

RADBOUD UNIVERSITY NIJMEGEN

MASTER'S THESIS

**Role of Structural Priming in
Contact-Induced Change: Subject
Pronoun Expression in NL-Turkish**

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'The beauty and mystery of this world only emerges through affection, attention, interest and compassion... open your eyes wide and actually see this world by attending to its colors, details and irony.'

Orhan Pamuk, "My Name is Red"

Abstract

Subject pronoun expression has been thoroughly studied for effects of language contact, but it is fairly recent that these studies started including cross-linguistic structural priming paradigms (Travis, Torres Cacoullos & Kidd, 2017). Cross-language structural priming not only provides valuable insights into cross-language activation processes in bilinguals, but also into the mechanisms underlying contact-induced language change (e.g., Kootstra and Muysken, 2017). Turkish is a *pro*-drop language unlike Dutch. An early study with Turkish-Dutch bilinguals reported instances of unconventional use of subject pronouns due to contact with Dutch (Doğruöz, 2014). In a structural priming experiment, we investigated the on-going change of subject pronoun use in Turkish spoken in the Netherlands in both monolingual and bilingual settings. A cross-language interaction between Turkish and Dutch was expected, resulting in more overt pronoun use and stronger priming of overt pronouns in Turkish that is in contact with Dutch (bilingual setting) than in Turkish alone (monolingual setting). 28 Turkish-Dutch bilinguals listened to audio stories, which were constructed to create a pragmatic context that allowed *pro*-drop. Each story ended with a sentence instructing participants to say something to an interlocutor from the story. This final sentence was the prime sentence, which was manipulated in terms of the subject pronoun it had (overt or dropped). Participants were asked to provide their responses aloud as if they were directly talking to this interlocutor. To investigate priming in monolingual and bilingual settings, the experiment consisted of two blocks: In the first (monolingual) block, both the story and prime sentence were in Turkish. In the second (bilingual) block, the story was always in Dutch, and the prime sentence was in Turkish. Participants always had to respond in Turkish. A mixed-effects logistic regression analysis revealed a main effect for language mode and a significant interaction between language mode and the primed structure. Consistent with our hypothesis on cross-language structural priming, overt subject pronouns were used more in the bilingual setting following a prime sentence with an overt than a null pronoun. Contrary to our expectation, the participants were more likely use an overt subject pronoun in the monolingual than in the bilingual setting. Our findings, which are based on a structure and a language that have not yet been studied much in relation to structural priming (i.e., subject pronoun use in Turkish), strengthens the empirical basis of how structural priming influences syntactic choices in language contact settings.

Keywords: contact-induced change, structural priming, subject pronoun expression, Turkish

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To my mother, Nezahat

Chapter 1

Introduction

Language as a dynamic system is prone to change. One context in which change in language is particularly visible is language contact. When speakers of two or more different languages communicate with each other in the same geographical area and time period, the languages often start resembling each other in terms of form and content. In most cases, the convergence is unidirectional: One of the languages shapes the other, but remains unaffected itself. This change in contact settings (henceforth, contact-induced change) has attracted the attention of many subfields of linguistics, including historical linguistics, sociolinguistics and, to some extent, psycholinguistics.

Turkish in the Netherlands, with its 50-year history of contact with Dutch, has been extensively examined for language contact phenomena, mostly from a sociolinguistic perspective. Joining a recent trend, the present study investigates contact-induced structural change in this language by using the phenomenon of structural priming. Priming, although primarily defined as a short-term online effect during conversation, has been defined as a possible mechanism of contact-induced language change (Fernández, De Souza and Carando, 2017; Kootstra and Şahin, 2011; Muysken, 2013). Repetition and use as triggers of change in long-term representations of language have also been in the center of usage-based proposals of language (e.g., Bybee, 2006; Christiansen and Chater, 2016). In this study, the role of structural priming in contact-induced change will be examined through an empirical investigation of subject pronoun expression in Turkish in contact with Dutch.

This chapter will present a brief overview of previous work and theories on both contact-induced change and structural priming, and go into recent arguments about structural priming as a mechanism underlying language change and about how it can be used as a tool to investigate such relationship. It will end by discussing the motivations for the present study and introducing its research questions and hypotheses.

1.1 Background

1.1.1 Language change

Language change refers to variation observed over time in features of language use. It is easy to encounter variation in language in our daily lives. For example, the way we speak or communicate can be very different from the way our parents do, and a TV reporter might not sound like a supermarket cashier. People who speak two or more languages might start using some lexical items or compounds that monolingual speakers of either language do not use. This variability might lead to changes in language over time (Nevalainen & Raumolin-Brunberg, 2016).

