) suggesting that the dominant language is inhibited more strongly when speaking in the non-dominant language.

Another issue that has been discussed with respect to cognate status is the difference between noun cognates and verb cognates (Van Assche et al., 2013). The majority of studies exploring the relationship between cognates and facilitation effects have focused on noun cognates. This is due to the fact that more identical noun cognates exist than verb cognates. Identical cognates refer to words that are spelled identically across languages (Tense, 2013). It has been demonstrated that identical cognates lead to a greater facilitation effect than unidentical cognates in lexical processing (Tense, 2013). Importantly, facilitation is greater for verb cognates taken out of context than when presented in a sentence context (Van Assche et al., 2013). Compared to noun cognates, facilitation effects for verb cognates appear to be smaller, hinting at a weaker cross-linguistic activation (Van Assche et al., 2013). Indeed, studies using a self-paced reading task and a shadowing task have reported that verb cognates did not modulate switching cost in any form (Bultena et al., 2015 a, b). However, other studies show that despite the incomplete overlap of non-identical cognates, specifically verb cognates, a facilitation effect remains observable (Van Assche et al., 2013; Tense, 2013).

Further, noun processing has been found to be less effortful than verb processing (Tyler, Russel, Fadili & Moss, 2001). This processing advantage can be explained by morphological, syntactic and semantic factors. For example, nouns commonly denote concrete and distinct entities, while verbs are more often polysemous and dependent on the linguistic context they are surrounded by. Additionally, verb meanings differ more greatly between languages than noun meanings (Gentner, 1981). Consequently, verb cognates are more difficult to source, since they vary not only

conceptually but also orthographically and phonologically (Van Assche et al., 2013). Verbs are therefore on the whole more language-specific and more aspects need to be considered when selecting verb cognates.

### 2.3 Trilingualism and Codeswitching

Trilingualism denotes an individual´s ability to use and understand three languages in various linguistic contexts. Contrary to bilingualism, literature and research on trilingualism is rather limited, especially with respect to psycholinguistic studies (Stavans & Swisher, 2006). On the other hand, it has been suggested that a large number of the studies focusing on bilingual processing in fact used trilingual and even multilingual participants (De Bot & Jaensch, 2015). De Bot and Jaensch (2015) specify that many of the leading researchers in psycholinguistics conducted research with Dutch psychology students that often partook in foreign language instruction in German and/or French for at least four years. Yet, English is foregrounded as their second language, and the study design and focus is set on bilingualism, while the other languages spoken by participants are merely mentioned and not considered to contribute participants´ multilingualism status.

With respect to trilingualism, different types have been defined, depending on different variables, such as age of acquisition of the languages, proficiency and formality of later acquisition. Specifically, three types of trilingualism have emerged from previous literature (Stavans & Swisher, 2006). The first type may be described as simultaneous or infant trilinguals, referring to individuals who have acquired all three languages from early childhood. The second type is known as formal foreign language learners – those who learnt one or more additional language/s in a formal schooling setting. Finally, the last type of trilingualism, namely informal foreign language learners, concerns those who learnt one or more language/s through immersion in the linguistic and cultural context of the language/s.

As with any other language conditions, trilingualism is fluid and dynamic. To clarify, the different categories of trilingualism do not exclude one another, except for infant trilingualism, since it is age dependent. However, an infant trilingual may also become a formal foreign language learner

and thus add a fourth language to one´s linguistic repertoire. In the same vein, external circumstances may for example lead to the immersion of an additional language and/or neglect of one of the other three languages. It is often noted that trilingualism can be compared to bilingualism in many ways. On the other hand, it has been noted that contrasts exist with respect to "formal linguistic constraints, functional sociocultural communicative needs and procedural psycholinguistics demands" (Stavans & Swisher, 2006, p.194). In particular, codeswitching has been found to display differences between bilinguals and trilinguals (Stavans & Swisher, 2006).

Stavans and Swisher (2006) recorded speech data and examined codeswitching patterns of two infant trilinguals of English,Spanish and Hebrew at different ages[4] over a period of 20 months. They found that both children mostly switched between two languages, and only occasionally between all three. Focusing on intra-sentential switches, three types of codeswitching for noun phrases emerged:

> (1) noun phrases involving a determiner and a noun, in which the noun was switched and the determiner remained in the ML, for example 'I did give her a beso' (Spanish, 'kiss') [12 of these]; (2) noun phrases in which the entire NP was switched, for example: 'I am not going to la escuela' (literally, 'the school' in Spanish; and (3) noun phrases in which only the determiner was switched, for example: 'This is el cake' ('the' in Spanish), and 'que no entren the moscos' ('so the flies don't come in'). (Stavans & Swisher, 2006, p.207)

Type two and three switches challenge previous results. Studies on bilingual switching patterns have shown that determiners often remain in the default language (English in this case) and the fact that a function word is switched in example three, also contrasts with previous findings (Parafita Couto & Gullberg, 2019). Stavans and Swisher (2006) further reported on a variety of morphosyntactic boundary violations concerning the base forms of nouns and verbs. For example, an English inflection was added to a Spanish verb, or the Hebrew definite morpheme was merged with an English noun. The older child also produced morphosyntactic violations involving all three languages. It is concluded that codeswitching patterns in trilinguals signal "unique trilingual

[4] (The younger child from 2;6 to 4;2 and the older child from age 5;5 to 7;1)

competence development that capitalises on multiple languages" (Stavans & Swisher, 2006, p.217). Other studies confirm the increased complexity of codeswitching patterns found in trilinguals as well as the speakers´ ability to fluently move between monolingual, bilingual and trilingual language modes (Pittman, 2008; Qasim & Qasim, 2014).

As with bilingualism, it is assumed that all three languages spoken by a trilingual individual are active during language production and comprehension, to varying degrees (De Bot & Jaensch, 2015; Green, 1986). Trilingual language control is assumed to be highly complex. At the word level, the control system must assure that the intended word is selected, while all competing lexical entries in the three languages must be inhibited. Monitoring processes then verify or repair word selection via feedback loops (De Bot, 1996; Levelt, 1989). Furthermore, controlling states of activation and inhibition for three languages is assumed to increase processing load (Green, 1986; Kavé et al., 2008; Mägiste, 1986). This is particularly relevant with respect to CS, since inhibition and activation processes are required to corporate efficiently and adding languages may complicate and/or slow down certain cognitive processes (Kavé et al., 2008; Mägiste, 1986). However, as mentioned earlier, studies on trilingual CS demonstrate that trilinguals are able to fluently switch between languages, indicating successful and effective control mechanisms (Pittman, 2008; Qasim & Qasim, 2014). De Bot and Jaensch (2015) examined previous, published research on trilingual processing and conclude that there is evidence for differentiating bilingual from multilingual processing, although not enough studies exist to be able to determine how L3 processing differs from L2 processing.

Few studies have investigated the relationship between codeswitching and cognates in more than two languages (Lemhöfer et al., 2004; Lijewska & Chmiel, 2015; Szubko-Sitarek, 2011). Using a word recognition task, Lemhöfer et al. (2004) demonstrated that triple cognates (shared between three languages) led to even faster recognition times than double cognates (shared between two languages). This can be explained by the heightened frequency of the words and supports the view that all languages are activated during lexical access. Hence, triple cognates co-activated three lexicons, providing support for the relevance of non-selective access with respect to trilinguals. Similarly, using a lexical decision task, Szubko-Sitarek (2011) examined whether unbalanced Polish-English-German trilinguals would recognise triple noun cognates between the three

languages more rapidly than double- and noncognates. It was found that triple cognates were recognized faster than double cognates and control words. However, Szubko-Sitarek (2011) suggest that the proficiency levels in the two foreign languages impacted on results. As such, it was argued that participants´ L2 (English) mainly sped up recognition in triple cognates, and less so their L3 (German). It is also emphasized that placing the triple and double cognates in a sentence context may yield a different outcome. To test precisely whether cognate facilitation effects can be observed in a sentence context, Lijewska and Chmiel (2015) conducted a study comparing trilingual interpreters with trilingual non-interpreters. Participants were asked to translate sentence final L3 words into their L1 and L2. Significant cognate facilitation effects were evident for L3-L1 translations, although only cognates between L3-L2 were included. In contrast, translation from L3-L2 was found to be challenging for all participants and did not give rise to cognate facilitation effects. Further, cognate facilitation effects were evident for both low context and high context sentences. Hence, irrespective of semantic constraints, cognates were translated faster than noncognates (for L3-L1).

Again, the faciliatory effect of cognates in recognition- and translation tasks differs from the production of cognates in a CS experiment. However, across experimental paradigms (tasks) it has been found that lower proficiency prompts lower cross-language activation and therefore decreases cognate facilitation effects (Lemhöfet er al., 2004; Poarch & Van Hell, 2012; Szubko-Sitarek, 2011).

# 3 The current study

To date, studies have found contradictory results concerning switching cost in a sentence context in both production (Gullifer et al., 2013; Tarlowski et al., 2013) and comprehension (Ibáñez et al., 2010; Philipp & Huestegge, 2015). While some studies emphasize the faciliatory aspect (triggering effects) of cognates (e.g., Broersma et al., 2009; Clyne, 1967) other studies have shown increased interference caused by cross-language competition (Li & Gollan, 2018a/2018b) or simply no cognate effects in the processing of switches (Santesteban & Costa, 2016). Involuntary switches, preceded by cognates and noncognates are expected to increase processing cost. As seen in Li and Gollan´s (2018a) study, cognates specifically interfere with language selection in planned speech. Therefore, the current study focuses on switching difficulty rather than triggering or facilitation with respect to cognates.

Much research on CS and cognates has focused on bilingual speakers of different language pairs and varying proficiency levels (Broersma, 2009; Kootstra et al., 2012). Few word recognition and translation studies have examined cognate effects in trilinguals (but see Lemhöfer et al., 2004; Lijewska & Chmiel, 2015; Szubko-Sitarek, 2011). Moreover, no previous study has examined how cognates may affect processing of CS in trilingual speakers. More specifically, processing effects of cognates shared between three languages (labelled triple cognates in the following) in a CS experiment have not yet been explored in trilingual speakers. Thus, the question arises whether triple cognates preceding switches cause more language interference than cognates shared between two languages (henceforth double cognates). Therefore, the current study intends to investigate cognate effects in CS by focusing on trilingual speakers of German, English and Danish. While German and English have been examined within the context of CS studies, Danish has not. Finally, following Li and Gollan´s (2018a) findings, this study aims to examine whether stronger speech monitoring can be observed for switches preceded by cognates and whether triple cognates increase rate and speediness of speech corrections.

The present study may be considered explorative since no study has previously targeted trilingual speakers and accordingly manipulated cognates (triple cognates versus double cognates) in a CS production experiment.

## 3.1 Research questions and hypotheses

This thesis seeks to address the following research questions.

1. Do verb cognates cause more switching difficulty than noncognates in planned, connected speech between three typologically related languages?
2. Do triple cognates make switches more difficult than double cognates?
3. Do cognates provoke stronger speech monitoring activity than noncognates?

To address the research questions, the following hypotheses were formulated on the basis of previous literature:

H1 Codeswitches following verb cognates are expected to provoke more hesitations and intrusion errors than codeswitches following noncognate verbs.

This hypothesis is based on Li and Gollan´s (2018a) findings, which demonstrated that unlike in spontaneous speech, cognates in planned speech increases cross-language competition and therefore lead to more intrusion errors (and hesitations).

H2 Triple cognates will lead to more hesitations and intrusion errors (more language competition) than double cognates.

Since triple cognates should lead to the activation of three languages, cross-language competition is expected to be more evident as opposed to double cognates, activating only two languages.

H3 German-English cognates will lead to more intrusion errors and hesitations than German-Danish cognates.

Since the CS in this study are into English, participants are expected to activate English more strongly than Danish, resulting in increased cross-language competition and thus more overt disfluencies in the presence of German-English than German-Danish cognates.

H4 Codeswitches following cognate verbs provoke better error-detection and self-corrections than codeswitches following noncognate verbs.

This hypothesis is also based on Li and Gollan´s (2018a) findings, which suggested that error-detection and monitoring is enhanced with increased language-competition.

H5 Triple cognates will generate better error-detection than double cognates.

Again, since cross-language competition for triple cognates is assumed to be stronger than for double cognates, error-detection is assumed to be more effective for triple cognate contexts.

# 4 Methods

## 4.1 Participants

Thirty trilingual participants (25 female, 5 male) were recruited for this study. Participants were recruited via social media (Facebook groups). The recruitment text was written in German and outlined the eligibility criteria for participants (Appendix F). Participants were fluent speakers of German, English and Danish and reported using all languages on a regular basis in a questionnaire distributed as part of the study, The Language History Questionnaire LHQ3 (REF; see 4.3.2). As can be seen in Table 1, participants' self-reported proficiency level (ranging from 0=poor, 7=excellent) in reading and speaking (see Appendix H for full table) in each of the three relevant languages appeared rather balanced, with German being the strongest language, and displaying the smallest variation. A repeated measures ANOVA revealed a significant main effect of language ($F(1,3) = 20.1$, $p = < .001$, $\eta^2_p = .409$ ). The follow-up post hoc analyses (table 2) showed that speakers rated themselves as being significantly more proficient in German, than Danish, $t(29)= 5.610$, $p= < .001$ and English, $t(29)= 6.433$, $p= < .001$. No significant difference was found between Danish and English.

*Table 1. Self-reported proficiency levels for reading and speaking.*

| Self-reported proficiency level (0-7) | | | |
|---|---|---|---|
| | **Language** | **Mean** | **SD** |
| Reading | German | 6.83 | 0.38 |
| | English | 6.23 | 0.77 |
| | Danish | 6.30 | 0.60 |
| Speaking | German | 6.87 | 0.35 |
| | English | 6.07 | 0.78 |
| | Danish | 5.93 | 0.98 |

*Table 2. Post Hoc Test for self-reported proficiency levels between German, English and Danish.*

Post Hoc Comparisons – Dominance between languages

| Comparison | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Languages** | | **Languages** | **Mean Difference** | **SE** | **df** | **t** | $p_{tukey}$ | $p_{bonferroni}$ |
| German | - | Danish | 0.7333 | 0.131 | 29.0 | 5.610 | < .001 | < .001 |
| | - | English | 0.7000 | 0.109 | 29.0 | 6.433 | < .001 | < .001 |
| Danish | - | English | -0.0333 | 0.150 | 29.0 | -0.223 | 0.973 | 1.000 |

Participants' first language was German, meaning that it was the main language they spoke growing up. Seven participants reported having grown up bilingually speaking both German and Danish, due to having one Danish parent, having attended a Danish kindergarten, or having lived near the German/Danish border. German was, however, the dominant language spoken at home. A further three participants reported having attended a Danish (and German) elementary school. The remaining twenty participants learnt Danish after the age of nine and varied with respect to which language they learnt first (English or Danish). Participants' age as well as their age of exposure to German, Danish and English is summarised in Table 3.

*Table 3. Participants´ age and age of exposure to German, English, and Danish.*

| Participant information | Range | Mean | SD |
|---|---|---|---|
| Age | 18-56 | 32 | 8.49 |
| Age of exposure to German | 0-3 | 0.77 | 0.82 |
| Age of exposure to English | 6-20 | 10.53 | 2.32 |
| Age of exposure to Danish | 0-32 | 16.43 | 11.58 |

All participants except two were based in Denmark at the time of testing. One was currently on exchange in Germany, and the other was commuting between Denmark and Germany on a daily basis.

With regard to language mixing, 22 of 30 participants reported on a Likert scale of 0-7 (0=never, 7=always) that they frequently mix languages (*M*=4.59; *SD*=1.33) in everyday life in different contexts: family, work, school or friends. The contexts that were most strongly associated with mixing languages concerned family and friends. This result is consistent with previous research demonstrating that CS occurs most commonly in private domains and with familiar interlocutors (Zentella, 1999). Most participants reported switching between German and Danish, German and English as well as Danish and English. Almost half of the participants also reported mixing all three languages in a single conversation if the interlocutor is also a speaker of these languages.

Since the experiment examines reading in read-aloud task, we also probed reading times in the three languages (cf. Table 4). On average participants reported reading at least half an hour a day, either for fun or at work and/or school.

*Table 4. Self-reported reading time per day in minutes in each of the languages*

| Daily self-reported reading (minutes) | | | |
|---|---|---|---|
| **Purpose** | **Languages** | **Mean** | **SD** |
| For fun | German | 36 | 0.44 |
| | English | 27 | 0.45 |
| | Danish | 27 | 0.56 |
| For work/school | German | 26 | 1.06 |
| | English | 125 | 2.33 |
| | Danish | 94 | 1.96 |

Unsurprisingly, most participants indicated reading more in English and Danish for work purposes than in German, and German was most regularly read at home during leisure time. Some participants specified that they mainly read German to their children to foster home language maintenance in the Danish context.

## 4.2 Experimental materials

The experiment consisted of a read-aloud task, inspired by Li & Gollan (2018a), designed to detect differences in the processing of code-switches as defined by the disfluency rate, and disfluency location relative to a switched noun phrase (NP) in transitive constructions. Of crucial interest is whether the cognate status of the word *preceding* the CS affects processing or not. This is in contrast to Li and Gollan (2018a) where the cognate status of the switched words themselves were manipulated. The reasons for this change were that the current study focuses on CS as opposed to language switching and that in studies focusing on spontaneous switches, cognates preceding CS appear to facilitate switches. However, no previous study has explored the effects of cognates preceding CS in planned speech.

Short paragraphs were created consisting of two sentences (Appendix E). The word count for the paragraphs varied between 27-33 words. The default language of the paragraphs was German, and the language of the switched NP was always English (see ex 4). The target sentences consisted of a subject (proper name, pronoun, or determiner+noun; balanced across conditions), the target verb (either a cognate with two or three languages or a non-cognate control verb), the CS direct object NP, followed either by the coordinator *und* 'and' or by a prepositional phrase (balanced across conditions).

The CS noun phrase always included an indefinite determiner, an adjective, and a noun. Example (4) illustrates a target paragraph (boldface = target verb; underlined phrase =CS NP)[5]:

(4) *Ingrid ist Schuldirektorin und hat soeben eine Ansprache bezüglich der anstehenden Klassenfahrten nach Italien gehalten. Sie* ***wünscht*** *<u>a safe journey</u> und verabschiedet sich danach von den Schülern.*

[5] Underlining and boldface was not part of the experimental presentation but is included here for illustration purposes.

> ‘Ingrid is the school director and has just given a speech about the upcoming school trips to Italy. She wishes a safe journey and then says goodbye to the students.’

Three conditions were established which contained (1) a triple verb cognate, shared between all three languages, (2) a double verb cognate shared between German and English only, or (3) a double verb cognate shared between German and Danish only. Double verb cognates between English-Danish were not part of the current study, since the focus was set on cognates including participants´ L1 (German). A control condition in which the word preceding the CS was not a cognate with any of the languages was also created. In addition, two types of filler sentences were also created. The filler sentences consisted of (1) paragraphs including CS that were different to the target CS, and (2) entirely monolingual German paragraphs. The CS in these filler sentences differed in their location (e.g., occurred in the first sentence, as opposed to the second sentence), number of switched words, and/or the part of speech of the CS words.

The cognate status of verbs was checked to establish a list of verb cognates to be included in one of the three cognate conditions. This was done by examining previous studies that used verb cognates as well as by checking through verb lists between German-English and German-Danish and selecting verbs displaying similar orthography and phonology. Then, a first tentative list of potential cognates corresponding to all three conditions was subjected to the judgements of two native speakers of English and Danish, respectively. These were asked to judge the similarity between the third person singular present tense forms of the cognates in the respective languages and the German translation equivalents on a scale from 1-4 (1= no similarity, 4= obvious similarity). Only verbs that were rated between 3-4 were included in the experiment. It was more challenging to find double cognates between German and English than between German and Danish, yet overall similarity scores were balanced for each cognate condition. Appendix B lists the similarity ratings.

