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Code-switching as a compensatory strategy in the discourse of Galician-Spanish bilinguals diagnosed with dementia

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Abstract. This study analyzes code-switching (CS) as a discursive strategy in the natural speech of Spanish-Galician bilinguals with dementia. The objectives of this work are to: (i) examine whether CS is present in the discourse of Spanish-Galician bilingual people diagnosed with dementia; (ii) determine the pragmatic function of CS at the different stages of the disease in order to assess whether CS is used as a reparation strategy when people with dementia are faced with problematic utterances; (iii) analyze how cognitive decline affects the ability to code-switch. The study includes a sample of 27 participants diagnosed with different types of dementia (13 in the mild stage, 8 in the moderate stage, and 6 in the severe stage). Participants were videotaped discussing their life history, daily routines, and hobbies in their first language (L1). The recorded data were transcribed and annotated using ELAN 6.7. Results indicate that people with dementia retain the ability to code-switch until the severe stage of dementia, where CS may serve as a compensatory strategy. Additionally, differences were observed in the discursive functions of CS between Spanish and Galician speakers, suggesting that language background influences how bilingual individuals with dementia employ CS in communication.

Keywords. dementia, code-switching, bilingual, aging, Spanish, Galician

A peer-reviewed contribution to the *Journal of Language and Aging Research* (JLAR).
Submitted: 2025-03-30
Accepted: 2025-11-07
Published: 2025-12-29
DOI: 10.15460/jlar.2025.3.2.1739

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Please cite as Varela Suárez, Ana and Anastasiia Ogneva. 2025. "Code-switching as a compensatory strategy in the discourse of Galician-Spanish bilinguals diagnosed with dementia." *Journal of Language and Aging Research* 3(2): 107–131. 10.15460/JLAR.2025.3.2.1739.

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1 Introduction

1.1 Sociolinguistic situation of Galicia

The sociolinguistic situation of Galicia, an autonomous community in the northwest of Spain, is characterized by diglossia[2], and both Galician and Spanish are co-official languages according to the Spanish Constitution. Although Galician is considered a minority language (Monteagudo 2017), it has existed for as long as Spanish. Historically, Galician-Portuguese was a fully developed language with well-established written and spoken forms (Duarte 2024). In the 13th century, due to political and historical factors, the two languages diverged and became separate. The official status of Portuguese as a national language led to its early standardization, and today, it is considered one of the most spoken languages in the world (De Lusignan Fan-Moniz 2021). Galician, however, evolved differently (Ramallo 2007).

By the end of the medieval period, Galician was primarily spoken in the region of Galicia and some bordering areas of Asturias. Between the 15th and 19th centuries, Galician survived mainly in its spoken form, while its written use declined. When it reemerged, Spanish linguistic norms were incorporated into it (De Lusignan Fan-Moniz 2021). As Ramallo (2007) points out, in the early 20th century, the Galician language experienced a cultural and literary revival, with prospects for official recognition. However, the Spanish Civil War and Franco's dictatorship (1939–1975) halted these efforts. While Galician was not explicitly banned, the regime's policies promoted Spanish and suppressed regional languages, effectively marginalizing Galician and restricting its cultural production. More recently, Monteagudo (2024) also argues that in order to move toward a situation of balanced societal bilingualism, where Galician and Spanish are used on more equal terms across institutions, education, and everyday life, there must be a greater willingness among Spanish speakers to actively use Galician. In this context, "achieving bilingualism" refers not only to the individual's ability to speak both languages but also to strengthening Galician's role in public domains and intergenerational transmission, thereby fostering a more cohesive and equitable linguistic community.

In the 21st century, De Lusignan Fan-Moniz (2021) notes that the European Charter for Regional or Minority Languages (Council of Europe 2024) granted Galician legal protection and supported its promotion in education, media, and public services. Nevertheless, bilingualism in Galicia remains unequal. According to the Instituto Galego de Estatística (2025), 24 % of young adults and children have little or no knowledge of Galician. Moreover, only 22.7 % of Galician households report that all members are able to speak the language.

Recent data from the Instituto Galego de Estatística (2025) over a 15-year period show that the majority of Galician speakers are adults aged 65 and older. However, there has been a significant decline in the percentage of speakers who use only Galician, dropping from 66.1 % in 2003 to 40.3 % in 2023. Additionally, there has been a noticeable increase in the number of older adults who primarily speak Spanish, rising from 18.1 % in 2003 to 32.1 % in 2023.

General demographic statistics of the Galician population reveal a clear demographic shift towards the aging population (around 26.6 % are older than 65 years,

2. Diglossia is a sociolinguistic phenomenon in which two distinct varieties of a language coexist within a speech community, each serving different social functions (Ferguson 1959).

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57 % of people older than 65 are women, 43 % are men). The mean longevity is 86.9 years for women, and 80.9 years for men (Galician Institute of Statistics, 2025).

According to the Federación de Asociaciones Gallegas de Familiares de Enfermos de Alzhéimer y Otras Demencias (Federación Alzhéimer Galicia 2025), 70 500 people are diagnosed with dementia in Galicia. Out of this, 12.5 % are people older than 65 years, and 31.25 % are older than 85 years. These data underscore the fact that in Galicia there is a large community of bilingual speakers struggling with a neurodegenerative disorder which affects — to different extents — their discursive ability.

Despite this fact, Galician-Spanish bilingualism in the population with dementia has not been explored in research before. Indeed, this is a rather unexplored area of research globally, as we will see in Section 3. Bearing this in mind, this study aims to:

1. Examine whether code-switching (CS) is present in the discourse of Spanish-Galician bilingual people diagnosed with dementia.
2. Determine the pragmatic function of CS in the different stages of the disease in order to assess whether CS is used as a reparation strategy when they are faced with problematic phrases.
3. Analyze how cognitive decline affects the ability to code-switch.

In the following sections we will present a thorough description of our theoretical approach to CS, the most relevant studies conducted so far on bilingualism and dementia, as well as on CS and dementia, as well as the methodology applied to our work and the results we have obtained. The document finishes with a discussion on the implications of the results.

2 Theoretical framework

2.1 Definition of code-switching

A bilingual is not two monolinguals in one person (Grosjean 1989), as it has been demonstrated that bilingual people show some degree of simultaneous activation and interaction of both languages (Bialystok, Craik, and Luk 2012). CS can be broadly defined as the alternating use of two languages by a bilingual speaker within the same interaction (Appel and Muysken 1987). This alternation may occur within a single utterance or sentence (*intra-sentential CS*), or across utterances and conversational turns (*inter-sentential CS*). At this point, it is important to establish the difference between CS and code mixing. Code mixing is defined by Muysken (2000) as the phenomenon in which grammatical elements and lexical items from two different languages appear in the same sentence. It is considered an exclusively intrasentential phenomenon, constricted by grammar.

