CODE-MIXING AND ITS POSSIBLE RELATION TO PATHOLOGICAL AND STRATEGIC BEHAVIOUR IN BILINGUAL SPEAKERS WITH APHASIA

Is the use of code-mixing in a population of bilingual speakers with aphasia more so related to strategic or pathological behaviour?

Radboud Universiteit

Nijmegen, September 2021

Radboud University Nijmegen

Faculteit der Letteren, masterspecialisatie Taal- en Spraakpathologie

Master thesis

Author: Elynn E. L. J. Vollebregt (s1048163)

Thesis Supervisor: Dr. M. B. Ruiter

Second Supervisor: S. Mooijman, MA

Preface

The thesis that you are about to read has been written in the context of graduating from the master specialization Taal- en Spraakpathologie at Radboud University Nijmegen. The thesis was written in the period between January 2021 and September 2021. The current study aimed to research code-mixing in bilingual speakers with aphasia, specifically whether code-mixing is more so related to pathological behaviour and/or strategic behaviour. The current study was explorative, because at the time of writing there was a debate concerning whether code-mixing in bilingual speakers with aphasia should be seen as pathological, strategic or could be both, and no previous research could be found which used statistical analysis on data such as the current data.

Prior to the master specialization at Radboud University Nijmegen, I graduated as speech and language therapist at Hogeschool Rotterdam. In the first place, I started my bachelor degree because I wanted to work with children, but soon after actually starting I realized that, even though I still think children are fun to work with, my passion lay with working with clients who suffer from speech and language dysfunctions caused by acquired brain injury. Hence, my choice to follow up my bachelor degree with the master specialization Taal- en Spraakpathologie and the choice of the subject of my thesis.

To conclude this preface I would like to thank my thesis supervisors dr. Marina Ruiter and Saskia Mooijman, MA for their guidance, knowledge, feedback and patience during the course of writing this thesis. Especially in times where I was insecure about certain aspects I could count on their expertise. A special thank you goes out to Saskia for making her data available for the benefit of this thesis. I would like to thank Esther Janse for coordinating the thesis process. Also a big thank you to the participants for their time and sharing their experiences. Their participation in the interviews and their stories have made it possible to do the current research. The second reader, Thordis Neger, I would like to thank for her time and effort concerning the grading of my thesis. Last, but not least, I would like to thank my parents, my sister and my friends who have listened to me talk about this thesis for months and have given me their unlimited support in the process.

I hope you enjoy reading my thesis!

Elynn Vollebregt

Abstract

Code-mixing is a well-known phenomenon in bilingual speakers, both with and without aphasia. Since the question: “Is the use of code-mixing in a population of bilingual speakers with aphasia more so related to strategic or pathological behaviour?” has not yet been given a conclusive answer in previous research, it was deemed necessary to conduct research towards this subject. Bilingual speakers are a growing part of society and so are people with aphasia. Understanding bilingual speakers with aphasia and their communicative behaviour is of importance, because bilingual aphasia is due to become the norm instead of the exception.

For the current study interviews were conducted with both bilingual speakers with and without aphasia. To learn about the experiences of bilingual speakers a rough, anecdotal type of qualitative analysis took place. This qualitative analysis was used exploratively and as a way to support or reject results from the statistical analysis. For the statistical analysis only data from the bilingual speakers with aphasia was used. The data-set consisted of communicative behaviours (code-mixing, pathological behaviour and strategic behaviour) which were counted and converted into percentages. Correlational analyses were performed as to see whether a relationship existed between code-mixing and pathological behaviour, code-mixing and strategic behaviour and, pathological- and strategic behaviour.

The statistical analysis showed there was no significant relationship between code-mixing and pathological behaviour or code-mixing and strategic behaviour. This was in accordance with answers given by both groups of bilinguals during their interviews, and as such the qualitative analysis. Both pathological and strategic use of code-mixing was experienced by the bilingual speakers with and without aphasia.

It was concluded that code-mixes could be both pathological and strategic, and code-mixing was not more so related to pathological or strategic behaviour in the population of bilingual speakers with aphasia who participated in the current study.

A significant limitation of the current study was the small participant group who participated in the statistical analysis (N=9). Since the current statistical analysis was inconclusive it is recommended for future research towards this subject to recruit a larger participant group of bilingual speakers with aphasia.

Table of Contents

1. Introduction

The current study revolves primarily around bilingual aphasia. What is meant by this term is when a bilingual speaker, someone who knows two or more languages or dialects which they use in their everyday life (regardless of the context of this use) (Grosjean, 1985), gets aphasia. During the history of aphasiology, many definitions have been proposed for aphasia. For the purpose of the current study the following definition by Papathanasiou, Coppens, and Davidson (2017) has been used to define aphasia as:

> "An acquired selective impairment of language modalities and functions resulting from a focal brain lesion in the language-dominant hemisphere that affects the person's communicative and social functioning, quality of life, and the quality of life of his or her relatives and caregivers". (pp. 4)

A behavioural aspect which bilingual speakers (both with and without aphasia) may show during communication is code-mixing. As stated by Muñoz et al. (1999) code-mixing is a phenomenon where one or more languages are used interchangeably by bilingual speakers. Bilingual speakers may code-mix in different amounts, frequencies and languages depending on environmental, social and personal influences.

In communication, bilingual speakers with aphasia may make errors during discourse due to their aphasia. These errors are then typically seen as pathological behaviour and can be, for example, grammatical errors, slips of the tongue or possibly code-mixing (Bastiaanse, 2011; Green & Abutalebi, 2008). Pathological behaviour is usually involuntary and therefore simply happens to the person in question. Sometimes, the person is able to repair their errors and in other instances an interlocutor repairs the error or the error is not repaired at all. In instances where the person with aphasia feels that they may make an error or are unable to retrieve the word which they are looking for, they may use strategic behaviour. Strategic behaviour can be gestures, a description of the word which they are trying to use or possibly code-mixing (Bastiaanse, 2011; Fridriksson et al., 2006; Grosjean, 1985; Muñoz et al., 1999; Olsson et al., 2020). The use of strategic behaviour is usually a conscious choice the person makes. The occurrence of pathological behaviour or use of strategic behaviour does not make the communication of people with aphasia less functional. Usually, strategic behaviour actually leads to better functional communication. To conclude, if a person is able to get their message across, no matter the way in which they do so, it is seen as successful and therefore functional communication.

With functional communication as their goal, bilingual speakers with aphasia may use the to them available resources from more than one language in communication. This means, that it is possible for them to use code-mixing to get their message across in which case code-mixing may be a form of strategic behaviour which is consciously chosen by the bilingual speaker with aphasia (Centeno et al., 2017). Centeno et al. state how in other instances, where the lesion location limits the ability to control the code-mixing, the bilingual speaker with aphasia may be hindered from avoiding the use of the non-target language in a unilingual conversation. In this case code-mixing may be seen as pathological; an error the speaker unconsciously makes. These examples show that it is at this moment not clear whether code-mixing should be seen as pathological or strategic behaviour, or if it can be both.

In the current study interviews with bilingual speakers with aphasia and bilingual speakers without aphasia were conducted as to investigate the relation between code-mixing and strategic behaviour, and code-mixing and pathological behaviour. The research question which was formulated is as follows: "Is the use of code-mixing in a population of bilingual speakers with aphasia more so related

to strategic or pathological behaviour?". In the following sections a review of relevant literature can be found and the sub-questions which reside within the research question of the current study will be explained.

1.1 Bilingualism

In the current study both participant groups consisted of bilingual speakers. The following section explains bilingual speakers as to better understand the difference between mono- and bilingualism.

Previous research has stated that over half of the world's population is in fact bilingual (Ansaldo et al., 2008). That is, when taking into account the following definition of bilingualism which was used for the current study. A bilingual is an individual who knows two or more languages or dialects which they use in their everyday life, regardless of the context of this use (Grosjean, 1985). It is highly probable that the increase of bilingualism will continue over the years since globalization results in the migration of over a hundred million people each year (Ansaldo et al., 2008). This globalization has promoted bilingualism around the world (Ansaldo & Ghazi-Saidi, 2014). Ansaldo and Ghazi-Saidi have stated that bilingualism may provide better career opportunities and how evidence suggests that it may contribute to the development of specific cognitive advantages such as enhanced intellectual development, openness to cultural diversities and greater flexibility and creativity. Because of the growing amount of bilingual speakers around the world, bilingual aphasia has become more frequent. Therefore, it is most likely that bilingual aphasia is becoming the rule instead of the exception in clinical settings (Ansaldo et al., 2008).

When studies speak of bilingualism they often distinguish between two types: simultaneous and sequential bilingualism. Simultaneous bilingual speakers begin acquiring both languages at the same moment in time, whereas sequential bilingual speakers receive exposure to the second language after acquiring their first language (Gross et al., 2014). Studies have been conducted in the past as to look at ways in which simultaneous and sequential bilingual speakers may differ. Berken et al. (2016) found a stronger correlation between language and cognitive control regions in simultaneous bilingual speakers. Berken et al. associated this pattern with more efficient brain activation during speech and thought this to highlight how functional connections in the brain differ depending upon when language learning takes place.

1.2 Executive functions

This section starts of by explaining the executive functions (EF; also called executive or cognitive control). Furthermore it looks into the relationship between EF and aphasia, and EF and bilingualism. The aim of this section is to gain a deeper understanding of certain (dis)advantages bilingual speakers with and/or without aphasia may experience in comparison to monolingual speakers with and/or without aphasia. If (dis)advantages exist, this may explain possible differences between bilingual and monolingual aphasia and could possibly clarify whether certain behaviour (e.g. code-mixing; see section 1.3 for more information) and the amount in which they occur are most likely pathological (caused by aphasia) and/or strategic (made possible by a person's bilingualism).

The executive functions are the higher control functions of the brain (Olsson et al., 2020). Executive functions bring different cognitive functions together and transcend the individual functions. EF influences planning, initiating, executing and monitoring (Blair, 2017; Olsson et al., 2020; Ozga et al., 2018). Furthermore, EF are necessary for adjusting conscious, complex, goal-oriented, non-routine behaviour. It is reported by Bialystok (2009) that the primary processes in the executive system are inhibition, shifting of mental sets (task switching or cognitive flexibility), and updating information in working memory. During communication, which is goal-oriented, complex behaviour, our executive functions are necessary. Executive dysfunction can have several negative effects on communication,

of which a few are mentioned in Table 1 (based on Peach & Shapiro, 2012; Suchy, 2015; Suchy et al., 2017).

Table 1

Executive Functions

Aspects of Executive Functions	**Possible communicative behaviour if aspect is disturbed**
Awareness	Being unable to estimate or see the usefulness of (future) problems during communication
Planning and organisation	Illogical story build-up
Taking initiative and execution	Being unable to initiate strategies during communication
Regulation and self-control	Being unable to notice miscommunication
Flexibility and problem solving	Being unable to fix the miscommunication
Self-inhibition	Misplaced comments, perseveration
Strategic behaviour	Being unable to generalize learned strategies

1.2.1 EF and Aphasia

Cerebrovascular disease and, more specifically, strokes can cause focal deficits such as aphasia, but non-linguistic cognitive deficits are also a common result (Cannizzaro & Coelho, 2012). To clarify, the current study assumes that language is cognition and therefore will sometimes distinguish between linguistic and non-linguistic cognitive deficits and functions. Aphasia and (non-linguistic) cognitive dysfunction often go hand in hand, with attention, short-term memory and executive functions being the most often affected areas of cognitive functioning (Cannizzaro & Coelho, 2012; Olsson et al., 2020; Schumacher et al., 2019). Schumacher et al. (2019) report that nearly 50% of their participants with aphasia showed deficits in at least half of the administered tests concerning executive functions. This goes to show how often one or more of the executive functions are impaired in people with aphasia. Schumacher et al. also state that impairment in the cognitive functions play an important role in aphasia recovery and rehabilitation. Previous research has shown that impaired executive functions in the second week after a stroke is the most important predictor of functional recovery after one year and that patients who demonstrated impairments on measures of EF are at risk for failure to fully benefit from rehabilitation during the acute period and the several months thereafter (Cannizzaro & Coelho, 2012; Olsson et al., 2020; Shea-Shumsky et al., 2019). Therefore, it seems of importance to take impairments in EF into account when dealing with aphasia and should be taken into account during a study such as the current one.

1.2.2 EF and Bilingualism

Bilingualism can have both negative and positive effects on the executive functions of a person when in comparison with monolingualism (Bialystok, 2009). First we will look into examples of how bilingualism may have a negative effect on the EF in comparison to monolingualism. Linguistic performance may generally be less in bilingual speakers. For example, bilingual children having a smaller vocabulary in one language than monolingual children, and adult bilingual speakers performing more poorly on lexical retrieval tasks (Bialystok, 2009). Bialystok discusses several articles that speak of disadvantages in bilingual adults such as: bilingual adults have shown to be slower on picture naming tasks, encounter more tip of the tongue experiences, have more trouble with identification through noise, and experience more interference in lexical decision. Several explanations for deficits in lexical access have been proposed, but what the actual reason is, is

unclear. One proposed explanation presented by Bialystok is an account which involves age of acquisition of the vocabulary in each language and may have different outcomes depending on the age of L2 acquisition. Both Bialystok and Lehtonen et al. (2018) propose that the cause of these disadvantages is thought to be, at least partly, a problem in a lexical interference between the competing languages of the bilingual which must be resolved. They add that the advantages have also been proposed to be attributable to less exposure to the individual languages of a bilingual speaker when in comparison with monolingual speakers. A monolingual speaker is constantly exposed to their language, whereas a bilingual speaker can only be exposed to one of their languages at a certain moment in time. Gross et al. (2014) state that bilingual speakers have distributed vocabulary knowledge and may know a certain word in one language, but not in the other. Gross et al. add that therefore it is not realistic to expect a bilingual speaker to have the same vocabulary knowledge in one language as a monolingual speaker has in their only language.

As explained above, the combination of aphasia and executive dysfunction can lead to struggles concerning communication, and bilingualism can also have a negative effect on cognitive processes in comparison to monolingualism. However, bilingualism has also been associated with a positive effect on executive functions when compared to monolingualism in people without aphasia (e.g., Bialystok, 2017). Advantages in EF have been reported in all age groups, but they are most consistently observed in older adults who are not at the peak of their cognitive functioning (Lehtonen et al., 2018). Lehtonen et al. propose that this could be the case if the normal, age-related decline of EF processes is attenuated in bilingual speakers. It has been suggested by Lehtonen et al. that during the course of an experiment the bilingual advantage decreases with practice, which reduces the difference between groups over time. These kinds of practice effects are slower in older participants which means that the decrease of the aforementioned advantage takes longer in these older participants (Lehtonen et al., 2018). This explains why advantages are most consistently observed in older adults. Other research has found an effect regarding cognitive performance that enhances executive functioning and protects against the decline of executive control in aging (Bialystok, 2009). Bialystok goes on to add that these effects interact to produce a complex pattern with regards to the effect of bilingualism on memory performance.

During communication, the languages of a bilingual speaker are constantly active (Lehtonen et al., 2018). It may be possible that, because bilingual language production needs constant involvement of the executive control system as to maintain the attention on the target language, this system is enhanced, more robust for other functions and therefore more efficient in bilingual speakers in comparison to monolingual speakers (Bialystok, 2009). Thus, in contrast to the negative effects of bilingualism Bialystok found for vocabulary size and rapid lexical retrieval, bilingualism should have an advantageous effect on the function of executive control. For example, Bialystok et al. (2008) reported that bilingual speakers performed better on the Stroop task (Stroop, 1935) than monolingual speakers, which indicates better executive control in the bilingual speaker. The Stroop task measures (prepotent) response inhibition and assesses the ability to inhibit cognitive interference which occurs when one has to process specific stimulus features whilst simultaneously processing a second stimulus attribute (Faria et al., 2015; Lesley University, n.d.). In the case of the Stroop task these features are colours and words. It can be used to measure selective attention capacity and skills and processing speed (Faria et al., 2015; Lesley University, n.d.). It may be concluded that if bilingual speakers performed better on the Stroop task than monolingual speakers that bilingual speakers have, apart from the aforementioned better executive control (Bialystok et al., 2008), a better ability to inhibit cognitive interference, better selective attention capacity and skills and/or faster processing speed. This could be explained by referring to how it was previously

reported that the languages of bilingual speakers are always active, which means that if they intend to speak in one language at a time they have to use inhibition and cognitive control as to repress their other language(s). Bilingual language production then requires constant involvement of the executive control system as to direct their attention to the target language (Bialystok, 2009). Since they practice this function constantly, it could explain why in a cognitive task such as Stroop's they perform better than a monolingual speaker who does not have this specific kind of practice of cognitive control and inhibition.

As previously stated in this section, bilingualism can have both a positive and a negative effect on certain executive functions. The stroke which causes aphasia may also cause executive dysfunction. A bilingual speaker may have some advantages concerning EF premorbid in comparison to a monolingual speaker, but postmorbid they may both experience executive deficits. What a premorbid advantage in specific executive functions (e.g. inhibition and cognitive control) means for a bilingual speaker after a stroke in comparison to a monolingual speaker is currently unclear. It could mean that bilingual speakers with aphasia come across (partly) different problems during communication than monolingual speakers with aphasia. Furthermore, this section explained how bilingualism has the ability to cause better inhibition and cognitive control in bilingual speakers as to prevent them from mixing non-target languages into a conversation in a target language when they do not want to do so. When a bilingual speaker has suffered a stroke and as a cause of that stroke has aphasia and executive deficits, this inhibition and cognitive control may be affected. This may cause more mixing of languages in bilingual speakers with aphasia than in bilingual speakers without aphasia.

1.3 Code-mixing

It was established in the previous sections that the languages of a bilingual speaker are constantly active, even if only one language is needed in a particular conversation. When several languages are active, it is possible for the languages to mix within an utterance or conversational turn. What is meant by "mix" is, a word or several words of a non-target language may slip into an utterance or conversation during unilingual conversation (see Figure 1). The term which is used for these types of situations is "code-mixing". As to prevent confusion, the decision has been made to use the term "code-mix" for each form of language mixing during the current study, and therefore not use the term "code-switch".

Figure 1

Example of code-mixing English-Dutch

"I was riding my fiets and then I viel"
[bike] [fell]

According to Muñoz et al. (1999), code-mixing is a phenomenon where one or more languages or dialects are used interchangeably by bilingual speakers. It is a linguistic practice which is constrained by grammatical principles, shaped by the environment, and social and personal influences. Personal influences may include age, the amount of time someone has been in a certain country, their educational background and their social networks. Some communities accept code-mixing, whereas others maintain strict divisions between languages.

Muysken (2000) distinguished different types of code-mixes: alternation, insertion and congruent lexicalisation. These types of code-mixing overlap partially (Lipsky, 2009). Alternation comprises

code-mixes where a segment is spoken in one language, alternated by a segment in a different language within a conversational turn (Green, 2018). Lipsky states that alternation assumes that each segment involves a language with its own constituent structure. Therefore, mixed elements are generally constituent-sized, for example, phrases or clauses. In the case of insertion, a base or matrix language is presupposed in which lexical items from another language are introduced. These lexical items need to be appropriately configured. This means that, during the language production process, the phrase structure is determined by the base language. Therefore, an utterance consisting a code-mix should be grammatical according to this base language. This includes the order and type of constituents. Lastly, congruent lexicalisation is a form of code-mixing which can only be seen in bilingual speakers who speak at least two languages which have a (largely) shared structure that can be lexicalised by elements from either language (Green, 2018). "The grammatical structure is shared by languages A and B, and words from both languages A and B are inserted more or less randomly" (Muysken, 2000, p. 8). A requirement for congruent lexicalization is that the languages in contact have a very high degree of structural congruency (Lipsky, 2009). When a bilingual speaker speaks a dialect besides one or more languages, this may also cause code-mixes in the form of congruent lexicalization. There are linguistic and extralinguistic factors which favour each code-mixing type (see Table 2).