The frequency of all cognate and control verbs (Appendix A), all nouns included in the CS NP (Appendix C), and the adjective-noun combinations in the CS NPs (Appendix D) was checked. This was done by using Sketch Engine[6] as a corpus tool for the English, Danish and German Web

[6] https://www.sketchengine.eu/

corpora (Kilgarriff et al., 2014). The Web Corpora consist of texts gathered from the Internet. In the corpora, the texts were extracted between 2013-2018. The main text domains, responsible for over 70% of the corpora, were manually examined to exclude any incomprehensible and unqualified linguistic content. All three corpora belong to the TenTen Corpus Family, which were collected using the same criteria and are therefore considered to be comparable corpora (Kilgarriff et al., 2014).

Using Sketch Engine, frequencies of cognate verbs and the nouns included in the CS were compared between the English Web Corpus and the British National Corpus (BNC) to ascertain that there were no frequency differences across the corpora.

The word length of nouns included in the CS NPs was controlled by limiting them to one and two-syllable words. With the help of two native Danish and English speakers, it was ensured that the codeswitched phrases were semantically compatible with the cognate target verb cognates as well as with the control verbs. For example, we checked whether the control verb *take* may be used to express *take a slow breath* in all three languages. Thus, the verb cognates and control verbs could be used in all three languages in the same semantic context.

The paragraphs in the three cognate conditions and in the control condition included only the target verb cognate, meaning that no other verb cognates occurred in the sentences. The filler sentences included no or no more than one verb cognate. If there was a verb cognate in the filler paragraphs, the verb cognates did not precede the CS. All paragraphs were also controlled for noun and adjective cognates. No more than four cognates were present in any paragraph. This was important to check, since the presence of other cognates than the target verb cognates may potentially affect participants´ ease of switching.

All paragraphs were also checked by three German native speakers, other than the author, to make sure that the sentences were semantically coherent and the word choices appropriate. This was important since many seemingly natural lexical choices had to be altered to exclude any additional verb cognates and to adhere to the overall limit of cognate words.

The final 36 paragraphs (Appendix E) consisted of 3 training paragraphs, 5 paragraphs for condition 1 (triple cognates), 2 (German-Danish cognates), 3 (German-English cognates) and 4

(control condition including noncognates) as well as 16 filler paragraphs, 8 of which included different CS and 8 were monolingual.

All paragraphs were numbered and an online randomizer[7] was used to create three random orders that were used and counter-balanced between participants. These three random orders were added to three Power Point presentations.

### 4.2.1 Pilot study

Prior to commencing the real experiment, three pilot tests were conducted with German-English bilingual speakers. The pilot studies were specifically helpful to identify any lexical items that appeared to affect the reader´s fluency and to determine the timeline for the transitions between the paragraphs. For example, one paragraph included the German word *Tattoo* (a triple cognate), which prompted the first pilot participant to pronounce the word in English, since they assumed it was a CS. This word was therefore deleted, and the sentence was reformulated. Further, it became clear that reading pace differed between participants, and it was decided that a display time of 14 seconds achieved the desired time pressure among all pilot participants.

## 4.3 Procedure

### 4.3.1 The read-aloud task

The experiment was conducted online via Zoom due to the restrictions connected to the covid-19 pandemic. All participants received a consent form prior to the experiment (see Appendix I).

[7] https://www.randomizer.org/

Consent was obtained orally and recorded via Zoom. Each participant received a gift voucher as compensation for their time.

All instructions as well as communication prior to the reading task were given in German. It was important to make sure participants were in monolingual German ‘mode’ prior to the experiment (Grosjean, 1999). The concept of language mode was developed to distinguish between monolingual and bilingual language mode (Grosjean, 1999). Bi- and multilinguals, often unconsciously, decide which language/s appear to be important to activate and use in any given communicative situation. Multiple factors may impact on the language mode, such as speaker´s proficiency, linguistic repertoire and familiarity of their interlocutors (Grosjean, 1999). Research examining bi- or multilingual processing, specifically facilitation effects and/or interferences, should consider language mode an important and influential factor for experimental results (Grosjean, 1999). Although it was a requirement for participants in this study to speak German, English and Danish, the language/s of the reading task were not revealed prior to participation in the experiment.

The reading task was run and recorded via Zoom. Participants were asked to have their cameras switched on. The researcher shared the screen to the Power Point presentation. The Power Point presentation contained an instructional slide, informing participants that one paragraph (two sentences) per slide will appear, which should be read aloud. It was also stated that participants should start reading as soon as a new paragraph appeared on the screen, since each slide will only be displayed for a limited amount of time. Finally, the instructional text informed participants that the first three slides would serve as training, and that there would be an opportunity to ask questions following the trial. The training trials (three slides) included two monolingual paragraphs and one paragraph with a random CS, meaning that the sentential location and switched word classes differed from the target switched phrases in the cognate conditions. After the training trials, another slide was displayed to provide participants with the opportunity to ask any last questions before commencing the real experiment.

Both training and experimental slides were moved forward automatically, whereas the instructional slides were moved forward by the researcher. The presentation of stimuli was split into two parts. First 18 paragraphs were shown, followed by a one-minute break, and then the

remaining 18 sentences were presented. Each paragraph was shown for 14 seconds, which gave participants enough time to read the full paragraphs yet created some pressure to start reading as soon as a new paragraph was shown.

The last slide included a text thanking the participant for their contribution to the study. Then, the participants were debriefed[8] by the researcher.

### 4.3.2 The Language History Questionnaire

After the reading task, participants filled in the language history questionnaire[9] (LHQ 3.0; Li et al., 2020). This was chosen to probe participants´ linguistic repertoire (Li, Zhang, Yu & Zhao, 2020; Li & Gollan, 2018a/2018b; Kootstra et al., 2020). The LHQ has been shown to be an efficient language background assessment tool, enabling researchers to classify different types of bilingual and multilingual individuals (Li, Zhang, Yu & Zhao, 2020). The LHQ questions were itemized according to what appeared most relevant to the present study (Appendix G). In the context of this study, it was specifically important that participants reported their daily use of all three languages, including language mixing habits, as well as at what age each individual language was acquired. Since it was one of the main recruitment criteria to speak/use all three languages on a regular basis, it was expected that participants report high scores concerning both language usage and proficiency. All participants filled out the LHQ in German, following the experiment. Some did this in their own time, and others completed the questionnaire during the Zoom meeting, with the assistance of the researcher.

[8] The participants were informed about the purpose of the study and any questions they had were answered. Participants were also asked whether they would like to receive a copy of the thesis report, once completed.
[9] https://lhq3.herokuapp.com/

## 4.4. Data treatment and coding

### *4.4.1 Transcription and coding of dependent variables*

After completion of all participant recordings, each recording of the target (experimental and control) sentences was transcribed. The target sentences consisted of the second sentence of each paragraph, as illustrated in example 5 in boldface. To highlight the CS, it has been underlined in example 5, which was not the case for the stimuli participants encountered in the experiment.

(5) *Familie Müller ist heute im Tierheim und eine nette Frau möchte ihnen ein paar Tiere zeigen.* ***Sie bringt <u>a cute dog</u> und die Kinder verlieben sich sofort in ihn.***
'The Müller family is at the animal shelter today and a nice woman wants to show them some animals. She brings <u>a cute dog</u>, and the kids instantly fall in love with him.'

The sentences were transcribed in Microsoft Excel and then coded. Processing difficulty was operationalized as (a) hesitation markers and (b) intrusion errors; speech-monitoring was operationalized as rate of (c) speech-error corrections.

*Hesitation markers.* Hesitation markers included unfilled pauses, filled pauses (e.g. *uh, uhm*), lengthening of sounds, and noticeably slower produced words. Hesitation phenomena in bilingual speech production has previously been linked to mental effort, planning and lexical retrieval difficulties (Hlavac, 2011), including in reading (Schmid & Fägersten, 2010).

Although the whole target sentence was transcribed, hesitation markers were exclusively counted from the start of the sentence to the first word after the CS. This was done to reduce the likelihood that a hesitation was caused by anything other than the cognates (and switches). Speakers tend to pause prior to independent clauses as well as at phrasal boundaries (Wang et al., 2010). Pauses preceding and following subordinators and conjunctions have also been described as typical pause locations (Hawkins, 1971; Hansson, 1998; Bada, 2006). Specifically, in oral reading, individuals seem to produce consistent pausing patterns, while atypical pauses are more common in spontaneous speech (Wang et al., 2010). Since switches were either followed by a conjunction or a preposition, the probability that pauses were provoked by the switch decreased and thus were

not subject to analysis. In example 6, the relevant part of the sentence is bold, meaning that only the pause, indicated by *(-)*, between *vergisst* and *an* was counted, since the second pause occurred after the conjunction.

(6) ***Er vergisst (-) <u>an important file</u> und*** *seinen (-) Geldbeutel, aber sonst hat er dieses Mal alles dabei.*
‘He forgets <u>an important file</u> and his wallet, but otherwise he has everything with him this time.’

Wherever possible, the language of filled pauses was specified. An instance of a speaker producing a filled pause in Danish can be seen in example 7. Here, it was audible that the speaker used the Danish vowel *Ø* in øhm, which is a common filler found in Danish speech data (Navarretta, 2016). This was transcribed using the English conventions *uh* and *uhm* and specified by either *(D)* for Danish, *(G)* for German and *(E)* for English.

(7) *Er rennt <u>a whole hour</u>* ***uhm(D)*** *auf dem Sportplatz und kann kaum glauben, dass er keine Schmerzen hat.*
‘He runs <u>a whole hour</u> on the sports field and can hardly believe that he is not in pain.’

It has previously been suggested that speakers transfer fillers from their more dominant language when speaking in their less proficient language (Clark & Tree, 2002). Although across languages speakers are often not consistent in their use of filled pauses, language-specific phonetic information in filled pauses may indicate which languages are activated (de Boer & Heeren, 2019). Since this study did not use a program to reliably identify phonetic features, most pauses were left unspecified, and only obvious instances of language-specific filled pauses were transcribed as such. While different symbols were used for each distinct hesitation markers (see Appendix J), all instances of hesitations were later grouped together for the final analysis.

In cases where the researcher was unsure of the presence of hesitation markers, a second person (intersubjective) validation by a German-English bilingual was sought[10].

*Intrusion errors*. Intrusion errors were always marked with the intruding language, as either /E for English, */D* for Danish and /*G* for German. An intrusion error occurs when a speaker selects the non-target language in a particular context. In example 8, the speaker produced the English word *plans* instead of the German word *plant*, and in example 9, the German indefinite determiner *ein* was produced instead of the English equivalent *a*.

*(8) Sie **plans/E** a fun trip mit dem Wohnwagen und freut sich schon sehr ihrem Freund davon zu berichten.*
‘She is planning a fun trip with the caravan and is looking forward to telling her boyfriend about it.’

*(9) Er fährt **ein/G** expensive car und ist sehr schnell unterwegs, um seine Verfolger abzuhängen.*
‘He drives an expensive car and drives very fast to leave his pursuers behind.’

It is an accepted fact that intrusion errors may increase in bilingual speech and specifically when switching between languages. Furthermore, studies on cognates and CS have demonstrated that intrusion errors are common when producing cognate words, due to increased language competition (Li & Gollan, 2018a).

*Speech error correction*. Finally, to control for speech monitoring, speech error corrections were coded. Hence, errors that were made and corrected in the relevant part of the sentence were noted.

As opposed to Li and Gollan´s (2018a) study, the present study considered all error corrections and repetitions within the target clause and not solely intrusion error corrections. This was done to

[10] There were 14 instances where assistance of a second bilingual speaker was sought to determine whether a participant produced a hesitation or not. The assistant was provided with a scale from 0-4 (0=no 1=unlikely 2=maybe 3=likely 4= very likely) to decide whether a hesitation was present. If both the assistant and the researcher rated between 3 and 4, the hesitation was coded. If one of the two rated 2 and the other one 3 or 4 the hesitation was also coded. If both rated 2, the hesitation was dismissed (not coded). The target paragraph often had to be replayed several times before a rating could be made.

examine whether differences in monitoring was observable between the different cognate conditions and the control condition. As can be seen in example 10, a speaker made an intrusion error and immediately self-corrected. An abrupt mid-error interruption was marked by – and the point of correction by *!*. In example 11, the speaker produced an intrusion error following the switched phrase. This example was counted as both an intrusion error and a self-correction. Although the obvious intrusion occurred following the preposition *in*, it is assumed that the preposition cognate itself was already an intrusion. Example 12 illustrates a repetition (as opposed to a corrected intrusion error) of the cognate verb *vergessen* and example 13 shows an error correction of the switched adjective *heavy*.

*(10)* *Er* ***run-/E ! er rennt*** *a whole hour auf dem Sportplatz…*
'He runs a whole hour on the sports field…'

*(11)* *Oliver hängt a beautiful painting* ***in his /E Wohnzimmer ! in sein Wohnzimmer****...*
'Oliver hangs a beautiful painting in the living room…'

*(12)* *Er ver-* ***! Er vergisst*** *an important file…*
'He forgets an important file…'

*(13)* *Sie trägt a* ***hel- ! a heavy bag*** *auf ihrem Rücken…*
'She carries a heavy bag on her back …'

Example 10 illustrates a mid-error correction of an intrusion, since the intrusion *run* was corrected before being completed with the third person singular marker *`s´*. Example 11 depicts a correction of a full intrusion (*in his* to *in sein*).

*Location*. Finally, the location of hesitation markers, intrusion errors and self-corrections was noted with respect to the CS. For example, a pause may either occur before the switched phrase, within the switched phrase, or following the switched phrase. Although the locations were not central to the research questions asked in the current study, they will be presented in the results and may provide grounds for discussion in further research.

The absolute number of hesitations markers, intrusion errors and speech corrections were calculated for each participant as well as the average and standard deviation (SD) to inspect the variation.

### *4.4.2 Statistical analyses*

First, descriptive statistics summaries were created for all measures (hesitations, intrusions and speech-error corrections) combined as total number of disfluencies, and then for each measure individually. Descriptive summaries were generated for all participants.

In addition, since previous studies have shown that language dominance and age of acquisition may affect processing of bilingual speech, participants were also split into two sub-groups. Although participants reported similar proficiency levels, German was consistently found to be the dominant language. Therefore, no sub-groups were created with respect to dominance. Instead, sub-groups were based on the age of acquisition of Danish. One sub-group consisted of participants who learnt Danish at a younger age (0-8) and went to a Danish (and German) elementary school ($N$=10). The other group consisted of participants who learnt Danish after elementary school ($N$=19). Participants who learnt Danish at a younger age will be referred to as the German-Danish sub-group and the other participants as the German sub-group. One participant was excluded in the sub-group analyses, since it was unclear from the LHQ3 which sub-group was more relevant (due to a malfunction in the questionnaire).

Analyses were thus also computed by sub-groups.

Repeated measures ANOVAs (RMANOVAs) were performed for each measure to compare the change from one condition to another for all participants. Repeated measure factors consisted of every participant's response within all four conditions. With respect to speech-error corrections, an additional analysis was conducted to examine whether mid-error corrections of intrusions occurred more frequently in the cognate conditions than the control condition. This was done to allow for comparison between the current and Li and Gollan´ (2018) study. Repeated measures ANOVAs were also conducted for the two sub-groups. The advantage of Repeated measures ANOVAs is that each participant serves as their own control in each of the conditions, allowing for a statistical analysis even for studies with smaller numbers of participants. Planned post-hoc

tests were administered for statistically significant interactions and included Tukey and Bonferroni corrections.

Jamovi [11]version 1.8.2 was used for both the descriptive statistical analyses and RMANOVAs. Neither normality nor sphericity were checked since Jamovi does not provide built in tests for normality.

[11] https://www.jamovi.org/

# 5 Results

## 5.1 Disfluencies for all participants

### 5.1.1 All disfluencies

Table 5 summarizes the total number of disfluencies (hesitation markers and intrusion errors). On the whole, participants generally read fluently across the conditions and produced relatively few disfluencies. However, Condition 1 (triple cognates) provoked the fewest number of disfluencies, while condition 3 (German-English cognates) led to most hesitations and intrusion errors.

*Table 5. Total disfluency rates across conditions.*

Descriptive statistics

| | **Condition 1 (triple cognates)** | **Condition 2 (G-D cognates)** | **Condition 3 (G-E cognates)** | **Condition 4 (noncognates)** |
|---|---|---|---|---|
| N | 30 | 30 | 30 | 30 |
| Mean | 1.13 | 1.33 | 2.00 | 1.27 |
| Median | 1.00 | 1.00 | 2.00 | 1.00 |
| Standard deviation | 1.28 | 1.15 | 1.76 | 1.34 |
| Minimum | 0 | 0 | 0 | 0 |
| Maximum | 4 | 5 | 7 | 5 |

A repeated measures ANOVA revealed a statistically significant difference between the conditions ($F(1,3) = 4.02$, $p = .010$, $\eta^2_p = .122$). Post hoc tests (see Table 6 for all comparisons) showed that participants produced significantly more hesitations in condition 3 with German-English cognates

(*M* = 2, *SD* = 1.76) than in condition 1 with triple cognates (*M* = 1.13, *SD* = 1.28), *t*(29) = -3.315, *p* =.012.

*Table 6. Post Hoc Test for total disfluencies across conditions.*

Post Hoc Comparisons - Conditions

| Comparison | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Conditions** | | **Conditions** | **Mean Difference** | **SE** | **df** | **t** | $p_{tukey}$ | $p_{bonferroni}$ |
| Condition 1 | - | Condition 2 | -0.2000 | 0.246 | 29.0 | -0.812 | 0.848 | 1.000 |
| | - | Condition 3 | -0.8667 | 0.261 | 29.0 | -3.315 | 0.012 | 0.015 |
| | - | Condition 4 | -0.1333 | 0.298 | 29.0 | -0.447 | 0.970 | 1.000 |
| Condition 2 | - | Condition 3 | -0.6667 | 0.273 | 29.0 | -2.445 | 0.091 | 0.125 |
| | - | Condition 4 | 0.0667 | 0.267 | 29.0 | 0.250 | 0.994 | 1.000 |
| Condition 3 | - | Condition 4 | 0.7333 | 0.287 | 29.0 | 2.552 | 0.073 | 0.098 |

The comparison between condition 3 and condition 4 was marginally significant but will not be discussed.

Several intrusion errors were recorded in condition 2 for sentence 3 (see Appendix E) that accidentally included a triple cognate, *comfortable*, in the switched NP *a comfortable chair*. Both German and Danish have different translation equivalents (German: *bequem*; Danish: *behagelig*) that are used more frequently than *comfortable* (German: *komfortabel*; Danish: *komfortabel*), also in combination with the noun *chair*. However, since this cognate caused intrusion errors and it was the intention to exclude any cognates from the switched phrases to precisely prevent this, a separate repeated measures ANOVA on all disfluencies was performed on the data excluding this item.

As before, the repeated measures ANOVA revealed a main effect of condition ($F(1,3) = 4.32$, $p = .007$, $\eta^2_p = .130$), and the post hoc analyses still showed a significant difference between condition 1 and 3, *t*(29) = -3.315, *p*=.012 (cf. Table 7). However, there was now also a significant difference

between condition 2 (German-Danish cognates) and condition 3 (German-English), $t(29) = -2.755$, $p = .047$.