Besides intellectual curiosity there are many scientific reasons for why we should study language change. First of all, by exploring the ways languages change, it is possible to get insights into how language itself operates in human mind. Identification of the exact mechanisms involved in language change can help us understand the internal processes (and constraints on these processes) of the linguistic system in general. Another reason for studying language change comes from the fact that languages change to adapt to the ever-shifting needs of their speakers (Hickey, 2012). They might be used in different ways within a society due to different motivations. These differences in use tell us something about human sociality and its effects on language use. Altogether, language change is a valuable topic of study that is informative about language in general, as it is shaped by properties of cognition and sociality.

1.1.2 Contact-induced change

Language change has been studied in different fields in relative isolation from one another. This includes historical linguistics (at the level of language), dialectology (at the level of regional varieties), and sociolinguistics (at the level of communities). These fields differ in terms of how they conceptualize change and their claims about the possible mechanisms involved in change. In historical linguistics and sociolinguistics, it is common practice to classify cases of language change according to their source. In general, language change is considered to be the consequence of either external or internal sources (Elšík & Matras, 2006; Winford, 2003). For over a hundred years, mainstream historical linguists have mostly focused on language-internal sources and mechanisms (Thomason & Kaufman, 1988, p. 1). Internal sources refer to internal developments, such as sounds and/or forms in language to which alternations can be traced back (Hickey, 2012). External influence is the impact of another language, triggered by the sociolinguistic factors that cause bilingualism, and has been considered the last resort in the absence of a convincing internal account (Romaine, 1988, p. 349). For many years, language change as a historical phenomenon was put aside, as linguists preferred to study the language system in isolation. Later, a new approach arose from the seminal work of

Uriel Weinreich (1953) on language contact, which could be considered as the first systematic exploration of language contact phenomena. He broadened the scope of the field by claiming that bilingual speakers, not only their linguistic systems, are central to contact-induced change. Yet, in the two decades following Weinreich's work, the dominance of generative linguistics and sociolinguistics and the absence of a systematic taxonomy to describe different language contact phenomena and their effects caused language contact studies to remain outside mainstream research (Hickey, 2010, pp. 1-2).

After Weinreich (1953), contact-induced change became a more or less central topic in theoretical linguistics, sociolinguistics and historical linguistics, whereas within the domains of second language acquisition (SLA) and applied linguistics the notion of transfer was advanced (Sakel, 2012). Lines of research typically use either the concept of interference or that of transfer, the former being used by traditions that investigated language contact and the latter mostly by SLA. The phenomenon of interference was introduced and defined by Weinreich (1963) Lines of research typically use either the concept of interference or that of transfer, the former being used by traditions that investigated language contact and the latter mostly by SLA. The phenomenon of interference was introduced and defined by Weinreich (1963) as instances where speakers deviate from the norms of a language in their speech due to their ability to communicate in more than one language. In the early 1970s, the term interference was largely abandoned by researchers, especially in second language acquisition, due to its negative connotations; the implication was that a change caused by contact is a defect that shows multilinguals cannot keep their languages separate (Sankoff, 2002).

The development of contact linguistics was given a boost by Sally Thomason and Terrence Kaufman, who proposed a new framework for the analysis of contact-induced change and discussed a range of contact scenarios (Thomason & Kaufman, 1988). While not denying the contribution of internal factors, they argued that historical analysis of a language should also include the history of its speakers because internal and external factors jointly shape language contact outcomes (Thomason & Kaufman, 1988, p. 4). They discussed two main types of contact-induced change; borrowing and interference through shift. They defined borrowing as the addition of foreign linguistic features to a language by native speakers of that language. In the case of borrowing, the native language is maintained but with added (i.e., borrowed) features. In contrast, interference through shift is when a non-native speech community acquires a foreign language but introduces features of its erstwhile native language to that foreign language (Thomason & Kaufman, 1988, p. 39).

Any change in the features of a language as a result of contact with another language can be seen as contact-induced language change (Backus, 2005). Changes can be found at many different levels and in many different forms. There are also many ways to classify types of change. One of the most frequently observed instantiations of language change is loan translation. This refers to the direct translation of lexical

items, verbs, morphemes, phrases and idioms (Backus & Dorleijn, 2009). A famous example is the rendering of English skyscraper into different languages; it is *Wolkenkratzer* in German (lit. cloudscraper), *gratte-ciel* in French (lit. skyscraper), and *gökdelen* in Turkish (lit. skyscraper). Another type of change observed in language contact settings is loanwords. They are words borrowed from another language by directly copying their meanings and forms. A very well-known loanword is *zeitgeist*, which entered English from German in the nineteenth century, with the meaning of "the defining spirit or mood of a particular period, especially as reflected in the prevailing ideas, beliefs, and attitudes of the time" (Oxford English Dictionary, 2018).