Table 2

Codeswitching types, from Deuchar, Muysken & Wang (2007: 309)

Code-mixing type	**Linguistic factors favouring this type**	**Extralinguistic factors favouring this type**	**Example of code-mixing type**
Insertion	Typological distance	Colonial settings; recent migrant communities; asymmetry in speaker's proficiency in two languages.	English/Dutch: "Give me my *auto*" (Give me my car)
Alternation	Typological distance	Stable bilingual communities; tradition of language separation.	English/Dutch: "I can't come in today, *want ik ben ziek*" (I can't come in today because I am ill)
Congruent lexicalization	Typologically similar languages	Two languages have roughly equal prestige; no tradition of overt language separation	Sranantongo/Dutch: "Wan heri *gedeelte* de cendro beheer fu *gewapende machten*" (One whole part is under control of the armed forces)

Note. Adapted from ""Fluent dysfluency" as congruent lexicalization: A special case of radical code-mixing" by J. M. Lipsky, 2009, *Journal of Language Contact, 2*(2), p. 3. Example congruent lexicalization taken from "Bilingual Speech: A Typology of Code-mixing" by P. Muysken, 2000, Cambridge University Press, p. 139.

Code-mixing often depends on the context in which the bilingual speaker finds themselves. If it concerns a single language context, where only one language is known by the interlocutor, only one language can be used by the bilingual speaker (Green, 2018; Green & Abutalebi, 2013). In a dual language context, the bilingual speaker may be speaking to two interlocutors and speak one

language to one and one language to the other. A dual language context may also be a conversation with one interlocutor who knows two or more of the languages that the bilingual speaker speaks. To be able to participate in both single and dual language contexts, bilingual speakers must enable different patterns of language use to use their languages in different ways as a function of interactional context.

Concerning single language contexts and the first example given of a dual language context, the bilingual speaker is required to select one language but not the other(s) (Green, 2018; Green & Abutalebi, 2013). For example, if in a single language context the target language is English, the bilingual is required to speak English as to be understood by the interlocutor and cannot use one or several of their other languages (e.g. Dutch or French). If in a dual language context one interlocutor only speaks English and the other only speaks Dutch, the bilingual must speak English to interlocutor one, and Dutch to interlocutor two as to be properly understood. To be able to execute this selection process properly, a competitive control regime is needed in which activated items from the non-target language are temporarily blocked from entry into the utterance planning mechanism. As mentioned before, in a dual language context it is also possible that both languages are allowed to be spoken in a conversation with one and the same interlocutor. For example, if the interlocutor and the bilingual speaker both know the English and Dutch language. This means that a cooperative control process in which the resources of both language networks are allowed into the utterance planning mechanism is also a possibility for bilingual speakers. This form of control within bilingual speakers, specifically the ability to purposely mix languages within a conversation and/or utterance (e.g. in the previous example where the bilingual speaker and the interlocutor both know English and Dutch) or prevent code-mixing from happening, suggests involvement of executive functions (Cannizzaro & Coelho, 2012; Olsson et al., 2020; Smidts, 2003) (also see section 1.2). When a bilingual speaker produces a word in one language, it is also active in their other language(s). This elicits competition between the lexical alternatives (Lehtonen et al., 2018). As stated by Lehtonen et al., to prevent interference from the non-target language, cognitive control functions must work effectively to be able to fluently use the target language. For a bilingual to efficiently use two languages it is assumed that they require inhibition of items of the non-target language and flexible switching between languages.

Lerman et al. (2019) reported that there is an ongoing debate whether code-mixing in bilingual speakers with aphasia is a sign of an impairment to the language system or to the language control system (a pathological cause), whether it is intentional or unintentional, and whether code-mixing is used as a strategy to improve communication. Lerman et al. state how after a stroke, unintentional code-mixing has been estimated to be present in around 7% of cases of bilingual speakers with aphasia, although in many more cases language mixing occurs intentionally (e.g., Muñoz et al., 1999). They, however, do not specify exactly in how many cases language mixing occurs intentionally. In cases where code-mixing is unintentional this often has a negative effect on communication (Lerman et al., 2019). Lerman et al. describe code-mixing as a result of language control deficits after a stroke, but say that ultimately, the reason behind code-mixing after a stroke is still unclear. They explain how code-mixing may be caused by an impaired control mechanism in the brain. This then results in a decline of inhibition of the non-target language or impaired monitoring of language use, in which case code-mixing may be seen as pathological (e.g., Green & Abutalebi, 2008). A different proposition is that code-mixing may be a strategy which improves word retrieval and continues the flow of a conversation by retrieving a translation of the target word (e.g., Grosjean, 1985; Muñoz et al., 1999). To exemplify, there are instances where the lesion location may limit the ability to control code-mixing, therefore hindering the bilingual speaker with aphasia from avoiding the use of the wrong language in unilingual conversation (Centeno et al., 2017). In this case code-mixing may be

seen as pathological; an error the speaker unconsciously makes. In another instance a bilingual speaker, in this case with aphasia, may use the to them available resources from more than one language to communicate and therefore use code-mixing to get their message across, in which case code-mixing may be a strategy consciously chosen by the bilingual speaker with aphasia (Centeno et al., 2017). Lastly it may be possible that a code-mix by a bilingual speaker with aphasia is at one moment an unconscious phenomenon caused by language control deficits after a stroke (pathological behaviour), whereas at another moment in time it may be a conscious strategy which the bilingual speaker chooses to use when they cannot find a certain word or clause in the target language of a conversation. If this may be the case, then one could say code-mixing is neither pathological or strategic in bilingual speakers with aphasia, but can be both. These examples and results from previous studies show that it is at this moment not clear whether code-mixing should be seen as pathological or strategic behaviour, or if it may be possible that it is or can be both.

1.4 Strategic communicative behaviour and functional communication

The following section will explain strategic communicative behaviour and its role in functional communication. Strategic communicative behaviour comprises of communicative behaviour that is used as a strategy when verbal expression fails or takes too long (Olsson et al., 2020). In previous research it has also been called compensatory behaviour, since it compensates for a function that may no longer work post-stroke as it did pre-stroke (e.g., Olsson et al., 2020). In the current study it will mostly be referred to as strategic behaviour. The following section explains how awareness of possible deficits is needed to be able to use strategic behaviour, and deficits in awareness may negatively influence the ability to use strategies (Crosson et al., 1989). Finally, there are several types of strategic behaviour which may be observed during (informal) discourse with bilingual speakers with aphasia. For the cause of the current study a few will be discussed in the following section.

For a person with aphasia to be able to compensate for certain deficits in their verbal expression and therefore use strategic communicative behaviour, awareness is required. However, there may be awareness deficits caused by the acquired brain injury which has also caused the aphasia. Crosson et al. (1989) distinguish three types of awareness deficits: deficits in intellectual awareness, deficits in emergent awareness, and deficits in anticipatory awareness. The presence or absence of an awareness deficit and the type determines what kinds of strategic behaviour a person with aphasia may be able to use. Crosson et al. explain intellectual awareness as the ability of a patient to, at some level, understand that a particular function is impaired. Patients need to at least understand that they are having difficulties with some activities. To recognize a common thread in these now difficult activities a higher level of intellectual awareness is needed. Input from a doctor, therapist or family may help a patient with a deficit in intellectual awareness by telling the patient about their deficits. However, permanent limitations in memory and/or abstract reasoning may have a negative effect on these attempts. Next, Crosson et al. speak of emergent awareness. This, they describe as the ability of a patient to recognize a problem when it is happening. As to recognize a problem while it is happening, intellectual awareness is a prerequisite, because one first needs to be aware that a particular function is impaired and problems may occur because of this impairment. A deficit in emergent awareness means that a patient is unable to perceive a problem as it is occurring and therefore will not compensate for it. It is possible for a person to have intact intellectual awareness and a deficit in emergent awareness. The patient then does have awareness of the deficits themselves and therefore can explain what functions are impaired, but because of the deficit in emergent awareness cannot use compensation when it is needed because they do not realize that they are having problems at the moment that these problems actually occur. Lastly, Crosson et al. explain anticipatory awareness, which is the ability to anticipate that a problem may occur because of a known deficit. As to be able to anticipate in this way, both intellectual and emergent awareness

are required. One needs to have knowledge of their deficits and be aware of them at the moment they occur. If someone has a deficit in anticipatory awareness they cannot anticipate that a problem may occur and that it may be beneficial to use strategic behaviour as to reduce the chance of problems in communication. This does not mean that they cannot initiate strategic behaviour when the problem is occurring, because this is still possible if emergent awareness is intact.

When a person with aphasia has the ability to initiate compensation through strategic behaviour there are several options. One of these options is the use of gestures. Gestures are often a companion of speech. We accompany the words we say with movements of the hands even if those movements do not particularly add something to what we are saying. However, sometimes our gestures add something complementary or additional to what is being verbally expressed. Occasionally, gestures may even convey a message without the need of spoken language. Speakers without aphasia use gestures occasionally and most of the time they mean nothing or complement the spoken language (Hogrefe et al., 2017). In people with aphasia this may be different. Hogrefe et al. state how impaired verbal expression in aphasia provides an exceptional situation in which it may be needed to use gestures as to convey a message. Gestures are then used as a strategy to compensate for the insufficiency of their verbal expression. One has to keep in mind, however, that the brain damage which has caused the aphasia may also interfere with gesture use, which can make it more difficult than it seems to use gestures as a strategy to support verbal expression. For example, Hogrefe et al. found that participants who, besides aphasia, suffered from semantic processing disorders or apraxia produced less comprehensible gestures than participants who did not have semantic processing disorders or apraxia. A different study by Purdy & Koch (2006) found a negative impact of reduced cognitive flexibility on the flexibility of participants with aphasia to switch to another communication channel, such as gestures, when conveying a verbal message failed.

In other cases, people with aphasia who have naming difficulties may describe the word they cannot find. This way they may win themselves time to find the target word (see example 1; Figure 2), their description may initiate an attempt at repair executed by the interlocutor (see example 2; Figure 2) or the person with aphasia may use the description to replace the target word (see example 3; Figure 2). This, too, is seen as a conscious and strategic act in communication.

Figure 2

Examples of descriptions

1. *BWA: "The stuff you wash your hands with (..)"*
   BWA: "Soap."

2. *BWA: "A place where they take care of elderly people."*
   Interlocutor: "A nursing home?"
   BWA: "Yes!"

3. *BWA: "I don't like that sour, yellow fruit"*
   Interlocutor: "And are there any vegetables you don't like?"

Note. BWA stands for Bilingual speaker With Aphasia.

Definitions of functional communication can vary greatly, which makes it pertinent to state the operational definition of this construct as it is treated in the current study (Fridriksson et al., 2006). Functional communication is the ability to get messages across in a variety of ways (Olsson et al.,

2020). It can also be described as effective everyday communication and to achieve this, verbal expression is not a necessity. As previously stated, besides a fully formed grammatical message, a message or a part thereof can also (partly) be conveyed through, for example, gestures (Fridriksson et al., 2006; Olsson et al., 2020). The study by Fridrikkson et al. found significant correlations between scores on general tests of executive functions and functional communication in natural context in aphasic patients. Hogrefe et al. (2017) state how even though Fridrikkson et al. did not analyse different communication channels, it seems very likely that gestures were among the alternative communication channels used by participants and contributed substantially to the success of functional communication.

Functional communication may be seen as somewhat of a scale with on one end the fully formed grammatical messages and on the other end a message fully conveyed through gestures (Fridriksson et al., 2006). No matter where a message can be placed on this scale the message can be successful and comprehensible, and therefore a part of functional communication. In line with this statement, the use of strategic behaviour by people with aphasia does not have to be frowned upon, but could be combined with other purposes of communication such as verbal expression (Dietz et al., 2020). The current study assumes that this way the person with aphasia is able to convey their thoughts now in a way which befits their possibilities, but at the same time may continue to work on their abilities to verbally express themselves with the help of a speech and language therapist. If the language problems turn out to be (partly) chronic, the person with aphasia has already taught themselves how to use strategic behaviour as a way of compensation. Therefore, functional communication remains a possibility with or without the use of verbal expression. To clarify, these statements are currently up for debate and not all previous research agrees with them, but the afore given definitions and opinions are what the current study assumes.

1.5 Bilingual aphasia

The previous sections have spoken about different aspects of both bilingualism and aphasia, for example, concerning their definitions, their effect on executive functioning and code-mixing. Furthermore, a few statements have already been made about the combination of bilingualism and aphasia. This section speaks of other previous research regarding bilingual aphasia which is thought to be relevant to the current study.

In the Netherlands, the amount of people that have suffered a stroke in the year 2040 will be 54% more than the amount which was measured in 2015. This has been established by the Hersenstichting (2020) based on data concerning brain disorders published by the RIVM (Rijksinstituut voor Volksgezondheid en Milieu) in the *Volksgezondheid toekomst verkenning 2018* (VTV-2018). An increase in stroke cases will result in an increase in people with aphasia, since approximately 30 to 35% of stroke survivors have aphasia (Papathanasiou, Coppens, & Davidson, 2017). As stated before, the number of bilingual speakers in the world is constantly growing. 57% of Europeans report that they know one or two foreign languages and some countries in the world have two official languages, which favours extensive bilingualism (Centeno et al., 2017). With globalization increasing the number of bilingual speakers in the world and the increasing amount of people who suffer brain damage each year, bilingual aphasia is due to be the norm instead of the exception it used to be (Ansaldo et al., 2008; Bastiaanse, 2011; Centeno et al., 2017; Hersenstichting, 2020).

There are several variables which may influence the consequences of an acquired brain injury when it concerns bilingual speakers. Kuzmina et al. (2019) found that a first-acquired language is most often better preserved in aphasia than a second-acquired language. Concerning age of acquisition (AoA) they found that bilingual speakers who acquired their second language after the age of seven showed significantly better performance in their first-acquired language than the second one.

Bilingual speakers who acquired their second language before the age of seven showed comparable results in both languages. Furthermore, Kuzmina et al. found that premorbid more proficient languages were better preserved after a stroke. Generally speaking, when a first-acquired language was more proficient or both languages were somewhat equally proficient premorbid, then participants showed better overall performance in their first-acquired language postmorbid. Lastly, Kuzmina et al. found that, generally speaking, the language which is used the most by a bilingual premorbid, is most likely to be the most proficient language postmorbid. The results from this meta-analysis (Kuzmina et al., 2019) are important to keep in mind during the current study, because the current participants with aphasia differed in AoA, premorbid language proficiency and language use and these differences may (partially) explain certain behaviours and the experiences of bilingual participants with aphasia.

The following part revolves around language recovery. Recovery as a term covers any and all behavioural changes. As stated by Papathanasiou, Coppens, Durand, & Ansaldo (2017), these behavioural changes can be restoration, reorganization, compensation, habituation, restitution, substitution, new learning and more. This can affect both language production and -comprehension. Papathanasiou et al. later make the distinction between recovery and compensation by stating that recovery refers to the capacity to perform a task which was previously impaired in the same manner as the person did premorbid. Compensation refers to using a new strategy as to perform that same task.

Language recovery of bilingual speakers with aphasia comes in one of two main postmorbid recovery patterns and deficits: parallel and nonparallel (Centeno et al., 2017; Kuzmina et al., 2019). Parallel recovery is most frequently reported and it involves the simultaneous recovery of two languages (Centeno et al., 2017; Kuzmina et al., 2019; Vaid & Genesee, 1980). In parallel recovery, aphasia symptoms are similar in both languages, but the actual expressive profile of each language may differ (Bastiaanse, 2011; Centeno et al., 2017). Nonparallel recovery can occur in various ways and refers to an unequal order in the recovery of the languages or differences in the way in which they are used (Centeno et al., 2017; Vaid & Genesee, 1980). If only one language is available after a stroke this is called “Selective recovery”, if both languages are affected but not in the same amount it is called “Differential recovery” and when both languages are alternatively affected over periods of time we call this “Antagonistic recovery” (Centeno et al., 2017; Kuzmina et al., 2019). In nonparallel recovery, the language most frequently used by the patient at the time of the stroke is most likely to show recovery, but most often the languages known by the bilingual speaker premorbid recover proportionally to their pre-stroke proficiency (Centeno et al., 2017). Research concerning bilingual speakers with aphasia has given evidence for the statement that both early acquisition and premorbid language dominance contribute to the language recovery (Bastiaanse, 2011; Kuzmina et al., 2019). Kuzmina et al. state that the dominance of language use in the linguistic environment of a bilingual speaker with aphasia will have an impact on the patterns of the aphasia after stroke, which may explain the several types of recovery described above. To conclude, Kuzmina et al. mainly found that the first-acquired language recovers best, which was modulated by dominance and/or usage and that proficiency and early acquisition of a language usually have a positive effect on language recovery.

Previously in the current study findings concerning executive functioning in bilingual speakers and people with aphasia were reported separately. Regarding executive functioning when comparing bilingual speakers with aphasia and bilingual speakers without aphasia Patra et al. (2020) reported the following. Their participants without aphasia scored significantly better on the Stroop task than their participants with aphasia, which shows how the bilingual speakers with aphasia had more

difficulty regarding inhibitory control. Furthermore, the bilingual speakers without aphasia showed to have better task switching abilities than the bilingual speakers with aphasia. This shows that the aforementioned negative effect on executive functioning in people with aphasia (e.g., Cannizzaro & Coelho, 2012; Olsson et al., 2020; Schumacher et al., 2019) is also relatable to bilingual speakers with aphasia when in comparison with bilingual speakers without aphasia.

1.6 The current study

In the previous sections it has been explained what has and has not been researched up until now regarding bilingual aphasia and code-mixing. To continue, as stated by Aboh (2020), previously conducted studies on code-mixing generally have been focused on the form of code-mixing, its social functions, and its cross-linguistic commonalities (e.g., Bulluck & Toribio, 2009; Muysken, 2000; Myers-Scotton, 1998, Myers-Scotton, 2006; Poplack, 1980). Furthermore, studies comparing properties of code-mixing between healthy bilingual speakers (neuro-typical) and bilingual speakers who have aphasia (neuro-atypical) are sparse (Aboh, 2020). Understanding similarities and/or differences between healthy bilingual speakers and bilingual speakers with aphasia is important to establish which core aspect of the language capacity is resilient, and which aspect is less so (Aboh, 2020). In addition, the fact that it is as of now not clear whether code-mixing is more so related to pathological behaviour or strategic behaviour makes the current study a necessary one.

To iterate the research question of the current study: “Is the use of code-mixing in a population of bilingual speakers with aphasia more so related to strategic or pathological behaviour?”. To answer the research question the following sub-questions will need to be answered: a. How does code-mixing present itself in conversation b. to what extent is code-mixing related to pathological behaviour or errors (grammatical error, slip of the tongue) c. to what extent is code-mixing related to strategic behaviour (gestures, descriptions) d. is there a difference between the extent of relation between code-mixing and pathological behaviour and code-mixing and strategic behaviour e. how do bilingual people with and without aphasia describe their code-mixing (strategic, pathological/accidental).