The term “code-switching” was originally introduced by Vogt (1954), and was initially regarded as a deviant language behavior (Weinreich 1953). However, in recent years, this negative perception has been rejected, and CS is now recognized as an inherent aspect of bilingualism (Poplack 1980; Yim and Clément 2021).

Several proposals have been made to account for the conversational functions of CS (Appel and Muysken 1987; Auer 1995; Gumperz 1982; Ibarra Murillo 2011;

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Myers-Scotton 1993). In this study, we follow the functional classification of Appel and Muysken (1987), which emphasizes that CS is not only a structural phenomenon but also serves multiple communicative purposes: referential, rhetorical/expressive, phraseological, and metalinguistic. This framework allows us to capture the full range of CS observed in our data, beyond mere structural alternation.

1. Referential
    - The speaker produces CS because of a lack of ability in one of the languages.
    - Example: *¡Mira ese* ***carballo*** *(roble), qué grande es!* 'Look at this oak, how big it is!'[3].
2. Rhetorical or expressive
    - The speaker produces exclamations, interjections, and discourse fillers that function as bilingual emblems.
    - Example: *¿Te puedes creer que se porte así?* ***Éche un demo!*** 'Can you believe he behaves like that? He's wicked!'.
3. Phraseological
    - The speaker uses a fixed phrase, meaning an utterance with a stable meaning in the communicative context.
    - Example: *Y viene mi hijo y me pide que le compre un teléfono también a él.* ***Alá vai outra vaca no millo!*** 'And my son comes and asks me to buy him a phone too. *There goes another cow into the cornfield!*'.
4. Metalinguistic
    - The speaker uses CS to show knowledge of expressions in another language. Sometimes it appears with discourse markers that introduce CS, such as "as they say".
    - Example: *Ya sabes cómo es, es, como se suele decir, su* ***modus operandi****.* 'You know how he is, as they say, his *modus operandi*'.

While CS is generally regarded as a communicative strategy, there is an ongoing debate concerning its nature in neurogenic disorders such as aphasia and dementia. Some scholars argue that CS remains fundamentally strategic and interactionally motivated (Goral, Norvik, and Jensen 2019), whereas others contend that in certain cases it may be pathological, reflecting deficits in language control rather than deliberate communicative choices (Fyndanis and Lehtonen 2022).

Typologically, there are different types of CS. One of them is the tag-switching which Gumperz (1982) refers to as interjections and expletives. This type of switching serves as starters or maintaining communication flow. Some of the examples in Spanish are: *bueno* 'well,' *qué va* 'no way,' *¿vale?* 'ok?,' *por ejemplo* 'for example,' et cetera. The other type is intra-sentential CS. This consists of language alternation within the same grammatical sentence or clause (Van Hell, Litcofsky, and Ting 2015). For example, *bueno carallo* 'well' and *tú no sabes cómo es esa . . .* 'you don't really

3. The sentence is in Spanish, the CS is produced in Galician

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know how she is.' Finally, there is an inter-sentential CS which consists of inserting entire sentences from one language (L1) into another language (L2) and vice versa. For example, *xa che dixen que non as quero. ¿Me quieres escuchar?* 'I already told you that I don't want them [in Galician]. Do you want to listen to me? [in Spanish].'

Previous research suggests that CS is not an arbitrary linguistic shift but rather a communicative strategy influenced by several factors (Clyne 2003; Poplack 1980). Linguistic and social factors were found to be relevant in CS (Gumperz 1982; Poplack 1980). Bilinguals may code-switch to signal belonging to a social group or to adapt to the communicative setting (e. g., formal and informal contexts) (Gardner-Chloros 2009). A dditionally, social attitudes may encourage or discourage CS. Gumperz (1982) points out that as a direct consequence of diglossia, the minority language becomes "we-code" and the majority language becomes "they-code," where the latter is associated with informal and in-group activities, and the former is associated with formal activities and larger out-group relations.

Furthermore, the level of proficiency in language has also been discovered to influence CS. Some studies pinpoint that CS is usually employed as a compensatory strategy when the language skills in one of the languages is deficient (e. g.,Cheng and Butler 1989; Cook 2002; Hughes et al. 2006). A compensatory strategy is conceived as a manifestation of strategic competence, one of the main areas of communicative competence. By strategic competence we refer to those resources speakers rely on in order to tackle communicative problems (Canale and Swain 1980, 1981). It comprises a series of both verbal and non-verbal skills which are used to anticipate problems, as when the speaker detects the trouble source before it happens, or to repair utterances that have not fulfilled the intended communicative purpose (or, in Gricean terms, have flouted one of the conversational maxims of quality, manner, or relevance).

However, other research has argued that to be able to switch code efficiently, speakers must have acquired a competent level in both languages (Becker 1997). On the one hand, Poplack (1980) stated that bilinguals with a higher language competence switched code more frequently. However, Aldalbahy (2022) found that whereas there seems to be a significant correlation between the type intra-sentential versus inter-sentential and language proficiency, none could be found between CS frequency and language proficiency.

Typological distance plays a significant role in shaping CS processes (Hofweber, Zeller, and Treffers-Daller 2023). Muysken (2000) proposed that the degree of typological similarity between languages can influence both the frequency and nature of CS. Supporting this idea, Treffers-Daller et al. (2022) examined CS among Malay-English bilinguals, offering valuable insights into how structural similarities and differences between languages contribute to the variation and complexity of CS patterns.

Finally, Svennevig et al. (2019) suggests that the degree of cognitive decline may also affect CS. However, not a lot of research has been conducted on this topic. Bearing this in mind, this study aims to address this gap.

3 State of the art

3.1 Dementia and bilingualism

Dementia and bilingualism have been extensively studied over the past decades. One of the main questions of this research is whether bilingualism delays the onset of

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dementia symptoms (Alladi et al. 2013; Anderson, Hawrylewicz, and Grundy 2020; Bialystok, Craik, and Freedman 2007). A significant body of evidence indeed suggests that bilingualism may delay the manifestation of dementia symptoms by acting as a form of cognitive reserve that helps the brain cope with neurodegenerative changes (Anderson, Hawrylewicz, and Grundy 2020).