*Table 7. Post Hoc Test of overall disfluencies across conditions, excluding intrusions for sentence 8 in condition 2.*

Post Hoc Comparisons - Conditions

| Comparison | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Conditions** | | **Conditions** | **Mean Difference** | **SE** | **df** | **t** | $p_{tukey}$ | $p_{bonferroni}$ |
| Condition 1 | - | Condition 2 | -0.1000 | 0.237 | 29.0 | -0.423 | 0.974 | 1.000 |
| | - | Condition 3 | -0.8667 | 0.261 | 29.0 | -3.315 | 0.012 | 0.015 |
| | - | Condition 4 | -0.1333 | 0.298 | 29.0 | -0.447 | 0.970 | 1.000 |
| Condition 2 | - | Condition 3 | -0.7667 | 0.278 | 29.0 | -2.755 | 0.047 | 0.060 |
| | - | Condition 4 | -0.0333 | 0.260 | 29.0 | -0.128 | 0.999 | 1.000 |
| Condition 3 | - | Condition 4 | 0.7333 | 0.287 | 29.0 | 2.552 | 0.073 | 0.098 |

### 5.1.2 Hesitation markers only

Table 8 and Figure 1 present the distribution of hesitation markers only across the four conditions. Most hesitations were found in condition 3 ($M = 1.70$, $SD = 1.66$). On average, condition 1 ($M = 1$, $SD = 1.14$) and 4 ($M = 1$, $SD = 1.23$) provoked the fewest hesitations, although condition 4 demonstrated greater variation.

*Table 8. Hesitation markers across conditions.*

Descriptives of hesitation markers

| | **Condition 1 (triple cognates)** | **Condition 2 (G-D cognates)** | **Condition 3 (G-E cognates)** | **Condition 4 (noncognates)** |
|---|---|---|---|---|
| N | 30 | 30 | 30 | 30 |
| Mean | 1.00 | 1.13 | 1.70 | 1.00 |
| Median | 1.00 | 1.00 | 1.00 | 1.00 |
| Standard deviation | 1.14 | 1.14 | 1.66 | 1.23 |
| Minimum | 0 | 0 | 0 | 0 |
| Maximum | 4 | 5 | 7 | 5 |

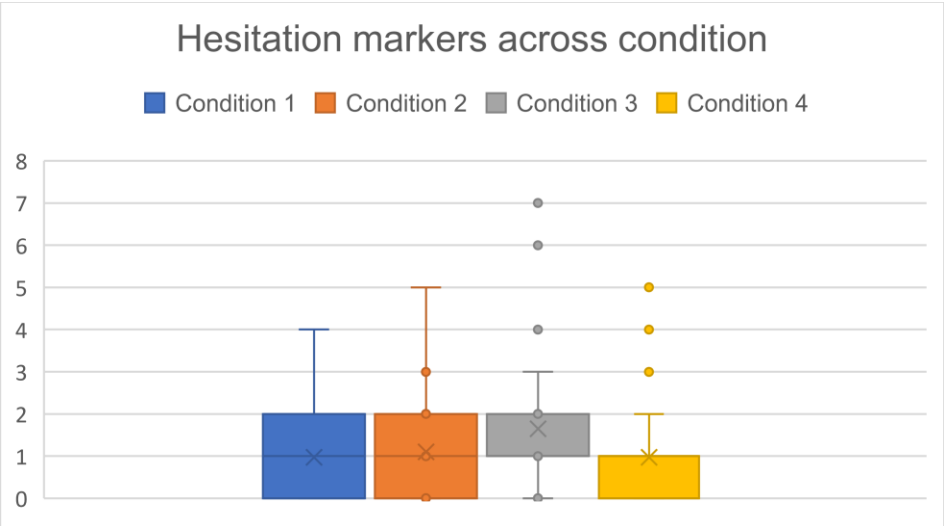


*Figure 1. Hesitation markers across conditions.*

A repeated measures ANOVA revealed a significant main effect of condition ($F(1,3) = 3.81$, $p = .013$, $\eta^2_p = .116$ ). The follow-up post hoc analyses (table 9) showed that there were significantly more hesitations in condition 3 than in condition 4, $t(29) = 3.102$, $p = .021$, and condition 1, $t(29) = -2.752$, $p = .047$.

*Table 9. Post Hoc Test of hesitation markers across conditions.*

Post Hoc Comparisons - Conditions

| Comparison | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Conditions** | | **Conditions** | **Mean Difference** | **SE** | **df** | **t** | $p_{tukey}$ | $p_{bonferroni}$ |
| Condition 1 | - | Condition 2 | -0.133 | 0.224 | 29.0 | -0.597 | 0.932 | 1.000 |
| | - | Condition 3 | -0.700 | 0.254 | 29.0 | -2.752 | 0.047 | 0.061 |
| | - | Condition 4 | 6.66e-16 | 0.271 | 29.0 | 2.46e-15 | 1.000 | 1.000 |
| Condition 2 | - | Condition 3 | -0.567 | 0.238 | 29.0 | -2.379 | 0.104 | 0.145 |
| | - | Condition 4 | 0.133 | 0.234 | 29.0 | 0.571 | 0.940 | 1.000 |
| Condition 3 | - | Condition 4 | 0.700 | 0.226 | 29.0 | 3.102 | 0.021 | 0.026 |

### 5.1.3 Intrusion errors only

As seen in Table 10 and Figure 2, very few intrusion errors were produced and most of those in condition 3 ($M$ = 3, $SD$ = 1.76). As previously discussed, the intrusion errors relating to the accidental cognate (*comfortable*) in sentence 8 were excluded from the analysis. Examining the types of intrusion errors, cognates were responsible for 4 out of 5 intrusions. For example, the English verb *wish* was articulated instead of the German equivalent *wünscht*. Four other intrusion errors applied to sentence 12, including the switched NP “an important file”. Instead of the English indefinite article *an*, the German equivalent *ein* was produced. One intrusion error consisted of the

English preposition *for*, following the switched NP *a healthy lunch*, instead of the German equivalent *für*. In all cases of intrusions, orthographic, phonological and semantic overlap was present.

*Table 10. Intrusion errors across conditions.*

Descriptives

| | **Condition 1 (triple cognates)** | **Condition 2 (G-D cognates)** | **Condition 3 (G-E cognates)** | **Condition 4 (noncognates)** |
|---|---|---|---|---|
| N | 30 | 30 | 30 | 30 |
| Mean | 0.133 | 0.200 | 0.300 | 0.267 |
| Median | 0.00 | 0.00 | 0.00 | 0.00 |
| Standard deviation | 0.346 | 0.407 | 0.702 | 0.521 |
| Minimum | 0 | 0 | 0 | 0 |
| Maximum | 1 | 1 | 3 | 2 |

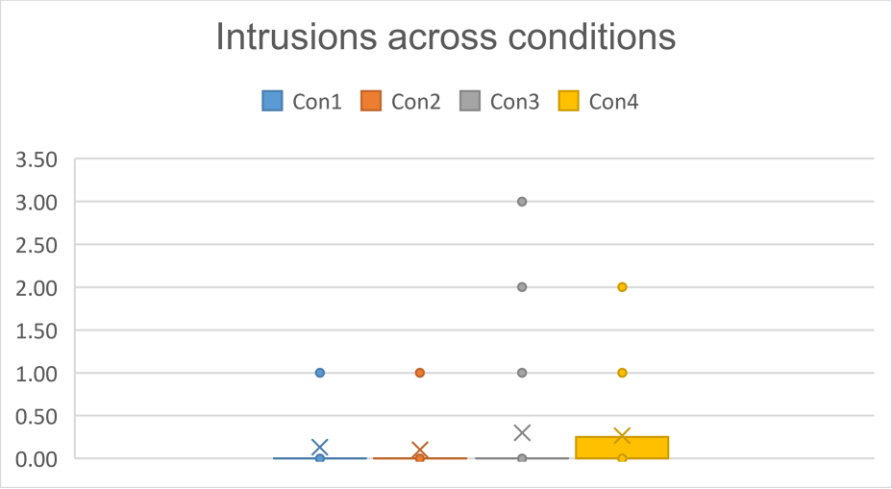


*Figure 2. Intrusions across conditions.*

At first glance the fact that participants produced more intrusion errors in control condition 4 than in the cognate conditions 2 and 1 may seem surprising. However, intrusions in condition 4 were of two kinds. First, as in condition 3, five participants articulated the German indefinite determiner *ein* instead of the English equivalent *an* in the switched phrase *an expensive car* in sentence 19. The second intrusion, produced by the participants, concerned the German conjunction *und*, which was replaced by the English equivalent *and*. Interestingly, this intrusion error also occurred in one sentence (sentence 20) consistently, with the switched phrase being *a slow breath*. For both examples, orthographic similarity may have facilitated these intrusion errors. Especially with respect to the indefinite article, as similar intrusions could be observed in the other conditions.

Overall, the number of data points was too low to be subjected to statistical analysis. However, while intrusion errors were only counted for instances in which a speaker produced a word in a non-target language, there were 16 instances of phonological transfer. For example, some speakers pronounced cognate and control verbs using English phonology. Contrary, German as well as Danish phonology or accent could be detected in the switched NPs. Since phonological transfer as such was not part of the hypotheses, these instances were not subject to the analysis. Phonological transfer was also observed in the non-target sentences (first sentences of paragraphs) and filler paragraphs. Specifically, German-Danish cognates were sometimes pronounced using Danish phonological features (for example *lærer* for the word *Lehrer* 'teacher') or proper names were pronounced using English (e.g., Dirk) or Danish accent (Marlene). Again, these were not included in the analysis.

## 5.2 Speech-error corrections for all participants

Across conditions very little speech-monitoring was observable. Table 11 summarises the total number of speech error corrections across conditions. The overall highest correction rate was found in the control condition 4 ($M$ = 0.3, $SD$ = 0.596). However, a repeated measures ANOVA showed no significant difference across conditions $F(1,3) = 1.33$, $p = .269$, $\eta^2_p = .044$).

*Table 11. Speech-error correction rates across conditions.*

Descriptives

| | **Condition 1 (triple cognates)** | **Condition 2 (G-D cognates)** | **Condition 3 (G-E cognates)** | **Condition 4 (noncognates)** |
|---|---|---|---|---|
| N | 30 | 30 | 30 | 30 |
| Mean | 0.133 | 0.100 | 0.167 | 0.300 |
| Median | 0.00 | 0.00 | 0.00 | 0.00 |
| Standard deviation | 0.346 | 0.403 | 0.379 | 0.596 |
| Minimum | 0 | 0 | 0 | 0 |
| Maximum | 1 | 2 | 1 | 2 |

Table 12 summarizes the occurrence of mid-error correction for intrusions. While condition 1 and condition 4 did not lead to any mid-error corrections, condition 3 and 2 displayed some. A separate repeated measures ANOVA showed an effect of condition ($F(1,3) = 3.06$, $p = .032$, $\eta^2_p = .096$). However, the repeated measures post-hoc tests yielded no statistical significance between condition (see Table 13). Error corrections of full intrusions were not analyzed, since the data points were even lower.

*Table 12. Mid-error corrections of intrusion errors across conditions.*

Descriptives

| | **Condition 1 (triple cognates)** | **Condition 2 (G-D cognates)** | **Condition 3 (G-E cognates)** | **Condition 4 (noncognates)** |
|---|---|---|---|---|
| N | 30 | 30 | 30 | 30 |
| Mean | 0.00 | 0.0333 | 0.133 | 0.00 |
| Median | 0.00 | 0.00 | 0.00 | 0.00 |
| Standard deviation | 0.00 | 0.183 | 0.346 | 0.00 |
| Minimum | 0 | 0 | 0 | 0 |
| Maximum | 0 | 1 | 1 | 0 |

*Table 13. Post hoc test of mid-error corrections between conditions.*

Post Hoc Comparisons- Conditions

| **Comparison** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Conditions** | | **Conditions** | **Mean Difference** | **SE** | **df** | **t** | $p_{tukey}$ | $p_{bonferroni}$ |
| Condition 1 | - | Condition 2 | -0.0333 | 0.0333 | 29.0 | -1.00 | 0.751 | 1.000 |
| | - | Condition 3 | -0.1333 | 0.0631 | 29.0 | -2.11 | 0.173 | 0.260 |
| | - | Condition 4 | 0.0000 | 0.0000 | 29.0 | NaN | NaN | NaN |
| Condition 2 | - | Condition 3 | -0.1000 | 0.0735 | 29.0 | -1.36 | 0.533 | 1.000 |
| | - | Condition 4 | 0.0333 | 0.0333 | 29.0 | 1.00 | 0.751 | 1.000 |
| Condition 3 | - | Condition 4 | 0.1333 | 0.0631 | 29.0 | 2.11 | 0.173 | 0.260 |

## 5.3 Sub-group analyses

Analyses of sub-groups based on age of acquisition were conducted between the German-Danish and the German sub-group. The two groups showed similar results compared to the whole-group analyses. No statistical significance was found regarding all measures for both sub-groups (see Appendix K).

### 5.3.1 All disfluencies

As table 14 shows, condition 3 led to most overall disfluencies in both sub-groups, which corresponds to the pattern of the whole-group analysis. The German-Danish sub-group displayed more disfluencies in condition 4 than the German sub-group. Both sub-groups produced relatively little disfluencies in condition 1. The biggest difference can be seen in condition 2: participants belonging to the German sub-group produced fewest disfluencies, while German-Danish participants produced equally as many disfluencies as in condition 4.

*Table 14. Overall disfluencies of German- and German-Danish sub-group (GS/GDS).*

Descriptives

| | **Condition 1** | | **Condition 2** | | **Condition 3** | | **Condition 4** | |
|---|---|---|---|---|---|---|---|---|
| | **GS** | **GDS** | **GS** | **GDS** | **GS** | **GDS** | **GS** | **GDS** |
| N | 19 | 10 | 19 | 10 | 19 | 10 | 19 | 10 |
| Mean | 1.11 | 1.20 | 0.95 | 1.70 | 1.74 | 2.50 | 1.11 | 1.70 |
| Median | 1 | 0.5 | 1 | 1 | 1 | 2 | 1 | 1 |
| Standard deviation | 1.29 | 1.40 | 1.03 | 1.25 | 1.56 | 2.17 | 1.05 | 1.77 |
| Minimum | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| Maximum | 4 | 3 | 3 | 5 | 5 | 7 | 4 | 5 |

### 5.3.2 Hesitations

Compared to the German-Danish group, the German sub-group produced a lower number of hesitation markers for German-Danish cognates (*M*=0.895, *SD*=0.994) as summarized in Table 15. Consistent with the whole-group analysis, most hesitation markers occurred in condition 3. The German-Danish sub-group produced a lot more hesitations for condition 4 than the German sub-group.

*Table 15. Hesitation markers of German- and German-Danish sub-group (GS/GDS).*

Descriptives

| | Condition 1 | | Condition 2 | | Condition 3 | | Condition 4 | |
|---|---|---|---|---|---|---|---|---|
| | GS | GDS | GS | GDS | GS | GDS | GS | GDS |
| N | 19 | 10 | 19 | 10 | 19 | 10 | 19 | 10 |
| Mean | 1.00 | 1.20 | 0.895 | 1.7 | 1.32 | 2.50 | 0.789 | 1.70 |
| Median | 1 | 0.5 | 1 | 1 | 1 | 2 | 1 | 1 |
| Standard deviation | 1.20 | 1.4 | 0.994 | 1.25 | 1.25 | 2.17 | 0.713 | 1.77 |
| Minimum | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| Maximum | 4 | 3 | 3 | 5 | 4 | 7 | 2 | 5 |

### 5.3.3 Intrusions

Participants belonging to the German-Danish group produced fewer intrusion errors in condition 3 as opposed to the other conditions (see Table 16). This finding may simply be caused by the fact that the number of participants belonging to the German-Danish group was smaller than in the other group.

*Table 16. Intrusions for the German- and German-Danish sub-group (GS/GDS).*

Descriptives

| | Condition1 | | Condition 2 | | Condition 3 | | Condition 4 | |
|---|---|---|---|---|---|---|---|---|
| | **GS** | **GDS** | **GS** | **GDS** | **GS** | **GDS** | **GS** | **GDS** |
| N | 19 | 10 | 19 | 10 | 19 | 10 | 19 | 10 |
| Mean | 0.105 | 0.200 | 0.211 | 0.200 | 0.421 | 0.100 | 0.316 | 0.200 |
| Median | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 |
| Standard deviation | 0.315 | 0.422 | 0.419 | 0.422 | 0.838 | 0.316 | 0.582 | 0.422 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Maximum | 1 | 1 | 1 | 1 | 3 | 1 | 2 | 1 |

### 5.3.4 Speech monitoring

As indicated by Table 17, overall speech-monitoring appeared to be weakest in condition 3 (*M* = 0.1, *SD* = 0.316) in the German-Danish group. Again, this may be due to the small number of participants. However, it can be seen that condition 4 (*M* = 0.3, *SD* = 0.675) and condition 2 (*M* = 0.3, *SD* = 0.675) included most speech-error corrections. In condition 4, increased repetitions and non-intrusion errors were made, which subsequently increased rate of error corrections. Again, this was also demonstrated in the whole-group analysis and the German sub-group and therefore does not seem to be connected to participant´s age of acquiring Danish. However, Table 17 also demonstrates that the German sub-group displayed no speech monitoring in condition 2.

*Table 17. Speech-error corrections for the German- and German-Danish sub-group (GS/GDS).*

Descriptives

| | **Condition 1** | | **Condition 2** | | **Condition 3** | | **Condition 4** | |
|---|---|---|---|---|---|---|---|---|
| | **GS** | **GDS** | **GS** | **GDS** | **GS** | **GDS** | **GS** | **GDS** |
| N | 19 | 10 | 19 | 10 | 19 | 10 | 19 | 10 |
| Mean | 0.105 | 0.200 | 0.00 | 0.300 | 0.211 | 0.100 | 0.316 | 0.300 |
| Median | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 |
| Standard deviation | 0.315 | 0.422 | 0.00 | 0.675 | 0.419 | 0.316 | 0.582 | 0.675 |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Maximum | 1 | 1 | 0 | 2 | 1 | 1 | 2 | 2 |

## 5.4 Location of disfluency markers and speech-error corrections

Locations of hesitation markers, intrusion errors and speech-error corrections were recorded to investigate where cognate effects may have been strongest. The locations relate to the code-switched NP. As such, *pre* indicates that the measure occurred prior to the switched NP, *in* indicates that the measure occurred switch-internally, and *post* indicates that the measure ocurred following the switched NP. The focus will be on the locations in each condition that provoked most hesitations, intrusions and corrections. As Figure 3 shows, in condition 1 and condition 3, most hesitation markers ocurred prior to the switched NP. Hence, the cognate targets involving both externally activated languages elicited most hesitations at the cognate location. In contrast, condition 2 and condition 4 prompted most hesitations following the switched NP.

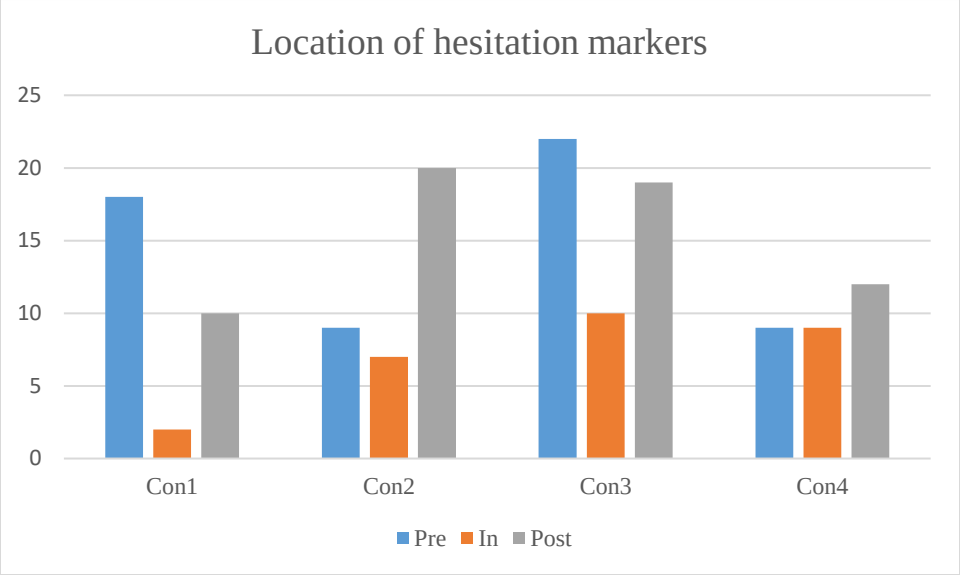


*Figure 3. Location of hesitation markers across conditions. Pre = prior to the switched NP, In = in the switched NP, Post = following the switched NP.*

Figure 4 illustrates locations of intrusion errors across conditions. Most intrusions in condition 4 and 2 ocurred switch-internally. Condition 1 elicited most intrusions prior to the switched NP, and condition 3 also elicited most intrusion prior to the switched NP, as well as switch-internally. The fact that only conditions 1 and 3, led to pre-switch intrusions, indicates that the intrusions related to cognate targets.