It is also possible to borrow "structures" from a language, which is labeled as grammatical borrowing. The distinction made by Aikhenvald (2003) between system-altering and system-preserving changes will be considered here to understand grammatical borrowing for its relevance to the object of the present study, which is subject pronoun expression. The first category refers to the addition or loss of grammatical categories and forms; the second to changes in distribution or use of existing grammatical categories. Changes in distribution may include changes in the frequency of use of a certain linguistic feature. Often, the usage frequency of a feature starts to resemble the usage frequency of its counterpart in the other language. The change in subject pronoun use to be studied here is an example of a system-preserving change. In cases of contact between a *pro*-drop and a non-*pro*-drop language, the category of the subject pronoun exists in both languages, since *pro*-drop languages typically allow the use of overt pronouns in particular circumstances. What has been typically observed in case of contact is a change either in the distribution of omitted and overt forms in the *pro*-drop language, favoring the distribution pattern of the non-*pro*-drop language (i.e. more overt pronouns; more detailed discussion regarding this type of change will appear in Sections 1.1.3 and 1.1.4). Note that the typology described here is organized according to subsystems of language; it is not tailored to specific contact situations (Backus, 2005).

Contact-induced grammatical change stands out as an interesting phenomenon that is hard to account for. The motivation for borrowing new words from other languages is relatively straightforward given the contact between two different cultures. Speech communities borrow new words when they need to label a new concept to which they have been recently introduced, or they might start to need a label for a concept that they are familiar with but lack a corresponding label for in their language. However, why would structural change occur? For quite a long time, it was the prevalent view in the field of language contact that contact-induced change in grammar is rare (c.f. Aikhenvald, 2002; Haase, 1992; Nau, 1992/93). Changes were often attributed to language-internal motivations. Heine and Kuteva (2005) were the first to show that language contact can actually trigger the same processes of structural change as internal motivations do. In their book *Language Contact and Grammatical Change*, they discussed one particular subtype of structural change,

which was first distinguished by Weinreich (1953, p. 30), as the transfer of grammatical functions, or the meanings that attach to grammatical forms. They conceptualized contact-induced grammaticalization as the consequence of a creative process. The concept of creativity is built upon the view of language speakers as language “actors” or “builders”. Accordingly, language contact outcomes cannot be seen as disruptions of a norm; instead, they should be seen as a new state that differs from what it used to be (Heine & Kuteva, 2005, p. 34) In a certain sociolinguistic situation, under the influence of a set of factors such as structure of the languages in contact, or communicative intentions of the speakers, creativity can kick in to enable speakers to “use the linguistic resources available in novel ways” (p.35).

This focus on the behavior of the multilingual speaker necessitates investigation of what speakers actually do in language contact settings. Features can only jump from one language to the other in the minds of actual speakers. The speech of bilinguals has been studied extensively in the literature on code-switching (or lexical borrowing). An important characteristic of bilingual speech is that bilinguals alternate between different contexts of language use, some of which require monolingual speech in one of their languages while others allow their free combination. Grosjean 1998, 2001 emphasized the fact that bilinguals generally do not keep their languages separate, and argued against the norm of language separation by claiming that language mixing is not an exception, nor pathological behavior. Grosjean proposed a language mode continuum, with monolingual and bilingual modes at the extremes. Bilingual speakers can position themselves at any point along the continuum (i.e., select a certain language mode) as the communicative context demands. Communicating with a bilingual speaker can trigger a bilingual mode, while talking to a monolingual family member typically requires a monolingual mode. Apart from interlocutor, mode selection is also determined by the setting of the conversation. For example, at an international scientific conference all attendees need to speak in English, as it is the lingua franca of science. Experimental studies on bilingual lexical processing in the years following Grosjean (1998) have demonstrated that selection of a language mode is an issue that is more complicated than originally thought. Many factors play a role, such as experience, demands of the experimental tasks, and the level of activation in the non-target language (e.g., Kroll, Bobb and Wodniecka (2006)).