In a pioneering study by Bialystok, Craik, and Freedman (2007), 184 people diagnosed with dementia were examined, half of whom were bilingual. The findings revealed that bilingual participants exhibited dementia symptoms approximately four years later than their monolingual counterparts. Subsequent studies confirmed these results. Craik, Bialystok, and Freedman (2010) explored data from 211 people diagnosed with Alzheimer's disease (AD), 102 bilingual and 109 monolingual. The findings revealed that bilingual people experienced a delay in the onset of AD symptoms by approximately five years and received their confirmed diagnosis 4.3 years later compared to monolinguals. More recently, Alladi et al. (2013) conducted research in India involving 648 people diagnosed with dementia and found that bilingual individuals developed dementia symptoms four and a half years later than monolinguals, irrespective of factors such as education, occupation, and urban or rural residence. A later study by Bialystok et al. (2014) also corroborated the previous findings. They explored the onset of the disease in 74 individuals with Mild Cognitive Impairment (MCI) and 75 people with AD; half of the participants in each group were bilinguals. The results revealed a delay of 4.7 and 7.3 years respectively. This study also included other lifestyle variables that could potentially affect the results, such as diet, smoking, alcohol consumption, physical activity, and social activity, which did not explain the variability between groups of monolinguals and bilinguals. These studies collectively support the notion that bilingualism serves as a protective factor against cognitive decline, potentially delaying the onset of dementia symptoms through enhanced cognitive and neural reserve mechanisms. However, the evidence is not entirely consistent. For instance, Keijzer and Schmid (2017) found no significant differences in dementia onset between bilinguals and monolinguals, and Mukadam, Sommerlad, and Livingston (2017) have even suggested that multilingualism might accelerate onset due to the cognitive demands it imposes. Furthermore, as Liao (2023) notes, one important research gap concerns how CS itself may be affected by cognitive reserve and executive functions. This highlights the need to connect findings on bilingualism's protective effects with more fine-grained analyses of discourse strategies such as CS.

Other studies, however, argue that bilingualism's effects on pathological aging may be restricted to certain situations. Gollan et al. (2011) found that the delay in AD onset due to bilingualism was evident only in individuals with lower education levels, whereas highly educated Spanish-English bilinguals in the United States did not experience the same advantage. Similarly, Chertkow et al. (2010) reported that bilingualism was associated with a later onset of AD only among immigrants, while non-immigrant bilinguals showed no significant delay. These findings suggest that the cognitive benefits of bilingualism may be influenced by factors such as education level and immigration status.

Beyond behavioral studies, neuroimaging research has provided additional evidence supporting the protective effects of bilingualism against neurodegeneration. For example, Schweizer et al. (2012) used computed tomography scans to examine brain atrophy in bilingual and monolingual individuals diagnosed with AD. While both

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groups exhibited similar levels of cognitive impairment, bilingual individuals showed greater brain atrophy. At first glance, this finding may seem contradictory to the idea that bilingualism is beneficial. However, since monolinguals and bilinguals were matched for symptom severity, the results actually suggest a bilingualism advantage. Bilingual individuals demonstrated a greater ability to compensate for neural damage, maintaining cognitive performance despite more advanced brain deterioration. This supports the notion that bilingualism enhances cognitive reserve, allowing individuals to cope with neurodegenerative changes more effectively. Similarly, Perani et al. (2017) investigated metabolic connectivity in the brains of bilingual and monolingual people diagnosed with AD using fluorodeoxyglucose and PET. Their results demonstrated that bilingual patients had better-preserved metabolic connectivity in brain regions typically affected by AD, particularly in areas associated with executive functions and memory.

Overall, recent studies and meta-analyses report that people who actively use two languages tend to experience dementia symptoms five to seven years later than those who only speak one language (Anderson, Hawrylewicz, and Grundy 2020; Brini et al. 2020; Gallo et al. 2022). It is, however, still necessary to conduct further large-scale cross-national studies in order to corroborate the effects of bilingualism and multilingualism on pathological aging (Klein, Christie, and Parkvall 2016).

3.2 Dementia and code-switching

The use of CS in dementia has not been as frequently studied as other issues in sociolinguistics. Although a few early studies briefly mention this subject (e. g.,Goldstein and Katz 1937), it gained initial prominence in the 1990s, when most of the work on this topic agreed that bilingual and plurilingual people diagnosed with this syndrome frequently mixed terminology from the languages they knew (De Santi et al. 1990; Hyltenstam and Stroud 1993; Luderus 1995).

Additionally, Hyltenstam (1995) conducted a study with 6 participants with mild AD (Finnish L1, Swedish L2) and concluded that the structure and principles that healthy individuals apply when switching codes are the same as those applied by people with dementia. She found that most of the relevance-related issues in CS in dementia, that is those switches that occur "out of the appropriate context" and thus are "devoid of their conventional social significance" Hyltenstam (1995, 305) were due to an impairment in attention skills, since reduced cognitive processing capacity makes it difficult to sustain focus on topic, interlocutor, and context.

Taking a different approach, Friedland and Miller (1999) applied Conversation Analysis techniques to a group of 4 people with AD (English-Afrikaans bilinguals). They discovered that this group frequently used the incorrect code or mixed both languages, leading to statements that were difficult to interpret. Similarly, De Picciotto and Friedland (2001) conducted an experimental naming study with 30 healthy individuals and 6 participants with AD, all of whom were bilingual in English and Afrikaans. They concluded that whereas healthy individuals relied on CS as a compensatory strategy, individuals with AD did not make use of it during the task.

In their research, Gómez-Ruiz, Aguilar-Alonso, and Espasa (2012) worked with 12 bilingual individuals (Catalan-Spanish) in the mild stage of AD. They observed that the mean number of CS instances was similar between their participants and their control group (healthy individuals); additionally, the number of borrowed words and

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structures was higher from Spanish to Catalan than vice versa in both the healthy and the Alzheimer's group.

In a study conducted from a more pragmatic approach, Svennevig et al. (2019) analyzed CS in the discourse of seven multilinguals with different language combinations, all diagnosed with dementia and with Norwegian as an L2, acquired in their late teens or twenties. The authors found that individuals with AD usually employ CS to compensate for anomia. They also observed that even if in most cases the switch could be considered pertinent (in Gricean terms), deficits in episodic memory could increase the occurrence of non-pertinent switches, either because the utterance was produced in a language that their interlocutor did not understand or because it was impossible to decode.