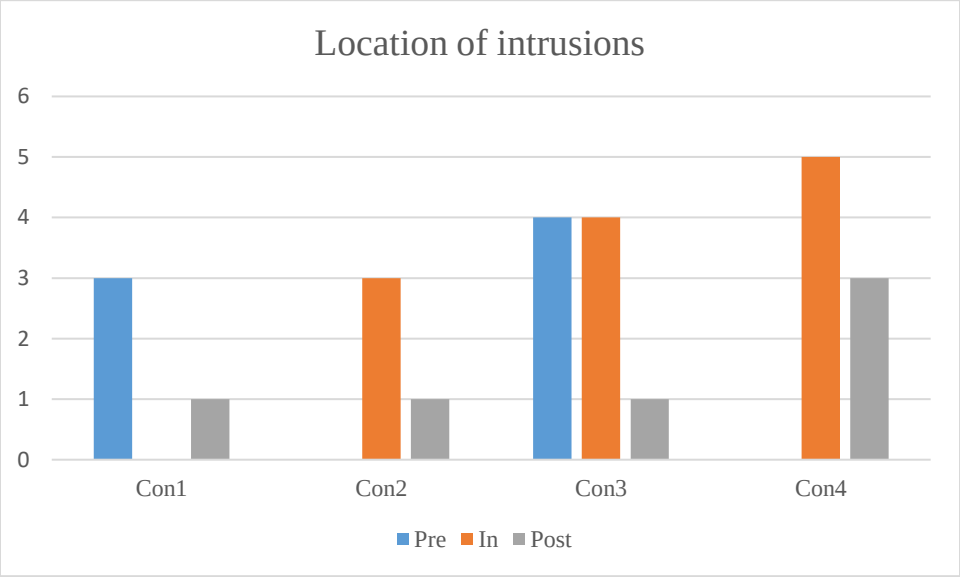


*Figure 4. Locations of intrusion errors across conditions. Pre = prior to the switched NP, In = in the switched NP, Post = following the switched NP.*

Figure 5 indicates the locations where speech-error corrections were made across conditions. All error-corrections and repetitions were included in this figure. Participants self-corrected most errors switch-internally in control condition 4. Thus, in condition 4 also errors other than intrusions were frequently made and corrected in the switched NP. The switch-internal corrections in condition 4 related mostly to mispronunciation of a switched English word, which were not counted as hesitation markers within the premises of this study but provoke the need to consider such errors as meaningful markers of CS processing in future studies. Participants corrected most

errors prior to the switched NP, the cognates, in condition 3. It should be stressed that the absence of speech-error corrections in certain locations and conditions does not signify that no errors were made, just that they were not corrected. For example, as can be seen in Figure 4, a total of 9 intrusion errors were made in condition 3, yet as seen in Figure 5 (speech-error monitoring) only 5 errors were corrected. In condition 4, 8 intrusion errors were counted, and 9 errors overall corrected. Thus, corrections of any errors (not just intrusions) within the target phrase are summarised in figure (5).

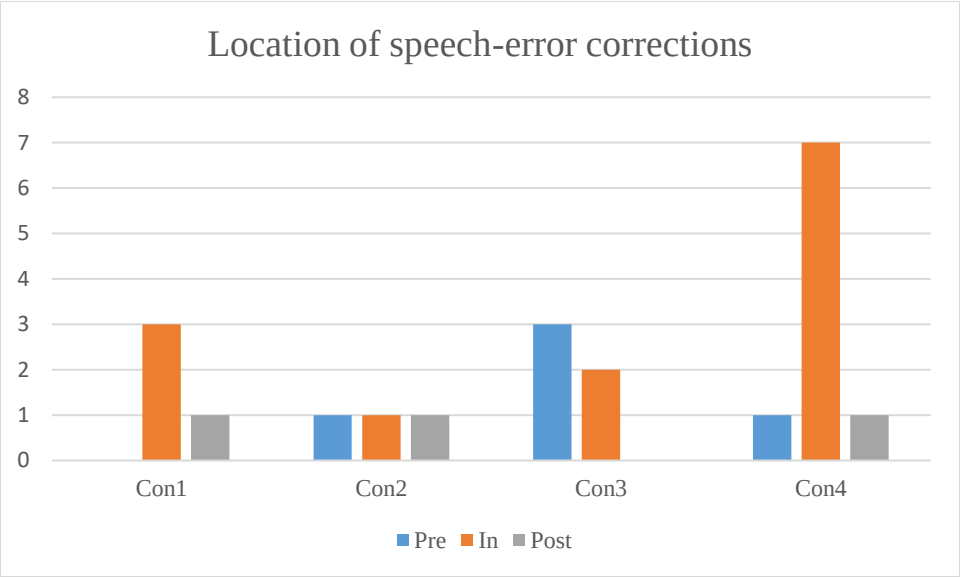


*Figure 5. Location of speech-error corrections across conditions. Pre = prior to the switched NP, In = in the switched NP, Post = following the switched NP.*

A similar pattern for location of hesitation markers was found when splitting participants into their sub-groups (see Appendix L). Due to the low number of intrusions and speech-error corrections in the respective groups, no meaningful comparison could be made.

# 6 Discussion

The primary goal of this study was to examine how cognate status between three typologically related languages affect switching difficulty in trilinguals. It was hypothesised that verb cognates preceding switched NPs would lead to more hesitations and intrusions than switches following noncognate verbs. By distinguishing between three different types of cognates (triple cognates, and double cognates between either German-English or German-Danish), it was further hypothesized that cognates shared between three languages would increase language competition and thus provoke more hesitations and intrusion errors than cognates shared between two languages only. The study also aimed to examine whether speech-error monitoring would be enhanced by the presence of cognates as previously found in Li and Gollan´s (2018a) study. A further goal was to examine possible effects of language dominance and age of acquisition.

The general findings of this study can be summarized as follows: (a) Triple cognates led to easier processing overall than non-cognates, (b) double cognates in German-English led to most overall difficulties in processing, and (c) non-cognates led to more speech-monitoring compared to the cognate conditions in this experiment.

## 6.1 Research questions revisited

To return to the research questions, the following can be said.

1. Do verb cognates cause more switching difficulty than noncognates in planned, connected speech between three typologically related languages?

Verb cognates of the two overt languages (German and English) used in the experiment led to increased switching difficulty, specifically reflected in more hesitations. However, the three cognate conditions differed in effects. Triple cognates did not lead to increased switching difficulty in comparison to noncognates, and the difference between German-Danish cognates and

noncognates was not significant. Therefore, it may be concluded that depending on cognate status and relative language activation through stimuli, cognates may cause more switching difficulty than noncognates.

2. Do triple cognates make switches more difficult than double cognates?

Triple cognates do not cause more switching difficulty than double cognates. Interestingly, triple cognates caused the fewest switching disfluencies in comparison to all other conditions. Consequently, it appeared that triple cognates may facilitate switches or at least provide a processing advantage.

3. Do cognates provoke stronger speech monitoring than noncognates?

The current study cannot reliably answer this question, due to the scarcity of data points. It can be said that based on the number of speech-corrections and repetitions, cognates did not appear to facilitate speech monitoring. However, with respect to corrections of intrusion errors, participants made mid-error corrections only in cognate conditions and not for noncognates.

### 6.2 Hypotheses revisited

H1 stated that codeswitches following verb cognates would provoke more hesitations and intrusion errors than codeswitches following noncognate verbs. H1 was partly supported since hesitations occurred significantly more frequently in condition 3 (German-English cognates) than condition 4 (noncognates). However, there were not significantly more overall disfluencies (hesitations and intrusions) in cognate than noncognate conditions. Therefore, H1 was not supported.

H2 stated that triple cognates would lead to more hesitations and intrusion errors than double cognates. However, the results revealed that one of the double cognate conditions, German-English cognates, led to significantly more switching disfluencies than triple cognates. This is unexpected, since triple cognates were hypothesized to provoke most hesitations and intrusion errors due to potential cross-language competition between all three languages. Based on these results, H2 was not supported.

To distinguish further between the different cognate conditions, H3 stated that German-English cognates would provoke more intrusion errors and hesitations than German-Danish cognates. This was indeed found. Results therefore supported H3.

To examine speech-monitoring, H4 stated that more speech-error corrections would be produced for cognate conditions than noncognate conditions. However, cognates did not lead to a better detection and correction of speech-errors. Instead, unexpectedly, noncognates were found to provoke the most error-corrections. However, when corrections of intrusion errors only were considered, all instances of mid-error corrections were found in cognate conditions, and none in the control condition. Overall, there was no statistical support for H4.

Finally, H5 stated that triple cognates would generate better speech-error detection than double cognates. Numerically, triple cognates rated second lowest in number of speech-corrections. However, there was no statistical support for H5.

### 6.3 Sub-groups

The sub-group analyses revealed similar effects as observed in the whole group analysis. This indicates that German-English cognates provoked most language interference irrespective of participants´ age of acquisition of Danish. However, there were some differences between the groups.

The German sub-group produced no speech-error corrections and fewer hesitation markers than the German-Danish sub-group in condition 2 (German-Danish cognates). Hence, Danish may have been less activated in trilinguals who acquired Danish later as opposed to trilinguals who acquired Danish earlier in life. This may explain why participants in the Danish sub-group produced more hesitations and displayed stronger speech monitoring in condition 2 (German-Danish cognates) than participants belonging to the German sub-group. However, it has previously been suggested that language dominance plays a more important role with respect to inhibition processes (Li & Gollan, 2018a). Specifically, it was found that “the more-inhibited language appears to be

determined most by language dominance rather than by language immersion, or the order of language acquisition" (Li & Gollan, 2018a, p.933). Since dominance between the sub-groups did not significantly differ[12], two explanations are plausible. Firstly, the results may indeed suggest that age of acquisition in trilinguals affects language activation levels in the processing of cognates. Participants who were exposed to Danish from a younger age, would also score higher with respect to language immersion for Danish. Hence, the combination of earlier age of acquisition and stronger immersion may consequently affect activation levels for Danish. Secondly, the difference observed between the two sub-groups may be random due to the small number of participants. Either way, the study suggests that age of acquisition may be as relevant a factor as language dominance in multilingual processing and should not be dismissed.

### 6.4 Theoretical implications of the present results

Although only one hypothesis was supported, the findings of the present study have demonstrated some interesting tendencies regarding how different cognates and noncognates may affect codeswitching.

The most striking finding of the current study is that (a) double cognates in German-English led to the most overall difficulties in processing, and (b) triple cognates led to easier processing overall than non-cognates. As such, no cognate facilitation effect was evident for double cognates, but an enormous one could be observed for triple cognates. These novel findings will be discussed first, and then results will be discussed with respect to each condition.

*Condition 3 – German-English cognates*. Increased switching difficulty as observed with German-English cognates could be explained by the stronger relevance and subsequent activation of English and German in the context of the experiment as opposed to Danish. The large number of hesitations may therefore indicate co-activation and subsequently interferences provoked by German-English cognates. Although, no significant results could be reported for intrusion errors, German-English cognates elicited more intrusions than other cognate conditions and noncognates.

[12] All participants were German-dominant

Again, this can be explained by increased language competition between the two most active languages. This finding aligns with Li and Gollan´s (2018a) study, in that, cognates of the (overtly[13]) activated languages provoke more intrusion errors than noncognates. It is important to clarify that the study designs cannot directly be compared, since Li and Gollan (2018a) examined switching difficulty of single word (cognate/noncognate) switches, as opposed to cognates/noncognates preceding switched NP phrases, as in the current study. Further, Li and Gollan (2018a) focused on noun cognates and phonological overlap only, while the present study examined verb cognates involving both phonological and orthographic overlap. However, the fact that cognate targets, especially in condition 3 led to increased intrusions coincides with Li and Gollan´s (2018a) findings. German-English cognates clearly interfered with bi-multilingual language control in the present study, particularly with the selection of lexical items in the appropriate language/s. This strengthens the link between cognate interference effect and CS in planned speech and contrasts with cognate facilitation effect and CS in spontaneous speech (Broersma & De Bot, 2006; Broersma, 2009; Li & Gollan, 2018a).

*Condition 1 – triple cognates*. The fact that condition 1 (triple cognates) elicited the fewest intrusions and overall disfluencies is more difficult to interpret. It could be argued that triple cognates facilitated CS, even though facilitation effects of cognates in the production of CS have been more strongly associated with spontaneous and voluntary switches (Broersma & de Bot, 2006). The question arises as to why double cognates of the two activated languages caused switching difficulty due to cross-language competition, and triple cognates did not. It may be worth considering whether the fact that triple cognates rank higher in frequency[14] may have influenced faciliatory processes of cognates. Psycholinguistic studies have demonstrated that increased frequency of words and word combinations facilitate language processing in both production and comprehension (Ellis, 2002). Put differently, the more frequently a lexical item is encountered, the easier and faster it can be processed (Ellis, 2002).

[13] The languages that were used for the experiment.

[14] Since triple cognates exist in all three languages, participants may use and encounter these words more frequently than double cognates (only shared between two languages).

An alternative explanation of the seemingly faciliatory effect of triple cognates may be that the additional lexical representation of the cognate targets in a third language may accelerate monitoring processes leading to corrections at the pre-error stage. Previous fMRI studies have shown that error-related brain regions are activated even when the output is correct, indicating pre-error monitoring and internal self-corrections (Abel et al., 2009; Gauvin et al., 2016). However, whether these brain areas are more strongly activated when encountering cognates, specifically triple cognates, remains unexplored.

Furthermore, quite a few instances of phonological transfer were observed in both condition 3 (German-English cognates) and condition 1 (triple cognates). If examples of foreign accent or phonological transfer had been considered, little difference between condition 1 and condition 3 may have been observable. In other words, increased phonological transfer was evident for triple cognate- and German-English cognate targets, yet not all resulted in intrusions. It may also be argued that the examples of phonological transfer may have been instances of partial intrusions. The distinctions between partial intrusions and phonological transfer or so-called accent errors are somewhat blurred. Li and Gollan (2018a) reported that determining the language in which a cognate was produced led to most of the disagreements between researchers involved in the study. Hence, classifying an intrusion error, partial intrusion or accent error may be rather subjective. It is possible that both triple and double cognates led to cross-language interference but that triple cognates caused less full intrusions due to more efficient monitoring.

*Condition 2 – German-Danish cognates*. Although language activation appeared to have been stronger for German and English than for Danish, this does not mean that German-Danish cognates did not activate Danish at all. Again, the stronger activation of German and English in the experiment was expected. However, it was unclear to what degree German-Danish cognates would activate Danish. Although the difference was not significant, participants produced more hesitations for German-Danish cognates than noncognates and triple cognates. This may indicate that German-Danish cognates provoked an interference effect when switching from German into English. As mentioned previously, specifically participants belonging to the German-Danish sub-group, produced hesitations in condition 2. No Danish intrusion errors were recorded for the German-Danish cognate targets, indicating that lexical competition between German and Danish

could be resolved more rapidly than between German and English cognates. Since participants switched into English, the irrelevance of Danish lexical items competing for selection may have been detected early, facilitating inhibition for Danish.

*Condition 4 -noncognates.* Significantly fewer hesitations were produced in condition 4 in comparison with condition 3, hesitations. The number of hesitation markers in condition 4 was more consistent with condition 1 and 2. However, many intrusion errors for control condition 4 (noncognates) were found, which may have been primarily caused by orthographic overlap, since most intrusion occurred for function word cognates (e.g *ein* instead of *an,* or *for* instead of *für*).

The increased number of intrusion errors in control condition 4 may have been caused by lack of facilitation through the noncognates. For example, intrusions *preceding* the switched NP were all in German, indicating switching difficulty. Intrusion *following* the switched NP were all in English, implying difficulty of switching back into the default language (German). This may be an example of the reverse dominance effect, since German was found to be participant´s dominant language. This finding fits within the theoretical framework of the ICM, in that the magnitude of inhibition increased for German when switching into English and causing processing delays when switching back into the default language. Hence, while German is assumed to be the most strongly activated (dominant) language in the experiment, switching into another language requires stronger inhibition of the more activated/dominant language, delaying the re-activation/re-use of the dominant language. Further, studies have shown that controlled, involuntary switching leads to increased cognitive load reflected in cost as opposed to staying in one language (Costa & Santesteban, 2004; Gollan & Ferreira, 2009). Thus, irrespective of cognate status, top-down processes may cause switching difficulty reflected in hesitation markers and other disfluencies.

*Speech-errors corrections across conditions.* With respect to speech-monitoring, instances of speech-error corrections and repetitions were very low, reflecting the general ease of switching found among participants. However, it appeared that noncognates gave rise to stronger speech-monitoring than cognates. Specifically, noncognates seemed to evoke more speech-error

detections and corrections for all errors and repetitions found in the target clause. This is contrary to what was found in Li and Gollan´s (2018a) study. However, the corrections of speech-errors in condition 4 primarily related to mispronunced English words, indicating switching difficulty. Hence, the switching disfluency found in condition 4 may reflect impeding effects of noncognates. As such, the lack of co-activation through cognates in condition 4 may delay the (phonological) activation of the guest language (English). If mispronunciations and other errors of words in the target clause had been coded for, the correction rate in condition 4 may have appeared less surprising. Hence, future studies may want to code any speech-errors and run an analysis for speech-error corrections in relation to all errors (intrusions, mispronunced words, deletions and/or insertions of words).

Focusing on corrections of intrusion errors only, German-English and German-Danish cognates generated mid-error corrections, while noncognates did not generate any mid-error corrections of intrusions. Although the numbers are so low that no general conclusion can be drawn with respect to speech monitoring, the fact that only cognate conditions provoked mid-error corrections of intrusions is consistent with Li and Gollan´s (2018a) findings and could be interpreted as cognates facilitating speech-monitoring. The relation between cognates and speech-monitoring is complex and provokes the need to be investigated using different methods (e.g., ERP, fMRI).

### 6.4 Considerations and outlook for future research

It is important to stress that overall results of the study indicated that CS did not provide a major challenge for most participants. In fact, several participants produced no or very few disfluencies in the target phrases. This may be explained by several factors. For example, the high self-reported abilities (proficiency) of participants in each of the three target languages. Further, the majority of participants may be classified as habitual codeswitchers, which may have contributed to ease of switching. This is consistent with other studies that have demonstrated that factors such as experience may reduce processing cost in bilingual discourse (Beatty-Martínez & Dussias, 2017; Beatty-Martínez et al., 2018). Specifically, habitual codeswitchers may have experienced more cooperative control states resulting in less cross-language competition and subsequently less

hesitation phenomenon. On the other hand, participants who reported codeswitching less frequently may have been subject to a more competitive control state and subsequently produced more switching disfluencies (Beatty-Martínez & Dussias, 2017). Another participant-related aspect that may have led to variation is reading skills. Ideally, participants´ reading skills should have been tested to eliminate it as a confounding factor. However, since participants self-rated their language skills in the LHQ with respect to speaking, listening, reading and writing, reading was consistently ranked highest, while writing skills were usually ranked lowest. A number of studies have demonstrated that more advanced speakers self-asses their (foreign) language abilities more accurately, and tend to underestimate rather than overestimate themselves (Alderson, 2005; Brantmeier & Vanderplank, 2008; Heilenman, 1990). Therefore, it can be assumed that since participants were all advanced speakers of the three languages in questions, the scores in the LHQ relating to reading abilities as well as general proficiency correspond to their actual language skills. Nevertheless, other studies have reported that irrespective of proficiency levels, learners tend to overestimate their language abilities (Davidson & Henning, 1985).