The research question of the current study will be answered with the help of both quantitative data, concerning bilingual speakers with aphasia, and qualitative data, concerning both bilingual speakers with and without aphasia. This means data will be analysed both through a statistical analysis, as well as through qualitative analysis. To research the relation between code-mixing and pathological behaviour, code-mixing and strategic behaviour and whether there is a difference between the extents of those relations correlation analyses will be executed. These correlation analyses will give answer to sub-questions b, c and d. The qualitative analysis is a rough analysis of the answers given by the participants during the interviews. In previous research, conversational samples from bilingual speakers with aphasia have been known to reveal the impact of their brain damage on their language performance with regards to the use of code mixing in their bilingual discourse (Centeno et al., 2017), and therefore interviews may give insight in whether a code-mix was more likely to have been strategic or pathological. The qualitative analysis is anecdotal and consists of a summary of relevant answers given by both the participants with and without aphasia. This will give answer to sub-questions a and e.

In the current study concerning whether code-mixing is more so related to strategic or pathological behaviour there are no specific hypotheses, as there seem to be four options concerning the quantitative analysis: (1) Code-mixing is not more so related to strategic or pathological behaviour. In this case no significant correlation is found between code-mixing and strategic behaviour and between code-mixing and pathological behaviour. The quantitative analysis will show to be inconclusive. It cannot be said whether code-mixing can be seen as more pathological or more

strategic, which means it may be possible code-mixing can be both. (2) Code-mixing is more so related to pathological behaviour. There is a significant correlation between code-mixing and pathological behaviour and there is not a significant correlation between code-mixing and strategic behaviour. (3) Code-mixing is more so related to strategic behaviour. There is a significant correlation between code-mixing and strategic behaviour and there is no significant correlation between code-mixing and pathological behaviour. (4) Code-mixing is related to both pathological and strategic behaviour. There is a significant correlation between both code-mixing and pathological behaviour and code-mixing and strategic behaviour. In this case, code-mixing can be both pathological and strategic and the quantitative analysis will show to be inconclusive. Furthermore, the qualitative analysis will only be used as to support or contradict the quantitative analysis, which is the reason there is also no hypothesis on the grounds of the qualitative analysis.

2. Methods

The current study is a branch of the PhD trajectory of Saskia Mooijman. As a part of this trajectory, she conducted interviews with bilingual speakers with aphasia as an explorative foundation to her study. The study by Saskia Mooijman has been approved by the ETC-GW (number 2019-5035). Since the aforementioned interviews lent themselves for further analysis, they were made available for further investigation through a master thesis and therefore the current study. For the benefit of the current study a second participant group of bilingual speakers without aphasia was added. In the next section the design, all participants, materials, procedures and analyses will be explained in detail.

2.1 Design

The current study consisted of both a qualitative- and a quantitative approach. The qualitative approach was to understand subjective experiences concerning code-mixing in bilingual speakers. The research design of the current study concerning the qualitative approach is phenomenology, because the aim is to understand a phenomenon (code-mixing) by describing the participants' experiences which they have spoken about during the conducted interviews. The quantitative approach was to measure variables, describe frequencies (in percentages) and compare correlations between variables. The research design of the current study concerning the quantitative approach is, therefore, correlational. Also, because the variables measured during the current study have not been influenced.

2.2 Participants

Two participant groups partook in the current study. One group consisted of bilingual speakers with aphasia (BWA) (2 female, 8 male; mean age 55 years, range 30-74; see Table 3 for more details), and one group consisted of bilingual speakers without aphasia (Healthy Bilingual speaker: HB) (8 female, 5 male; mean age 42 years, range 24-57; see Table 4 for more details). All participants spoke at least two languages or dialects which they use in their everyday life, regardless of the context of this use.

The participant group "Bilingual speakers with aphasia", also abbreviated to BWA, showed inter-subject variability with respect to aphasia type and severity, time post onset and type of acquired brain injury. At the time of the writing of the current study all participants had the diagnosis "aphasia", but the aphasia type and severity was not specified for all participants. Therefore, aphasia types and severities are not mentioned in Table 3. BWA_10 was excluded completely from the statistical analysis on the grounds that they did not produce any code-mixes during the interview. All participants from both groups, including BWA_10, were included in the qualitative part of the current study.

Table 3

Participants: Bilingual speaker with Aphasia (BWA) (N=10)

	Age (in yrs)	Languages	Sex	Time post onset (in yrs)	Type of acquired brain injury
BWA_1	47;10	L1: Kerkraads (Dutch, Limburg dialect), L2: Dutch, L3: German, L4: English	M	6;7	Ischemic stroke (2x)
BWA_2	57;0	L1: Dutch, L2: English, L3: German, L4: Portuguese, L5: French	M	2;6	Haemorrhagic stroke
BWA_3	66;6	L1: German, L2: English, L3: Dutch	M	0;7	Ischemic stroke (2x)
BWA_4	39;4	L1: Turkish, L2: Dutch, L3: English, L4: German, L5: French	M	2;10	Haemorrhagic stroke
BWA_5	61;1	L1: Dutch, L2: English, L3: Swedish	M	4;8	Ischemic stroke
BWA_6	74;6	L1: English, L2: Dutch	F	4;2	Ischemic stroke
BWA_7	63;5	L1: Dutch, L2: English, L3: French	M	11;5	Ischemic stroke
BWA_8	53;0	L1: Dutch, L2: English, L3: German, L4: French, L5: Cantonese	M	2;2	Haemorrhagic stroke
BWA_9	66;9	L1: Spanish, L2: Papiamento, L3: English, L4: Dutch	F	4;0	Ischemic stroke
BWA_10	30;1	L1: Somali, L2: Dutch, L3: English, L4: German	M	1;0	Haemorrhagic stroke

Table 4

Participants: Bilingual speaker without Aphasia (Healthy Bilingual speaker: HB) (N=13)

	Age (in yrs)	Languages	Sex
HB_1	29;6	L1: Arabic, L2: English, L3: Dutch	M
HB_2	38;4	L1: Kurdish, L2: Dutch, L3: English	M
HB_3	43;9	L1: Turkish, L2: Dutch	F
HB_4	34;6	L1/2: Russian & Azerbaijani (Simultaneously), L3/4: Dutch & English (Simultaneously), L5: Italian	F
HB_5	38;0	L1/2: Kurdish & Turkish (Simultaneously), L3: Dutch	F
HB_6	49;4	L1: Dutch, L2: Sranantongo/Surinamese, L3: English, L4: Spanish	M
HB_7	24;8	L1/2: Italian & Dutch (Simultaneously), L3: English	F
HB_8	42;6	L1: Italian, L2: Dutch, L3: English, L4: French	F
HB_9	57;2	L1: Spanish, L2: English, L3: Dutch	F
HB_10	54;9	L1/2: Hungarian & Dutch (Simultaneously), L3: English, L4: French, L5: German, L6: Spanish	M
HB_11	48;6	L1: Polish, L2: Russian, L3: English, L4: Dutch	F
HB_12	47;1	L1: Dutch L2/3: Arabic (Moroccan dialect) & Berber (Simultaneously), L4: English	M
HB_13	45;2	L1/2: Russian & Bulgarian (Simultaneously), L3: English, L4: Dutch	F

The participant group BWA had already been interviewed by Saskia Mooijman and therefore did not need to be recruited. However, the participant group "Bilingual speakers without aphasia", also abbreviated to HB, did not exist prior to the current study and therefore recruitment was needed. Recruitment took place through personal connections of the author. Possible participants were mailed a recruitment message (see Appendix 3) with a short explanation of the study and if they were interested in participation they were sent the link to an online informed consent form (see Appendix 4) through Qualtrics (https://www.qualtrics.com). Inclusion criteria regarding the bilingual speakers without aphasia were that they had to speak two or more languages. The situation(s) in which they spoke each language could vary (at home, at work, with certain family members, et cetera). One language did not have to be used as much as the other(s), but it was of importance that at least two languages were spoken relatively fluently, used on a regular basis and that they had been speaking each language for at least a year. Besides the speaking of two or more languages there were no specific criteria that had to be met by the aspiring participants. Since the current study is explorative, difference in bilingual type (simultaneous or sequential), language(s), sex or age were not thought to be able to affect the outcome of the qualitative analysis and were therefore no in- or exclusion criteria.

2.3 Materials

2.3.1 Bilingual speakers with aphasia

The most vial material needed for the current study were the interviews. The interviews with BWA were already conducted and audio and/or video recorded before the onset of the current study as part of the aforementioned PhD trajectory of Saskia Mooijman. All interviews took place online via Zoom (Zoom Video Communications Inc., 2021), because of the situation at the time concerning Covid-19. The interviews took place with approval of the ETC-GW. The interviews were semi-structured and conducted by Saskia Mooijman in Dutch. Prior to the actual conduction of the interviews all participants gave online written consent for audio/video-recording and the use of the data for future research.

To get similar information from all participants a (Dutch) interview protocol was developed by Saskia Mooijman (see Appendix 1). In this protocol all of the questions are listed and a behavioural code for the person who conducts the interviews is mentioned. As for the more general questions this interview protocol was partly based on the Aachen Aphasia Test (AAT; Graetz et al., 1987). Furthermore, the protocol contained questions regarding (bilingual) language use, history, experience, et cetera.

To transcribe the interviews with bilingual speakers with aphasia, the program Computerized Language ANalysis (CLAN; MacWhinney, 2000) was used. CLAN is a program used for the creating and analysing of transcripts (AphasiaBank, n.d.; MacWhinney, 2000). CHAT conventions (MacWhinney, 2000) were used to transcribe all the interviews (AphasiaBank, n.d.). CHAT, as stated by MacWhinney, stands for "Codes for the Human Analysis of Transcripts" and is the standard transcription system for CLAN. Prior to the transcription process, a codebook was made to specify which communicative behaviour types would be transcribed and how to recognize them (see Appendix 5). The codebook described each type of behaviour, specified different subtypes if necessary and gave examples of what these behaviour types may look like in conversation. As to develop the codebook literature was used which addressed the pathological and/or strategic behaviour which can be found in the codebook. It was researched through this literature which pathological and strategic behaviour types were suitable to be transcribed to be able to properly answer the research question. There were the same amounts of pathological and strategic behaviour types needed and they needed to be often observed in people with aphasia. This last criterium as to

be sure that the behaviour types would be observed during the transcription and data-analysing process. The types and subtypes of pathological and strategic behaviour were then explained in the codebook and given a fitting code from the CHAT-manual (AphasiaBank, n.d.; MacWhinney, 2000). Lastly, examples were given from each (sub)type of behaviour. A list of the transcribed behaviour types and how they were operationalized during the transcription process can be found in Table 5.

Table 5

Transcribed behaviour types from codebook

Pathological behaviour	• Grammatical error • Slips of the tongue	• Each grammatical error was labelled with [*], a possible target word was added [: target], and in the comment tier (%com) the type of grammatical error was added. • Each slip of the tongue was labelled with [*], a possible target word was added [: target] and in the comment tier (%com) the slip of the tongue was defined as either semantic or phonematic.
Strategic behaviour	• Gestures • Descriptions	• Each gesture was transcribed as e.g. &=hand:icon:height (the participant shows the height of an object with their hand) or &=finger:deik:INV (the participant points their finger at the investigator). • If a participant described a word this would be added in a comment tier (%com) underneath the utterance.
Others	• Code-mixes • Self-initiated repair • Disfluencies • Corrections	• Each code mix was followed by the code @s:* in which the * had to be replaced by the three letter code of the language in which the code-mix was uttered (eng/nld/swe/et cetera). • Types of repair were defined in a comment tier (%com) underneath the utterance. • Pauses were transcribed as (.) for a short pause, (..) for a medium pause and (…) for a long pause. Fillers were transcribed as &-uh or &-uhm and word fillers as &-ja (English: yes). • A correction was labelled with [//] a retracing without correction with [/]. In a comment tier (%com) underneath the utterance it was specified if a correction was unnecessary, e.g. if the utterance was first grammatically correct, but after correction by the speaker is now grammatically incorrect

2.3.2 Bilingual speakers without aphasia

The interviews with HB were conducted specifically for the current study by the author. Again, all interviews were semi-structured, took place online via Zoom (Zoom Video Communications Inc., 2021), and were conducted in Dutch. There was a special RU-license appointed to the author as to be able to record the interviews on Zoom. Beforehand, all participants gave consent for the video-recording, the use of data concerning the current study and future research in this field. Consent was given through an online informed consent form through Qualtrics (https://www.qualtrics.com).

Therefore, the first materials needed for this participant group were a recruitment message and an online informed consent form (see Appendix 3 and 4). The recruitment message merely gave a short explanation of the study and the main inclusion criteria. The online informed consent form consisted of an explanation of the study and what would be expected of the participants if they were to decide to participate in the current study.

A second (Dutch) interview protocol was made for the interviews with HB. This second interview protocol is an adaptation of the interview protocol used for the BWA group. Since not all questions of the BWA interview protocol were relevant for the HB participant group, some questions were removed and others were added. The interview protocol for the interviews with HB was made by the author and can be found in Appendix 2. The more general questions in this protocol were still partly based on the AAT (Graetz et al., 1987). The questions regarding aphasia were taken out and more questions regarding code-mixing and bilingualism were added, taken from the "Bilingual Switching Questionnaire" (Rodriguez-Fornells et al., 2012).

2.4 Procedure: Data collection

2.4.1 Bilingual speakers with aphasia

As formerly stated, the interviews with BWA had already been conducted prior to the onset of the current study. Therefore, all video and/or audio recordings were already available for analysis. The data which was needed were transcripts of each interview with the BWA. These interviews were transcribed in CLAN by the author (Computerized Language ANalysis; MacWhinney, 2000). To be able to transcribe each video- and/or audio recording in the same way the aforementioned codebook was used (see Appendix 5). Each video was transcribed in the order as shown in Table 6.

Table 6

Transcription order

1.	Orthographically: By transcribing exactly what was said by participant and the investigator. • If it was impossible to transcribe a certain utterance (e.g. because it was not clearly spoken or the Wi-Fi connection faltered) it was transcribed as "xxx". • Names of people, places and institutions were anonymized. If it concerned people who were present during the interview their names were replaced by their transcription code (PAR1: the BWA, PAR2: a partner or therapist, INV: the investigator/person who conducted the interviews). In the case of people who were not present, places and institutions, those were transcribed with "xxx". In a comment tier beneath the utterance with the anonymized name the fact that anonymization had taken place was specified.
2.	The gestures were transcribed by watching the video-recording closely
3.	All strategic- and pathological behaviour was labelled according to the codebook
4.	All utterances where repair had taken place were divided and labelled as either: a. Self-repair own initiative b. Self-repair initiative of the interlocuter c. Other-repair own initiative d. Other-repair initiative of the interlocuter e. Possibility of initiating repair.
5.	Final check: The transcript was checked once more and improvements were made if deemed necessary.

After the transcripts were finished all pathological behaviour (slips of tongue and grammatical errors), strategic behaviour (gestures and descriptions), the code-mixes and forms of repair (see Table 6, section 4) were counted as to see how many times each behaviour or form of repair was seen in the conversations with bilingual speakers with aphasia (absolute data). There was a difference in length of the language samples (the amount of utterances and words participants uttered during the interviews) which made statistical analysis with the absolute numbers of each type of behaviour unreliable. Therefore an MLU-analysis (Mean Length of Utterance) was done through CLAN to see how many utterances and words each BWA had spoken and what their MLU (words per utterance) was (see Table 7). The amount of utterances were used to compute the percentages of repair (see Figure 3; equation 2), since if repair occurred in an utterance it was counted as one form of repair. There could be only one label of repair per utterance.

Figure 3

Equations for percentage computation

1. $$\%\ \mathrm{C_M}, \mathrm{PathBe}, \mathrm{StratBe} = \frac{\text{Absolute amount of behaviour x 100}}{\text{Amount of words}}$$

2. $$\%\ \text{Repair type} = \frac{\text{Absolute amount of repair type x 100}}{\text{Amount of utterances}}$$

Note. CM = code-mix, PathBe = Pathological Behaviour (1. Slips of tongue, 2. Grammatical errors, 3. All pathological behaviour: slips of tongue + grammatical errors), StratBe = Strategic Behaviour (1. Gestures, 2. Descriptions, 3. All strategic behaviour: gestures + descriptions).

Since code-mixing, the strategic- and the pathological behaviour types were counted per word, and could therefor occur several times within an utterance (as many times as the amount of words in an utterance), the amount of words was used to compute the percentage of code-mixes, strategic- and the pathological behaviour types (see Figure 3; equation 1). The percentages could then be compared amongst the participant group BWA as to see how often each behaviour had been observed, it made it possible to see how often code-mixing was seen in comparison to the pathological and strategic behaviour, and the percentages could be used in the data-set for the statistical analysis. The equations were written by the author, based on the mathematical equation for percentage computation.

Table 7

Utterances, words and MLU of each participant

	Amount of utterances	**Amount of words**	**MLU (words per utterance)**
BWA_1	342	1769	5,173
BWA_2	287	1354	4,718
BWA_3	219	472	2,155
BWA_4	458	1669	3,644
BWA_5	516	1483	2,874
BWA_6	233	873	3,747
BWA_7	431	1593	3,696
BWA_8	182	828	4,549
BWA_9	530	1434	2,706

During the current research all obtained samples consisted of more than 300 words (see Table 7). As mentioned in the ASTA (Analyse voor Spontane Taal bij Afasie; Vereniging voor Klinische Linguïstiek, 2013), 300 words is a common and reliable size when it comes to language samples. When samples have less words the results are less reliable. As such, the samples used in the current study are of a common size and should have the ability to produce reliable results.

2.4.2 Bilingual speakers without aphasia

The interviews all took place online through video calling. First, a few general questions were asked, after which the rest of the interview consisted of questions regarding bilingualism. The author followed the natural course of the interview, which meant that the questions were not asked in a particular order, but the aim was to in the end have all questions answered by the HB (see Appendix 2 for interview protocol). During the interviews both participant groups were asked similar questions, mostly differing concerning the fact that the BWA were asked questions about their aphasia (see Appendix 1 for the questions). The questions concerning bilingualism were the same. The HB were asked extra questions about code-mixing to better understand this process in bilingual speakers without aphasia, which were taken from the "Bilingual Switching Questionnaire" (Rodriguez-Fornells et al., 2012).

These interviews were used exploratively to better understand how bilingual speakers experience their bilingualism and how code-mixing presents itself in bilingual speakers who do not suffer from aphasia. The aim was to make it more comprehensible which types of behaviour shown by the bilingual speakers with aphasia may be strategic (made possible by bilingualism) and which may be pathological (caused by aphasia). A separate section of qualitative data is presented later on, because the answers the HB group has given could create a better understanding of code-mixing in healthy individuals and therefore help in the clarification of behaviour shown by the BWA group.

2.5 Data-analysis: Qualitative data

For the current study the aim was to analyse different kinds of data. In the case of the BWA group, there was both quantitative and qualitative data. For the HB group this was restricted to qualitative data only. As stated by Centeno et al. (2017) conversations with bilingual speakers with aphasia can provide valuable insights on both receptive and expressive communication skills and strategies employed during (informal) discourse. They specifically mean spoken narratives which are elicited using topics which are familiar to the patient. By focusing on a specific topic (in this case code-mixing) semi-structured interviews can help understand how and why a specific type of behaviour occurs and provide data to support a statistical analysis (Ahlin, 2019). For these reasons, a rough analysis of qualitative data was performed. The analysis was anecdotal. Data comprised of a summarization of statements made by the participants.