Indeed, Friedland and Miller (1999) and Svennevig et al. (2019) describe cases where CS resulted in utterances that were difficult to interpret or non-pertinent in context. These findings could be seen as aligning with Fyndanis and Lehtonen's (2022) notion of "pathological CS," where switching reflects a breakdown in language control rather than an intentional strategy. In this paper, the authors also reflect on the pragmatic functions of CS in dementia discourse. Firstly, they detected that CS is sometimes used as a compensatory strategy for word retrieval when the speaker cannot find a particular word in L2; moreover, CS is also used for making metacommunicative parentheses, for supplying additional communicative information such as expressing frustration with the interaction; finally, the authors also address the "inappropriate" change of code, which happens when the interlocutor may not deem the switch adequate in that particular communicative context.

More recently, Schneider (2023) wrote a detailed book on code choice in people diagnosed with AD. The results of this work were highlighted in Schneider and Bös (2024), where the authors assessed the function of CS in interactions between two women with AD (Spanish from Puerto Rico L1, English L2) and their caregivers through a Conversation Analysis approach. The authors focus on the pragmatic preparation the speaker engages in when introducing a switch, distinguishing two main categories: non-inclusive CS, when no code accommodation is involved, resulting in epistemic asymmetry between the participants, and inclusive CS, when the speaker recognizes the uncertainty of the switch and chooses to include co-constructions. They observed that both subjects with AD showed high language awareness and that communicative success was more easily achieved when their conversational partners accommodated their code to them.

Despite this growing body of research, further studies are still needed. In their recent work, Stilwell et al. (2016) reviewed 186 articles on bilingualism and cognitive decline, particularly focusing on two about CS, and concluded that more research should be conducted on this subject (and with different samples) in order to reach clearer conclusions.

This work intends to shed light on some of these remaining issues, particularly on how cognitive decline affects CS and the function CS plays on discourse at the different stages of the disease.

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4 Methods and materials

4.1 Participants

The sample of this study contained a total of 27 participants (Table 1).

Table 1: Participants' data description

ID	Gender	L1	Diagnosis	GDS	Length (min.)	Word count	Total no.CS
I01	Female	Spanish	AD	7	4.02	29	0
I02	Female	Galician	AD	7	4.62	44	1
I03	Female	Spanish	AD	7	15.0	676	0
I04	Male	Galician	Mixed	6	26.67	2067	19
I05	Male	Spanish	AD	6	2.22	39	0
I27	Female	Galician	Vascular	6	9.57	452	3
I07	Female	Galician	AD	5	23.05	1443	66
I08	Female	Galician	AD	5	17.82	996	11
I09	Male	Galician	AD	5	15.05	1229	14
I10	Male	Galician	Mixed	5	13.47	1153	4
I11	Female	Spanish	Vascular	5	9.08	240	1
I12	Female	Galician	Non-specified	5	13.47	1291	14
I25	Female	Galician	Vascular	5	6.32	351	4
I26	Female	Galician	Non-specified	5	4.38	281	6
I06	Female	Spanish	AD	4	21.4	2039	5
I13	Female	Spanish	AD	4	23.35	3498	2
I14	Female	Galician	AD	4	19.83	2003	22
I15	Female	Spanish	AD	4	14.67	1245	1
I16	Female	Spanish	AD	4	17.22	2235	6
I17	Male	Spanish	AD	4	20.43	2262	2
I18	Female	Spanish	AD	4	15.9	1617	5
I19	Male	Spanish	AD	4	10.4	467	0
I20	Male	Spanish	AD	3	11.7	689	2
I21	Male	Spanish	AD	3	20.2	2388	0
I22	Female	Spanish	Frontotemporal	3	15.48	1581	0
I23	Female	Spanish	Mixed	3	15.33	1763	1
I24	Female	Spanish	Frontotemporal	3	9.13	637	3

The inclusion criteria were as follows:

- The participant had to be over 65 years old.
- The participant had to have received a diagnosis of dementia from a neurologist.
- The participant could not have a severe form of aphasia that limits the understanding of their statements.
- The participant could not have any audiovisual deficits that can interfere with the results of the study.
- The participants had to be either bilingual or have spent a significant period of time living in a bilingual community.

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In the group, 70.3 % (n = 19) were women and 29.6 % (n = 8) were men; 48.1 % (n = 13) were in the mild stage of the disease, 29.6 % (n = 8) in the moderate stage, and 22.2 % (n = 6) in the severe stage. This study does not have a control group, as the objective is to assess the variation in the function of CS in discourse as the disease progresses; therefore, the informants in the mild stage act as the referential group. Concerning the diagnosis, 63 % (n = 17) suffered from AD, 11.1 % (n = 3) had vascular dementia; 11.1 % (n = 3) had mixed dementia; 7.4 % (n = 2) had frontotemporal dementia; and 7.4 % (n = 2) had a non-specified form of the syndrome. With regard to their language profile, 85.1 % (n = 23) were raised in Galicia and grew up bilingual. Among them, 40.7 % (n = 11) had Galician as their first language, and 48.1 % (n = 16) primarily spoke Spanish. Additionally, 11.1 % (n = 3) spoke mainly Spanish, but understood Galicia. Table 1 summarizes these data.

4.2 Instruments

Most of the participants in this study were referred from AFAGA (Galician Association for AD and other dementias). In order to join this association, members must have received a diagnosis of a dementia-causing disease from a team of neurologists. The psychologists from this association provided us with a neurocognitive report for each informant, including the Barthel Index (Mahoney and Barthel 1965), as well as the Mini-mental Status Examination in its Spanish version (Lobo et al. 1999). For those cases in which the informants were contacted outside the association, the neurocognitive report was completed by the researchers with the help of the caregivers. Apart from this, the Pragmatic Coherence Assessment Protocol (Varela Suárez 2018) was also applied to obtain a comprehensive natural language profile of each of them.

4.3 Data production

This study aimed to analyze CS occurrences, as well as their pragmatic function in discourse, in natural language. Hence, a qualitative-naturalistic approach was taken, and subsequently a quantitative analysis of the resulting data was implemented. The experiment consisted of the elicitation of a semi-guided dialogue, by posing to the informants questions about their daily lives, routines, past history and hobbies. All the questions were posed in the informant's L1, except for two, which were designed to determine whether the participants switched code with the interviewer. The interviewer was a bilingual person, with Spanish as L1 and Galician as L2. The length of the interactions varied between 5 and 30 minutes, depending on the participant's ability and willingness to talk. Since participants were interviewed only once, the data obtained in this study are cross-sectional rather than longitudinal. All the interactions were videotaped so that non-verbal communication could also be taken into account. The first recording took place in April 2016 and the last one in January 2024, as all the recordings belong to CORDESGAL (see Varela Suárez 2018), a corpus of oral production by people diagnosed with dementia with Galician and Spanish as their first languages. Recordings have been progressively added to the corpus since its inception.