Since all participants reported German to be their dominant language, results may have differed if the current study had tested switch-direction. For example, if the present study design would be replicated using English or Danish as the default language, including a German switched NP, a different outcome could be expected. Specifically, in Li and Gollan´s (2018a) study with Mandarin-dominant bilinguals, more intrusion errors were produced for Chinese cognate targets as opposed to English cognate targets. As mentioned earlier, the current study showed that switching back into the dominant language appeared to specifically be challenging in condition 4. This reverse dominance effect may therefore be increased if switching from a non-dominant into the dominant language. Consequently, altering switch direction may increase the number of intrusions as well as hesitation markers. In other words, since weaker inhibition processes are assumed to apply to the non-dominant language/s, switching into the non-dominant language/s may be easier and less costly than the other way around.

With respect to stimuli, although similarity ratings of the cognate verbs were balanced, it is possible that differences of orthographic and phonological overlap were present and impacted on both switching difficulty and cognate facilitation effects. One approach to quantifying differences

between the orthographic forms of cognates would be to calculate the Levenshtein distance (Levenshtein, 1966). This method could have contributed to a more reliable distribution of cognates between conditions. Generally, it can be said that German-Danish cognates may rank higher in orthographic overlap due to the typological relatedness of the two languages.

Another stimuli-related factor that may have been influential, is the predictability of switches, which has been found to facilitate CS in previous studies (Costa & Santesteban, 2004; Fink & Goldrick, 2015). In the present study, switches in target paragraphs always occurred in the same sentential location, which makes it likely that a learning effect took place and possibly influenced the results. However, as seen in Declerck et al.´s (2013) study, even when participants are informed about when to switch languages, switch cost could not be eliminated. Furthermore, filler sentences involving different switching locations and types may have reduced the predictability of the target CS. Some participants reported an anticipatory effect after completion of the experiment. In other words, participants expected to switch at the same location and reported to be more confused when reading a completely monolingual paragraph as opposed to a paragraph including switches. This confirms that participants were in bilingual mode, which may have played another key role regarding switching facilitation.

In addition, since the recruitment text specified that participants should be able speak German, English and Danish fluently, participants anticipated the relevance of all three languages in the experiment. After completion of the trial run, several participants asked whether they would also encounter Danish in the paragraphs[15]. This anticipation may have led to the activation of all three languages, specifically in the beginning of the experiment. As participants started the experiment, it was likely that activation of Danish was gradually suppressed, once participants realised that paragraphs only involved German, and English.

A further issue to be mentioned is that of typological relatedness. The proportions of shared cognates are highly specific to the languages tested in cognate and CS studies. Whether two or more languages are typologically related may affect the degree of activation during speech production, irrespective of which languages are used. In the context of the present study, the fact

[15] This question was of course not answered by the researcher.

that Danish and German share a large number of cognates may increase activation of Danish, even when the language is not actively being used. Though German and English are also typologically related, the language pair is more distant than German and Danish. Then again, Danish and English also share a substantial proportion of cognates. Hence, the relatedness of three languages may lead to an increased activation, even when only two are being used. Replicating the current study with Danish switches as opposed to English switches may result in different patterns. Considering that German-Danish cognates are generally more similar than German-English cognates, inhibition processes of the non-target language may be more costly, and consequently interferences may be stronger.

Word class is another factor that may have affected the present findings, especially the low occurrences of intrusions. Studies have shown that verb cognates are recognized more slowly than noun cognates and decrease cognate facilitation effects (Bultena et al., 2014). Specifically, in sentence contexts, verb cognates have been reported to show no or only minor facilitation effects (Bultena et al., 2014). This is due to the fact that verb cognates cannot achieve the same similarity as noun cognates. Therefore, the smaller similarity may have influenced language competition and the relatively low occurrence of intrusion errors for the cognate conditions.

However, within the premises of the present study it can be said that verb cognates appeared to influence CS processing. Further, since several function word cognates caused intrusions, the current study demonstrates that cognate status of lexical items, irrespective of their word class, appeared to interfere with language selection. In the same vein, it is undeniable that noun cognates achieve higher similarity scores and may therefore increase cross-language competition and simultaneously lead to more intrusions. Many of the verb cognates included in this study did, however, not lead to intrusion errors, which may have been due to lower orthographic and/or phonological overlap. Here, it may be worth emphasizing that selecting verb cognates between three languages constituted a great challenge. Specifically, since not only similarity scores were controlled but also frequencies for each of the cognates in the respective languages.

Whether intrusions may be defined as errors or simply as codeswitches at locations that feel more comfortable to the bilingual/trilingual speaker may also be debated, specifically with respect to intrusions that do not concern cognate targets. For example, a respectable number of participants

produced indefinite determiners in German and commenced the CS with the adjective. As seen in Parafita Couto and Gullberg´s (2019) study, switches in noun phrases primarily occurred in simplex NPs (DetN) and determiners were provided by the default language. The frequency of this switching location may indicate that noun phrases switching between determiner and noun may cause less/no switch cost, while more uncommon locations may cause or increase switch cost. Hence, the fact that participants commenced the CS with an adjective instead of the determiner, may signal a lower cost associated with switching content words. Put simply, processing cost may be increased when switching at uncommon locations in a sentence.

However, testing the processing of different switch locations (VP-external vs. VP-internal) and switch directionality, Suurmeijer et al. (2020) did not find an independent effect for switch locations. Further, as seen in studies examining trilingual switching patterns, more complex alternations were observed and NPs including determiners may indeed be switched (Pittman, 2008; Stavans & Swisher, 2006; Qasim & Qasim, 2014). To examine whether trilinguals conform to the predictions made with respect to switching patterns is unclear and provokes the need to further investigate natural switching data from trilinguals as well as multilinguals. Poeste et al. (2019) examined the possible relationship between CS and language dominance in bi-tri- and multilingual children. Language dominance did not seem to impact on CS frequency, nor switching types (Poeste et al., 2019). It was also examined what switching patterns could be found with respect to inter- and intra-sentential switching. Interestingly, all intra-sentential codeswitching in Poeste et al.´s (2019) study on trilinguals and multilinguals was found to be of the insertional type. Adopting Muysken´s (2000) framework of different types of code-mixing; the switched NP in the current study may be referred to as an insertion. Muysken (2000) emphasises that most insertions found in speech samples consist of NPs. However, the inserted lexical elements primarily comprise content words, which is not the case in this study. Nevertheless, variation of insertional switching has been recorded, especially with respect to trilinguals (Pittman, 2008; Stavans & Swisher, 2006). Since German, English and Danish also share grammatical structure to some degree, it may also be argued that the CS stimuli used in the present study may be examples of congruent lexicalization. Hence, the order of determiner, adjective and noun are the same in all three languages and the syntactic structure of declarative sentences (Subject + Verb+ Object) align between the languages. Thus, the switched lexical items could easily be replaced by any of the

three languages. Since insertional CS appears to be common, the general ease of CS as seen in this study may be due to the nature of the switched phrase (Poeste et al., 2019). Further, the fact that the target sentence follows the syntactic and grammatical constraints of all three languages, may have facilitated processing. A recent study examining the role of gender congruency in CS experiments, suggests that incongruent switches may be more difficult to process (Beatty-Martínez & Dussias, 2017). Further studies are needed to test different CS types and their impact on processing.

As has become clear, the discussion of how different word classes may affect processing of switches is a complex matter. According to Muysken´s (2000) framework, the fact that a determiner was included in the switched NP, may have increased switching cost. However, too little is known about switching patterns in tri-and multilinguals in order to reliably apply the theoretical frameworks to the current study. It can be assumed that cognate effects were evident in the current study. Nevertheless, the probability that the switched determiner may have caused some of the disfluency phenomena surrounding the switched NP cannot be eliminated.

It is also important to address some methodological limitations of the current study that may have affected the findings. Although assistance of additional bilingual and native speakers of the respective languages was used, there was no real interrater reliability testing. Additionally, pauses varied in length, yet this could not be captured by the employed method. Future studies may want to measure pause lengths, which may result in a more precise analysis of hesitation phenomenon with respect to CS. Further, eye-tracking could provide valuable information about switching difficulty. Finally, alternative statistics could be applied in future studies (e.g., multilevel modelling).

Replication studies are needed to corroborate or challenge the current findings. Experimental studies may specifically compare whether different switch locations as well as word classes included in a switched phrase, may impact on processing of CS. The relationship between speech-monitoring and cognates also remains unclear due to low data points. Notwithstanding, this study may provide valuable insights into the relationship between cognates and codeswitching in trilinguals.

# 7 Conclusion

This study offered experimental evidence of how different cognates in three typologically related languages affect CS. This is the first study to examine the relation between cognates and CS in trilinguals using a read-aloud task, therefore contributing to a much underresearched domain within CS studies.

The fact that German-English cognates were found to elicit the strongest effects across measures (hesitation markers, intrusions and speech-error corrections) among all participants, indicates that the two languages used in the experiment interfered with the selection of the target items in the appropriate language. On the other hand, the study showed that triple cognates caused fewest reading disfluencies, which suggests that different processes may have been at play, with respect to bi-/multilingual language control. To determine whether this is the case, and if so, how triple cognates may have facilitated CS in comparison with double cognates, several explanations have been explored. More effective speech-monitoring may have been caused by increased cross-language competition and consequently resulted in fewer overt hesitations and intrusions. The greater frequency of triple cognates may alternatively lead to a processing advantage, facilitating switches. Although this finding was not expected, it may potentially be used to expand on existing bilingual processing models as well as provide grounds to consider differences between bilingual and tri-/multilingual processing. Consequently, the study contributes to our understanding of multilingual control and processing.

Ultimately, this study highlights how little is known about CS involving more than two languages and highlights the importance of examining differences and similarities between language processing of tri-multilinguals and bilinguals. It will be important in future studies to explore similarities and differences of triple cognate effects in spontaneous and planned speech, and in typologically related and unrelated languages.

# References


Alderson, J. C. (2005). *Diagnosing foreign language proficiency: The interface between learning and assessment*. A&C Black.

Alhourani, A. Q. (2018). Code Switching as a Communicative Strategy for the Bilingual Saudi Speakers at Jouf University. *Online Submission*, *1*(4), 10-19.

Altarriba, J., & Santiago-Rivera, A. L. (1994). Current perspectives on using linguistic and cultural factors in counseling the Hispanic client. *Professional Psychology: Research and Practice*, *25*(4), 388.

Bada, E. (2006). Pausing, preceding and following 'that' in English. *ELT Journal*, *60*(2), 125-132.

Badiola, L., Delgado, R., Sande, A., and Stefanich, S. (2018). Code-switching attitudes and their effects on acceptability judgment tasks. *Linguist Approaches Biling. 8*, 5–24.

Baker, C. & Wright, W. E. (2017). *Foundations of Bilingual Education and Bilingualism*. 6th ed. Bristol: Multilingual Matters.

Basnight-Brown, D. M., & Altarriba, J. (2007). Code-switching and code-mixing in bilinguals: Cognitive, developmental, and empirical approaches. *Speech and language disorders in bilinguals*, *69*, 89.

Beatty-Martínez, A. L., & Dussias, P. E. (2017). Bilingual experience shapes language processing: Evidence from codeswitching. *Journal of Memory and Language*, *95*, 173-189.

Beatty-Martínez, A. L., Navarro-Torres, C. A., Parafita Couto, M. C., & Dussias, P. E. (2017). The codeswitching map task corpus. *Manuscript in preparation*.

Belazi, H. M., Rubin, E. J., and Toribio, A. (1994). Code switching and X-Bar theory: the functional head constraint. *Linguist. Inquiry 25*, 221–237.

Berthele, R. (2012). “The Influence of Code-mixing and Speaker Information on Perception and Assessment of Foreign Language Proficiency: An Experimental Study.” *International Journal of Bilingualism 16* (4): 453–466.

Bhatia, T. K., & Ritchie, W. C. (2004). Social and Psychological Factors in Language Mixing. In W. C. Ritchie and T. K. Bhatia (eds.), *Handbook of Bilingualism* (pp.336-352). Blackwell Publishing.

Brantmeier, C., & Vanderplank, R. (2008). Descriptive and criterion-referenced self-assessment with L2 readers. *System*, *36*(3), 456-477.

Broersma, M., & De Bot, K. (2006). Triggered codeswitching: A corpus-based evaluation of the original triggering hypothesis and a new alternative. *Bilingualism: Language and Cognition*, 9, 1–13.

Broersma, M. (2009). Triggered codeswitching between cognate languages. *Bilingualism: Language and Cognition*, *12*(4), 447-462.

Broersma, M., Carter, D., Donnelly, K., & Konopka, A. (2020). Triggered codeswitching: Lexical processing and conversational dynamics. *Bilingualism: Language and Cognition*, *23*(2), 295-308.

Bullock, B. E., & Toribio, A. J. E. (2009). *The Cambridge handbook of linguistic code-switching*. Cambridge University Press.

Bultena, S., Dijkstra, T., & Van Hell, J. G. (2014). Cognate effects in sentence context depend on word class, L2 proficiency, and task. *Quarterly Journal of Experimental Psychology*, *67*(6), 1214-1241.

Bultena, S., Dijkstra, T., & Van Hell, J. G. (2015a). Language switch costs in sentence comprehension depend on language dominance: Evidence from self-paced reading. *Bilingualism: Language and Cognition*, *18*(3), 453-469.

Bultena, S., Dijkstra, T., & van Hell, J. G. (2015b). Switch cost modulations in bilingual sentence processing: Evidence from shadowing. *Language, Cognition and Neuroscience*, *30*(5), 586-605.

Caramazza, A., & Brones, I. (1979). Lexical access in bilinguals. *Bulletin of the Psychonomic Society*, *13*(4), 212–214.

Cenoz, J., & Gorter, D. (Eds.). (2015). *Multilingual education*. Cambridge University Press.

Chung, H. H. (2006). Code switching as a communicative strategy: A case study of Korean-English bilinguals. *Bilingual Research Journal, 30,* 293–307.

Clark, H. H., & Tree, J. E. F. (2002). Using uh and um in spontaneous speaking. *Cognition, 84*(1), 73-111.

Clyne, M. (1967). *Transference and triggering: Observations on the language assimilation of postwar German-speaking migrants in Australia*. The Hague, the Netherlands: Martinus Nijhoff.

Clyne, M. (2003). *Dynamics of language contact: English and immigrant languages*. Cambridge University Press.

Costa, A., & Santesteban, M. (2004). Lexical access in bilingual speech production: Evidence from language switching in highly proficient bilinguals and L2 learners. *Journal of memory and Language, 50*(4), 491-511.

Davidson, F., & Henning, G. (1985). A self-rating scale of English difficulty: Rasch scalar analysis of items and rating categories. *Language testing, 2*(2), 164-179.

Declerck, M., Philipp, A. M., & Koch, I. (2013). Bilingual control: sequential memory in language switching. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 39*(6), 1793.

Declerck, M., & Philipp, A. M. (2015). A sentence to remember: Instructed language switching in sentence production. *Cognition, 137,* 166-173.

De Boer, M., & Heeren, W. (2019). The speaker-specificity of filled pauses: A cross-linguistic study. *Proceedings of the International Congress of Phonetic Sciences (ICPhS) 2019* (pp.607–611). Melbourne, Australia: Australasian Speech Science and Technology Association.

De Bot, K. (1996). The psycholinguistics of the output hypothesis. *Language learning, 46*(3), 529-555.

De Bot, K., & Jaensch, C. (2015). What is special about L3 processing?. *Bilingualism: Language and Cognition, 18*(2), 130-144.

De Groot, A. M. B., Delmaar, P., & Lupker, S. J. (2000). The processing of interlexical homographs in translation recognition and lexical decision: Support for nonselective access to bilingual memory. *Quarterly Journal of Experimental Psychology, 53A*(2), 397–428.

Deuchar, M. & Quay, S. (2000). *Bilingual acquisition: Theoretical implications of a case study*. Oxford: Oxford University Press.

Dewaele, J. M., & Wei, L. (2014). Attitudes towards code-switching among adult mono-and multilingual language users. *Journal of Multilingual and Multicultural Development*, *35*(3), 235-251.

Dijkstra, T., & van Heuven, W.J.B. (1998). The BIA-model and bilingual word recognition. In J. Grainger and A. Jacobs (Eds.), *Localist connectionist approaches to human cognition* (pp. 189-225). Hove: LEA.

Dijkstra, T., Miwa, K., Brummelhuis, B., Sappelli, M., & Baayen, H. (2010). How cross-language similarity and task demands affect cognate recognition. *Journal of Memory and language*, *62*(3), 284-301.

Dussias, P. E., & Courtney, E. H. (1994). Que es un good code-switch? Testing the Functional Head Constraint within Noun Phrases. *Journal of Second Language Acquisition and Teaching*, *2*, 1-13.

Ellis, N. C. (2002). Frequency effects in language processing. *Studies in Second Language Acquisition*, *24*, 143–188.

Fink, A., & Goldrick, M. (2015). Pervasive benefits of preparation in language switching. *Psychonomic Bulletin & Review*, *22*(3), 808-814.

Finkbeiner, M., Almeida, J., Janssen, N., & Caramazza, A. (2006). Lexical selection in bilingual speech production does not involve language suppression. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *32*(5), 1075.

Flynn, S., Foley, C., & Vinnitskaya, I. (2004). The cumulative-enhancement model for language acquisition: Comparing adults' and children's patterns of development in first, second and third language acquisition of relative clauses. *International Journal of Multilingualism*, *1*(1), 3-16.

Fricke, M., Kroll, J. F., & Dussias, P. E. (2016). Phonetic variation in bilingual speech: A lens for studying the production–comprehension link. *Journal of memory and language*, *89*, 110-137.

Genesee, F. (1989). Early bilingual development: One language or two? *Journal of Child Language*, *16*, 161–179.

Gollan, T. H., & Ferreira, V. S. (2009). Should I stay or should I switch? A cost–benefit analysis of voluntary language switching in young and aging bilinguals. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *35*(3), 640.

Green, D. W. (1986). Control, activation, and resource: A framework and a model for the control of speech in bilinguals. *Brain and language*, *27*(2), 210-223.

Green, D.W. (1998a). Mental control of the bilingual lexico-semantic system. *Bilingualism: Language and Cognition*, *1*, 67-81.

Green, D.W. (1998b). Schemas, tags, and inhibition. *Bilingualism: Language and Cognition*, *1*, 100-104.

Green, D. W., & Wei, L. (2014). A control process model of code-switching. *Language, Cognition and Neuroscience*, *29*(4), 499-511.

Green, D. W., & Wei, L. (2016). Code-switching and language control. *Bilingualism: Language and Cognition*, *19*, 883–884.

Grimstad, M. B. (2017). The code-switching/borrowing debate: evidence from English-origin verbs in American Norwegian. *Lingue e linguaggio*, *16*(1), 3-34.

Grosjean, F. (1982). *Life with two language. An introduction to bilingualism*. Cambridge, MA: Harvard University Press.

Grosjean, F. (1995). A psycholinguistic approach to code-switching: The recognition of guest words by bilinguals. *One speaker, two languages: Cross-disciplinary perspectives on code-switching*, 259-275.

Grosjean, F. (1999). The Bilingual's Language Mode. *One Mind, Two Languages: Bilingual Language Processing*. (pp 1-22). Oxford: Blackwell.

Gullberg, M., Indefrey, P., & Muysken, P. (2009). Research techniques for the study of code-switching. In B. E. Bullock & A. J. Toribio (Eds.), *The Cambridge Handbook on linguistic code-switching* (pp. 21-39). Cambridge: Cambridge University Press.