1.1.3 Change in subject pronoun expression

One can expect the use of subject pronouns to change in case of contact between two languages of which one is a *pro*-drop language and the other is not. *Pro*-drop languages (also known as *null-subject* languages) are languages in which particular types of pronouns can be *dropped* (i.e., omitted) when it is possible to infer their referent based on the morphological marking on the verb. As a *pro*-drop language, Turkish allows the use of null subjects in finite clauses and possessive noun phrases

given the rich agreement morphology that specifies the referent (Enç, 1986; Kornfilt, 1984; Özsoy, 1987). Example 1 represents a typical instance of *pro*-drop in Turkish:

- (1) *pro* dün akşam lasagna ye-di-k.
 last night lasagna eat-PAST-1PL
 'We ate lasagna last night.'

The verb carries sufficient information regarding who is the subject (i.e., who ate lasagna last night) because the subject 'we' is already marked in the verb with 1st person plural marker. Therefore, there is no motivation to use an overt subject personal pronoun.

There are alternative accounts, however. (Öztürk, 2002) finds the classification of "*pro*-drop languages" misleading. She argues that the use of overt pronouns in Turkish is not optional or redundant, but motivated by certain pragmatic functions in discourse. One such case is when the subject has the function of defining or changing the "topic" (Erguvanlı-Taylan, 1986; cf. Turan, 1996). Omission of the pronominal subject in such cases changes the meaning of the sentence (Koban Koç, 2016). In case of topic change, the use of an overt pronominal subject becomes obligatory. On the other hand, if the topic does not change (i.e., in case of subject continuity), using an overt subject personal pronoun would cause unconventionality.

There is no systematic investigation of subject pronoun expression in Turkish as a function of pragmatics that can be used as a basis for future studies on subject pronoun use. Whether Turkish is indeed a *pro*-drop language, or whether the classification of *pro*-drop languages is a legitimate one, is still open for discussion. These issues are not within the scope of this study. The existing work seems to agree on the involvement of discourse properties in determining the choice of a null versus overt pronominal subject, and this acknowledgement will form the basis for the present study.

A variety of explanations has been offered for contact-induced changes in subject pronoun use. It has been classified as convergence (e.g., Backus, 2004; Montrul, 2004), attrition (e.g., Castro, 2011; Gürel, 2004), or parameter-resetting (Savić, 1995). These accounts seem to differ mostly in their labeling rather than in their essence. Heine and Kuteva (2005, p. 70) proposed that the change in subject pronoun expression is "a change from minor to major use pattern". It is a transfer of grammatical functions or meanings across languages without any morphological material borrowed. As a result of the shift from minor to major use pattern, the minor use pattern (in this case, overt *pro*-nouns) starts to be used more frequently, and its use becomes more generalized and less pragmatically-constrained (which can mean the loss of pragmatically defined functions, such as topic change). The major patterns replacing minor patterns might gradually become grammatical categories (i.e., they become "grammaticalized").

Subject pronoun expression is a well-studied topic, especially in the context of Spanish-English bilingualism in the US. Spanish as a *pro*-drop language has been

investigated for the influence from English in subject pronoun use as a result of their contact. However, many researchers did not observe an increase in the use of overt subject pronouns in the populations they studied (e.g., Silva-Corvalán, 1994; Flores-Ferrán, 2004; Pease-Álvarez, Hakuta and Bayley, 1996). Yet, a loosening of pragmatic constraints that determine the presence of an overt or a null subject pronoun was reported in many studies (e.g., Silva-Corvalán, 1994). In other immigrant languages in the US, such as Russian, Serbian and Hungarian, an increase in the frequency of overt subject pronouns was found (Bolonyai, 2000; Savić, 1995; Schmitt, 2000). The increase was more pronounced in speakers with a comparably lower level of proficiency in their heritage language (Montrul, 2004; Schmitt, 2000).

What about Turkish in contact with other languages? So far, only a few studies examined this topic. In an earlier study, Haznedar (2007) collected natural language production data from one Turkish monolingual child and one Turkish-English bilingual child during a period of 4 years, and examined the data for the amount of overt subjects used and for the discourse-pragmatic function they had. The bilingual child's rate of use of overt subjects was two times higher than the monolingual child's rate. Yet, these subjects could be pronominal or lexical, and there was no explicit qualitative comparison of the bilingual and monolingual children in terms of their pronominal subject use. Koban (2011) examined subject pronoun use in Turkish in contact with English in New York City, and reported higher rates of overt subject pronoun use in NYC-Turkish compared to that in TR-Turkish. This difference in the rate of overt pronominal subject use was attributed to the contact with English.