For the qualitative data analysis concerning the BWA the transcribed text and audio/video recordings were analysed. The interviews with HB were not transcribed, which means that the analysis comprised of rewatching the video recordings and listening to the audio recordings. Whilst analysing the recordings all statements concerning code-mixing were written down. All statements were compared between the participants within and between participant groups. The aim of the qualitative analysis was to hear the participants opinion concerning code-mixing in a matter of quantity, when it happened, which languages mixed, whether they were accepting of their own code-mixing or not, et cetera. The author was aware of the fact that there were differences in bilingualism (sequential or simultaneous), the amount of experience the participants had in each language, how they rated their own level in each language, the amount of time they used each language and the fact that some participants currently spoke in their mother tongue whilst others

spoke in a second, third or fourth (Dutch). When comparing the qualitative data these are aspects which may (partly) explain why one participant experiences their bilingualism differently from another.

2.6 Statistical analysis: Quantitative data

The choice was made to only statistically analyse the interviews concerning the BWA, for the reason that during the conduction of the interviews with HB it turned out that these particular participants did not produce any code-mixes during the interviews. As stated before, the aim of the study was to find a possible relation between code-mixing, strategic- and/or pathological behaviour. Therefore, to statistically analyse a conversation without code-mixing with the aim to further understand code-mixing was seen as counterproductive.

As to see whether code-mixing related more so to pathological- or strategic behaviour seven separate correlation analyses were performed (see Table 8). The decision to use correlation analyses was made because correlations give an indication of a possible relation between variables and this may tell us whether code-mixing correlates more with the pathological- or the strategic behaviour types measured during data-collection. This may show whether a significant relationship exists between code-mixing and pathological behaviour and/or code-mixing and strategic behaviour. It is unusual to perform a statistical analysis on data such as the data collected during the current study. Usually, this type of data is only analysed qualitatively through, for example, a conversation analysis (e.g., Maynard & Heritage, 2005; Wu, 2020). Quantification may take place in the form of computing percentages of each type of behaviour (e.g., Barnes & Armstrong, 2009). This means to say that the author was aware that the statistical analysis may be up for discussion, but that it was deemed the best fit to statistically analyse the current data as to give an answer to the current research question.

Table 8

The correlation analyses

1.	Correlation between Code-Mixes and Slips of the Tongue (SoT)
2.	Correlation between Code-Mixes and Grammatical Errors (G_E)
3.	Correlation between Code-Mixes and Pathological Behaviour (SoT + G_E)
4.	Correlation between Code-Mixes and Gestures (Ges)
5.	Correlation between Code-Mixes and Descriptions (Des)
6.	Correlation between Code-Mixes and Strategic Behaviour (Ges + Des)
7.	Correlation between Pathological- (Sot + G_E) and Strategic (Ges + Des) Behaviour

Correlation analyses 1 through 6 took place as to give answer to sub-questions b, c and d (see introduction section). Correlation analysis 7 took place as to see whether there was a relation between pathological and strategic behaviour. A possible relation between these two variables may give more insight in the occurrence of code-mixing.

The type of correlation computed during the current study was Kendall's tau. The data was not normally distributed, which made it impossible to use Pearson's correlation coefficient. Kendall's tau was chosen over Spearman's correlation coefficient, because the current participant group is very small (N=9). As stated by Field (2018) Kendall's tau should be used rather than Spearman's coefficient when there is a small data set. Field goes on to say that there is much which suggests that Kendall's statistic is a better estimate of the correlation in the population and that as such, more accurate generalizations can be drawn from Kendall's statistic than Spearman's.

For one participant (BWA_9) there was no data concerning gestures, since that particular interview had only an audio recording. Therefore, BWA_9 was excluded from the correlation analyses 4, 6 and 7 (see Table 8 for analysis descriptions). BWA_9 was included in the remaining analyses (1, 2, 3 and 5).

3. Results

In this section the results from the current study will be presented. First the results from the qualitative analysis will be objectively described, then those of the quantitative analysis.

3.1 Qualitative analysis: semi-structured interviews with bilingual speakers

The qualitative analysis consists of an anecdotal summary of the interviews with bilingual speakers. The summaries consist of answers given during the interviews which relate to code-mixing within utterances and/or conversations, switching languages between conversations, and other related topics. Each paragraph is the summary of one participant's interview.

3.1.1 Bilingual speakers with aphasia

BWA_1 mentioned that his Dutch is sometimes limited in conversation post-stroke. When he cannot think of the Dutch word, sometimes German comes forward and he is able to use the German word. It is his opinion that this is acceptable to do. When he was asked whether he uses this consciously and somewhat as a strategy he first answered with no, but later said yes. He said he does not think that the German word is able to help him to get to the Dutch word, but that the German word then replaces the Dutch word in the sentence and the Dutch word is not found or used in the sentence. He later added that this phenomenon happens occasionally and not several times a day, for example. Concerning verbal expression in his dialect BWA_1 said that he thinks he has gotten less competent post-stroke and that in cases where he would usually use dialect he now sometimes uses Dutch. He gave the example of that when he is tired he sometimes cannot recall words in his dialect so then he uses Dutch in between or switches to Dutch altogether. On the contrary, he said that when he gets very angry he will use dialect. Dialect does not mix into the other languages of BWA_1, he said. Furthermore, BWA_1 mentioned that his grandmother speaks German and that pre-stroke he would sometimes speak a mix of German and the dialect of Kerkrade (Limburg, Netherlands) with her. He mentioned that this did not faze him.

BWA_2 did not speak of the occurring of code-mixing either pre- or post-stroke during the interview. It is unclear if and, if so, how he experiences or experienced code-mixing in his daily life.

BWA_3 agreed with the investigator during the interview when she asked him whether it was convenient for him to be able to use several languages in case he cannot recall a word in one language. He did add that it is then also possible that none of his languages come forward and he therefore cannot find the word he wants to say in any of his languages. He mentioned he finds it difficult sometimes to differentiate between his languages and his speech and language therapist then added that she sometimes needs a German dictionary during their therapy sessions. BWA_3 said that German and Dutch tend to mix, but English feels more separate and therefore does not mix with his other languages. He later agreed with the investigator when she asked him if it was easier for BWA_3 to speak to people who know both German and Dutch so he can freely mix the languages.

BWA_4 stated that when he was a child he would usually speak Turkish with his parents, but sometimes they would mix Dutch and Turkish during conversations. Now he has his own family and BWA_4 said during the interview that they tend to mix the Dutch and Turkish language within their conversations too. He followed up by saying that with strangers he estimates whether someone may be able to speak Turkish and otherwise speaks Dutch with them. Later, he said that it does

sometimes occur that he is speaking Dutch, cannot recall a certain Dutch word, but is able to find it in his Turkish lexicon. He said this happens automatically. He agreed with the investigator when she asked him whether he thought both Dutch and Turkish are always active when he speaks. He followed up by stating that he finds it easier to suppress one of the two languages when he speaks than when he writes.

BWA_5 stated that he decided post-stroke that he would focus on three languages (Swedish, English and Dutch), because the other languages he knew pre-stroke (German, Danish and Spanish) caused a mixing of languages and BWA_5 said that that mixing is too hard for him. He wants conversations to contain one language, because otherwise his language comprehension and/or production is, as he said, compromised. Whether it is language comprehension, production or both does not become clear for the investigator or the transcriber/author. However, later on in the interview BWA_5 did say that he sometimes uses a Swedish word in conversation when he cannot find that particular word in his Dutch lexicon. He stated that he sometimes mixes language by saying one word in a different language than the rest of the sentence. When asked whether he uses code-mixing as a strategy he answered with “A little bit”.

BWA_6 said in her interview that both pre- and post-stroke she and her husband speak both Dutch and English together. Her husband added that now, post-stroke, BWA_6 tends to always answer fully in English, even if he speaks Dutch to her. She also stated that she is not able to find a word in her English lexicon when she has not been able to find it in her Dutch lexicon or the other way around. She said she cannot use code-mixing as a strategy, because if she cannot retrieve a certain word then she cannot retrieve it in either language. Lastly, BWA_6 said that when she speaks she is not aware of whether she is speaking in English or in Dutch.

When asked whether he ever mixes languages, BWA_7 said this never happens to him. A moment later he said that he had been code-mixing during the interview. He added that it is not something which happens unconsciously and that he may use it as a strategy at times. BWA_7 said it can be helpful for him to use another language when the language he was using fails at some point in conversation. He added that being able to mix languages and switch between them according to the situation he is in is also something he appreciates about knowing several languages. He stated that this is a conscious choice and not something which happens to him.

BWA_8 did not speak of code-mixing directly during his interview. He did mention that the English language is what comes to him first and that when he wants to speak in Dutch he first has to translate what he wants to say from English to Dutch.

When BWA_9 was asked whether she sometimes uses words from another language when she cannot find it in the mental lexicon of the language she was speaking, BWA_9 answered “yes”. She said it happens both consciously as well as unconsciously. She added that the knowing of four languages can turn into somewhat of a jumble inside her head.

BWA_10 stated that pre-stroke he would speak a mix of Dutch and Somali with his family. He later added that this has remained somewhat the same post-stroke. BWA_10 said it does happen to him that he does not know a word in Somali, but does know it in Dutch and that he does not understand how that works. He then adds that, besides it sometimes being convenient to be able to speak several languages, it can also be difficult to differentiate his languages.

3.1.2 Bilingual speakers without aphasia

HB_1 said that he sometimes unconsciously mixes Dutch and English. He described a situation where he was talking in English to an English-speaking friend and this friend said he did not understand

what was said because a Dutch word had been mixed into the conversation. HB_1 said that the mixing of languages is only Dutch words into English sentences, and not the other way around. Furthermore, code-mixing never happens between Arabic and Dutch or Arabic and English. He explained this by saying how Dutch and English are quite similar to him, whereas Arabic is completely different. He added that he thinks it may also be caused by the fact that Arabic is his mother tongue. HB_1 stated that the code-mixing happens quite often and that it is mostly a conscious decision to do so. He then uses the code-mixing as a strategy, since he is at that moment not able to recall the word in English. Furthermore, HB_1 spoke about situations at work where he has to speak Arabic with clients. In these situations moments sometimes occur where the subject of the conversation is heavily work-related (jargon) and it is difficult for HB_1 to find the right Arabic translation of a Dutch word. He said he solves this by giving a description of the concept instead of translating it. Besides jargon, HB_1 said that subjects that are infrequent in daily conversation are difficult and give cause for descriptions or code-mixing.

HB_2 said that sometimes when he is having a conversation in Dutch a word may slip out in Kurdish, or when he speaks with his mother in Kurdish a Dutch word may get mixed into the sentence. This then happens unconsciously. He followed up by saying that he thinks this does not have a negative impact on the communication. When HB_2 speaks with his daughter he prefers to do so in Kurdish, but as to ensure that she understands all her father says to her he sometimes consciously says a word in Dutch. In other instances, he may speak a mix of Kurdish and Dutch at home where this mixing happens unconsciously. To clarify, HB_2 said that the conscious code-mixing is something he does at home and would not do during conversations with people outside of the household. Rather, if there is a moment, for example, at work where he cannot recall a word he will give himself time or describe the concept to his interlocutors. Finally, he added that he thinks words which are less frequent are more likely to cause him trouble and may lead to a slower reaction time, a description or code-mixing.

With her family HB_3 speaks both Turkish and Dutch. She said it does occur that she will say a Dutch word during a Turkish conversation or the other way around. She added that this is only with people of whom she knows that they speak both languages. HB_3 stated that it can be just one word, but that it may also be a part of a sentence. The code-mixing happens quite often and can be both a conscious and unconscious phenomenon.

HB_4 has two mother tongues (Russian and Azerbaijani) which were spoken at home at an early age. HB_4 and her family would mix those two languages within and between conversations. This is common and accepted in her country of birth, she added. Now, she said she sometimes finds it difficult to switch from one language to the other in between conversations. She followed up by saying that she used to be able to do this switching between conversations, but that with age it has become more difficult. HB_4 also illustrated how sometimes after speaking Russian for a while she may have word finding difficulties when her next conversation is in Dutch. She then tells the interlocutor she needs a moment and recalls the word at a later time. It also happens the other way around, mostly when it concerns jargon in work-related conversations. Furthermore, she said that she may sometimes unconsciously code-mix words such as “yes” or “no” in Russian during a Dutch conversation, but code-mixing does not happen with more meaningful words.

HB_5 said that when she was young she and her family would speak a mix of Kurdish and Turkish between sentences or conversations. With friends and her brothers she said it can be Dutch or Turkish, and even English will get mixed in at times. She explained this comes natural to her and the mixing of languages during a conversation is a fluent action. Later on in the conversation, HB_5 said that she feels that sometimes thinking and speaking is not synchronized, because she will be

speaking Dutch and think of Turkish or English words which slows down the speaking process. This mainly happens in situations where she is speaking Turkish and wants to react out of emotion (e.g. enthusiasm) or on the spur of the moment. In such moments Dutch may interfere in her mind, but she will take some time or describe the concept and not code-mix. Furthermore, she tends to switch to English when she gets stuck in Dutch. She also remembered a moment where she unconsciously confused a Turkish word for a Dutch word and therefore mixed this Turkish word into a Dutch conversation. Lastly, she said that she sometimes code-mixes Turkish words into Kurdish conversations. This is a conscious act and also accepted because everyone who prefers to speak in the Kurdish language also speaks Turkish, she said.

HB_6 mentioned how he finds himself in situations where he may want to use a certain expression from English or Sranantongo of which there is no fitting Dutch translation. He said he will then use a description, but finds this to be somewhat cumbersome. On the subject of code-mixing HB_6 said he does code-mix and finds that at times where he works in education he feels free to do so, since he thinks children have a certain openness which makes them more accepting than certain grown-ups. More in general, he described how he often consciously code-mixes English words into Dutch conversation, because they are more capable of describing the message he is trying to get across. He continued by saying that it occasionally happens unconsciously, regarding a Surinamese form of Dutch and the Dutch which is spoken in the Netherlands.

HB_7 mentioned how when she was younger she would sometimes code-mix between Italian and Dutch. She followed up by saying that now that she is older she clearly knows when to speak each language. For example, Italian with her father and Dutch with her mother. She did say how a disadvantage of speaking two languages can be that sometimes when she speaks Italian she will not know a certain word in Italian, but does know it in Dutch. She will not say the word in Dutch, but rather use the English word. She added that this hardly ever happens. In contrast, she mentioned how she will freely mix Italian and Dutch when speaking to her parents, because they know both languages too. Furthermore, HB_7 said she may sometimes use Italian word order while speaking Dutch.

Firstly, HB_8 mentioned how switching languages between conversations is no issue for her and happens fluently. She said she thinks her switching ability in general may be good because of her bilingualism. If HB_8 code-mixes, this is always a conscious act. She said that her vocabulary in Italian has gotten less over the years and that this causes her to use a Dutch word in her Italian. It does also happen the other way around. She added that she only code-mixes with people of whom she knows they know both languages (in this case, Dutch and Italian), because she thinks this is acceptable. When she cannot find a word in Italian while speaking this language to someone who only knows Italian she will not code-mix, but rather describe the concept, mention it to the interlocutor and/or pause to think. The same goes for Dutch and interlocutors who only know the Dutch language. In general, HB_8 said that Dutch and Italian have always been clearly separated to her and that she knew exactly when to speak or expect which language.

HB_9 said how when she speaks English it quite often happens that she will unconsciously code-mix a Dutch word into the English sentence. She mentioned how she thinks her level in English has gone down since she started to learn Dutch. When code-mixing happens as explained before, she said she needs the interlocutor to mention that code-mixing happened, because she does not notice it happening herself. Later on in the conversation, HB_9 said that nouns are the type of words she will code-mix. She later said she has taught herself to try and avoid code-mixing, mostly because she wanted to be consequent about speaking one language at a time with her daughter. If a moment

occurs where she cannot recall a certain word she said she takes time to think or describes the concept, but does not consciously use code-mixing.

During the interview HB_10 mentioned how Spanish, French and Italian are languages which are sometimes difficult to differentiate. He said when he needs to switch languages between conversations when it comes to these three languages he notices that he needs to concentrate to do so. He said this phenomenon has no effect on Dutch, English or Hungarian. He said that in the case of French and Italian he notices how the first hour of speaking in these languages is difficult. He may make grammatical errors or have word finding difficulties, but this improves over time. He tends to use related languages to find words he cannot find and mentioned how, sometimes with help of an interlocutor, he will usually get to the target word eventually. About Italian he said he sometimes "Italianizes" Spanish words if he does not know the actual Italian word. HB_10 said he has no recollection of him ever having difficulty separating Dutch and Hungarian when growing up. He added that his parents had always thought it to be important that their children spoke Dutch at a high level. Over the course of the interview no mention has been made of code-mixing in the forms as described by Muysken (2000).

HB_11 explained how the word order in Polish is different than in Dutch, which sometimes causes her to use Polish word order whilst speaking Dutch, because she at that moment translates it directly. Furthermore, she said how sometimes her son will ask her to translate a Dutch word to Polish, and she will have difficulty finding the word because she does not use these types of words frequently in Polish. Usually her son then starts to guess and eventually they will find the right translation. Later on she explained how she currently hardly speaks Polish and notices how when she does speak Polish, Dutch words get mixed into her sentences. This happens quite often: about every two sentences. These are words such as "yes" and "but", and not nouns. Furthermore, she said that it happens unconsciously. HB_11 added that the same phenomenon happens in English. She also spoke of how when she cannot recall a Polish word she will describe the concept and let the interlocutor help her.

Because Dutch has a different word order than Arabic, Berber and English, HB_12 said that he regularly uses wrong word order. Meaning, he uses the word order of one language whilst speaking another. When HB_12 has difficulty to recall a word in the language in which he is speaking but does know it in another language he will consciously code-mix as long as this is acceptable to him (e.g. the interlocutor understands both languages too). In instances where code-mixing is not acceptable he will describe the concept or take more time to respond as to search for the word. He did also mention that he sometimes unconsciously code-mixes, usually in environments where this feels safe because everyone speaks two or more of his languages.

About code-mixing HB_13 said that some words seem more active in one language and will then mix in to a sentence which is in a different language. She said this happens automatically and unconsciously. She gave the example of speaking in Dutch and code-mixing an English word into the utterance. She said it is situational, environmental and depending on who the interlocutor is. Furthermore, she talked about how at home she tries to set a good example by speaking either all Hungarian or all Dutch. To her, at least a sentence must be fully in one language when she is speaking with her family at home. She said her daughter will sometimes start a sentence in Dutch and then halfway through switch to Hungarian. HB_13 and her husband are trying to teach their daughter to make correct sentences in one language at a time as to make sure Dutch and Hungarian remain separate. HB_13 said she herself had this type of code-mixing her daughter now shows when she just started learning Dutch, but no longer experiences this right now. Later on HB_13 said that if an interlocutor knows two or more of the languages she herself speaks, she will sometimes consciously

code-mix. She said she then chooses in which language she can best say or explain something. She added that Bulgarian and Hungarian never code-mix into conversations where she knows the interlocutor does not speak either of those two languages. Lastly, if she has difficulty recalling a certain word in the language she is speaking at that moment she will describe it or use English, because she thinks most people speak English in this day and age.

3.2 Quantitative analysis: bilingual speakers with aphasia

The quantitative analysis of the current study consisted of the quantification of the transcribed behaviour shown by participants during the interviews (percentages) and seven correlation analyses.

As stated before, BWA_9 was excluded from the analyses which involved the variable “Gestures” since there were no measures of that particular variable for that participant. However, the fact that participants BWA_3, BWA_4, BWA_6 and BWA_8 did not show descriptions was included in the analyses since even though they did not show this particular behaviour, it was possible to measure this variable and therefore should be taken into account during the analyses. Furthermore, because the current study is quite explorative p-values have not been corrected. The author is aware of the fact that in other cases it is expected that one corrects the p-values during statistical analysis.