This study follows a strict data protection policy. Both the guidelines in the Declaration of Helsinki (described by Williams 2008) and the OECD Guidelines on the Protection of Privacy and Transborder Flows of Personal Data (OECD 2002) were

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thoroughly applied during the data production process. A data protection agreement describing the purpose of the study and declaring the informant's rights was presented to and signed by the caregivers. This work does not openly mention any personal data and all the informants remain anonymous, therefore it did not require specific approval from an ethics committee (per Article 5 of Ley Orgánica 15/1999, de Protección de Datos de Carácter Personal), as it involved the analysis of anonymized recordings.

4.4 Annotation and transcription

The recordings were transcribed manually following the guidelines proposed by Müller (2005), which are specifically devised for working with clinical data. Both the transcription and annotation of the recordings were conducted using the software ELAN. In order to study the phenomena stated in the objectives, three annotation tiers were created: (1) "nature," intended to assess whether the switch in code occurred naturally or as a result of a researcher's cue; (2) "direction," designed to indicate the starting language (language A) and the target language (language B); and (3) "function," devised to analyze the pragmatic function of the CS in the interaction. Each of these tiers was divided into different categories using the controlled vocabulary function ELAN offers. These categories were created by following (a) the data compiled in the theoretical framework of this work and (b) the type of the occurrences found in the corpus. Table 2 explains in detail all the analysis categories in the study and provides examples directly extracted from the corpus.

In order to achieve annotation reliability, each author annotated half of the corpus and then reviewed the other researcher's half. In the cases where the annotations differed, a decision was reached by consensus.

4.5 Data analysis

After the qualitative analysis in the annotation process, the quantitative analysis was conducted. All descriptive statistics were calculated using Microsoft Excel. Additionally, cross-variable analysis was performed in IBM SPSS Statistics version 23, including Pearson's correlation, chi-square, Mann-Whitney U, and ANCOVA.

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Table 2: Annotation guidelines with examples from the corpus

Tier	Type	Description
Nature	Voluntary	The informant switches code voluntarily.
	Elicited	The informant changes the language as a result of the researcher switching code.
	No CS	The informant does not switch the code in spite of the researcher changing code.
Direction	SP > GAL	The informant is speaking Spanish and utters a sentence in Galician.
	GAL < SP	The informant is speaking Galician and utters a sentence in Spanish.
Functionality	Repetitive	The informant repeats the sentence from language A in language B, in order to reinforce the message. [SP] Voy a ir ahí, ¿eh? [GAL] *Mira que vou, eh?* → I'm going there! Just so you know, I'm going!
	Rhetoric	Exclamations, interjections and fillers that work as bilingual expression forms. ¿Te puedes creer que se porte así? *Éche un demo!* → Can you believe him behaving like that? He's a demon!
	Metalinguistic	It is used to intentionally show the knowledge in other language. It is frequently accompanied by discourse fillers such as "as they said" or "as it is commonly called." Ya sabes cómo es, es, como se suele decir, un *miñaxoia*." → You know how he is, as they said, he's "naif."
	Appreciative	A suffix is added to convey an appreciative or derogatory value. Todavía es muy *pequeniño*. / Es un niño muy *mentireiro*. → He's still so tiny/ He's a little liar.
	Inferential	It works as an emphatic marker through a conversational implicature. No me puedo creer que saliese sin chaqueta. *¿Vai calor, eh?* → I can't believe I've gone out without a jacket. It's hot, isn't it?
	Referential	The speaker uses a word in language B due to an inability to retrieve the word in language A. ¡Mira ese *carballo* (roble), que grande es! → Look at that oak, how big it is!
	Compensatory	The speaker changes the code as a distraction of the fact that they are incapable of answering fully their interlocutor's question. —¿Cuántos años tienes? — *Moitos!*[4] —How old are you? — Very.
	Phraseological	The speaker introduces an idiom that only exists in language B. Y viene mi hijo y me pide que le compre un teléfono también a él. *Alá vai outra vaca no millo!* -> And then my son comes and asks me to also buy him a phone. Here we go again!
	Reported	The speaker switches code as a marker of a change of the narrator, in order to introduce reported speech. —Y va y me dice: *"¿quéresme?"* —And then he asks me: "do you love me?".

5 Results

5.1 Code-switching frequency

The total number of code switches (CS) in the corpus was 192. The total number of CS uttered by each participant can be observed in the last column of Table 1. In total, 77.8 % (n = 21) of the participants included a switch of code in their speech. Regarding

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the frequency of CS depending on the degree of cognitive decline, a CS/minute rate was calculated. In the mild stage, the average rate was 0.20 CS/minute; in the moderate stage, it was 0.98 CS/minute; and in the severe stage, it was 0.21 CS/minute. However, this should not be taken as a representation of how the CS/minute rate varies across stages, since, as shown in Table 1, the distribution of L1 in the sample is not homogeneous across stages. The CS ratio was higher among Galician speakers (8.72 code switches per speaker) than among the Spanish ones (6 code switches per speaker). Additionally, 100 % (n = 11) of the Galician speakers included a change of code in their discourse, whereas this percentage was lower among Spanish speakers (68.7 %; n = 11). Regarding the distribution of the total number of code switches, 85.4 % (n = 164) were produced by Galician speakers and 14.6 % (n = 28) by Spanish speakers. Thus, those informants with Galician as their first language produced significantly more CS than those whose first language was Spanish ($\chi^2(1) = 158.71$, $p < 0.001$). However, when examining the individual distribution of our data, the Mann-Whitney U test shows no significant difference in the CS ratio between both groups (U = 48.5, p>0.05), probably due to the addition of the cognitive decline variable, which will be examined in Section 5.4 of this paper. None of the participants born outside of Galicia switched code during their interactions.

5.2 Code-switching and communicative intention

In total, 97.9 % (n = 190) of the switches were voluntary. When observing the participants' reactions to their interviewer changing code, we see that in 81.8 % (n = 18) of the interactions, the interviewee did not react by changing the code accordingly, whereas in 18.2 % (n = 4) of them they switched to language B.

5.3 Pragmatic function

Regarding the pragmatic function that CS played in the discourse of our participants, the most common uses in our corpus were rhetorical and referential (both 30.7 %, n = 59). Additionally, 14.6 % (n = 28) of the switches had a phraseological function, and 11.5 % (n = 22) were used as a compensatory strategy. Less frequently, reported speech (5.7 %, n = 11) and inferential functions (3.6 %, n = 7) were also detected. Finally, the least frequent occurrences were the appreciative (2.1 %, n = 4) and the metalinguistic functions (1.0 %, n = 2). The repetitive function was not observed in this corpus. Figure 1 represents the frequency of each pragmatic function analyzed in this study.