Regarding Turkish in contact with Dutch, Doğruöz and Backus (2007; 2009; 2010) reported instances of redundant use of overt subject personal pronouns, for example when there was no topic change. Doğruöz (2014) did not find a difference in rates of overt subject pronoun use between NL-Turkish speakers and TR-Turkish speakers, but did observe some instances of unconventional pronoun use in NL-Turkish. The source of unconventionality was argued not to be found in the subject personal pronouns themselves, but in the larger chunks they were part of and which seemed to be copied from Dutch. Unconventional overt subject pronouns in the data were mostly in fixed expressions or constructions. Doğruöz (2014), for example, discusses an utterance from the corpus, 'Oranın bir şeyi var onu ben sevmem' (lit. there-POSS one thing it has, that I do not like; 'There is something there I don't like it'; '*Er is daar iets wat ik niet leuk vind*' in Dutch) and claims it involves the copying of a partially schematic construction from Dutch to Turkish. She argues that the utterance is an almost literal translation of its Dutch counterpart '*Er is daar iets wat ik niet leuk vind*' (lit. there is there something what I not pleasant find). Copying from Dutch would then have resulted in an unconventional instance of overt pronoun use. Doğruöz (2014) questions the prevalent view that Turkish subject pronouns are optional, and instead suggests that their forms and meanings are an integral part of the constructions in which they are used.

1.1.4 Current state of affairs with regard to subject pronoun expression

Given the literature reviewed above, it seems unclear whether or not there is ongoing change in subject pronoun expression in the Turkish contact situation. This is both a theoretical and empirical issue. Theoretically, to claim that structural change has occurred in a contact situation is not as straightforward as it is for lexical borrowing. Most of the time the construction of interest is not a structure that is “completely new” to the language but one that is used more often by bilingual speakers than by monolingual speakers of that language (Onar Valk & Backus, 2013). The arguments about what should be taken as evidence for structural change vary with the theoretical approach, as this influences what is understood by “change” and “syntax”. Theories in formal syntax often do not acknowledge instances of structural borrowing as actually instantiating structural change; instead, they argue that contact-induced structural change is actually nothing more than a change in preference (Onar Valk & Backus, 2013). On the other hand, for usage-based approaches to language a change in preference is indeed structural change, because for these approaches usage frequency is regarded as a factor involved in shaping mental representations. The difficulty in claiming that an instantiation of change reflects structural change plays a role in most of the studies on language contact, as they can only describe the patterns observed in data. Explanations about how and why the change has occurred differ due to the theoretical approach adopted.

The empirical side of this issue concerns the data sources that are used to investigate subject pronoun expression in contact settings. Speech corpora and acceptability judgment tasks are the two most commonly used sources of data. Speech corpora consist of direct observations of natural speech, therefore they have higher ecological validity than experimental studies. They can be used to make generalizations about usage patterns and their distributions, and to test these on further corpus data. They often contain a large number of data points but their manifestations are subject to many variables, so that the data involves much more noise than data obtained through experiments. Corpus linguistics has started using advanced statistical techniques such as exploratory data analysis or multilevel modeling to overcome this issue. Yet, corpus analysis is limited in terms of providing information about cognitive aspects of bilingualism (e.g., bilingual language processing) (Şahin, 2015). Acceptability judgment tasks (or grammaticality judgment tasks) are one way of overcoming that, but measures of grammatical knowledge are not always good measures of what drives performance, depending on how items are constructed. For example, if items consist of single sentences, and participants are forced to judge them without previous context, this can affect participants’ judgments and distort the results. Acceptability judgments have a limited participant profile; only native speakers can be tested, and only those who are developmentally mature enough (older than 3 years of age) to provide metalinguistic judgments can be tested (Branigan & Pickering, 2017). Their use is not sufficient for a complete understanding of the mechanisms responsible for a change, e.g. in subject pronoun expression.

1.1.5 Priming as a mechanism of language change

In the light of the literature reviewed here and the problematic aspects mentioned, it is clear that additional approaches to contact-induced change are needed. The present study adopts a psycholinguistic perspective on contact-induced change (e.g., Kootstra and Muysken, 2017; Muysken, 2013; Şahin, 2015). It aims to contribute to this tradition by exploring the relevance of structural priming, the tendency to repeat structures we have recently comprehended or produced (Gries & Kootstra, 2017) as a method that can tell us something about bilingual mental representations.