Gullifer, J. W., Kroll, J. F., & Dussias, P. E. (2013). When language switching has no apparent cost: Lexical access in sentence context. *Frontiers in psychology*, *4*, 278.

Gumperz, J. J. (1967). On the linguistic markers of bilingual communication. *The Journal of Social Issues*, *23*(2), 137–153.

Hansson, P., (1998). *Pausing in spontaneous speech*. In: Branderud, Peter, Hartmut, Traunmüller (Eds.), Proceedings of FONETIK 98, The Swedish Phonetics Conference, May 27–29. Department of Linguistics, Stockholm University,Stockholm, pp. 158–161.

Haspelmath, M. (2009). *Lexical borrowing: Concepts and Issues*. In M. Haspelmath & U. Tadmor (eds.), Loanwords in the world's languages: A comparative handbook, 35-54. Berlin: Mouton de Gruyter.

Hawkins, P. R. (1971). The syntactic location of hesitation pauses. *Language and Speech*, *14*(3), 277-288.

Hlavac, J. (2011). Hesitation and monitoring phenomena in bilingual speech: A consequence of code-switching or a strategy to facilitate its incorporation?. *Journal of Pragmatics*, *43*(15), 3793-3806.

Ibáñez, A. J., Macizo, P., & Bajo, M. T. (2010). Language access and language selection in professional translators. *Acta psychologica*, *135*(2), 257-266.

Jackson, G. M., Swainson, R., Cunnington, R., & Jackson, S. R. (2001). ERP correlates of executive control during repeated language switching. *Bilingualism*, *4*(2), 169.

Kavé, G., Eyal, N., Shorek, A., & Cohen-Mansfield, J. (2008). Multilingualism and cognitive state in the oldest old. *Psychology and aging*, *23*(1), 70.

Kilgarriff, A., Baisa, V., Bušta, J., Jakubíček, M., Kovář, V., Michelfeit, J., Rychlý, P., & Suchomel, V. (2014). The Sketch Engine: ten years on. *Lexicography*, 1: 7-36.

Kim, E. (2006). Reasons and motivations for code-mixing and code-switching. *Issues in EFL*, *4*(1), 43-61.

Kleinman, D., & Gollan, T. H. (2016). Speaking two languages for the price of one: Bypassing language control mechanisms via accessibility-driven switches. *Psychological science*, *27*(5), 700-714.

Köppe, R., & Meisel, J. M. (1995). Code-switching in bilingual first language acquisition. One speaker, two languages: Cross-disciplinary perspectives on code-switching, 276– 301.

Kootstra, G. J., Van Hell, J. G., & Dijkstra, T. (2012). Priming of code-switches in sentences: The role of lexical repetition, cognates, and language proficiency. *Bilingualism: Language and Cognition*, *15*(4), 797-819.

Kootstra, G. J., Dijkstra, T., & van Hell, J. G. (2020). Interactive alignment and lexical triggering of code-switching in bilingual dialogue. *Frontiers in psychology*, *11*, 1747.

Kroll, J.F., & Stewart, E. (1994). Category interference in translation and picture naming: Evidence for asymmetric connections between bilingual memory representations. *Journal of Memory and Language*, *33*, 149-174.

Kroll, J. F., & Dijkstra, A. (2001). *The bilingual lexicon.* In R. Kaplan (Ed.), Handbook of applied linguistics (pp. 301–321). Oxford: Oxford University Press.

Kroll, J. F., Van Hell, J. G., Tokowicz, N., & Green, D. W. (2010). The Revised Hierarchical Model: A critical review and assessment. *Bilingualism (Cambridge, England)*, *13*(3), 373.

La Heij, W. (2005). Selection processes in monolingual and bilingual lexical access. *Handbook of bilingualism: Psycholinguistic approaches*, 289-307.

Lemhöfer, K., Dijkstra, T., & Michel, M. (2004). Three languages, one ECHO: Cognate effects in trilingual word recognition. *Language and cognitive processes*, *19*(5), 585-611.

Levelt, W. J. M. (1989). *Speaking: From intention to articulation*. Cambridge, MA: Bradford.

Levenshtein, V. I. (1966, February). Binary codes capable of correcting deletions, insertions, and reversals. In *Soviet physics doklady* (Vol. 10, No. 8, pp. 707-710).

Lewis, G., Jones, B., & Baker, C. (2012a). Translanguaging: Origins and development from school to street and beyond. *Educational Research and Evaluation*, *18*(7), 641-654.

Lewis, G., Jones, B., & Baker, C. (2012b). Translanguaging: Developing its conceptualisation and contextualisation. *Educational Research and Evaluation*, *18*(7), 655-670.

Li, C., & Gollan, T. H. (2018a). Cognates interfere with language selection but enhance monitoring in connected speech. *Memory & Cognition, 46(6*), 923-939.

Li, C., & Gollan, T. H. (2018b). Cognates facilitate switches and then confusion: Contrasting effects of cascade versus feedback on language selection. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 44*(6), 974-991.

Li, P., Zhang, F., Yu, A., & Zhao, X. (2020). Language History Questionnaire (LHQ3): An enhanced tool for assessing multilingual experience. *Bilingualism: Language and Cognition, 23*(5), 938-944.

Lijewska, A., & Chmiel, A. (2015). Cognate facilitation in sentence context–translation production by interpreting trainees and non-interpreting trilinguals. *International Journal of Multilingualism, 12*(3), 358-375.

Mägiste, E. (1986). Selected issues in second and third language learning. In J. Vaid (ed.), *Language processing in bilinguals: Psycholinguistic and neurolinguistic perspectives*, pp. 97–122. Hillsdale, NJ: Lawrence Erlbaum.

Macizo, P., Bajo, T., & Paolieri, D. (2012). Language switching and language competition. *Second Language Research, 28*(2), 131-149.

MacSwan, J. (2000). The architecture of the bilingual language faculty: Evidence from intrasentential code switching. *Bilingualism: language and cognition, 3*(1), 37-54.

Meuter, R. F., & Allport, A. (1999). Bilingual language switching in naming: Asymmetrical costs of language selection. *Journal of memory and language, 40*(1), 25-40.

Montes-Alcalá, C. (2000). "Written code-switching. Powerful bilingual images," in *Code-switching worldwide II*. Berlin and New York. Mouton de Gruyter, 193–219.

Muysken, P. (1997). Code-mixing: Constraints and strategies. In *First International Symposium on Bilingualism, held in Newcastle upon Tyne, UK*.

Muysken, P. (2000). *Bilingual Speech. A Typology of Code-Mixing*. Cambridge: Cambridge University Press.

Muysken, P. (2013). Language contact outcomes as the result of bilingual optimization strategies. *Bilingualism: Language and Cognition 16*(4). 1–22.

Müller, N., Arnaus Gil, L., Eichler, N., Geveler, J., Hager, M., Jansen, V., Patuto, M., Repetto, V. & Schmeißer, A. (2015). *Code-Switching: Spanisch, Italienisch, Französisch. Eine Einführung*. Tübingen: Narr.

Myers-Scotton, C. (1993). *Duelling Languages: Grammatical Structure in Code Switching*. Oxford: Oxford University Press.

Myers-Scotton, C. (2002). *Contact Linguistics: Bilingual Encounters and Grammatical Outcomes*. Oxford: Oxford University Press.

Navarretta, C. (2016). The Functions of Fillers, Filled Pauses and Co-occurring Gestures in Danish Dyadic Conversations. *Linköping Electronic Conference Proceedings*, *105*, 55-61.

Nozari, N., Dell, G. S., & Schwartz, M. F. (2011). Is comprehension necessary for error detection? A conflict-based account of monitoring in speech production. *Cognitive psychology*, *63*(1), 1-33.

Nicoladis, E., & Genesee, F. (1997). Language development in preschool bilingual children. *Journal of Speech-Language Pathology and Audiology*, *21*, 258–270.

Philipp, A. M., & Huestegge, L. (2015). Language switching between sentences in reading: Exogenous and endogenous effects on eye movements and comprehension. *Bilingualism: Language and Cognition*, *18*(4), 614-625.

Parafita Couto, M. C., Davies, P., Carter, D., and Deuchar, M. (2014). "Factors influencing code-switching," in *Advances in the Study of Bilingualism*, eds E. Thomas and I. Mennen (Bristol: Multilingual Matters), 111–140.

Parafita Couto, M. C., & Gullberg, M. (2019). Code-switching within the noun phrase: Evidence from three corpora. *International Journal of Bilingualism*, *23*(2), 695-714.

Pittman, I. (2008). Bilingual and trilingual codeswitching between Hungarian, Romanian and English in the speech of two Transylvanians living in North America. *International Journal of Multilingualism*, *5*(2), 122-139.

Poeste, M., Müller, N., & Arnaus Gil, L. (2019). Code-mixing and language dominance: Bilingual, trilingual and multilingual children compared. *International journal of multilingualism*, *16*(4), 459-491.

Poplack, S. (1980) Sometimes I'll start a sentence in Spanish *y termino en Español*: Toward a typology of code-switching. *Linguistics 18*, 581618.

Qasim, A., & Qasim, Z. (2014). A case study of code switching in trilingual conversations. *Research on Humanities and Social Sciences*, *4*(22), 180-183.

Redlinger, W. E., & Park, T. Z. (1980). Language mixing in young bilinguals. *Journal of Child Language*, *7*, 337–352.

Redinger, D. (2010). *Language Attitudes and Code-Switching Behaviour in a Multilingual Educational Context: The Case of Luxembourg*. PhD Thesis, University of York.

Reynolds, M. G., Schlöffel, S., & Peressotti, F. (2016). Asymmetric switch costs in numeral naming and number word reading: Implications for models of bilingual language production. *Frontiers in Psychology*, *6*, 2011.

Roelofs, A., Meyer, A. S., & Levelt, W. J. (1998). A case for the lemma/lexeme distinction in models of speaking: Comment on Caramazza and Miozzo (1997). *Cognition*, *69*(2), 219-230.

Rosselli, M., Ardila, A., Jurado, M., & Salvatierra, J. (2014). Cognate facilitation effect in balanced and non-balanced Spanish–English bilinguals using the Boston Naming Test. *International Journal of Bilingualism*, *18*(6), 649-662.

San Isidro, X., & Lasagabaster, D. (2019). Code-switching in a CLIL multilingual setting: a longitudinal qualitative study. *International Journal of Multilingualism*, *16*(3), 336-356.

Sankoff, D., & Poplack, S. (1981). A formal grammar for code-switching. *Research on Language & Social Interaction*, *14*(1), 3-45.

Santesteban, M., & Costa, A. (2016). Are cognate words "special"?". *Cognitive control and consequences of multilingualism*, *2*, 97.

Schmid, M. S., & Fägersten, K. B. (2010). Disfluency markers in L1 attrition. *Language learning*, *60*(4), 753-791.

Silva-Corvalán, C. (1983). Code-Shifting Patterns in Chicano Spanish. In L. Elías-Olivares (Ed.), *Spanish in the U.S setting: beyond the Southwest* (pp. 69–87). Rosslyn, VA: National Clearinghouse for Bilingual Education.

Sridhar, S. N., & Sridhar, K. K. (1980). The syntax and psycholinguistics of bilingual code mixing. *Canadian Journal of Psychology/Revue canadienne de psychologie*, *34*(4), 407.

Stammers, J. & M. Deuchar. (2012). Testing the nonce borrowing hypothesis: Counter-evidence from Englishorigin verbs in Welsh. *Bilingualism: Language and Cognition 15* (3). 630-643.

Stavans, A., & Swisher, V. (2006). Language switching as a window on trilingual acquisition. *International Journal of Multilingualism*, *3*(3), 193-220.

Strijkers, K., Costa, A., & Thierry, G. (2010). Tracking lexical access in speech production: electrophysiological correlates of word frequency and cognate effects. *Cerebral cortex*, *20*(4), 912-928.

Suurmeijer, L., Parafita Couto, M. C., & Gullberg, M. (2020). Structural and extralinguistic aspects of code-switching: Evidence from Papiamentu-Dutch auditory sentence matching. *Frontiers in Psychology*, *11*(592266).

Szubko-Sitarek, W. (2011). Cognate facilitation effects in trilingual word recognition. *Studies in Second Language Learning and Teaching*, *1*(2), 189-208.

Tarlowski, A., Wodniecka, Z., & Marzecová, A. (2013). Language switching in the production of phrases. *Journal of psycholinguistic research*, *42*(2), 103-118.

Tay, M. W. (1989). Code switching and code mixing as a communicative strategy in multilingual discourse. *World Englishes*, *8*(3), 407-417.

Thomason, S. G. (2003). Contact as a Source of Language Change. In R. D. Janda & B. D. Joseph (eds.), *A Handbook of Historical Linguistics*, 687-712. Oxford: Blackwell.

Van Assche, E., Duyck, W., & Brysbaert, M. (2013). Verb processing by bilinguals in sentence contexts: The effect of cognate status and verb tense. *Studies in Second Language Acquisition, 35(2),* 237-259.

Vihman, M. M. (1985). Language differentiation by the bilingual infant. *Journal of Child Language, 12,* 297–324.

Vu, J. A., Bailey, A. L., & Howes, C. (2010). Early cases of codeswitching in Mexican-heritage children: Linguistic and sociopragmatic considerations. *Bilingual Research Journal, 33,* 200–219.

Wang, Y. T., Green, J. R., Nip, I. S., Kent, R. D., & Kent, J. F. (2010). Breath group analysis for reading and spontaneous speech in healthy adults. *Folia Phoniatrica et Logopaedica*, *62*(6), 297-302.

Weinreich, U. (1953) *Languages in Contact: Findings and Problems*. The Hague: Mouton.

Yow, W. Q., Tan, J. S., & Flynn, S. (2018). Code-switching as a marker of linguistic competence in bilingual children. *Bilingualism: Language and Cognition*, *21*(5), 1075-1090.

Zentella, A. C. (1999). *Growing up bilingual*. Malden. MA: Balckwell.

# Appendices

## Appendix A

*Table 18. Relative frequencies of verb cognates in Condition 1 according to the relevant corpora.*

| | **Relative Frequencies per million words** | | | | |
|---|---|---|---|---|---|
| **Condition 1** | verbs | German Web | English Web | English BNC | Danish Web |
| | planen | 131 | 142 | 137 | 54 |
| | hören | 211 | 247 | 354 | 427 |
| | packen | 38 | 34 | 33 | 56 |
| | bringen | 568 | 402 | 440 | 166 |
| | hängen | 102 | 55 | 90 | 135 |

*Table 19. Relative frequencies of verb cognates in Condition 2 according to the relevant corpora.*

| | **Relative Frequencies per million words** | | |
|---|---|---|---|
| **Condition 2** | verbs | German Web | Danish Web |
| | fangen | 74 | 89 |
| | sammeln | 83 | 427 |
| | wählen | 169 | 695 |
| | bestellen | 87 | 123 |
| | besuchen | 143 | 175 |

*Table 20. Relative frequencies of verb cognates in Condition 3 according to the relevant corpora.*

| | **Relative Frequencies per million words** | | | |
|---|---|---|---|---|
| **Condition 3** | verbs | German Web | English Web | English BNC |
| | vergessen | 110 | 85 | 122 |
| | kochen | 37 | 42 | 33 |
| | warnen | 36 | 41 | 69 |
| | wünschen | 168 | 114 | 170 |
| | rennen | 25 | 400 | 425 |

*Table 21. Relative frequencies of control cognates according to the relevant corpus.*

| | **Relative Frequencies per million words** | |
|---|---|---|
| **Control Condition** | verbs | German Web |
| | nehmen | 697 |
| | tragen | 268 |
| | schließen | 155 |
| | zeichnen | 67 |
| | fahren | 292 |

# Appendix B

*Table 22. Similarity ratings of cognate verbs in English and Danish.*

| | **Similarity rating English** | | |
|---|---|---|---|
| | **cognates** | **native speaker 1** | **native speaker 2** |
| **Condition 1** | plans-plant | 4 | 4 |
| | hears-hört | 3 | 3 |
| | packs-packt | 4 | 4 |
| | hangs-hängt | 4 | 4 |
| | brings- bringt | 4 | 4 |

| | **Similiarity rating English** | | |
|---|---|---|---|
| | **cognates** | **native speaker 1** | **native speaker 2** |
| **Condition 3** | cooks - kocht | 3 | 4 |
| | forgets - vergisst | 3 | 3 |
| | warns - warnt | 4 | 4 |
| | wishes - wünscht | 3 | 3 |
| | runs - rennt | 4 | 4 |

| | **Similiarity rating Danish** | | |
|---|---|---|---|
| | **cognates** | **native speaker 1** | **native speaker 2** |
| **Condition 1** | planlægger-plant | 3 | 4 |
| | hører-hört | 4 | 4 |
| | pakker-packt | 3 | 4 |
| | hænger-hängt | 4 | 3 |
| | bringer- bringt | 4 | 4 |

| | Similiarity rating Danish | | |
|---|---|---|---|
| | **cognates** | **native speaker 1** | **native speaker 2** |
| **Condition 2** | bestiller - bestellt | 4 | 4 |
| | samler - sammelt | 3 | 4 |
| | fanger - fängt | 4 | 3 |
| | besøger - besucht | 3 | 3 |
| | vælger - wählt | 3 | 3 |

# Appendix C

*Table 23. Relative frequencies of switched nouns in the English Web Corpus.*

**Relative Frequencies per million words**

| Conditions | CS nouns | English Web Corpus |
|---|---|---|
| **Condition 1** | trip | 104 |
| | bottle | 46 |
| | noise | 52 |
| | painting | 50 |
| | dog | 134 |
| **Condition 2** | bird | 70 |
| | flower | 57 |
| | movie | 120 |
| | chair | 65 |
| | lady | 46 |
| **Condition 3** | lunch | 44 |
| | file | 193 |
| | girl | 166 |
| | journey | 61 |
| | hour | 311 |
| **Control Condition** | bag | 69 |
| | picture | 150 |
| | car | 267 |
| | gate | 34 |
| | breath | 30 |

# Appendix D

*Table 24. Absolute and relative frequencies of switched adjective-noun collocations*

## Adjective-noun collocations

| | collocations | AF | RF per million |
|---|---|---|---|
| **Condition 1** | fun trip | 2,248 | 0.10 |
| | empty bottle | 6,431 | 0.29 |
| | strange noise | 4,434 | 0.20 |
| | beautiful painting | 3,136 | 0.14 |
| | cute dog | 1,373 | 0.06 |
| **Condition 2** | large bird | 6,555 | 0.30 |
| | pretty flower | 2,533 | 0.12 |
| | scary movie | 6,344 | 0.29 |
| | comfortable chair | 5,957 | 0.27 |
| | lovely lady | 8,707 | 0.40 |
| **Condition 3** | healthy lunch | 3,208 | 0.15 |
| | important file | 6,171 | 0.28 |
| | pregnant girl | 1,797 | 0.08 |
| | safe journey | 2,750 | 0.13 |
| | whole hour | 2,609 | 0.12 |
| **Control Condition** | heavy bag | 6,043 | 0.28 |
| | colorful picture | 1,522 | 0.07 |
| | expensive car | 7,225 | 0.33 |
| | narrow gate | 1,595 | 0.07 |
| | slow breath | 1,350 | 0.06 |

# Appendix E

Stimuli paragraphs used in the experiment

**Highlights and abbreviations:**
**Blue: nontarget cognates**
**Yellow: the target verb cognate**
**Green: noncognate verb**
**TWC: total word count**

**Training trial sentences:**

1. Die Kinder hocken auf dem Boden vor einem Feuer und Maria erzählt eine schaurige Gruselgeschichte (15). Als ein lauter Schrei aus dem Wald ertönt erschrecken sich alle und machen sich schnell davon (15). **TWC:30**

Translation: The children crouch on the floor in front of a fire and Maria tells a spooky horror story. When a loud scream is heard from the forest, everyone is frightened, and they quickly leave.