Furthermore, when examining the most common pragmatic function for each language, we observed relevant differences between both populations. To start with, the L1 Galician-speaking participants used the rhetorical function the most (36 %, n = 59), followed by the referential (25 %, n = 41) and the phraseological (17.1 %, n = 28) functions. This group also used CS as a compensatory strategy (12.8 %, n = 21) and as a marker for reported speech (5.5 %, n = 9). Finally, the inferential (3 %, n = 5) and the appreciative functions were also detected (0.6 %, n = 1). The metalinguistic function was not observed in this group's discourse.

On the other hand, the Spanish-speaking informants exhibited fewer types of functions. The most common for this group was by far the referential use (64.3 %, n = 18). The appreciative (10.7 %, n = 3), inferential (7.1 %, n = 2), reported (7.1 %, n = 2), metalinguistic (7.1 %, n = 2), and compensatory (3.6 %, n = 1) functions were also present

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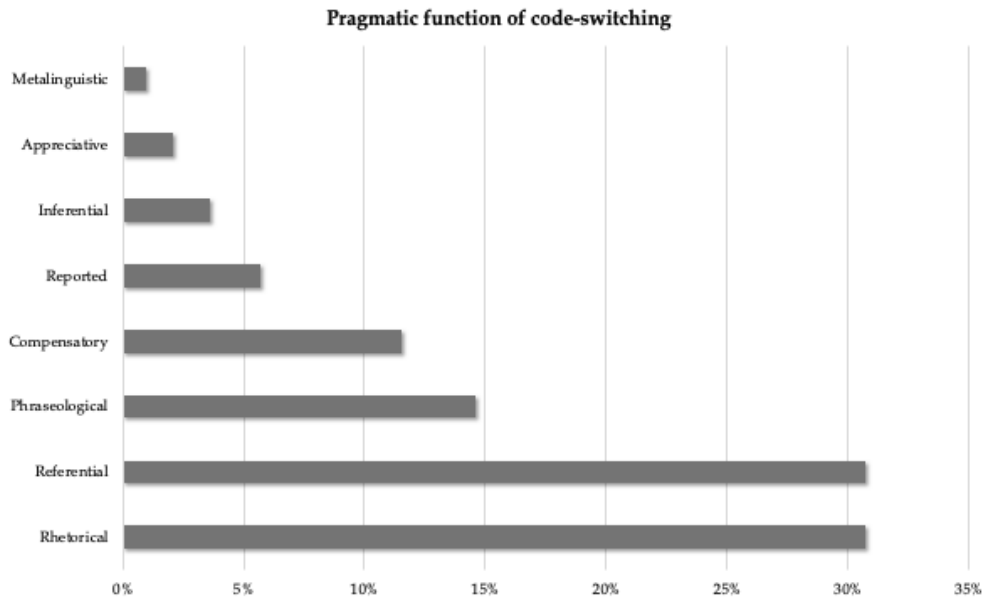

Figure 1: Frequencies of CS pragmatic function in the corpus

in these participants' discourse. The rhetoric and phraseological functions were not observed in this group. Figures 2 and 3 show a comprehensive depiction of these data.

5.4 Code-switching and cognitive decline

In order to meet objective (3) of this study, we needed to cross-analyze the variables "ratio of CS" and "level of cognitive decline." In this sense, the representation of this result follows an almost perfect Gaussian bell curve (GDS-3: 0.1 CS/minute; GDS-4 = 0.3 CS/minute; GDS-5 = 1 CS/minute; GDS-6: 0.3 CS/minute; GDS-7 = 0.1 CS/minute) This means that no significant correlation was found between these two variables ($r = .097$; $p = .629$). However, a two-way ANCOVA was conducted to determine the effects of both first language (Galician or Spanish) and cognitive impairment on CS ratios, given the results obtained in 5.1. The results indicate that the relationship between cognitive impairment and CS ratios varies depending on the participant's first language (F (1, df2) = 8.032, $p = 0.009$).

Given that previous research indicates that compensatory strategies are most common in the intermediate stage of the disease (GDS-5) (Varela Suárez 2020), the main hypothesis to explain this phenomenon is that CS is being used as a compensatory strategy by the participants in this stage. Thus, the function of the CS in the three main stages was observed, in order to identify a pattern.

The results indicate that the most common function of CS in GDS-3 was referential (50 %, n = 3), followed by reported speech (33.3 %, n = 2) and appreciative (16.7 %, n = 1); in GDS-4, the referential function was also the most frequent (46.5 %, n = 20), followed by rhetorical (18.6 %, n = 8), reported speech (14 %, n = 6) and compensatory (7 %, n = 3) functions; the metalinguistic, appreciative, and inferential functions were

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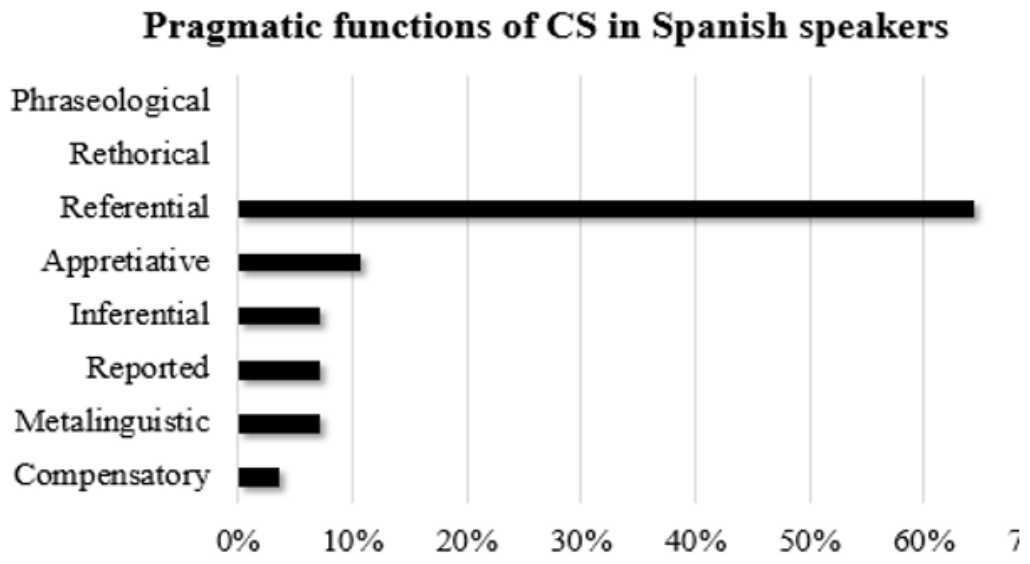