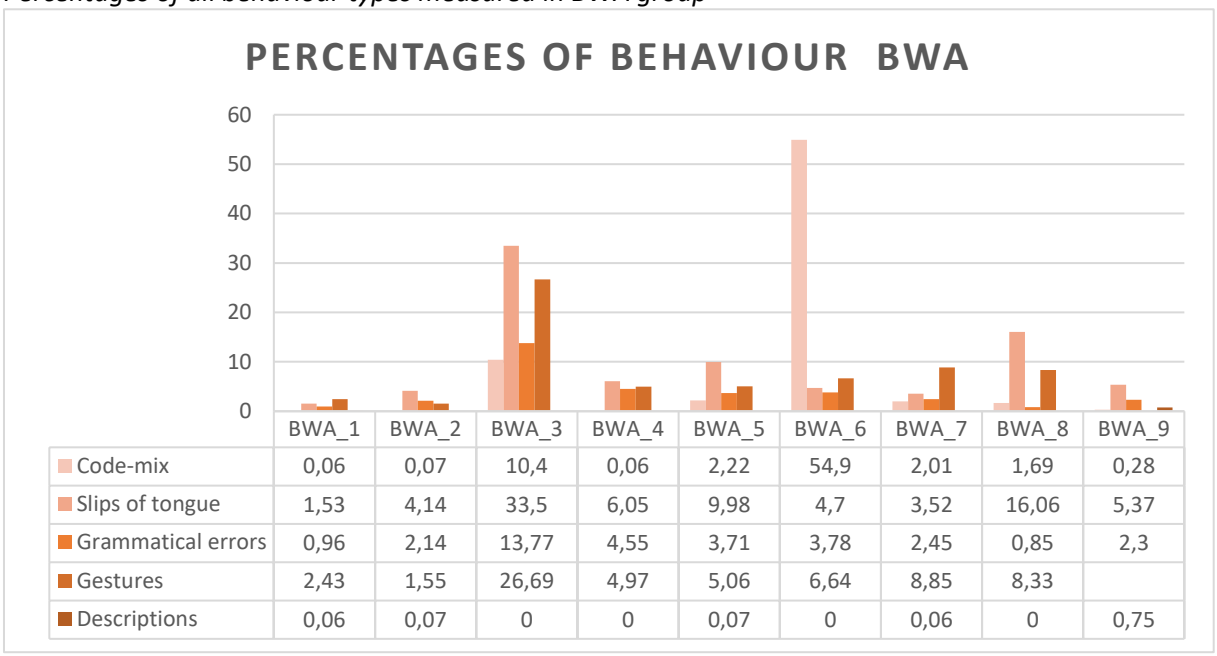
The percentages of occurrence of each behaviour and repair-type for each participant can be found in Figures 4 and 5. In general, some participants showed the measured behaviour types only in small percentages throughout their interview (e.g. BWA_1), whereas, for example, BWA_6 code-mixed on more than half of the words they uttered during their interview (54,9%). This high percentage of code-mixes can be explained by the observation that BWA_6 used both English and Dutch in almost every utterance. BWA_6 was the case with the most code-mixes among all 9 bilingual speakers with aphasia. In general, it was detected during the quantitative analysis that none of the participants had code-mixes from the category “congruent lexicalization” and therefore all code-mixes either fell in the category of “insertion” or “alternation”. BWA_3 had the most slips of the tongue (33,5%) and grammatical errors (13,77%) during conversation, and used the most gestures (26,69%) concerning strategic behaviour. Lastly, BWA_9 used the most descriptions during conversation (0,75%). In general, descriptions hardly occurred. Gestures were the most common strategic behaviour. For the pathological behaviour types the percentages lay closer together, but slips of the tongue were more common than grammatical errors.

Almost all participants used “self-repair own initiative” most when it comes to repair types (see Figure 5). This means they detected an error or an aspect of their utterance which they wanted to correct and repaired this themselves. BWA_3 is the outlier in this case with having “other-repair initiative of the interlocutor” as the most common repair type. In these cases the interlocutor detected an error or pathological behaviour which the participant did not detect and therefore did not repair themselves or judged that it needed no repair. The interlocutor carried out the repair in these cases.

In general, all forms of repair occurred regularly, which caused the fact that the label of “Possibility initiating repair” was hardly given. In the transcripts one can see that in most cases where repair is desired, either the participant or the interlocutor does initiate repair.

Figure 4

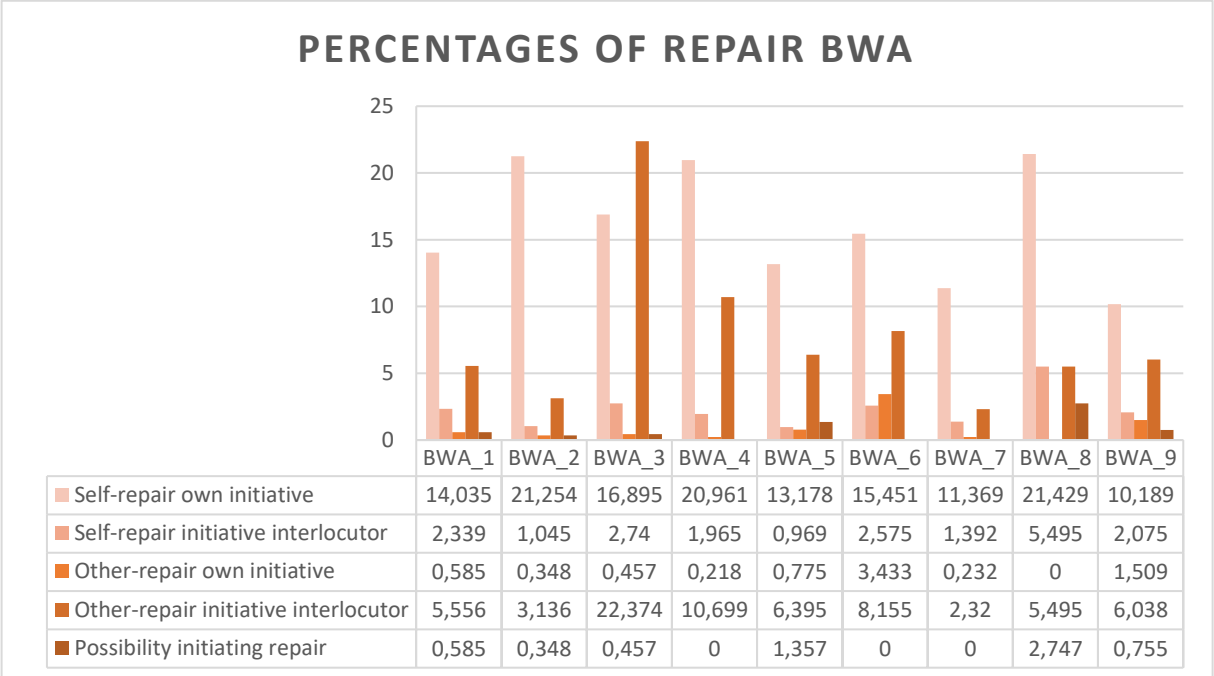
Percentages of all behaviour types measured in BWA group



	BWA_1	BWA_2	BWA_3	BWA_4	BWA_5	BWA_6	BWA_7	BWA_8	BWA_9
Code-mix	0,06	0,07	10,4	0,06	2,22	54,9	2,01	1,69	0,28
Slips of tongue	1,53	4,14	33,5	6,05	9,98	4,7	3,52	16,06	5,37
Grammatical errors	0,96	2,14	13,77	4,55	3,71	3,78	2,45	0,85	2,3
Gestures	2,43	1,55	26,69	4,97	5,06	6,64	8,85	8,33	
Descriptions	0,06	0,07	0	0	0,07	0	0,06	0	0,75

Figure 5

Percentages of all repair types measured in BWA group



	BWA_1	BWA_2	BWA_3	BWA_4	BWA_5	BWA_6	BWA_7	BWA_8	BWA_9
Self-repair own initiative	14,035	21,254	16,895	20,961	13,178	15,451	11,369	21,429	10,189
Self-repair initiative interlocutor	2,339	1,045	2,74	1,965	0,969	2,575	1,392	5,495	2,075
Other-repair own initiative	0,585	0,348	0,457	0,218	0,775	3,433	0,232	0	1,509
Other-repair initiative interlocutor	5,556	3,136	22,374	10,699	6,395	8,155	2,32	5,495	6,038
Possibility initiating repair	0,585	0,348	0,457	0	1,357	0	0	2,747	0,755

3.2.1. Code-Mixes and Pathological Behaviour

The correlation analyses 1 through 3 concerning code-mixes and pathological behaviour showed the following. Analysis 1 showed there was not a significant relationship between code-mixes and slips of the tongue, $\tau = .31$, $p = .249$. Analysis 2 showed there was not a significant relationship between code-mixes and grammatical errors, $\tau = .423$, $p = .116$. Analysis 3 showed there was not a significant relationship between code-mixes and pathological behaviour, $\tau = .366$, $p = .173$.

3.2.2. Code-Mixes and Strategic Behaviour

Concerning code-mixes and strategic behaviour, correlation analyses 4 through 6 showed the following. Analysis 4 showed there was not a significant relationship between code-mixes and gestures, $\tau = .473$, $p = .105$. Analysis 5 showed there was not a significant relationship between code-mixes and descriptions, $\tau = -.16$, $p = .577$. Analysis 6 showed there was not a significant relationship between code-mixes and strategic behaviour, $\tau = .327$, $p = .262$.

3.2.3. Pathological Behaviour and Strategic Behaviour

Finally, correlation analysis 7, concerning pathological behaviour and strategic behaviour, revealed the following. Strategic behaviour was significantly related to pathological behaviour, $\tau = .714$, $p = .013$.

A summary of the outcomes of all seven correlation analyses can be found in Tables 9 and 10.

Table 9

Correlations Code-Mixing and Pathological- and Strategic Behaviour

Variable	τ	p	N
1. Slips of Tongue	0,310	0,249	9
2. Grammatical errors	0,423	0,116	9
3. Pathological Behaviour	0,366	0,173	9
4. Gestures	0,473	0,105	8
5. Descriptions	-0,160	0,577	9
6. Strategic Behaviour	0,327	0,262	8

Note. ns = not significant ($p > 0.05$), *$p < 0.05$.

Table 10

Correlation Strategic- and Pathological Behaviour

Variable	τ	p	N
7. Strategic Behaviour	0,714	0,013	8

Note. ns = not significant (p > 0.05), *p < 0.05.

4. Discussion

4.1 Qualitative data and analysis

The first topic of the discussion is the qualitative data found during the current study and the analysis of this data. Generally, there was more mentioning of code-mixing and related topics in the group of participants without aphasia (HB), than the group with aphasia (BWA). This can be explained by the fact that the interviews with BWA had different topics which were discussed (e.g. aphasia) of which code-mixing was one, whereas the interviews with HB concerned code-mixing for the largest part.

Both the HB and the BWA group made mention of experiencing code-mixing in varying amounts and in general mentioned having difficulties differentiating between the languages they speak and/or understand from time to time. There was no mention worthy difference in conscious and unconscious code-mixing between the HB and BWA group. In both groups there was mention of both conscious and unconscious code-mixing, where conscious code-mixing was described as a strategy or a consciously taken decision, and unconscious code-mixing as an error (when it concerned HB) or pathological behaviour (when it concerned BWA). An example of code-mixing as a consciously taken decision which was given by several participants in both participants groups was how with family members they consciously mix two languages in their daily conversation and that this is accepted and a normal phenomenon for both the participant (HB and BWA) and their family. They may code-mix within or between sentences or conversations and this is done by all family members who participate in that conversation. In general, these findings from the qualitative analysis are in agreement with previous research who mentioned that code-mixing can be conscious or unconscious and pathological or strategic (e.g., Centeno et al., 2017; Lerman et al., 2019). The findings of the qualitative analysis are in contrast with previous research that favours code-mixing as pathological behaviour (e.g., Green & Abutalebi, 2008) or as strategic behaviour (Grosjean, 1985; Muñoz et al., 1999).

The BWA made less mention of keeping acceptance of code-mixing in mind when code-mixing occurred. This acceptance was more of a theme in the HB group, where most participants made mention of only code-mixing when they see this as acceptable (e.g. when the interlocutor speaks two or more of the same languages as the speaker). This could be linked to BWA possibly having less cognitive control concerning their languages than HB which makes them more likely to mix a non-target language into the target language during conversation even if this may be less or not acceptable at that moment. This would be in accordance with previous research which has made mention of a stroke being able to have a negative effect on executive functioning (e.g., Cannizzaro & Coelho, 2012; Olsson et al., 2020; Schumacher et al., 2019), and specifically on cognitive control (e.g., Patra et al., 2020). However, this cannot be properly concluded from the current study and should be further investigated. This could be done by conducting a similar study as the current one, but adding

tests which measure executive functioning. The tests would have to at least measure inhibition control and shifting/mental flexibility as to investigate whether, generally speaking, a BWA has less competence concerning the cognitive control needed to stop unwanted code-mixing from happening than a HB. By using non-verbal tests you would take away the disadvantage a BWA may have because of their aphasia. However, because you will want to measure executive functioning with regards to code-mixing (a verbal act), to see whether there is a difference between BWA and HB it would be advised to use verbal tests (too). An example of a test which measures inhibition control is the Stroop task (Faria et al., 2015; Patra et al., 2020; Stroop, 1935). As to measure shifting/mental flexibility a test such as the Wisconsin Card Sorting Task (WCST) or the Trail Making Test (TMT) could be used (Faria et al., 2015; Patra et al., 2020). If one wanted to take it further, it may be interesting to add participant groups of monolingual speakers with and without aphasia. This way one could compare the deterioration in executive function after acquired brain injury between monolingual speakers and bilingual speakers, assuming that, for example, inhibition control and mental flexibility of a bilingual speaker in general is better than those of a monolingual speaker (e.g., Bialystok, 2017; Bialystok et al., 2008; Patra et al., 2020). One could measure whether bilingualism in a person with aphasia lessens the deterioration of those executive functions which benefit from bilingualism after acquired brain injury when compared to monolingualism.

Furthermore, BWA mentioned that they were more likely to use code-mixing as a strategy when they encountered word finding difficulties in the target language in comparison to HB. HB were more likely to describe the concept or take more time to respond if they had difficulty retrieving a word in the target language. It was observed how BWA mostly spoke of code-mixing on nouns, whereas HB mentioned both nouns and smaller words such as “yes”, “no” and “but”. Lastly, primarily focused on comparison within the BWA group, most participants mentioned that when they have trouble finding a word in the target language they can find it in a non-target language. These participants could then use code-mixing as a strategy. Only BWA_3 and BWA_6 said that it is possible, or even often occurs, that they cannot find a target word in any of their languages and therefore cannot use code-mixing as a strategy.

4.2 Quantitative data and statistical analysis

The second topic of the discussion is the quantitative data. In general, it may be concluded that each bilingual speaker with aphasia showed differences in amounts of pathological behaviour, strategic behaviour and code-mixing. This is not surprising, since all participants differed in aphasia type and severity, and had different times post-onset. The current study was explorative, which explains why there was no need for more unity within the participant group of bilingual speakers with aphasia. For the quantification of the data it has been tried to forestall some of the differences by using percentages instead of absolute data. Fact remains that it is recommendable for future research with a less explorative nature to compare more similar bilingual speakers with aphasia during a similar type of research.

The statistical analysis of the current study was for the biggest part inconclusive. No significant relations were found between code-mixes and pathological or strategic behaviour. This could mean either of two things: (1) code-mixing during the current study could be both pathological and strategic differing between or depending on, among other variables, participant and utterance, (2) code-mixing during the current study was neither pathological or strategic and should be seen as something else or a behaviour on its own. Keeping in mind proposals made by Centeno et al. (2017) and Lerman et al. (2019) option 1 seems the most plausible of the two. The differences in correlation between code-mixing and strategic behaviour and code-mixing and pathological behaviour during the current study was not significant enough as to say whether the one is more so related to code-

mixing than the other. Possibly, with a larger and/or more similar participant group significant relations can be found and there will be a visible difference between pathological and strategic behaviour.

Specifically concerning the significant relation found between strategic and pathological behaviour one might conclude that there was a relation between the two during the current study. Meaning, that during the current study it was found that the more someone shows pathological behaviour, the more likely they are to use strategic behaviour. If you look back at Figure 4, you can see how, in general, the heights of the pathological behaviour bars and strategic behaviour bars have consistency. If there is a pathological bar which is a bit higher, there usually is a strategic bar which is also a bit higher. For example, BWA_3 had quite some slips of the tongue, but in the meantime also used quite some gestures during their interview.

4.3 Comparing the qualitative and quantitative data

If one were to compare the qualitative and quantitative data found during the current study the fact that no significant relation was found between code-mixing and pathological and strategic behaviour corresponds with how BWA said during their interviews that they experience both conscious and unconscious code-mixing. Both the quantitative and qualitative data suggests that code-mixing can be both pathological and strategic, and that it mostly depends on the level of awareness whether code-mixing during an utterance should be labelled as pathological or strategic. This is, again, in accordance with statements made by Lerman et al. (2019). If, for example, someone were to realize at a certain moment during discourse that they do not know a word in the target language and then make the decision to use the word in a non-target language this could be seen as a conscious code-mix and in this case strategic behaviour (Grosjean, 1985; Lerman et al., 2019; Muñoz et al., 1999). If somebody is at a different moment during discourse not aware that they used a word in a non-target language this could be seen as an unconscious code-mix and, in the case of a bilingual speaker with aphasia, pathological behaviour (Green & Abutalebi, 2008; Lerman et al., 2019). Meaning, that both strategic and pathological code-mixing could exist within one conversation or even utterance (Lerman et al., 2019). One may then conclude that as to research which code-mix is pathological and which is strategic one would have to measure the level of awareness. However, measuring the level of awareness during an interview would be near impossible since you would have to ask a participant after each code-mix whether it was a deliberate decision or not. A different approach would be to let a transcriber or investigator decide during analysis, however this would be in no way objective. What may be possible is to map out, prior to the start of this future research, whether participants with aphasia have any deficits in the three levels of awareness (Crosson et al., 1989). If a participant has a deficit in any of these three levels of awareness, the chance of them using code-mixing as a strategy is lower than when a participant does not have any awareness deficits. This, because a person with an awareness deficit may not be able to initiate compensation since they are not aware of them having an impaired function in general (intellectual awareness), when a problem occurs (emergent awareness) or are not able to anticipate that a problem in communication may occur and that the use of a strategy may be beneficial (anticipatory awareness) (Crosson et al., 1989). One could then also compare a group of bilingual speakers with aphasia who have awareness deficits and a group of bilingual speakers with aphasia who do not have awareness deficits as to see whether such deficits affect the way in which code-mixing presents itself in these different participant groups during discourse.