2. Ella telefoniert auf dem Dachboden und wühlt nebenbei durch alte Sachen, die sie von ihrer Oma geerbt hat (18). **She discovers some jewelery** in einer verstaubten Kiste und freut sich über ihren Fund. (14). **TWC:32**

Translation: Ella is on the phone in the attic and is rummaging through old things that she inherited from her grandma. She discovers some jewlery in a dusty box and is happy about her find.

3. Nach einem erfolgreichen Leichtathletik Wettkampf, begeben sich Lea und ihre Eltern zur Siegerehrung in der großen Vereinshalle (17). Lea erhält eine Siegerurkunde und ist mit ihrer Leistung sehr zufrieden (11). **TWC:28**

Translation: After a successful athletics competition, Lea and her parents go to the award ceremony in the club hall. Lea receives a winner´s certificate and is very satisfied with her performance.

**Condition 1: „triple cognate "(shared between all 3 languages)**

1. Bald verbringen Tina und ihr Freund ihre ersten Ferien zusammen und Tina ist sehr aufgeregt. Sie plant **a fun trip** mit dem Wohnwagen und freut sich schon sehr ihrem Freund davon zu berichten. **TWC:**32

Translation: Tina and her boyfriend will soon have their first holiday together and Tina is very excited. She is planning a fun trip with the caravan and is looking forward to telling her boyfriend about it.

2. Mara spaziert durch abgelegenes, verschneites Gelände in den Alpen, als auf einmal die Schneedecke vor ihr einreißt (17). Sie hört **a strange noise** und weiß sofort, dass Lawinengefahr besteht (11). **TWC:28**

Translation: Mara is walking through remote, snow-covered terrain in the Alps when suddenly the snow cover tears in front of her. She hears a strange noise and immediately knows that there is a danger of avalanches.

3. Lea richtet sich gerade für ihren Flug her, da klingelt ihr Taxifahrer bei ihr (14). Sie packt **an empty bottle** in ihre Handtasche und eilt die Treppen herunter (13). **TWC:27**

Translation: Lea is getting ready for her flight when her taxi driver rings her doorbell. She puts an empty bottle in her handbag and hurries down the stairs.

4. Familie Müller ist heute im Tierheim und eine nette Frau möchte ihnen ein paar Tiere zeigen (15). Sie bringt **a cute dog** und die Kinder verlieben sich sofort in ihn. **TWC:28**

Translation: The Müller family is at the animal shelter today and a nice woman wants to show them some animals. She brings a cute dog and the kids instantly fall in love with him.

5. Sabine und Oliver haben nun die Schlüssel für ihr erstes Eigenheim überreicht bekommen und freuen sich die Wohnung persönlich zu gestalten (19). Oliver hängt **a beautiful painting** ins Wohnzimmer und Sabine streicht die Wände in ihrer Lieblingsfarbe. **TWC:**33

Translation: Sabine and Oliver have now received the keys for their first home and are happy to design the apartment personally. Oliver hangs a beautiful painting in the living room and Sabine paints the walls in her favorite color.

**Condition 2: „double cognate "(shared between German and Danish)**

1. Auf einer Safari schauen Lotta und Mara dabei zu, wie ein kleiner Löwe seiner Beute auflauert und schließlich den Angriff wagt. Er fängt **a large bird** und versteckt sich hinter einem Strauch. **TWC:32**

Translation: On a safari, Lotta and Mara watch as a small lion ambushes its prey and finally dares to attack. It catches a large bird and hides behind a bush.

2. Die Pfadfinder begeben sich heute auf den Weg ins schöne Zillertal um die Gegend zu erkunden (16). Dirk sammelt **a pretty flower** und ein buntes Blatt, während sich die anderen ausruhen (15). **TWC:**30

Translation: Today the scouts are on their way to the beautiful Zillertal to explore the area. Dirk collects a pretty flower and a colored leaf while the others take a rest.

3. Leider hatte Oma Ursel einen schweren Unfall und ist daher die meiste Zeit bettlägerig (14). Sie bestellt **a comfortable chair** mit Aufstehhilfe und ist zuversichtlich, dass sie damit gut zurechtkommen wird (16). **TWC:** 30

Translation: Unfortunately, grandma Ursel had a bad accident and is therefore bedridden most of the time. She orders a comfortable chair with stand-up aid and is confident that she will be able to cope well with it.

4. Heute ist Paul früh aufgestanden, denn er holt leckere Brötchen vom Bäcker und kauft einen Blumenstrauß (16). Er besucht **a lovely lady** aus seiner Nachbarschaft und freut sich auf einen schönen Vormittag (15) **TWC:31**

Translation: Today Paul got up early because he gets delicious rolls from the bakery and buys a bouquet of flowers. He visits a lovely lady from his neighborhood and is looking forward to a nice morning.

5. Da die Kinos geschlossen sind, möchte Sarah ihre Freundinnen zu sich nachhause einladen (13). Sie wählt **a scary movie** und dunkelt den Raum ab, damit die passende Stimmung entstehen kann (16). **TWC:29**

Translation: Since all the movie theatres are closed, Sarah wants to invite her friends to her home. She chooses a scary movie and darkens the room so that the right mood can be created.

**Condition 3: „double cognate "(shared between German and English)**

1. Ein Restaurant setzt sich in diesem Monat für einen guten Zweck ein (12). Der Besitzer kocht **a healthy lunch** für die Bedürftigen und anschließend verteilen die Angestellten die Mahlzeiten (16). **TWC:**28

Translation: A restaurant wants to support a good cause this month. The owner cooks a healthy lunch for the needy and then the employees distribute the meals.

2. Tobi ist eine schusselige Person, aber heute nimmt er sich vor, alles mit auf die Arbeit zu nehmen (18). Er vergisst **an important file** und seinen Geldbeutel, aber sonst hat er dieses Mal alles dabei (16). **TWC:**34

Translation: Tobi is a very scatterbrained person, but today he intends to take everything with him to work. He forgets an important file and his wallet, but otherwise he has everything with him this time.

3. Peter ist Gärtner in einer Außenanlage und entdeckt hinter einer Mülltonne eine seltene Schlange (17). Er warnt **a pregnant girl** und verständigt den Zoo, damit die Zuständigen das Tier schnellstmöglich abholen (16). **TWC:**31

Translation: Peter is a gardener in an outdoor facility and discovers a rare snake behind a garbage can. He warns a pregnant girl and notifies the zoo so that those responsible can pick up the animal as soon as possible.

4. Ingrid ist Schuldirektorin und hat soeben eine Ansprache bezüglich der anstehenden Klassenfahrten nach Italien gehalten (15). Sie wünscht **a safe journey** und verabschiedet sich danach von den Schülern (12). **TWC:**27

Translation: Ingrid is the school director and has just given a speech about the upcoming school trips to Italy. She wishes a safe journey and then says goodbye to the students.

5. Leon möchte heute mal wieder Laufen gehen, da er durch eine Knieverletzung viele Wochen aussetzen musste. Er rennt **a whole hour** auf dem Sportplatz und kann kaum glauben, dass er keine Schmerzen hat. **TWC:33**

Translation: Leon finally wants to go running today because he had to take a break for weeks due to a knee injury. He runs a whole hour on the sports field and can hardly believe that he is not in pain.

**Condition 4 – Control Condition – (noncognate verbs)**

1. Niko ist heute der letzte auf seiner Arbeit im Burgmuseum und macht jetzt Feierabend. Er schließt **a narrow gate** und entscheidet sich noch etwas die Aussicht zu genießen. **TWC:28**

Translation: Today Niko is the last one at work in the castle museum and is getting ready to leave. He closes a heavy gate and decides to enjoy the view a little more.

2. Früh am Morgen bricht Lise mit ihrem Fahrrad auf, denn sie will eine beachtliche Strecke bewältigen (16). Sie trägt **a heavy bag** auf ihrem Rücken und bereut, dass sie ihre Kamera mitgenommen hat. **TWC: 32**

Translation: Early in the morning Lise sets off on her bike because she wants to cover a considerable distance. She wears a heavy bag on her back and regrets that she took her camera with her.

3. Mila möchte an einem Malwettbewerb teilnehmen und muss sich beeilen, denn die Teilnahme ist nur noch bis morgen möglich. Sie zeichnet **a colorful picture** von ihrer Heimatstadt und ist sehr zufrieden. **TWC:31**

Translation: Mila wants to take part in a painting competition and has to hurry, because the participation is only possible until the next day. She draws a colorful picture of her hometown and is very satisfied.

4. Ein Verbrecher biegt zügig in einen holprigen Zufahrtsweg mit aufgebrochenen Pflastersteinen und großen Schlaglöchern (14). Er fährt **an expensive car** und ist sehr schnell unterwegs, um seine Verfolger abzuhängen (14).

Translation: A criminal swiftly turns into a bumpy driveway with broken paving stones and big potholes. He drives an expensive car and drives very fast to leave his pursuers behind.

5. In der Gondel schlottert Marlene vor Angst, denn normalerweise vermeidet sie Höhen (12). Sie nimmt **a slow breath** und schließt ihre Augen in der Hoffnung, dass sie bald den Berggipfel erreichen (18). **TWC:30**

Translation: In the gondola, Marlene shakes with fear because she usually avoids heights. She takes a slow breath and closes her eyes hoping that they will soon reach the top.

**Filler sentences**

**A: Different CS**

1. Um Sandra zu ihren bestandenen **high school exams** zu beglückwünschen, hat ihre Mutter heimlich Gäste eingeladen (16). Sie verstecken sich aufgeregt in ihrem Zimmer und sind ganz leise (11). **TWC: 27**

Translation: To congratulate Sandra on passing her high school exams, her mother has secretly invited guests. They hide excitedly in her room and keep super quiet.

2. Hans hat soeben frische Maulwurfshügel in **his courtyard** entdeckt und regt sich gewaltig auf (14). Er verabscheut diese Tiere und kann es nicht fassen, dass sie ständig neue Löcher buddeln (15). **TWC:29**

Translation: Hans has just discovered fresh molehills in his courtyard and is very upset. He detests these animals and can't believe that they're constantly digging new holes.

3. Mia wird aus dem Schlaf gerissen, als ihr kleiner Bruder zu ihr ins Zimmer stürmt und ihre Vorhänge aufzieht (19). Sie ist genervt **by his behaviour** und schickt ihn wütend aus dem Zimmer (13). **TWC: 32**

Translation: Mia wakes up when her little brother rushes into her room and opens her curtains. Mia is annoyed by his behavior and angrily tells him to leave the room.

4. Marias Chef telefoniert im Flur seiner Abteilung **and shakes his head** (11). Seine Angestellte meldete sich zum wiederholten Male krank, obwohl er ihr gestern im Kino begegnet war (16). **TWC:27**

Translation: Maria's boss is on the phone in the hallway of his department and shakes his head. His employee called in sick again, even though he had met her at the cinema yesterday.

5. Es ist ein schöner Tag und die Maiers **are enjoying the warm season** auf einer Picknickdecke (15). Um das Wochenende einzuläuten vergnügen sie sich draußen und stoßen mit einem Glas Sekt an.**TWC:30**

Translation: It is a beautiful day and the Maiers are enjoying the warm season on a picnic blanket. To ring in the weekend, they have fun outside and toast with a glass of champagne.

6. Felix fällt auf, dass sein Wasserkocher nicht mehr funktioniert, denn sein Kaninchen hat das Kabel angeknabbert (16). **In that moment** verfluchte Felix seinen Hasen, denn erst letztens musste er seinetwegen ein Ladekabel ersetzen (16). **TWC:32**

Translation: Felix notices that his kettle is no longer working because his rabbit has nibbled on the cable. In that moment, Felix cursed his rabbit because he had already recently replaced his charging cable due to his rabbit.

7. Jonas hat sich eine Hündin angeschafft und hat sofort einen Hundetrainer angerufen, um sie zu erziehen (16). **With every visit** gehorcht sie besser und sie erzielen gute Ergebnisse (11). **TWC:27**

Translation: Jonas bought a dog and immediately called a dog trainer to train it. With every visit the dog obeys better, and they achieve good results.

8. Beim Feuerholz holen, stolperte Richard im Garten über eine dicke Baumwurzel (11). Ein stechender Schmerz durchfuhr Richards Knöchel und er humpelte **back inside** um sich die Verletzung anzuschauen (16). **TWC:27**

Translation: While fetching firewood, Richard tripped over a thick tree root in the garden. A sharp pain flooded Richard's ankle and he limped back inside to look at the injury.

**B: Monolingual Sentences**

1. Toms Vater besaß viele wissenschaftliche Bücher, welche in seinem Büro auf etlichen Regalbrettern gelagert waren (15). Um an die dicken Wälzer zu gelangen, musste Tom eine Leiter holen (12). **TWC:27**

Translation: Tom's father owned many scientific books that were stored on a number of shelves in his office. Tom had to get a ladder to reach the big tomes.

2. Am Wochenende stand die letzte Konzertprobe in Julians Klasse an (10). Julian hatte schlechte Laune, denn er konnte es nicht fassen, dass er an einem Samstag in die Schule musste (19). **TWC:29**

Translation: On the weekend, Julian´s class had his last concert rehearsal. Julian was in a bad mood because he could not believe that he had to go to school on a Saturday.

3. An einem Wandertag mussten sich die Mitglieder des Wandervereins durch dickes Farngestrüpp und Ranken zwängen (15). Im nu hatten sich diejenigen mit kurzen Hosen die ersten Kratzer zugezogen (12). **TWC:27**

Translation: On a hiking day, the members of the hiking club had to squeeze through thick ferns and tendrils. In no time those with shorts on got their first scratches.

4. Beim Fernsehen hatte es sich Patricks Katze auf seinem Schoß gemütlich gemacht und ist eingedöst (15). Als es klopft, schiebt er sie sanft beiseite, damit er sie nicht aus dem Schlaf reißt (16). **TWC:31**

Translation: While watching TV, Patrick's cat had made herself comfortable on his lap and dozed off. When it knocks, he gently pushes her aside so that he does not wake her up.

5. Während einer Matheprüfung, möchte Paul einen kühlen Kopf bewahren und nicht in Panik geraten (14). Doch mit einem Mal verschwimmen die Aufgaben vor seinen Augen und ihm wird schwindlig. (14). **TWC: 28**

Translation: During a math exam, Paul wants to keep a cool head and not panic. But suddenly the tasks blur before his eyes and he feels dizzy.

6. Auf dem Schulhof necken sich Paul und Ina, die noch kurz zuvor eine laute Auseinandersetzung im Unterricht geführt hatten (19). Ihr Lehrer beobachtet die zwei Turteltauben und muss innerlich schmunzeln (10). **TWC:29**

Translation: Paul and Ina teased each other in the school yard, although they had just had a loud argument in class. Their teacher watched the two lovebirds and smiled internally.

7. Am Bahnhof ist viel los und auf den Bahnsteigen herrscht Chaos, denn es ist Hauptverkehrszeit (15). Die Menschen drängeln sich gefährlich nah an den Schienen entlang, weil sie ihre Züge nicht verpassen wollen (17). **TWC:32**

Translation: There is a lot going on at the train station and there is chaos on the platforms due to rush hour. People jostle dangerously close to the rails because they don't want to miss their trains.

**8.** Ein lautes Donnergrummeln erschüttert einen Bauernhof und kündigt ein heftiges Gewitter an (12). Die Ziegen meckern, während sich im Westen schwarze Gewitterwolken zusammenballen und die ersten Regentropfen auf den Boden prallen (18). **TWC:30**

Translation: A loud rumble of thunder shakes a farm and announces a violent thunderstorm. The goats grumble while black thunderclouds are gathering in the west and the first raindrops hit the ground.

# Appendix F

Recruitment text posted in Facebook groups

*** Auf der Suche nach Teilnehmer*innen für meine Masterarbeit ***

*Hallo!*

*Ich suche Teilnehmer*innen für ein Sprachexperiment, das Teil meiner Masterarbeit im Fach Linguistik an der Universität Lund ist. Jede*r Teilnehmer*in erhält als Dankeschön einen 50dkk Gutschein, den ihr bei über 150 bekannten (online) Shops einlösen könnt.*

*Ihr solltet:*

** Deutsche Muttersprachler*innen sein und auch Englisch und Dänisch regelmäßig im Alltag anwenden!*

** in Dänemark wohnen*

** 18-60 Jahre alt sein*

*Das Experiment wird online (über zoom) durchgeführt. Das Experiment besteht aus einer Leseaufgabe und einem Fragebogen zu eurem sprachlichen Hintergrund (es ist also auch eine Gelegenheit euren eigenen multilingualen Sprachgebrauch zu reflektieren). Es wird ungefähr eine halbe Stunde dauern. Ihr seid als Teilnehmer*innen selbstverständlich anonym.*

*Wenn du an einer Teilnahme interessiert bist, oder jemand kennst der interessiert sein könnte, freue ich mich sehr, wenn du mich per E-Mail kontaktierst.*

# Appendix G

The LHQ questions used in the present study

1. Teilnehmer-Identifikationsnummer

2. Alter

3. Geschlecht

Stufen Sie ein...

4. Höchster Bildungsabschluss

Stufen Sie ein...

5. Höchster Bildungsabschluss der Eltern

Vater Stufen Sie ein... Mutter Stufen Sie ein...

6. Händigkeit

-- Wählen Sie eine Option aus --

7. Geben Sie Ihre Muttersprache(n) und alle anderen Sprachen an, die Sie erlernt haben, sowie das Alter, in welchem Sie begonnen haben, die jeweilige Sprache zu verstehen, zu sprechen, zu lesen und zu schreiben. Geben Sie auch die Anzahl der Jahre an, die Sie diese Sprache schon verwendet haben.

| Sprache | Verstehen | Sprechen | Lesen | Schreiben | Verwendungsjahre |
|---|---|---|---|---|---|
| Sprache... | | | | | |
| Sprache... | | | | | |
| Sprache... | | | | | |
| Sprache... | | | | | |

*Anmerkung: Sie können eine Sprache erlernt, sie eine Zeit lang nicht mehr genutzt und sie anschließend wieder verwendet haben. Bitte geben Sie die Gesamtzahl der Verwendungsjahre an.

8. Herkunftsland

Land...

9. Land des derzeitigen Wohnsitzes

Land...