Figure 2: Pragmatic functions of CS among Spanish speakers

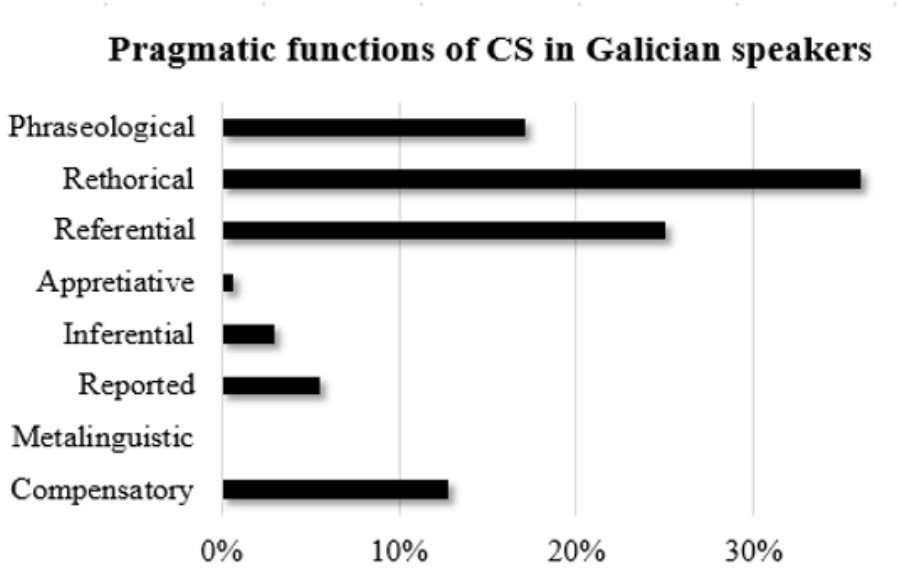

Figure 3: Pragmatic functions of CS among Galician speakers

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each 4.7 % (n = 2). In GDS-5 the rhetorical function was the most used (34.2 %, n = 41), followed by referential (29.2 %, n = 35), phraseological (23.3 %, n = 28) compensatory (5.8 %, n = 7), inferential (4.2 %, n = 5), reported (2.5 %, n = 3) and appreciative (0.8 %, n = 1). In GDS-6, compensatory was the main function (50 %, n = 11), followed by rhetorical (45.5 %, n = 10) and, to a lesser extent, referential (4.5 %, n = 1). Finally, in GDS-7 only the compensatory function appeared (100 %, n = 1). This indicates that, rather than being the most frequent in the moderate stage, the use of CS as a compensatory strategy increases as the disease progresses. Indeed, a strong significant correlation appears between these two variables ($r = .900$, $p < 0.037$).

Figure 4 represents the distribution of function frequencies by GDS level. For GDS-7, the data were limited to a single utterance, which accounts for the lack of variety in the representation of functions.

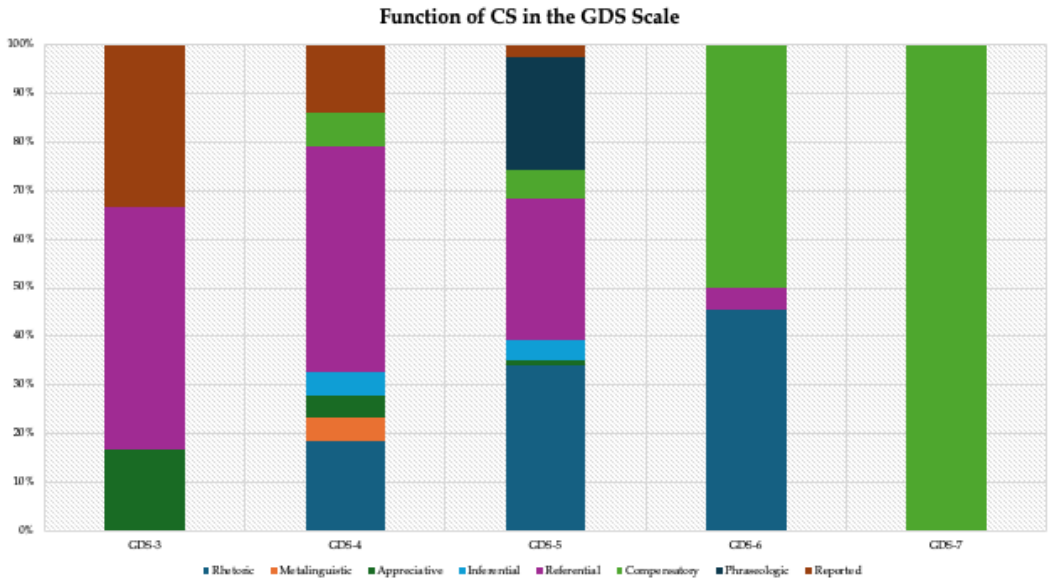

Figure 4: CS functions classified by GDS scale

5.5 Double code-switching

During the analysis of our data, we found an occurrence that was not predicted by our initial hypothesis: three of our informants — all of them with Galician as their first language — switched between codes twice in a single utterance. For example, we can observe this phenomenon in sequence (1).

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(1) Inv: Investigator, I04: Informant

01 Inv: [español] Cuéntame un poco de tu vida que me interesa mucho, que me contaron que tuviste una vida muy interesante.
[Spanish] Tell me a little bit about your life. I'm really interested; I've been told that you've had a very interesting life.

02 I04: [gallego] Bah! *No se pode botar muito ... Cosa porque a xente non ...* [español] No se ... Se-se-se ... Se empieza a afeitar para arriba
[Galician] Meh! You can't give a lot of ... Thing because people don't ... [Spanish] Don't ... They ... They start to wash their hands of it.

Here, the informant was previously speaking in Spanish, so the researcher asked her next question in the same language. Then, the participant switched code from Spanish to Galician, and, midway through the sentence, he switched back to Spanish. In all three instances in which this happens along the corpus, the first switch emerged as a compensatory strategy when the participant was unsure how to answer the question. Additionally, in each of these three occurrences, the second switch marked an abrupt change of topic, allowing the informant to continue with the conversation despite the previous trouble source. This observation resonates with Schneider's (2023) discussion of switching patterns in cognitively demanding moments, where CS (and reswitching) can emerge as an interactional strategy to manage communicative trouble sources and to lighten the cognitive load of the exchange.