4.4 Methods and materials

A by-product of the current study was the codebook (see Appendix 5) which was used as a guideline during the transcription process. The codebook was made before transcribing took place, but

eventually small details about the codebook had to be changed during transcription. In the first place it was planned to transcribe a code-mix on a noun differently from code-mixes on other word classes. However, since to answer the research question no distinction had to be made between nouns and other word classes it was decided to transcribe all code-mixes in the same way (e.g. offices@s:eng). Furthermore, it was planned and put in earlier versions of the codebook that there would be looked at age of acquisition (AoA) and frequency of the code-mixed words. Eventually it was decided by the author that this was beyond the scope of the current study and would not be necessary as to answer the research question. It could be interesting for future research to look at in what way code-mixing in bilingual speakers with aphasia is influenced by AoA, frequency and/or word class in comparison to monolingual speakers with aphasia and/or bilingual speakers without aphasia. In Lerman et al. (2019) it was stated that aphasia type might be associated with a pattern of problems with word retrieval expected across different word classes, particularly nouns and verbs. Someone with agrammatic aphasia usually had more difficulty retrieving verbs relative to nouns, whereas someone with anomic aphasia usually had more difficulty retrieving nouns relative to verbs (e.g., Druks, 2002; Kambanaros, 2010; Thompson et al., 2012). As stated by Kambanaros, this phenomenon has been observed in numerous languages, even when factors such as frequency of word use and age of acquisition are taken into account (Lerman et al., 2019). Lerman et al. also state that it has been observed in bilingual speakers with aphasia that if verbs are harder to retrieve than nouns in one language, there is an overwhelming likelihood that they will be harder to retrieve relative to nouns in the other language(s) too. Concerning age of acquisition in bilingual speakers with aphasia, Kuzmina et al. (2019) state that it has long been argued that words with an earlier AoA would be better preserved in aphasia, but experimental evidence has been mixed. There have been studies where some words with a later AoA were easier to retrieve (e.g., Goral et al., 2013). In their own meta-analysis Kuzmina et al. found that bilingual speakers who acquired their second language after the age of seven showed significantly better performance in their first-acquired language than the second one. Bilingual speakers who acquired their second language before the age of seven showed comparable results in both languages.

The interview protocol made regarding the participant group HB (see Appendix 2) turned out to have the right questions as to provide fitting qualitative data for the current study. All participants in the HB group gave answers regarding code-mixing and the interview protocol did not need to be altered during the conduction of the interviews. The interview protocol regarding the participant group BWA (see Appendix 1) was not specifically made with the current study in mind. This caused not all participants of whom the interviews were analysed to speak of code-mixing in the same amount and/or depth. Ultimately, BWA_2 and BWA_8 made no mention of code-mixing. Since interviews with BWA were conducted in the context of a different study (PhD trajectory of Saskia Mooijman) and readily handed to the author of the current study this interview protocol could not be altered as to better serve the current study. All interviews with the participants from the BWA group had already been conducted. If similar research is done in the future and it turns out that not everyone is speaking about the topic of interest it would be advised to revisit the interview protocol and alter it as to make sure all participants speak of the research topic.

As stated before, the current study had an explorative nature. For an explorative study interviews can give a lot of insight in the experiences of a participant (Ahlin, 2019; Centeno et al., 2017). To continue, conversations with bilingual speakers with aphasia can provide valuable insights on both their receptive and expressive communication skills and strategies during discourse (Centeno et al., 2017). For the HB group the insight in communication skills and strategies with regards to bilingualism was enough. The aim was to hear about their experiences as bilingual speakers as to get more insight in how that may differ from the experiences mentioned in the interviews with the

already existing participant group with aphasia. By making transcriptions of the interviews with BWA, counting all behaviour types and computing the percentage of appearance of these behaviour types it was possible to get an insight in which types of communication skills and strategies each participant with aphasia used and how many times this occurred during the interview. Since the aim was to look at the communicative behaviour types (code-mixing, pathological and strategic) in an explorative manner it was not needed to manipulate the situation. The interviews with BWA as data existed primary to the current study, since it is data which was collected in relation to the PhD trajectory of Saskia Mooijman. Since this PhD trajectory has been approved by the ETC-GW (number 2019-5035), it can be assumed that for the current study these interviews as data would be reliable and valid. The interviews with HB were conducted with a similar procedure and added questions from a pre-existing, renowned questionnaire focused on bilingualism: the "Bilingual Switching Questionnaire" (Rodriguez-Fornells et al., 2012). This way all questions asked during the interviews had either the approval of ETC-GW or had been approved during the development process of the "Bilingual Switching Questionnaire". If a semi-structured interview is approached in such a manner it may provide high validity (Ahlin, 2019). Future research may want to focus on a more experimental form of research, however, in which case interviews are a less reliable form of data than others. In this case it would be more fitting to work with measurements gathered through, for example, standardized tests (e.g. see the aforementioned tests on EF). To conclude, for an explorative study interviews may provide valuable insights and support results from a statistical analysis (Ahlin, 2019), but for future research standardized tests and/or experiments may be an interesting and, in that case, more reliable approach.

4.5 Limitations of the current study and points of improvement

The first limitation of the current study was the small participant group, especially concerning the statistical analysis (N=9). The current participant group of bilingual speakers with aphasia turned out to be too small to give a conclusive answer to the research question of the current study. At the time of conducting the current study no previous research could be found where statistical analysis was performed as to see whether code-mixing is more related to pathological or strategic behaviour. It would be interesting to see whether a larger participant group would result in a conclusive answer. If we know what to class code-mixing as, one could implement this in their communication with bilingual speakers with aphasia by either: (1) understanding that it may be a strategy and that code-mixing can help the bilingual speaker with aphasia, (2) understanding that it is pathological behaviour and that it could be a goal during therapy to minimize this behaviour if it bothers the bilingual speaker with aphasia, or (3) understanding that it could be both or either and that one must be careful in their judgement of code-mixing during discourse.

The level of constraint of the statistical analysis of the current study is quite low, caused by the fact that it was correlational. As stated by Snyder (n.d.), correlational studies miss a form of active control over sampling which other study designs (e.g. differential studies) do have. This active control minimizes the effect of confounding variables and therefore is able to strengthen the conclusions drawn from a study (Snyder, n.d.). With correlational studies there is always the possibility that other (non-measured) variables may be influencing the variables which are put in the analysis and their possible relationship (Field, 2018). Furthermore, correlational designs cannot make an attempt at drawing causal inferences. However, correlational designs can quantify the relationship between two or more variables and for the type of quantitative data of the current study a correlational design was the best fit. There was no manipulation of variables during the current study, which made the use of any form of ANOVA impossible (Field, 2018). Since the data consisted of percentages of the amount of times a type of behaviour was seen a chi-square test could not be performed. This, because a chi-square test needs data that consists of whether a behaviour type was seen, yes or no,

not how many times a behaviour type was seen. Only with a correlation analysis it was possible to research whether there was a relationship between variables with data that consisted of percentages of amount of times code-mixing, pathological- and strategic behaviour was seen (Field, 2018). Meaning, even though there are negative aspects to the use of a correlation analysis in the current study, it was the best fit and therefore chosen.

Up until now, several points of improvement regarding future research have been mentioned. Another point of improvement regarding future research is that it may have been interesting to see whether participants who had more possibilities for initiating repair also had more pathological behaviour during their interview. Possibilities for initiating repair was a label which was given to utterances where no repair took place by either the speaker or the interlocutor, but the transcriber thought it would have been productive for one of them to initiate repair. This could be directed at a slip of the tongue, grammatical error or when the message of the participant was unclear for the transcriber or the transcriber thought, by analysing the conversation after the particular utterance, the message had been unclear to the interlocutor. However, in the current study there were too little measures of possibilities for initiating repair and it was decided that this would have too little power as to give a conclusive answer to the question. Future research could look into this with a larger participant group, assuming that with more participants there will also be more measures of possibilities for initiating repair.

5. Conclusion

The current study set out to discover whether code-mixing is more so related to pathological or strategic behaviour. This was researched through both qualitative and quantitative data extracted from interviews with bilingual speakers with and without aphasia. The results from both the qualitative and quantitative data showed that code-mixing can present itself in different ways (consciously and unconsciously, pathological and strategic) in both bilingual speakers with and without aphasia with slight differences between both groups. By comparing the qualitative and quantitative data from bilingual speakers with aphasia it was concluded that the current study cannot give a conclusive answer as to whether code-mixing is more so related to pathological or strategic behaviour in the bilingual speakers with aphasia participating in the current study. This, because there was not a significant relation found between these variables. Besides, the differences between the correlations measured between code-mixing and pathological behaviour, and code-mixing and strategic behaviour were too small to say anything concrete about the difference between the extent of these relationships. Bilingual speakers with and without aphasia have described code-mixing as strategic and pathological/an error.

With regards to previous literature it was concluded that the current results lean towards the proposition that code-mixing can be both pathological and/or strategic in bilingual speakers with aphasia. As to draw hard conclusions, however, future research will have to recruit larger and more similar (e.g. aphasia type and severity, time post onset) groups of bilingual speakers with aphasia. This future research may then show whether code-mixing can indeed be related to both pathological and strategic behaviour, or whether it has a stronger relation with one of the two. Furthermore, future research may be able to discover more about the reason behind code-mixing in bilingual speakers with and without aphasia. This could possibly also say more about the differences in code-mixing between bilingual speakers with and without aphasia.

References

Aboh, E. O. (2020). Lessons From Neuro-(a)-Typical Brains: Universal Multilingualism, Code-Mixing, Recombination, and Executive Functions. *Frontiers in Psychology, 11*, 488. https://dx.doi.org/10.3389%2Ffpsyg.2020.00488

Ahlin, E. M. (2019). Semi-Structured Interviews With Expert Practitioners: Their Validity and Significant Contribution to Translational Research. In *SAGE Research Methods Cases.* https://dx.doi.org/10.4135/9781526466037

Ansaldo, A. I. & Ghazi-Saidi, L. (2014). Aphasia Therapy in the Age of Globalization: Cross-Linguistic Therapy Effects in Bilingual Aphasia. *Behavioural Neurology.* https://dx.doi.org/10.1155%2F2014%2F603085

Ansaldo, A. I., Marcotte, K., Scherer, L., & Raboyeau, G. (2008). Language therapy and bilingual aphasia: Clinical implications of psycholinguistic and neuroimaging research. *Journal of Neurolinguistics, 21*, 539-557. https://doi.org/10.1016/j.jneuroling.2008.02.001

AphasiaBank. (n.d.). *The CHAT manual.* Talkbank. https://talkbank.org/manuals/CHAT.pdf

AphasiaBank. (n.d.). *The CLAN manual.* Talkbank. https://talkbank.org/manuals/CLAN.pdf

Barnes, S. & Armstrong, E. (2009). Conversation after right hemisphere brain damage: motivations for applying conversation analysis. *Clinical Linguistics and Phonetics, 24*(1), 55-69. https://doi.org/10.3109/02699200903349734

Bastiaanse, R. (2011). *Afasie.* Houten, Netherlands: Bohn Stafleu van Loghum.

Berken, J. A., Chai, X., Chen, J. K., Gracco, V. L., & Klein, D. (2016). Effects of Early and Late Bilingualism on Resting-State Functional Connectivity. *Journal of Neuroscience, 36*(4), 1165-1172. https://doi.org/10.1016/j.neuropsychologia.2016.08.031

Bialystok, E. (2009). Bilingualism: The good, the bad, and the indifferent. *Bilingualism: Language and Cognition, 12*(1), 3-11. https://doi.org/10.1017/S1366728908003477

Bialystok, E. (2017). The bilingual adaptation: How minds accommodate experience. *Psychological Bulletin, 143*, 233–262. https://dx.doi.org/10.1037%2Fbul0000099

Bialystok, E., Craik, F. I. M. & Luk, G. (2008). Cognitive control and lexical access in younger and older bilinguals. *Journal of Experimental Psychology: Learning, Memory and Cognition, 34*, 859–873. https://doi.org/10.1037/0278-7393.34.4.859

Blair, C. (2017). Educating executive function. *Wiley Interdisciplinary Reviews. Cognitive Science, 8*(1-2). https://dx.doi.org/10.1002%2Fwcs.1403

Bulluck, B. E. & Toribio, A. J. (2009). *The Cambridge Handbook of Linguistic Code-Switching.* Cambridge University Press.

Cannizzaro, M. & Coelho, C. (2012). Communication following executive function. In R.K. Peach & L.P. Shapiro (Eds.), *Cognition and acquired language disorders: an information processing approach* (pp. 227-240). Elsevier Mosby.

Centeno, J. G., Ghazi-Saidi, L., & Ansaldo, A. I. (2017). Aphasia in multilingual populations. In I. Papathansiou & P. Coppens (Eds.), *Aphasia and related neurogenic communication disorders* (pp. 331-350). Jones & Bartlett Learning.

Crosson, B., Barco, P. P., Velozo, C. A., Bolesta, M. M., Cooper, P. V., Werts, D., & Brobeck, T. C. (1989). Awareness and compensation in postacute head injury rehabilitation. *Journal of Head Trauma Rehabilitation*, *4*(3), 46–54. https://doi.org/10.1097/00001199-198909000-00008

Dietz, A., Wallace, S. E., & Weissling, K. (2020). Revisiting the Role of Augmentative and Alternative Communication in Aphasia Rehabilitation. *American Journal of Speech-Language Pathology, 29*(2), 909-913. https://doi.org/10.1044/2019_ajslp-19-00041

Druks, J. (2002). Verbs and nouns—a review of the literature. *Journal of Neurolinguistics, 15*(3–5), 289–315. https://doi.org/10.1016/S0911-6044(01)00029-X

Faria, C. A., Alves, H. V. D., & Charchat-Fichman, H. (2015). The most frequently used tests for assessing executive functions in aging. *Dementia & Neuropsychologia, 9*(2), 149-155. https://dx.doi.org/10.1590%2F1980-57642015DN92000009

Field, A. P. (2018). *Discovering statistics using SPSS*. SAGE.

Fridriksson, J., Nettles, C., Davis, M., Morrow, L., & Montgomery, A. (2006). Functional communication and executive function in aphasia. *Clinical Linguistics and Phonetics, 20*(6), 401-410. https://doi.org/10.1080/02699200500075781

Goral, M., Naghibolhosseini, M., & Conner, P. S. (2013). Asymmetric inhibitory treatment effects in multilingual aphasia. *Cognitive Neuropsychology, 30*(7-8), 564-577. https://doi.org/10.1080/02643294.2013.878692

Graetz, P., de Bleser, P., & Willmes, K. (1987). *Akense Afasie Test (AAT).* Hogrefe Uitgevers.

Green, D. W. (2018). Language control and code-switching. *Languages, 3*(8). http://dx.doi.org/10.3390/languages3020008

Green, D. W. (1998). Mental control of the bilingual lexico–semantic system. *Bilingualism: Language and Cognition, 1*, 67–81. https://doi.org/10.1017/S1366728998000133

Green D. W., & Abutalebi, J. (2008). Understanding the link between bilingual aphasia and language control. *Journal of Neurolinguistics, 21*(6), 558–576. https://doi.org/10.1016/j.jneuroling.2008.01.002

Green, D. W. & Abutalebi, J. (2013). Language control in bilinguals: The adaptive control hypothesis. *Journal of Cognitive Psychology, 25*(5), 515-530. https://dx.doi.org/10.1080%2F20445911.2013.796377

Gross, M., Buac, M., & Kaushanskaya, M. (2014). Conceptual scoring of receptive and expressive vocabulary measures in simultaneous and sequential bilingual children. *American Journal of Speech Language Pathology, 23*(4), 574-586. https://dx.doi.org/10.1044%2F2014_AJSLP-13-0026

Hernandez, A. E. & Li, P. (2007). Age of acquisition: Its neural and computational mechanisms. *Psychological Bulletin, 133*, 638–650. https://doi.org/10.1037/0033-2909.133.4.638

Hersenstichting. (2020). *RIVM cijfers.* Hersenstichting. https://www.hersenstichting.nl/rivm-cijfers/

Hogrefe, K., Ziegler, W., Weidinger, N., & Goldenberg, G. (2017). Comprehensibility and neural substrate of communicative gestures in severe aphasia. *Brain & Language, 171,* 62-71. https://doi.org/10.1016/j.bandl.2017.04.007

Kambanaros, M. (2010). Action and object naming versus verb and noun retrieval in connected speech: Comparisons in late bilingual Greek–English anomic speakers. *Aphasiology, 24*(2), 210–230. https://doi.org/10.1080/02687030902958332

Kuzmina, E., Goral, M., Norvik, M., & Weekes, B. S. (2019). What Influences Language Impairment in Bilingual Aphasia? A Meta-Analytic Review. *Frontiers in Psychology, 10,* 445. https://dx.doi.org/10.3389%2Ffpsyg.2019.00445

Lehtonen, M., Soveri, A., Laine, A., Järvenpää, J., & de Bruin, A. (2018). Is Bilingualism Associated With Enhanced Executive Functioning in Adults? A Meta-Analytic Review. *Psychological Bulletin, 144*(4), 394-425. http://dx.doi.org/10.1037/bul0000142

Lerman, A., Pazuelo, L., Kizner, L., Borodkin, K., & Goral, M. (2019). Language mixing patterns in a bilingual individual with non-fluent aphasia. *Aphasiology, 33*(9), 1137-1153. https://dx.doi.org/10.1080%2F02687038.2018.1546821

Lesley University. (n.d.). *What the Stroop Effect Reveals About Our Minds.* Lesley. https://lesley.edu/article/what-the-stroop-effect-reveals-about-our-minds

Lipsky, J. M. (2009). "Fluent dysfluency" as congruent lexicalization: A special case of radical code-mixing. *Journal of Language Contact, 2*(2), 1-39. https://doi.org/10.1163/000000009792497742

MacWhinney, B. (2000*). The CHILDES Project: Tools for Analyzing Talk* (3rd Ed.). Lawrence Erlbaum Associates.