10. Geben Sie für jede Sprache, die Sie erlernt haben (einschließlich Ihrer Muttersprache), an, in welchem Alter Sie begonnen haben, diese in den folgenden Situationen zu verwenden.

| Sprache | Zu Hause | Mit Freund/innen | In der Schule | Im Beruf | Sprachlernsoftware | Online-Spiele |
|---|---|---|---|---|---|---|
| Sprache... | | | | | | |
| Sprache... | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sprache... | | | | | | |

11. Geben Sie die Sprache an, in der Sie im jeweiligen Bildungsabschnitt unterrichtet wurden. Falls die Unterrichtssprache sich innerhalb eines Bildungsabschnittes geändert haben sollte, geben Sie auch die Sprache an, in die "gewechselt" wurde. Wenn Sie zweisprachig unterrichtet wurden, führen Sie bitte die Namen der Sprachen auf und setzen Sie zusätzlich ein Kreuz bei „Beide Sprachen".

| Bildungsabschnitt | Sprache | (Gewechselt in) | Beide Sprachen |
|---|---|---|---|
| Grundschule | Wähle eine Option | Wähle eine Option | ☐ |
| Hauptschule | Wähle eine Option | Wähle eine Option | ☐ |
| Realschule | Wähle eine Option | Wähle eine Option | ☐ |
| (Fach-)Hochschule | Wähle eine Option | Wähle eine Option | ☐ |
| Lehre/Berufsausbildung | Wähle eine Option | Wähle eine Option | ☐ |
| Bachelor-Studium | Wähle eine Option | Wähle eine Option | ☐ |
| Master/Diplom-Studium | Wähle eine Option | Wähle eine Option | ☐ |
| Promotion | Wähle eine Option | Wähle eine Option | ☐ |

12. Stufen Sie für jede Sprache, die Sie erlernt haben (einschließlich Ihrer Muttersprache), Ihre derzeitigen Fähigkeiten in den Bereichen Verstehen, Sprechen, Lesen und Schreiben ein.

| Sprache | Verstehen | Sprechen | Lesen | Schreiben |
|---|---|---|---|---|
| Sprache... | Stufen Sie ein... | Stufen Sie ein... | Stufen Sie ein... | Stufen Sie ein... |
| Sprache... | Stufen Sie ein... | Stufen Sie ein... | Stufen Sie ein... | Stufen Sie ein... |
| Sprache... | Stufen Sie ein... | Stufen Sie ein... | Stufen Sie ein... | Stufen Sie ein... |
| Sprache... | Stufen Sie ein... | Stufen Sie ein... | Stufen Sie ein... | Stufen Sie ein... |

13. Schätzen Sie für jede Sprache, die Sie erlernt haben (einschließlich Ihrer Muttersprache), wie viele Stunden Sie die Sprache pro Tag für die folgenden Aktivitäten verwenden.

| Sprache | Fernsehen | Radio hören | Lesen zum Vergnügen | Lesen für Schule / Ausbildung / Universität / Arbeit | Social Media und Internet nutzen | Schreiben für Schule / Ausbildung / Universität / Arbeit |
|---|---|---|---|---|---|---|
| Sprache... | | | | | | |
| Sprache... | | | | | | |
| Sprache... | | | | | | |
| Sprache... | | | | | | |

14. Schätzen Sie für jede der Sprachen, die Sie erlernt haben (einschließlich Ihrer Muttersprache), wie viele Stunden Sie die Sprache pro Tag mit den folgenden Personengruppen sprechen.

| Sprache | Familienmitglieder | Freund/innen* | Klassenkameraden/Kommolitonen | Andere (Mitarbeiter **, Mitbewohner usw.) |
|---|---|---|---|---|
| Sprache... | | | | |
| Sprache... | | | | |

Berücksichtigen Sie hier auch Lebenspartner, falls Sie diese nicht schon in der Kategorie Familienmitglieder mteinbezogen haben.

**Berücksichtigen Sie hier alle Personen in ihrem Arbeitsumfeld (z.B. Wenn Sie als Lehrkraft tätig sind, zählen Sie auch Schülerinnen zu Ihren Arbeitskollegen)

15. Falls Sie im alltäglichen Leben verschiedene Sprachen mischen, geben Sie bitte für die folgenden Personengruppen die Sprachen an, die Sie mischen. Schätzen Sie auch die Häufigkeit, mit der sie die Sprachen in Alltagsgesprächen mischen.

| | Sprache 1 | Sprache 2 | Häufigkeit des Mischens |
|---|---|---|---|
| Familienmitglieder | Sprache... | Sprache... | Stufen Sie ein... |
| Freundinnen | Sprache... | Sprache... | Stufen Sie ein... |
| Klassenkameraden/Kommolitonen | Sprache... | Sprache... | Stufen Sie ein... |
| Andere (Mitarbeiter, Mitbewohner usw.) | Sprache... | Sprache... | Stufen Sie ein... |

16. Bitte geben Sie für die folgenden Situationen an, in welcher Sprache Sie in den Bereichen Verstehen, Sprechen, Lesen und Schreiben am besten kommunizieren können oder sich am wohlsten fühlen. Sie können dieselbe Sprache für alle oder nur für einige der unten aufgeführten Bereiche auswählen.

| | Verstehen | Sprechen | Lesen | Schreiben |
|---|---|---|---|---|
| Zu Hause | Sprache... | Sprache... | Sprache... | Sprache... |
| In der Schule | Sprache... | Sprache... | Sprache... | Sprache... |
| Im Beruf | Sprache... | Sprache... | Sprache... | Sprache... |
| Mit Freundinnen | Sprache... | Sprache... | Sprache... | Sprache... |

17. Geben Sie für jede der Sprachen, die Sie erlernt haben (einschließlich Ihrer Muttersprache), an, wie viel Prozent Ihrer Freund/innen die jeweilige Sprache sprechen.

| Sprache | Prozent | |
|---|---|---|
| Sprache... | | % |
| Sprache... | | % |
| Sprache... | | % |
| Sprache... | | % |

18. Nutzen Sie die folgende Kommentarbox, um zusätzliche Angaben zu den vorangegangenen Fragen zu machen, falls diese Ihren Sprachhintergrund oder Sprachgebrauch besser beschreiben als die vorgegebenen Antwortmöglichkeiten.

19. Falls Sie uns noch weitere Informationen bezüglich Ihres Sprachhintergrunds oder Sprachgebrauchs mitteilen möchten, schreiben Sie diese bitte in die folgende Kommentarbox.

# Appendix H

*Table 25. Self-reported proficiency levels for reading, speaking, writing, and listening in German, English and Danish.*

| Self-reported proficiency level (0-7) | | | |
|---|---|---|---|
| | Language | Mean | SD |
| Reading | German | 6.83 | 0.38 |
| | English | 6.23 | 0.77 |
| | Danish | 6.3 | 0.6 |
| Speaking | German | 6.87 | 0.35 |
| | English | 6.07 | 0.78 |
| | Danish | 5.93 | 0.98 |
| Writing | German | 6.63 | 0.61 |
| | English | 5.87 | 1.04 |
| | Danish | 5.57 | 1.17 |
| Listening | German | 6.93 | 0.25 |
| | English | 6.33 | 0.66 |
| | Danish | 6.23 | 0.90 |

# Appendix I

Consent form used in the experiment

LUNDS UNIVERSITET

**Einverständniserklärung zur Teilnahme an einem Forschungsprojekt**

| | |
|---|---|
| **1. Hintergrund und Zweck der Studie** | Diese Studie ist Teil einer Masterarbeit in der Spezialisierung Allgemeine Sprachwissenschaften am Zentrum für Sprach und Literaturwissenschaften der Universität Lund, mit der Supervisorin Marianne Gullberg. Zweck der Studie ist die Untersuchung von Sprachverarbeitung bei mehrsprachigen Personen. |
| **2. Die Studie** | Die Studie besteht aus einer Leseaufgabe und einem Fragebogen zum Sprachhintergrund. Die Studie findet über Zoom statt und Sie werden während der Leseaufgabe aufgenommen. |
| **3. Aufbewahrung der Daten** | Alle Daten werden im Bericht anonym behandelt. Beachten Sie, dass die Supervisorin des Projektes ebenfalls Zugang zu den Daten hat. Bis die Bewertung des Papiers erfolgt, werden alle Daten auf meinem Computer gespeichert, entsprechend den Richtlinien für Langzeit-Datenspeicherung der Joint Faculty of Humanities and Theology der Universität Lund. Danach werden die Aufnahmen gelöscht. |
| **4. Freiwillige Teilnahme** | Die Teilnahme ist freiwillig und als Teilnehmer*in haben Sie zu jedem Zeitpunkt das Recht, ihre Teilnahme zurückzuziehen. Sie können zu einem späteren Zeitpunkt eine Kopie des Projektaufsatzes erhalten. |
| **5. Verantwortliche und Kontakt-informationen** | _____<br>_____<br>_____ |

Ich _____bestätige hiermit, dass ich die Informationen über die Studie gelesen und verstanden habe und stimme einer Teilnahme am _____ zu. Ich bin mir bewusst, dass meine Teilnahme freiwillig ist und meine Identität anonym und dass ich das Experiment jeder Zeit abbrechen und meine Einwilligung zurückziehen kann.

# Appendix J

## Symbols used for Coding

*Table 26. Coding symbols and examples.*

| **Hesitations, intrusions and speech-error correctiosn** | **Transcription symbols** | **Examples** |
|---|---|---|
| Pauses | (-) | word (-) word |
| Filled pauses | uh, uhm | word uhm word |
| Language-specific filled pauses | uh, uhm specified by (E) for English, (D) for Danish, and (G) for German | word uhm(D) word |
| Lengthening of a sound | : | wo:rd |
| If a word is produced noticeably slow | () | (word) |
| mid-error interruption | - | wo- |
| Intrusion error produced in English | /E | word/E |
| Intrusion error produced in German | /G | word/G |
| Intrusion error produced in Danish | /D | word/D |
| Speech-error corrections and repetitions | ! | word ! word |

# Appendix K

*Table 27. Repeated measure ANOVA of overall disfluencies for the German-Danish sub-group.*

Within Subjects Effects

| | Sum of Squares | df | Mean Square | F | p | $\eta^2_p$ |
|---|---|---|---|---|---|---|
| Conditions | 8.67 | 3 | 2.89 | 2.23 | 0.108 | 0.198 |
| Residual | 35.07 | 27 | 1.30 | | | |

Note. Type 3 Sums of Squares

*Table 28. Repeated measure ANOVA of hesitation markers for the German-Danish sub-group.*

Within Subjects Effects

| | Sum of Squares | df | Mean Square | F | p | $\eta^2_p$ |
|---|---|---|---|---|---|---|
| Conditions | 10.2 | 3 | 3.40 | 2.68 | 0.067 | 0.229 |
| Residual | 34.3 | 27 | 1.27 | | | |

Note. Type 3 Sums of Squares

*Table 29. Repeated measure ANOVA of intrusion errors for the German-Danish sub-group.*

Within Subjects Effects

| | Sum of Squares | df | Mean Square | F | p | $\eta^2_p$ |
|---|---|---|---|---|---|---|
| Conditions | 0.0750 | 3 | 0.0250 | 0.144 | 0.932 | 0.016 |
| Residual | 4.6750 | 27 | 0.1731 | | | |

Note. Type 3 Sums of Squares

*Table 30. Repeated measure ANOVA of speech-error corrections for the German-Danish sub-group.*

Within Subjects Effects

| | Sum of Squares | df | Mean Square | F | p | $\eta^2_p$ |
|---|---|---|---|---|---|---|
| Conditions | 0.275 | 3 | 0.0917 | 0.414 | 0.744 | 0.044 |
| Residual | 5.975 | 27 | 0.2213 | | | |

Note. Type 3 Sums of Squares

*Table 31. Repeated measure ANOVA of overall disfluencies for the German sub-group.*

Within Subjects Effects

| | Sum of Squares | df | Mean Square | F | p | $\eta^2_p$ |
|---|---|---|---|---|---|---|
| Conditions | 5.68 | 3 | 1.89 | 1.75 | 0.167 | 0.089 |
| Residual | 58.32 | 54 | 1.08 | | | |

Note. Type 3 Sums of Squares

*Table 32. Repeated measure ANOVA of hesitation markers for the German sub-group.*

Within Subjects Effects

| | Sum of Squares | df | Mean Square | F | p | $\eta^2_p$ |
|---|---|---|---|---|---|---|
| Conditions | 2.95 | 3 | 0.982 | 1.47 | 0.233 | 0.076 |
| Residual | 36.05 | 54 | 0.668 | | | |

Note. Type 3 Sums of Squares

*Table 33. Repeated measure ANOVA of intrusion errors for the German sub-group.*

Within Subjects Effects

| | Sum of Squares | df | Mean Square | F | p | $\eta^2_p$ |
|---|---|---|---|---|---|---|
| Conditions | 1.05 | 3 | 0.351 | 1.19 | 0.323 | 0.062 |
| Residual | 15.95 | 54 | 0.295 | | | |

Note. Type 3 Sums of Squares

*Table 34. Repeated measure ANOVA of speech-error corrections for the German sub-group.*

Within Subjects Effects

| | Sum of Squares | df | Mean Square | F | p | $\eta^2_p$ |
|---|---|---|---|---|---|---|
| Conditions | 1.05 | 3 | 0.351 | 2.24 | 0.094 | 0.111 |
| Residual | 8.45 | 54 | 0.156 | | | |

Note. Type 3 Sums of Squares

# Appendix L

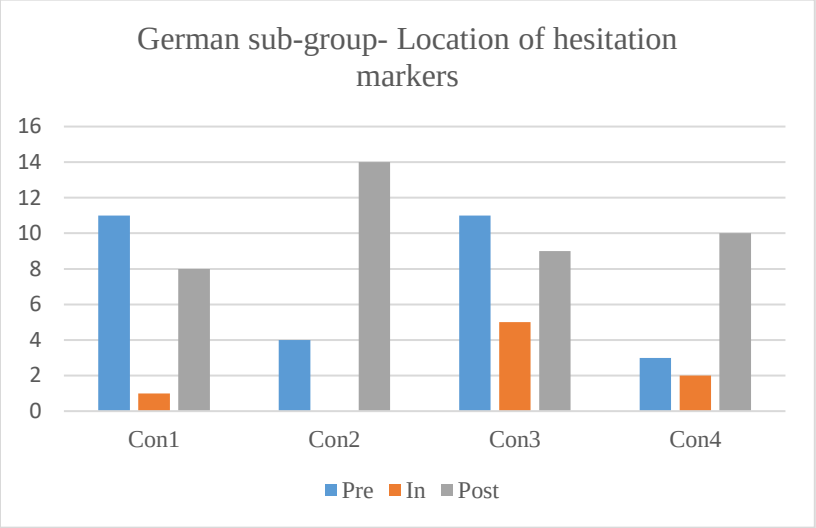


*Figure 6. Location of hesitation markers for the German sub-group.*

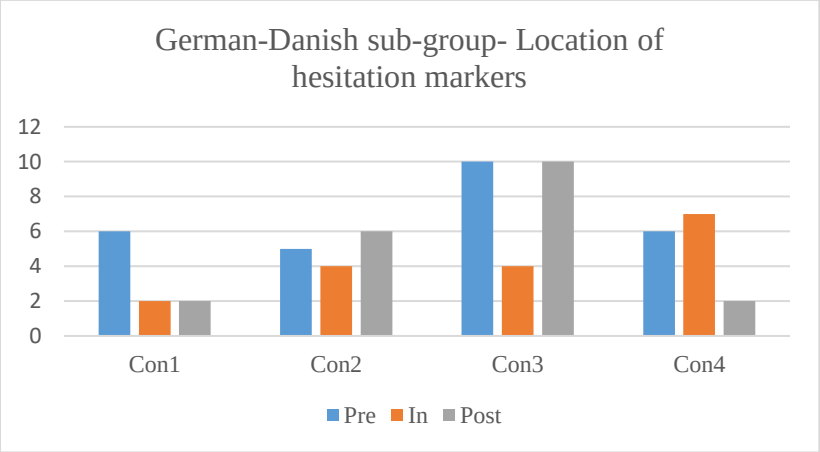


*Figure 7. Location of hesitation markers for the German-Danish sub-group.*

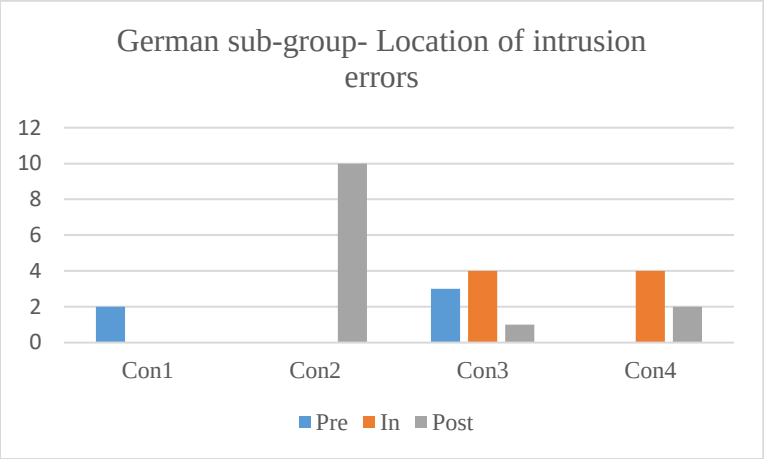


*Figure 8. Location of intrusion errors for the German sub-group.*

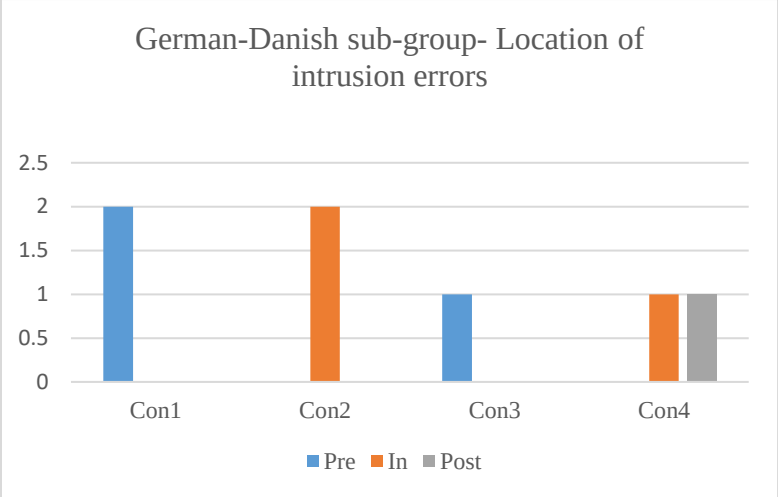


*Figure 9. Location of intrusion errors for the German-Danish sub-group.*

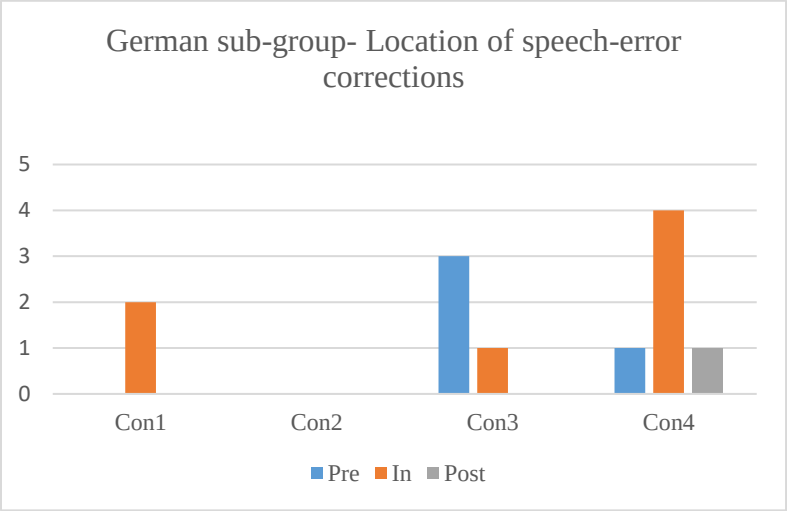


*Figure 10. Location of speech-error corrections for the German sub-group.*

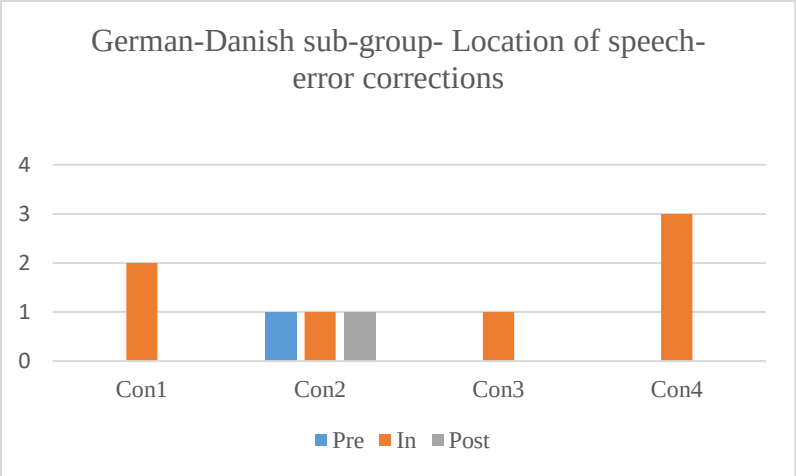


*Figure 11. Location of speech-error corrections for the German-Danish sub-group*