As a matter of fact, the idea that there is a connection between priming and language change or variation is not new. Regarding variation, a handful of studies have reported structural priming effects (Travis et al., 2017). In a corpus study on Puerto Rican Spanish, Poplack (1980) observed a priming effect for plural expression on noun phrases. If speakers used the plural marker *s* in the first element of a noun phrase (e.g., in a determiner), they tended to pluralize the subsequent elements too (e.g., the noun). If no plural marker was used in the first element, it mostly led to the absence of plural realization throughout the phrase. Similarly, Scherre and Naro (1990, 1991) reported priming of plural marking within the clause and across clauses in Brazilian Portuguese: Plural marking on verbs and predicate adjectives tended to occur more often if it had been used in previous elements of the same or previous clause. As for the relation of priming to language change, earlier psycholinguistic works on priming did point out the potential role of priming in determining language change (see Bock and Kroch, 1989, p. 187; Loebell and Bock, 2003; Luka and Barsalou, 2005).

Jäger and Rosenbach (2008) were the first to explicitly draw attention to the need for a psycholinguistic perspective on historical linguistics and suggested a pivotal role for priming. They argued that priming can be a mechanism in grammaticalization. In other words, priming can shed light on a central issue of language change, the issue of how a certain preference in performance becomes encoded in grammar. Much psychological research has made use of priming (Pickering & Ferreira, 2008). It is “a largely non-conscious or automatic tendency to repeat what one has comprehended or produced” (Pickering & Garrod, 2017, p. 173). Priming can occur at different levels, be it conceptual, perceptual, or semantic. It can occur across modalities; e.g., a visual stimulus can prime one’s response to an aurally-presented word.

Humans tend to imitate others’ choices, or repeat their own previously-made choices. Repetition entails persistence in memory, and therefore learning. We tend to preserve these choices and keep repeating them in both the short and long terms. Our ability to retain such choices comes from the fact that we are able to learn or acquire (or imitate) behavior (Pickering & Ferreira, 2008). This brings us to its relation to language change: If not only single individuals but a speech community preserves a certain linguistic choice, this can lead to language change over time.

To better understand the relationship between priming and language change, we first need to know how priming operates on the human mind. How is it possible

that humans get primed? Priming is an implicit memory effect which builds on the way human mind stores information. Our minds store information in memory based on associations. When we are “primed” by a stimulus, it starts to activate the relevant information about the primed concept and also other information that are associated with the concept. As a result, we retrieve a network of associations that are established around the primed concept. The activation of this network therefore influences our reaction to a subsequent stimulus.

1.1.6 Structural priming

One specific type of priming is structural priming, referring to the repetition of a linguistic structure that has recently been experienced. The research tradition investigating structural repetition started with Bock (1986), who did the first study of “structural priming” (i.e., priming of abstract syntactic representations) who primed abstract syntactic representations in a language production experiment. In this seminal study, Bock (1986) investigated priming effects for two types of syntactic structures (active versus passive sentences, and prepositional versus double-object dative alternations), and found out that participants’ choice of structure in their utterances was heavily influenced by the structure of an immediately previous sentence.

An example to explain how structural priming operates would be the following: In an experimental setting, you are shown a set of pictures that depict some events (e.g., lightning hitting a house) and asked to describe what you see in each picture. Yet, you are required to read, listen to or repeat a sentence before you start describing the picture. This sentence functions as “prime sentence”, and it is manipulated to have a particular syntactic structure. The prime sentence is expected to influence your response (the “target sentence”). If, let us say, the sentence you just processed had a passive structure, such as “The car was washed by the old man”, you are more likely to re-use this structure in your response and say “The house is hit by lightning” rather than form an active sentence such as “Lightning hits the house”. The assumption here is that to be able to claim the existence of a priming effect, the speakers should have more than one option in their response (Hartsuiker, Beerts, Loncke, Desmet & Bernolet, 2016). In the example above, the speaker can choose either an active or a passive construction to describe the picture, because English allows both options to be used in such descriptions.

Structural priming effects can be boosted by repeating not only the structure but also the lexical items that the structure contained (Mahowald, James, Futrell & Gibson, 2016; Segaert, Wheeldon & Hagoort, 2016), a phenomenon known as the lexical boost effect. The magnitude of this effect has been found to differ across production and comprehension tasks: In production tasks, structural priming effects are often observed when there is no lexical overlap between prime sentence and targeted response. The effect is just amplified if there is lexical overlap (e.g., Branigan, Pickering and Cleland, 2000; Segaert, Menenti, Weber and Hagoort, 2011). On the

other hand, in comprehension tasks structural priming is less frequently observed without lexical overlap (e.g., Traxler, 2008; Traxler, Tooley and Pickering, 2014).