Maynard, D. W. & Heritage, J. (2005). Conversation analysis, doctor-patient interaction and medical communication. *Medical Education, 39*(4), 428-435. https://doi.org/10.1111/j.1365-2929.2005.02111.x

Muñoz, M. L., Marquadt, T. P., & Copeland, G. (1999). A Comparison of the Codeswitching Patterns of Aphasic and Neurologically Normal Bilingual Speakers of English and Spanish. *Brain and Language, 66*, 294-274. https://doi-org.ru.idm.oclc.org/10.1006/brln.1998.2021

Muysken, P. (2000). *Bilingual Speech: A Typology of Code-mixing*. Cambridge University Press.
Myers-Scotton, C. (1998). *Codes and Consequences: Choosing Linguistic Varieties*. Oxford University Press.
Myers-Scotton, C. (2006). *Multiple voices: An Introduction to Bilingualism.* Blackwell Publishing.
Olsson, C., Arvidsson, P., & Blom Johansson, M. (2020). Measuring executive function in people with severe aphasia: Comparing neuropsychological tests and informant ratings. *NeuroRehabilitation, 46*(3), 299-310. https://doi.org/10.3233/nre-192998
Ozga, J. E., Povroznik, J. M., Engler-Chiurazzi, E. B., & Vonder Haar, C. (2018). Executive (dys)function after traumatic brain injury: special considerations for behavioral pharmacology. *Behavioural Pharmacology, 29*(7), 617-637. https://dx.doi.org/10.1097%2FFBP.0000000000000430
Papathanasiou, I., Coppens, P., & Davidson, B. (2017). Aphasia and related neurogenic communication disorders: basic concepts, management, and efficacy. In I. Papathanasiou & P. Coppens (Eds.), *Aphasia and related neurogenic communication disorders* (pp. 3-14). Jones & Bartlett Learning.
Papathanasiou, I., Coppens, P., Durand, E., & Ansaldo, A. I. (2017). Plasticity and recovery in aphasia. In I. Papathanasiou & P. Coppens (Eds.), *Aphasia and related neurogenic communication disorders* (pp. 63-80). Jones & Bartlett Learning.
Patra, A., Bose, A., & Marinis, T. (2020). Lexical and Cognitive Underpinnings of Verbal Fluency: Evidence from Bengali-English Bilingual Aphasia. *Behavioral Sciences, 10*(10), 155. https://dx.doi.org/10.3390%2Fbs10100155
Peach, R. K. & Shapiro, L. P. (2012). *Cognition and Acquired Language Disorders.* Elsevier Mosby.
Poplack, S. (1980). Sometimes I'll start a sentence in Spanish y termino en español: Toward a typology of code-switching. *Linguistics, 18*, 581–618. http://dx.doi.org/10.1515/ling.1980.18.7-8.581
Purdy, M. & Koch, A. (2006). Prediction of strategy usage by adults with aphasia. *Aphasiology, 20*(2-4), 337-348. https://doi.org/10.1080/02687030500475085
Rodriguez-Fornells, A., Krämer, U. M., Lorenzo-Seva, U., Festman, J., & Münte, T. F. (2012). Self-assessment of individual differences in language switching. *Frontiers in Psychology, 2*. https://doi.org/10.3389/fpsyg.2011.00388
Schumacher, R., Halai, A. D., & Lambon Ralph, M. A. (2019). Assessing and mapping language, attention and executive multidimensional deficits in stroke aphasia. *Brain, 142*(10), 3202-3216. https://dx.doi.org/10.1093%2Fbrain%2Fawz258
Shea-Shumsky, N. B., Schoeneberger, S., & Grigsby, J. (2019). Executive functioning as a predictor of stroke rehabilitation outcomes. *Clinical Neuropsychology, 33*(5), 854-872. http://dx.doi.org/10.1080/13854046.2018.1546905
Smidts, D. (2003). Executieve functies van geboorte tot adolescentie: een literatuuroverzicht. *Neuropraxis, 7*, 113-119. http://dx.doi.org/10.1007/BF03099824
Snyder, M. R. (n.d.). *Statistics* [lecture summary]. Psychology University Alberta. http://web.psych.ualberta.ca/~msnyder/Academic/Psych_356/p356_2.html
Stroop J. R. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology, 18*(6), 643–662. https://doi.org/10.1037/h0054651
Suchy, Y. (2015). *Executive functioning: A comprehensive guide for clinical practice.* Oxford University Press.
Suchy, Y., Niermeyer, M. A., & Ziemnik, R. E. (2017). Assessment of executive functions in research. In E. Goldberg (Ed.), *Executive functions in health and disease* (pp. 197-216). Elsevier Science & Technology.
Thompson, C. K., Lukic, S., King, M. C., Mesulam, M. M., & Weintraub, S. (2012). Verb and noun deficits in stroke-induced and primary progressive aphasia: The Northwestern Naming Battery. *Aphasiology, 26*(5), 632-655. https://doi.org/10.1080/02687038.2012.676852
Vaid, J. & Genesee, F. (1980). Neuropsychological Approaches to Bilingualism: A Critical Review. *Canadian Journal of Psychology, 34*(4), 417-445. https://doi.org/10.1037/h0081108

Vereniging voor Klinische Linguïstiek. (2013). *ASTA: Analyse voor Spontane Taal bij Afasie* [protocol]. Klinische Linguïstiek. https://klinischelinguistiek.nl/uploads/201307asta4eversie.pdf
Wu, Y. (2020). Pain talk in hospice care: a conversation analysis. *BMC Palliative Care, 19*(1), 116. https://doi.org/10.1186/s12904-020-00625-x

Appendix

1. Interview protocol: Bilingual speakers with Aphasia

Algemene vragen

1. *Wat is uw geboortedatum?*
2. *Bent u links- of rechtshandig, of tweehandig?*
3. *Hoe is uw hersenletsel ontstaan? (Bijvoorbeeld na een CVA, ongeval, hersentumor, ontsteking)*
4. *Wanneer heeft u hersenletsel gekregen?*
5. *Wat voor opleiding heeft u gedaan?*
6. *Zijn er andere bijzonderheden waarvan het goed is als ik daarvan op de hoogte ben, voordat we met het interview beginnen?*

AAT-vragen

1. *Kunt u mij, om te beginnen, zo uitvoerig mogelijk vertellen wat er eigenlijk met u gebeurd is?*
    a. *Hoe gaat het nu met u?*
    b. *Hoe gaat het nu met het spreken?*
    c. *Welke problemen met spreken waren er in het begin?*
2. *Wat is/was uw beroep?*
    a. *Waar hebt u het laatst gewerkt?*
    b. *Wat moest u dan precies doen? Kunt u daar iets meer over vertellen?*
    c. *Hoe bent u tot die keuze komen?*
3. *Waar woont u?*
    a. Kunt u mij iets over uw familie vertellen?
    b. *Waar heeft u als kind gewoond?*
4. *Wat doet u graag in uw vrije tijd? Heeft u hobby's?*
    a. *Kunt u daar iets meer over vertellen?*

Vragen over tweetaligheid

5. *Kunt u iets vertellen over de talen die u spreekt?*
    a. *Wat is uw moedertaal?*
    b. *Welke andere talen spreekt u?*
    c. *Waar hebt u deze talen geleerd?*
    d. *Wanneer heeft u deze talen geleerd?*
    e. *Hoe goed spreekt u deze talen?*
    f. *Hoe vaak en waar spreekt u deze talen?*
6. *Merkt u veel verschil tussen beide talen, voor en na uw hersenletsel? Zo ja, op welke manier?*
7. *Wat betekent het voor u om tweetalig te zijn?*
8. *In welke situaties sprak/spreekt u deze talen?*
9. *Hoe belangrijk is het voor u om deze beide talen te spreken?*
10. *Heeft uw tweetaligheid alleen voordelen of ondervindt u er ook hinder van? Kunt u uitleggen hoe dat werkt?*
11. *Helpt het kennen van een andere taal u bij het spreken van het Nederlands? Of juist niet?*
    a. *Zo ja/nee, op welke manier?*

12. *Heeft u wel eens moeite met het **uit elkaar houden** van uw twee talen? Zo ja, hoe uit zich dat?*
    a. *Heeft u het idee dat anderen u goed snappen als u twee talen door elkaar heen spreekt?*
13. *Heeft u, na uw hersenletsel, beide talen **geoefend**?*
    a. *Zo nee, waarom niet?*
    b. *Zo ja, hoe was dat?*
14. *Zijn er andere dingen die u wilt bespreken of benadrukken?*

Protocol (Leaman & Edmonds, 2019b)

Wel	***Niet***
Toon interesse met: • *Oogcontact* • *Lichaamstaal*	*Stel niet te veel vragen*
Knik, zeg 'hmmhmm', etc.	*Geef geen fonemische of semantische cues*
Maak opmerkingen	*Vraag niet om correctere uitspraak of woorden als je het wel begrijpt*
Deel korte verhalen over jezelf	*Vraag niet om een verbale productie van ideeën die al non-verbaal zijn gecommuniceerd*
Laat het onderwerp vanzelf/natuurlijk veranderen	*Vraag niet om dingen die je al weet*
Geef meer dan voldoende tijd	*Stel je niet te veel op als interviewer (als je merkt dat je dat wel doet: maak meer opmerkingen en deel een persoonlijk verhaal)*
Stilte is oké	*Vertel of instrueer niets over strategieën of hoe te communiceren*
Accepteer alle communicatiemodaliteiten	
Als je het niet begrijpt, laat dat dan weten	
Parafraseer wat je wel begrijpt	

Verder:

1. *PMA zegt iets*
2. *Als je het begrijpt:*
   a. *Ga door met het gesprek*
3. *Als je het niet begrijpt:*
   a. *Kun je een redelijke gok maken? Doe het! En ga door met het gesprek.*
   b. *Zeg: ik begrijp het niet helemaal. Geef de PMA alle tijd om het te verduidelijken.*
      i. *Begrijp je het nu wel? Ga door met het gesprek.*
      ii. *Kun je een redelijke gok maken? Doe het!*
      iii. *Begrijp je het nog steeds niet? Zeg het.*
         1. *Als je het na **drie keer** nog niet begrijpt, dan kun je een ondersteunende techniek gebruiken. Zoals: een strategie suggereren, keuzes presenteren, etc. Of je kunt ervoor kiezen door te gaan met het gesprek en dit over te slaan.*

2. Interview protocol: Bilingual speakers without Aphasia

Starten met introduceren van interviewer/kennismakingsgesprekje.

START OPNAME

Algemene vragen

1. Wat is uw geboortedatum (maand en jaar)?
2. Wat doet u in het dagelijks leven (werk, hobby's, etc.)?
3. Zijn er bijzonderheden waarvan het goed is als ik daarvan op de hoogte ben, of heeft u nog vragen voordat we met het interview beginnen?

Vragen meertaligheid

4. Kunt u mij iets vertellen over de talen die u spreekt?
    a. Wat is uw moedertaal?
    b. Welke andere talen spreekt u?
    c. Waar heeft u deze talen geleerd?
    d. Wanneer heeft u deze talen geleerd?
    e. Hoe goed spreekt u deze talen?
    f. Hoe vaak en waar spreekt u deze talen?
5. Wat betekent het voor u om meertalig te zijn?
6. In welke situaties spreekt u de talen?
7. Hoe belangrijk is het voor u om deze talen te spreken?
8. Welke voordelen ondervindt u van het meertalig zijn?
    a. Kunt u voorbeelden geven?
    b. Wat gebeurt er dan?
9. Ondervindt u wel eens hinder/nadelen van uw meertaligheid?
    a. Kunt u uitleggen wat er dan gebeurt/hoe dat werkt?
10. Helpt het kennen van een andere taal u bij het spreken van het Nederlands? Of juist niet?
    a. Zo ja/nee, op welke manier?
11. Heeft u wel eens moeite met het uit elkaar houden van uw talen?
    a. Zo ja, hoe uit zich dat?
    b. Heeft u wel eens dat u tijdens een zin overschakelt naar een andere taal? (Nederlands naar moedertaal of andersom)
    c. Als u een woord in de ene taal even niet weet, schakelt u dan over naar de andere taal?
    d. Hoe vaak gebeurt dit ongeveer? (Nooit, heel weinig, af en toe, redelijk vaak, vaak)
    e. Kunt u een voorbeeld geven/situatie schetsen?
    f. Heeft u het gevoel dat u het altijd bemerkt als u van taal wisselt? Gebeurt het wisselen bewust of onbewust?
    g. Heeft u het idee dat anderen u goed begrijpen als u twee of meerdere talen door elkaar heen spreekt?
    h. Heeft u het idee dat er bepaalde situaties zijn waarin het mengen van talen vaker voorkomt dan anderen?
        - Bijvoorbeeld wanneer u spreekt met bepaalde mensen, over bepaalde onderwerpen of op bepaalde momenten?
12. Zijn er andere dingen die u wilt bespreken of benadrukken?

EINDE INTERVIEW – OPNAME STOPPEN

WEL	NIET
Sub-vragen (a, b, c, etc.) gebruiken indien de participant hier in zijn/haar initiële antwoord niet over spreekt of indien je hier over wilt doorvragen/meer duidelijkheid wilt.	Vermijd het stellen van vragen die eigenlijk al beantwoord zijn.
Zelf voorbeelden geven uit eigen leven. Bijvoorbeeld als participant uit zichzelf niet veel spreekt, wanneer de vraag niet geheel begrepen wordt en/of om het meer de vorm van een gesprek te geven.	Zorg ervoor dat het geen kruisverhoor wordt.
Zo nodig de participant parafraseren bij doorvragen.	Vat niet onnodig veel samen. Vermijd te veel herhaling.
Begin met de algemene vragen en start daarna de vragen over meertaligheid.	Vraag niet om correctere uitspraak of woorden als je het wel begrijpt.
Pas je bij de vragen over meertaligheid aan aan hoe het gesprek loopt. Als het gesprek zo loopt, hoef je je niet te houden aan de volgorde waarin de vragen staan, maar houd wel in de gaten dat (zoveel mogelijk) al je vragen beantwoord zijn aan het einde van het gesprek.	
Als de participant (naast het Nederlands) een taal spreekt die jij zelf goed beheerst geef dan aan dat je die taal ook goed verstaat/spreekt. Laat merken dat het oké is om te wisselen tussen deze talen of dat (als dit prettiger is voor de participant) ook die andere taal gesproken mag worden.	
Als het gebeurt, mag je zelf tussen talen wisselen.	

3. Recruitment message

In het kader van mijn afstudeeronderzoek en -stage vanuit de opleiding “Master Taal- en Spraakpathologie” aan de Radboud Universiteit Nijmegen, ben ik op zoek naar volwassenen met een meertalige achtergrond. Dit houdt in dat u twee of meer talen spreekt en gebruikt. Dit kan in verschillende situaties zijn (thuis, op het werk, met bepaalde familieleden, etc.). De ene taal hoeft niet evenveel gebruikt te worden als de andere(n), maar wat wel belangrijk is, is dat u minstens twee talen relatief vloeiend spreekt en ook, relatief gezien, regelmatig gebruikt. Er zijn, naast het spreken van twee of meer talen, geen andere specifieke criteria waaraan u hoeft te voldoen.

Tijdens dit onderzoek gaat het om een eenmalig interview via Zoom van 30 tot (maximaal) 45 minuten gericht op uw meertaligheid. Ik zal u vragen stellen over de talen die u spreekt, wanneer u deze spreekt, hoe u het meertalig zijn ervaart, etc.

Indien u interesse heeft om deel te nemen aan dit onderzoek zal ik u via e-mail een online informatiebrief en toestemmingsformulier (informed consent) sturen. Hierin kunt u uitgebreid lezen waar dit onderzoek om gaat alvorens u wel of geen toestemming geeft om deel te nemen aan dit onderzoek. Aan het einde van het informed consent formulier is er de mogelijkheid 3 data opties in te vullen waarna ik u zal mailen om een afspraak op één van die momenten met u te bevestigen.

Dus bent u meertalig en heeft u interesse in deelname aan dit onderzoek? Geef dan uw naam en e-mailadres door via een email naar [E-mailadres] . Ook bij vragen vooraf bent u van harte welkom om mij een mailtje te sturen!

Uw deelname zou mij enorm verder helpen!

Met vriendelijke groet,

Elynn Vollebregt

4. Informed consent form

INFORMED CONSENT

Naam onderzoek: In gesprek over taal: Interviews met meertaligen

Uitvoerend student: Elynn Vollebregt

Begeleider(s) van student: Dr. Marina Ruiter en Saskia Mooijman, MA

Opleiding: Master Taal- en Spraakpathologie, Radboud Universiteit (Nijmegen)

Inleiding
Wij vragen u om mee te doen aan een wetenschappelijk onderzoek. Meedoen is vrijwillig. Om mee te doen is uw schriftelijke toestemming nodig. Voordat u beslist of u wilt meedoen aan dit onderzoek, krijgt u uitleg over wat het onderzoek inhoudt. Lees deze informatie rustig door en vraag de uitvoerend student uitleg als u vragen heeft.

Doel en procedure van het onderzoek
Met dit onderzoek wordt er gekeken naar meertaligheid. Er zullen vragen gesteld worden over de talen die u spreekt en hoe spreken over het algemeen verloopt in het dagelijks leven. Dit onderzoek vindt plaats in het kader van een stage gericht op dataverzameling. Daarnaast is het een onderdeel van een studie gericht op meertaligheid bij afasiepatiënten door Saskia Mooijman.

Wat wordt er van u verwacht?
In dit onderzoek gaat u samen met de uitvoerend student in gesprek over uw meertaligheid. Dit gesprek zal plaatsvinden via Zoom en hiervoor zal samen met u een afspraak ingepland worden. Het gesprek zal maximaal 45 minuten duren. Dit gesprek zal opgenomen worden (beeld en geluid) om de antwoorden te kunnen analyseren en vergelijken met andere data.

Risico's en ongemakken
Er zijn geen risico's voor uw gezondheid of uw veiligheid.

Vrijwilligheid

U doet vrijwillig mee aan dit onderzoek. Daarom kunt u op elk moment tijdens het onderzoek uw deelname stopzetten en uw toestemming intrekken. U hoeft niet aan te geven waarom u stopt. U kunt tot twee weken na deelname ook uw onderzoeksgegevens en persoonsgegevens laten verwijderen. Dit kunt u doen door een mail te sturen naar [E-mailadres]

Wat gebeurt er met mijn gegevens?
De onderzoeksgegevens die we in dit onderzoek verzamelen, zullen door wetenschappers gebruikt worden voor datasets, artikelen en presentaties. De anoniem gemaakte onderzoeksgegevens zijn tenminste 10 jaar beschikbaar voor andere wetenschappers. Als we gegevens met andere onderzoekers delen, kunnen deze dus niet tot u herleid worden.

In dit onderzoek worden video-opnames gemaakt. Deze opnames worden gebruikt voor analyse en vergelijking met andere data. Op basis van de opnames hopen we conclusies te kunnen trekken over meertaligheid.

De video-opnames kunnen niet volledig anoniem gemaakt worden aangezien u herkenbaar in beeld te zien zult zijn en door de unieke stem die ieder persoon heeft.

Van de opnames worden transcripten gemaakt. Deze transcripten zullen volledig geanonimiseerd worden waardoor het niet mogelijk zal zijn om de transcripten terug te herleiden naar u.

Indien u hier toestemming voor geeft zullen de originele opnames beschikbaar blijven voor gerelateerde onderzoeken op het gebied van meertaligheid. Indien u hier géén toestemming voor geeft, worden de opnames na het transcriberen definitief verwijderd.

De originele opnames zullen alleen worden gezien door de uitvoerend student en haar begeleiders. U krijgt van ons een formulier waarop u toestemming voor het maken en gebruiken van deze opnames kunt aangeven.

Voor de interne administratie van dit onderzoek zijn ook persoonsgegevens nodig, zoals naam, geboortedatum en e-mailadres. Deze gegevens zijn alleen toegankelijk voor de uitvoerend student, haar begeleiders en de gegevensbeheerder.

We bewaren alle onderzoeks- en persoonsgegevens op beveiligde wijze volgens de richtlijnen van de Radboud Universiteit.

Heeft u vragen over het onderzoek?
Als u meer informatie over het onderzoek wilt hebben, kunt u contact opnemen met Elynn Vollebregt [E-mailadres].

Als u meer informatie wilt over het onderzoek waarvan dit onderzoek deel uitmaakt, kunt u contact opnemen met Saskia Mooijman [E-mailadres]

Ethische toetsing en klachten
Het onderzoek waarvan deze studie een onderdeel is, is goedgekeurd door de Ethische Toetsingscommissie Geesteswetenschappen van de Radboud Universiteit (ETC-GW nummer 2019-5035)

Heeft u klachten over het onderzoek, dan kunt u contact opnemen met de uitvoerend student.

TOESTEMMINGSVERKLARING

Naam onderzoek: In gesprek over taal: Interviews met meertaligen
Verantwoordelijke student: Elynn Vollebregt
Begeleider(s) van student: Dr. Marina Ruiter en Saskia Mooijman, MA

Verklaring deelnemer
Ik heb uitleg gekregen over het doel van het onderzoek. Ik heb vragen mogen stellen over het onderzoek. Ik heb vrijwillig deelgenomen aan het onderzoek. Ik begrijp hoe de gegevens van het onderzoek bewaard zullen worden en waarvoor ze gebruikt zullen worden. Ik stem in met deelname aan het onderzoek zoals beschreven in de informatie die ik hiervoor gelezen heb.

Ik geef toestemming om (s.v.p. aanklikken wat van toepassing is. NB: Voor deelname aan dit onderzoek zijn de eerste drie opties nodig. De laatste is optioneel):

- ☐ Video-opnamen van mij te maken voor dit onderzoek en deze opnames op te slaan volgens de geldende regels van de Radboud Universiteit
- ☐ de audio/visuele beelden uit te schrijven (transcriptie)
- ☐ de anoniem gemaakte transcripten te gebruiken voor het wetenschappelijk onderzoek door Elynn Vollebregt
- ☐ de anoniem gemaakte transcripten te gebruiken voor gerelateerde wetenschappelijke onderzoeken op het gebied van meertaligheid

Ter ondertekening van dit online toestemmingsformulier vragen we u om hieronder uw naam in te vullen.