6 Discussion and conclusions

The subject of study of the present research was the presence, function, and implications of CS in the discourse of Spanish-Galician bilingual individuals diagnosed with dementia.

The first objective was to examine whether CS is present in the discourse of Spanish-Galician bilingual people diagnosed with dementia. Our findings confirm the presence of CS among bilinguals with dementia, in line with prior studies (De Santi et al. 1990; Hyltenstam and Stroud 1993; Luderus 1995). Notably, CS was particularly prominent in participants whose dominant language was Galician, which aligns with the findings of Gómez-Ruiz, Aguilar-Alonso, and Espasa (2012) in Catalan-Spanish bilinguals, where Catalan-dominant speakers incorporated more Spanish terms than vice versa.

Furthermore, CS served multiple functions across all stages of the disease, although the variety of uses reduces in the severe stage. This supports Schneider and Bös's (2024) hypothesis that individuals in the early stages of dementia retain code awareness and change it adequately in different discourse functions. Additionally, our data indicate that most instances of CS were voluntary, since participants responded to interlocutor-induced CS very little. This finding corroborates the results of Friedland and Miller (1999), which suggest that bilingual individuals with dementia do not engage in interactive CS adaptation. Moreover, our results align with those of Svennevig et al. (2019), showing that CS can sometimes function as a compensatory strategy for lexical retrieval. The exception was the severe stage, in which CS func-

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tions were primarily compensatory and phraseological, mainly serving to complete the questionanswer adjacency pair. No "inappropriate" use of CS was detected, which is likely explained by the close linguistic proximity of the languages analyzed in this study. Furthermore, we observed that speakers of different languages employ CS with distinct functions, highlighting the individual variability in bilingual language use.

The second objective was to determine whether CS was used as a reparation strategy by people with dementia when they are faced with problematic utterances. Concerning this, our findings contrast with De Picciotto and Friedland (2001), who did not observe CS as a compensatory mechanism in their data. This discrepancy is likely due to methodological differences between the studies, as theirs took an experimental approach, whereas ours followed a naturalistic approach to discourse. Additionally, the linguistic distance between the languages analyzed in both studies may also play a role in these divergent results (Eppler 2014).

Moreover, our results also pinpoint that as cognitive deterioration progresses, CS is increasingly used as a compensatory strategy, confirming Hyltenstam's (1995) observation that CS helps maintain conversational structure. Furthermore, Svennevig et al. (2019) proposed that CS compensates for anomia, which is consistent with our findings: the referential function of CS remained prevalent until the advanced stage, where it nearly disappeared. Additionally, we identified a pattern of double CS shifts: the first occurring as a reformulation and the second introducing a topic change, suggesting a compensatory function. All these data support the idea that bilingualism contributes to cognitive reserve, potentially leading to better comprehension and delayed symptom onset (Alladi et al. 2013; Bialystok, Craik, and Freedman 2007; Bialystok et al. 2014; Craik, Bialystok, and Freedman 2010).

Lastly, the third objective in our research was to analyze how cognitive decline affects the ability to code-switch. Although our sample does not allow us to conclude that the severity of cognitive decline directly affects CS frequency, we observed a reduction in the variety of discourse functions over time. In the early and moderate stages, CS occurred with seven distinct functions, whereas only three functions were recorded in the severe stage. Moreover, statistical analyses indicate that the combination of first language (L1) and Global Deterioration Scale (GDS) scores significantly determines the CS rate per minute. This finding highlights the complex interaction between linguistic background and cognitive decline, suggesting that while bilingual individuals may continue to code-switch, the functional diversity of CS diminishes as dementia progresses.

In addition to the relationship between cognitive decline and CS, our data highlight the interaction between linguistic background and CS behavior. Specifically, Galician-dominant participants not only switched more frequently than Spanish-dominant ones but also employed a broader range of pragmatic functions, including rhetorical and phraseological uses, which were absent in the speech of Spanish-dominant participants. This pattern suggests that CS strategies are partly shaped by the sociolinguistic environment in which each language is embedded. For Galician speakers, CS to Spanish appears to provide greater discursive flexibility, possibly reflecting both the minority status of Galician and its historically diglossic relationship with Spanish (Monteagudo 2024). By contrast, Spanish-dominant participants tended to use CS primarily for referential purposes, often to fill lexical gaps with Galician terms. These findings indicate that linguistic background interacts with dementia progression to influence not only the frequency but also the functional repertoire of CS.

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Although this study provides valuable insights on CS in dementia, certain limitations must be acknowledged. First, the sample size is relatively small and includes participants with different types of dementia (AD, vascular dementia, mixed dementia, et cetera), which may introduce variability in the findings. Additionally, the distribution of languages across disease stages is uneven, which could influence the observed patterns of CS. These factors limit the generalizability of the results and suggest the need for further research with a more balanced and larger sample.

Considering the findings in the present study, several avenues for future research are proposed. One important direction is to contrast these results with data from other Peninsular bilingual populations, such as Catalan and Basque speakers, to provide a broader linguistic perspective on CS in dementia. Moreover, our findings suggest that from the moderate stage of dementia onward, CS becomes less effective, impacting discourse coherence. Future research should further analyze the relevance of CS at different stages of dementia and its specific effects on communication, particularly in relation to language control and cognitive processing. Another important area of exploration is conducting experimental studies on CS across different types of dementia. Currently, most research focuses on AD, while other forms of dementia, such as vascular dementia, mixed dementia, and frontotemporal dementia remain underexplored in relation to CS. Examining how CS manifests differently across these conditions could provide valuable comparative insights into bilingual language processing and cognitive decline. Additionally, future studies should aim to include a more diverse sample by incorporating participants from Galicia's inland regions. This would allow for a more comprehensive understanding of CS patterns across different linguistic communities and sociolinguistic contexts.

Despite these limitations, this study makes significant contributions to the field. It provides new insights into how CS patterns evolve throughout the progression of dementia, highlighting linguistic changes associated with cognitive decline. Furthermore, it identifies CS as a potential compensatory strategy, which may be linked to cognitive reserve advantages. These findings contribute to a deeper understanding of bilingual communication in dementia and open up new possibilities for therapeutic and diagnostic applications.

Funding

The research presented in this article has not received funding from any public or private entity.

Ethics statement

The main caregiver of all the participants in this study were informed of their rights before signing a written consent form. This research fully adheres to the guidelines indicated in the Declaration of Helsinki and the OECD Guidelines on the Protection of Privacy and Transborder Flows of Personal Data.

Conflict of interest

The authors have no conflict of interest to declare.

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