Different accounts of structural priming offer different explanations for the lexical boost effect. The residual activation account (Pickering & Branigan, 1998) represents syntactic structures as combinatorial nodes in the mental lexicon. Processing of an utterance causes activation in the relevant nodes, and the level of this activation stays above the baseline for a short period of time. The maintained activation (i.e., residual activation) enhances the likelihood of the structure primed via the utterance to be selected in the speaker's production, which leads to structural priming. If the target sentence has to some extent lexical overlap with the prime sentence, then the priming is expected to be larger due to the combination of both the residual activation in combinatorial nodes and the extra activation traveling from the repeated lexical item to the relevant combinatorial node (Hartsuiker, Bernolet, Schoonbaert, Speybroeck & Vanderelst, 2008). This extra activation results in the lexical boost effect. The second view of structural priming is known as the implicit learning account (Chang, Dell & Bock, 2006). Unlike the residual activation account, this model sees syntactic knowledge as dynamic and ever-changing with experience (Savage, Lieven, Theakston & Tomasello, 2006). Producing a sentence that has the same structure as the prime sentence, without any semantic, lexical, or prosodic overlap, points out the implicit use of prior linguistic experience (Dell & Ferreira, 2016). Implicit-learning accounts (Bock & Griffin, 2000; Chang, Dell, Bock & Griffin, 2000; Chang et al., 2006; Ferreira & Bock, 2006) explain structural priming as a type of implicit learning, and predicts its effect to be long-lasting and persistent. Unlike the residual activation model, the implicit learning account does not predict a lexical boost effect. It assumes a division between syntax and lexicon - any change in abstract syntactic representation takes place independently of the lexical system (Hartsuiker et al., 2008).

Since Bock (1986), the structural priming effect has been replicated many times with different syntactic structures (though mostly with dative and active-passive constructions), in different languages, with different experimental paradigms, in analyses of speech corpora, with both behavioral and neural measurements, and with a wide range of language users such as aphasics, children, and L2 learners (for a review, see Pickering and Ferreira, 2008). With bilinguals, structural priming has been shown to be possible across languages. The implication for bilingual language processing is that cross-language priming is that a structure in one language can activate a similar structure in the other language (Kootstra & Muysken, 2017), indicating interactivity of the languages at the syntactic level. Therefore, findings about structural priming can inform theoretical models of bilingual language processing and of how languages may influence each other.

cross-language structural priming relates to cross-language transfer in second-language acquisition (Flett, Branigan & Pickering, 2013; Jackson & Ruf, 2017; Nitschke, Serratrice & Kidd, 2014), to code-switching (Kootstra, van Hell & Dijkstra, 2010,

2012; Fricke & Kootstra, 2016), and to contact-induced language change (e.g., Torres Cacoullous and Travis, 2011, 2016). Code-switching brings about language co-activation at multiple processing levels, and this has been claimed to possibly promote structural convergence (Fricke & Kootstra, 2016; Torres Cacoullous & Travis, 2011, 2016). Fricke and Kootstra (2016) demonstrate that priming effects can be extended to the contexts of spontaneous code-switching. They report lexical boost effects, long-lasting priming effects, and larger priming effects when speakers repeated themselves than when they repeated an interlocutor, and show that these effects are predictors of the distribution of code-switched utterances in a bilingual corpus.

So far, only a handful of studies has investigated the role of cross-language structural priming in contact-induced change. Most of these works are by by Rena Torres Cacoullous and Catherine Travis and focus on subject pronoun expression in Spanish in contact with English. Torres Cacoullous and Travis (2011, 2016; 2017) reported significant effects of both within-language (i.e., Spanish to Spanish) priming and cross-language priming in overt subject pronoun use in a bilingual corpus. However, the effect of cross-language priming was weaker and less persistent than within-language priming effect.

Many studies have reported an asymmetry in the amount of interference the two languages in a contact situation undergo (e.g., Bernardini and Schlyter, 2004; Hohenstein, Eisenberg and Naigles, 2006; Yip and Matthews, 2000). A speaker's dominant language was found to influence the weaker language much more than the other way around. Many cross-language structural priming studies with adult bilinguals have failed to find an association between cross-language influence and language dominance (e.g., Loebell and Bock, 2003; Meijer and Fox Tree, 2003; Schoonbaert, Hartsuiker and Pickering, 2007). However, some more recent studies have reported stronger cross-language structural priming effects from the dominant to the non-dominant language (e.g., Kootstra and Doedens, 2016), and from the higher proficiency to the lower proficiency language (e.g., Bernolet, Hartsuiker and Pickering, 2013; Kootstra et al., 2012). Conflicting results in the literature might be related to the different ways researchers have used to assess language dominance.