Ten slotte vragen we u om drie data te selecteren in de komende drie maanden waarop u beschikbaar bent voor een gesprek via Zoom. Wanneer de afspraak ingepland is wordt er contact met u opgenomen via e-mail.

	Maand	Dag	Tijd
Optie 1			
Optie 2			
Optie 3			

Einde informed consent en toestemmingsformulier
Bedankt voor uw interesse in dit onderzoek! Er wordt zo snel mogelijk contact met u opgenomen.

Einde informed consent en toestemmingsformulier
Om mee te kunnen doen aan dit onderzoek moet u toestemming geven. U heeft helaas geen toestemming gegeven. Uw deelname aan dit onderzoek is hiermee ten einde. Hartelijk bedankt voor uw tijd en interesse!

Is er iets fout gegaan en was dit niet uw bedoeling? Klik op het pijltje naar links om terug te gaan.

5. Codebook

Gedraging	Beschrijving	CLAN-transcriptie codes/afkortingen	Voorbeelden
Code-mixen	Code-mixen is het fenomeen waarbij een of meerdere talen door elkaar heen gebruikt worden. Om verwarring tussen termen te voorkomen is ervoor gekozen om elke vorm van vermenging van talen als code-mixen te beoordelen en de term code-switchen achterwege te laten. 1. Alternations Gevallen van code-mixen waarbij een aantal woorden in de ene taal worden afgewisseld met woorden uit een andere taal binnen een beurt in de conversatie. 2. Insertions Gevallen waarin woorden of bestanddelen uit de ene taal worden ingevoegd in het syntactisch frame of matrix van een andere taal. 3. Congruent lexicalisations Congruente lexicalisatie verwijst naar code-mixen wanneer er een gedeelde (of op zijn minst grotendeels gedeelde) structuur is tussen de beide talen die kan worden gelexicaliseerd door elementen uit beide talen. In een	@s:* *= drie letter code taal (eng/nld/etc.) %com: alternation/insertion/congruent lexicalisation Indien mogelijk [: target word]	Alternations: 1. Moroccan Arabic/Dutch maar 't hoeft niet li-'anna ida Šeft but it need not for when I-see I 'But it need not be, for when I see, I … ' Nortier 1990, p. 126 (cited in Muysken 2000, p. 5) 2. Spanish/English andale pues and do come again 'That's all right then, and do come again.' Gumperz and Hernandez-Chavez 1971, p. 118 (cited in Muysken 2000, p. 5) Insertions: 3. Bolivian Quechua/Spanish chay-ta las dos de la noche-ta chaya-mu-yku that-AC the two of the night-AC arrive-CIS-1PL 'There at two in the morning we arrive.' Muysken 2000, p. 63 Congruent lexicalisations: 4. Sranan/Dutch wan heri gedeelte de ondro beheer fu graupende machten one whole part COP under control of armed forces 'One whole part is under control of the armed forces.' Bolle 1994, p. 75 (cited in Muysken 2000, p. 139) *Voorbeelden uit Green (2018).*
	dergelijke situatie kunnen woorden of morfemen uit elke taal worden gecombineerd. Hierdoor zijn uitingen mogelijk die, op zichzelf staand, in beide talen ongrammaticaal zouden zijn. Ten slotte kan code-mixen zowel correct als incorrect zijn in één of beide talen. Bij incorrect mixen wordt er op twee niveaus gecodeerd: 1. Type fout 2. Herstel Volgens Muysken (2000) past een code-mix in het syntactisch frame van de taal waarin gesproken wordt. Correct mixen houdt in dat de code-mix past binnen het syntactisch frame. Incorrect mixen betekent dat het ingevoegde woord uit een andere taal niet past binnen het syntactisch frame van de taal waarin gesproken wordt.		Correct code-mixen: 5. *"Waar heeft u bijvoorbeeld Engels geleerd?"* "Op school, maar het meeste in de offices." In correct Nederlands zou 'kantoren' op dezelfde plek komen als waar de spreker nu de code-mix 'offices' plaatst. Uiting (5) is daarom een voorbeeld van correcte code-mixing. Incorrect code-mixen: 6. * "Ik heb seen een beer" In correct Nederlands zou *gezien* (NLse vertaling van 'seen') aan het einde van de zin komen, aangezien het frame zou zijn: "Ik heb een beer gezien". De code-mix is in (6) wel correct voor het Engels syntactische frame: "I have seen a bear". 7. * "Een bear ik zag" In (7) klopt de code-mix in beide talen niet met het gewenste syntactische frame.
Grammaticale fout	**Onder andere:** Contaminatie: Een verhaspeling van twee verschillende woorden of uitdrukkingen met een verwante betekenis, waardoor een verkeerd nieuw	[*] %com: benoemen grammaticale fout	8. "Aan het eind van de wedstrijd legt hij het laatste loodje" (het loodje leggen of de laatste loodjes wegen het zwaarst)

	woord of een verkeerde nieuwe uitdrukking ontstaat. <u>Ongrammaticale zinsconstructies:</u> 1. <u>Vermenging zinsconstructie:</u> De zinsconstructie bevat een fout in de volgorde (mogelijk verklaarbaar vanuit meertaligheid/andere ta(a)l(en) van de spreker). 2. <u>Vernauwing zinsconstructie:</u> Overlappen of samentrekken van twee opeenvolgende zinnen. 3. <u>Zinsconstructie niet afgemaakt:</u> De zin wordt gestart (goed of foutief), maar na een bepaald punt niet afgemaakt. <u>Verminderd/geen gebruik van functiewoorden:</u> lidwoorden, voorzetsels, voegwoorden. <u>Vervanging van functiewoorden:</u> lidwoorden, voorzetsels, voegwoorden. <u>Foutief gebruik werkwoord:</u> 1. <u>Tense fout:</u> De spreker gebruikt de verkeerde tijd of vervoegt foutief met betrekking tot de tijd/tense.		9. "Ik heb gevonden een boek." Komt overeen met het Engels, maar in het Nederlands is het volgende gewenst: "Ik heb een boek gevonden." 10. "En toen ging ik naar huis ging ik meteen." 11. "Ik heb alles kwijt verloren heb alles verspeeld." 12. "Ik ging naar de bakker en toen ja." 13. "Heb altijd hard gewerkt" 14. "Ik ging de winkel" 15. "De boek ligt aan de kast" 16. "Gister kook ik het avondeten." 17. "Morgen was ik hier"
	2. <u>Congruentiefout persoonsvorm-werkwoord:</u> Congruentie houdt in dat het getal van het onderwerp overeen komt met het getal van de persoonsvorm (het werkwoord). Wanneer dit foutief wordt gedaan ontstaat er "incongruentie" en hiermee een congruentiefout. Er zal per tweede (of derde) taal gekeken worden wat de meest gemaakte grammaticale fouten zijn in het Nederlands (moedertaal specifieke problemen). Hiervoor wordt de app "Moedertaal in NT2" gebruikt (Universiteit Utrecht, z.d.). Op deze fouten/problemen wordt vervolgens gelet tijdens de transcriptie/analyse.		18. "Zeven mensen heb aan die wedstrijd meegedaan" 19. "Ik geven jou de appel"
Klankgerelateerde versprekingen	1. Enkel- of meervoudige klankveranderingen, die bestaan uit verwisseling, vervanging en/of toevoeging van klanken (fonematische parafasieën). 2. Vervanging van een woord door een woord met een verwante betekenis (semantische parafasieën).	[*] [: target word] %com: fonematische parafasie %com: semantische parafasie	20. Pieps i.p.v. fiets 21. Passer i.p.v. liniaal
Zelf-geïnitieerde herstelpoging	De begrippenparen [initiëring, herstel] en [zelf, ander] leveren vier vormen van herstel op (Mazeland, 2003):		

	1. <u>Zelfherstel op eigen initiatief;</u> De pp. merkt zelf miscommunicatie op, neemt zelf initiatief tot herstel en voert het herstel zelfstandig (en succesvol) uit. 2. <u>Anderherstel op eigen initiatief;</u> De pp. merkt zelf miscommunicatie op, neemt zelf initiatief tot herstel, maar de gesprekspartner voert het herstel (succesvol) uit. 3. <u>Zelfherstel op initiatief van de gesprekspartner;</u> De gesprekspartner merkt miscommunicatie op, vraagt de pp. om herstel, pp. voert het herstel zelfstandig (en succesvol) uit. 4. <u>Anderherstel op initiatief van de gesprekspartner;</u> • De gesprekspartner merkt miscommunicatie op, vraagt de pp. om herstel, maar de gesprekspartner voert het herstel (succesvol) uit. • De gespreksparter merkt miscommunicatie op en voert het herstel (succesvol) uit.	+//. gevolgd door +,	22. "Ik lig op" +//. +, "Ik zit op een stoel." 23. "Ik wilde naar school nee &-uhm" "Ik wilde naar &-uhm" *"U wilde naar uw werk gaan?"* "Ja!" 24. "Ik voerde gesprekken met de parter" *"Sorry?"* "Met de partners." 25. "Ik liep naar de kruin" *"Wat bedoelt u?"* [Spreker is niet in staat te herstellen] *"Liep u naar de tuin?"* "Ja." 26. "Ik geef de hond altijd vlokken." *"U geeft de hond altijd brokken?"* "Ja."

	5. <u>Mogelijkheid tot initiatie herstel</u> De onderzoeker bemerkt een fout of onduidelijkheid die niet wordt benoemt en/of hersteld door de spreker of de gesprekspartner. Mogelijk hinderde deze fout de communicatie niet. Spreker en gesprekspartner vervolgen het gesprek zonder de fout te benoemen en/of te herstellen. Echter, volgens de onderzoeker was dit wel een mogelijkheid tot initiatie van herstel.	De fout wordt met de juiste code uit dit codeboek aangegeven. Verder zijn er geen bijzonderheden aangezien er geen vorm van herstel of correctie plaatsvindt.	
Mate van succes: overdracht van de boodschap	Voor elke uiting wordt beoordeeld of de uiting met succes werd overgebracht. Indien de boodschap verduidelijking nodig heeft, wordt dit aangegeven met een van de herstel-categorieën die hierboven uiteengezet zijn (**zelfherstel op eigen initiatief, anderherstel op eigen initiatief, zelfherstel op initiatief gesprekspartner, anderherstel op initiatief gesprekspartner**). Indien de boodschap duidelijk is, is er geen label aangegeven in de transcriptie. Direct succesvolle overdrachten worden gekenmerkt door de reactie van de gesprekspartner. Indien deze niet aangeeft dat de boodschap onduidelijk is, was de overdracht direct succesvol. Dit betekent dat ook indien het label **"Mogelijkheid tot initiatie herstel"** is	Wordt alleen aangegeven indien een herstelpoging niet succesvol was. Indien er niets in de comment tier staat kan worden aangenomen dat herstel succesvol was. %com: niet succesvol	

	toegekend de boodschap voor de gesprekspartner duidelijk was en hiermee succesvol. Deze heeft namelijk geen herstel toegepast of om herstel gevraagd. De boodschap mag zowel verbaal, non-verbaal, als beide zijn. In het geval van direct succesvolle overdrachten kan er sprake zijn geweest van **"zelfherstel op eigen initiatief"** of **"Mogelijkheid tot initiatie herstel"**, maar niet van de andere vormen van herstel. Echter, een boodschap kan ook succesvol zijn ná herstel. In dit geval voert de spreker of gesprekspartner herstel uit waardoor de boodschap toch succesvol overgebracht wordt. Een boodschap is niet succesvol overgebracht als zelfs na ander- of zelfherstel de boodschap niet begrepen wordt door de gesprekspartner. Er wordt besloten verder te gaan met het gesprek.		
Gebaren	Onder de term "gebaren" vallen bewegingen van de handen vanuit de intentie om ofwel te communiceren, ofwel verbale communicatie te ondersteunen. Iconische gebaren: *Handelingsgebaar*: de hand doet alsof je het voorwerp gebruikt wordt, bijvoorbeeld doen alsof je een schaar vast	&=hand:icon:schaar &=hand:deik:persoon &=hand:overig:beat &=vinger:icon:tekenen &=vinger:deik:afbeelding &=vinger:overig:beat (NB: eerste/laatste woord zijn voorbeelden. Legt uit waarmee het gebaar	
	hebt met duim en middelvinger om te 'knippen'. *Objectgebaar*: de hand representeert (een deel van) het object, zoals met wijs- en middelvinger schaarbewegingen maken om een schaar uit te beelden. *Vorm/grootte aangeven*: Met één vinger in de lucht tekenen of met de handen/armen de grootte van de referent uitbeelden. Deiktische gebaren: *Wijzen*: naar voorwerpen, mensen of afbeeldingen. Overige gebaren: Een gebaar wat niet onder een van de hiervoor genoemde vormen van gebaren valt.	gemaakt werd en wat het gebaar precies was.)	
Niet-vloeiendheden	Een niet-vloeiendheid is een pauze voor, tijdens of na een uiting. Deze pauze bestaat uit een stilte. Gevulde pauze (fillers): Een pauze waarin een uiting als "uh"/"uhm" wordt gehoord. Een uiting wordt hierdoor tijdelijk onderbroken. Gevulde pauzes kunnen overal in een uiting voorkomen. Gevulde pauze (word fillers): Een pauze die gevuld wordt met een woord als "ja". Een uiting wordt hierdoor tijdelijk	Pauze (.) pauze (..) lange pauze (...) extra lange pauze &-uh &-uhm &-ja	27. "Het was (.) dinsdag." 28. "Ik &-uhm wilde naar &-uh school gaan." 29. "Ik zag die &-ja fiets en ik dacht die is &-ja mooi."

	onderbroken. Word fillers kunnen overal in een uiting voorkomen.		
Correcties	Correctie van error: De spreker start met een verkeerd(e) klank, syllabe, woord, constituent of taal en corrigeert naar het gewenste. Dit is onafhankelijk van de taal. Het kan zowel een error zijn die duidelijk herkenbaar is als verkeerd voor gesprekspartner en/of beoordelaar, of een error waarbij de spreker zelf ingrijpt omdat hij/zij het anders wil zeggen.	[//] %com: error Indien participant een heel andere zin/ander verhaal start om bv. verhaal anders te vertellen: +//. gebruiken en volgende poging starten met +,	30. "Ik zat op een tafel &-uhm stoel." [//] 31. "Ik liep naar.." +//. +, "Ik fietste naar huis."
	Correctie van non-error: De spreker start met een gewenst(e) klank, syllabe, woord, constituent of taal en corrigeert naar een ongewenst woord. Dit is onafhankelijk van de taal.	[//] %com: non-error	32. "Ik zi- lig op een stoel." [//] 33. "Ik zit" +//. +, "Ik lig op een stoel."
	Retracing without correction: De spreker start een klank, syllabe, woord, constituent of taal in, initieert herstel bijvoorbeeld door middel van een (gevulde) pauze, zet vervolgens het eerdere plan voort. Hierdoor ontstaat een herhaling.	[/] &+e &+en	34. "Ik &+he heb heb een hond." [/] 35. "En toen kocht ik een jurk &-uhm een jurk in die winkel" [/]
	Fout zonder correctie: Er treedt een fout op bij de spreker, maar er vindt geen correctie plaats. De fout wordt ook niet bemerkt en/of benoemt door de gesprekspartner (mogelijk omdat de boodschap duidelijk is ondanks de fout).	[*] indien mogelijk [: target word]	36. "Ik schrok me een hoekje" [: hoedje] [*] *Hoekje moet hoedje zijn, maar niemand verbeterd dit.* 37. "Als ik koffie zet haal ik eerst een pak melk uit de vriezer" [: koelkast] [*] *Vriezer moet koelkast zijn, maar niemand verbeterd dit.*
Omschrijvingen	De participant omschrijft een woord in plaats van het woord daadwerkelijk te zeggen.	%com: omschrijving [: target word]	38. "Toen pakte ik uhm zo'n ding om mee te knippen" [: schaar]
Twijfel	De onderzoeker twijfelt over een fout.	[?] Deze code wordt in de CHAT-manual gebruikt bij twijfel over woorden. Hier wordt het gebruikt bij twijfelgevallen over wat voor fout er plaats vindt (zie kolom "voorbeelden").	Het is bijvoorbeeld onduidelijk of de spreker "wij" en "bij" verwisseld door een spraakapraxie (en het dus een articulatorische oorsprong kent) of dat dit komt door een parafasie.

References used in the making of the code-book:

Afasienet. (z.d.). *Symptomen.* Afasienet. https://www.afasienet.com/verwijzers/informatie/symptomen-2/

Appel, R. & Muysken, P. (1987). *Language contact and bilingualism.* Edward Arnold.

Arul, C.A., Solehan, N.A.B., & Othman, N.A.B. (2014). *Age of Acquisition.* Blogs ntu. https://blogs.ntu.edu.sg/hss-second-language-acquisition/wiki/chapter-5/age-of-acquisition/

Bastiaanse, R. & van Zonneveld, R. (2004). Afasie en werkwoorden. *Stem-, Spraak- en Taalpathologie, 12*(2), 105-116.

Green, D.W. (2018). Language control and code-switching. *Languages, 3*(8). http://dx.doi.org/10.3390/languages3020008

Mazeland, H. (2003). *Inleiding in de conversatieanalyse*. Uitgeverij Coutinho.

Muñoz, M.L., Marquadt, T.P. & Copeland, G. (1999). A Comparison of the Codeswitching Patterns of Aphasic and Neurologically Normal Bilingual Speakers of English and Spanish. *Brain and Language, 66*, 294-274. https://doi-org.ru.idm.oclc.org/10.1006/brln.1998.2021

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

Nederlandse Taalunie. (z.d.). *Contaminatie*. Taaladvies. https://taaladvies.net/taal/advies/term/23/contaminatie/

Ruiter, M. (2020). *Cognitieve communicatiestoornissen t.g.v. hersenletsel: Toelichting op de annotatielagen (tiers) binnen ELAN (versie 1.2).* Brightspace. https://brightspace.ru.nl/d2l/le/content/150155/viewContent/957510/View

Sciencedirect. (2021). *Age of Acquisition.* Sciencedirect. https://www.sciencedirect.com/topics/psychology/age-of-acquisition

Stagemax.nl. (z.d.). *Veel gemaakte fouten: Grammatica.* Stagemax. https://www.stagemax.nl/stage-informatie/veelgemaakte-taalfouten/grammatica

Thiessen, V. (2015). *Taal- en stijlfouten: Wat is incongruentie?* Spellingenzo. https://www.spellingenzo.nl/wat-is-een-incongruentiecongruentiefout/#:~:text=De%20congruentiefout%20is%20een%20fout,de%20persoonsvorm%20(het%20werkwoord)

Universiteit Utrecht. (z.d.). *Moedertaal in NT2*. Moedint2. https://www.moedint2.nl/home

Wikibooks. (2021). *Nederlands/Grammatica/Lijst van veelvuldig gemaakte fouten in het Nederlands*. Wikibooks. https://nl.wikibooks.org/wiki/Nederlands/Grammatica/Lijst_van_veelvuldig_gemaakte_fouten_in_het_Nederlands

Wikipedia. (2020). *Age of acquisition.* Wikipedia. https://en.wikipedia.org/wiki/Age_of_acquisition

Wikipedia. (2020). *Gebaar.* Wikipedia. https://nl.wikipedia.org/wiki/Gebaar

Wielaert, S. & Wilkinson, R. (2012). *Partners van Afasiepatiënten Conversatietraining (PACT): Handleiding.* Bohn Stafleu van Loghum.