1.1.7 This study

The goal of the present study is to explore whether cross-language structural priming can be used as a method to investigate contact-induced change. In particular, it attempts to see whether in NL-Turkish an increase in the use of overt subject personal pronouns can be induced as a function of cross-language structural priming. By doing so, it aims to understand the cognitive mechanisms that may be involved in contact-induced change. This goal resulted in four subquestions:

1. *Can structural priming as an experimental method be used to investigate priming of subject personal pronouns?*

Structural priming as a method has recently been used to investigate subject pronoun expression in contact settings (e.g., Torres Cacoullos and Travis, 2011; Travis et al., 2017). Yet, to our knowledge there is no experimental investigation of subject pronoun expression conducted by using the method of structural priming. The present study stands out as a test case for testing the applicability of structural priming as a method to different types of structures, such as subject personal pronouns.

2. *Can inducing a cross-language structural priming simulate the contact-induced change in subject pronoun expression?*

This study also aims to test the recent accounts to contact-induced change which suggested cross-language structural priming as a possible mechanism underlying change in contact settings (e.g., Pickering and Garrod, 2017). By using the method of structural priming, this study aims to simulate the on-going change in subject pronoun use in NL-Turkish in an experimental context.

3. *Does subject pronoun expression vary in monolingual and bilingual settings?*

The investigation of subject pronoun expression in contact settings requires to investigate it in monolingual and bilingual settings; the former represents the default behavior of speakers whereas the latter the same behavior influenced by the presence of another language (i.e., language contact). The comparison of the two language settings will reveal what changes in the use of subject pronouns as a function of the language setting.

4. *Are priming effects modulated by the language dominance of bilingual speakers?*

There is only a few studies that examined structural priming effects in relation to language dominance or language proficiency in bilinguals (e.g., Kootstra and Doedens, 2016). Yet, these studies yielded mixed results regarding the relationship between these two variables. The present study wants to contribute to the discussions regarding the relation of language dominance to structural priming by testing the interaction of language dominance with the structural priming effects.

To answer the questions stated above, we designed a language production experiment in which participants listened to a set of stimuli before they were primed with an overt or a zero subject pronoun, and for each item they produced a response out loud. Their responses were scored for their use of overt or zero subject pronouns. Since subject pronoun expression is pragmatically-motivated in Turkish, the nature of the material can potentially interact with structural priming effects. For the purpose of this study, we wanted to control for pragmatics, to isolate the structural effects of cross-language activation on subject pronoun use. Accordingly, we developed a set of stimuli that elicited a particular pragmatic context. This context allowed participants to either use an overt subject pronoun or not.

To investigate the effect of cross-language structural priming on the change of subject pronoun use, we needed to use a strategy that was different from the previous structural priming studies to induce a cross-language priming effect. Cross-language structural priming effect is often defined in the literature as "the tendency to use a particular structure in one language after having comprehended or produced the same structure in another language" (e.g., Gries and Kootstra, 2017). This definition originates from the paradigms used to elicit the priming effect: Participants are presented with a prime sentence which contains one variant of the structure of interest in one language (i.e., active voice as one variant of voice), and expected to repeat the same variant in the other language. This definition necessitates this effect to be operationalized as "observation of the use of a structure X in language A immediately after exposure to the same structure X in language B". For example, in their corpus study on 1sg pronoun use in Spanish in contact with English, Travis et al. (2017) operationalized the cross-language structural priming effect as "*yo* after *I*".

Unfortunately, it was not possible to apply this operationalization to our experimental design for two reasons. First, because Dutch is not a *pro*-drop language, it was not possible to make participants comprehend or produce a null subject in a prime sentence in Dutch. Second, it was not reasonable to use Dutch sentences with overt subjects as prime sentences either, because we would not be able to determine whether the resulting effect was due to having been exposed to an overt subject in another language, or simply due to being exposed to an overt subject regardless of the language it was from. For that matter, we made use of a strategy that could help us indirectly induce a cross-language structural priming effect. We manipulated the language mode of the participant as either monolingual or bilingual. We created the bilingual mode by presenting the stimuli in Dutch but the prime sentences in Turkish, and we anticipated that being exposed to Dutch would activate Dutch syntactic representations. When the bilingual mode was combined with the priming of overt subject personal pronouns, we expected this combination to trigger both Dutch syntactic representations and the representations of overt subject personal pronouns in Turkish, resulting in a cross-language structural priming effect.

By priming the use of overt or null subject pronouns in Turkish, we expected to find a within-language structural priming effect on overt subject pronoun use. In other words, participants were expected to use an overt pronominal subject in their responses more if they were primed with a sentence including an overt subject pronoun than with a sentence including a null subject.

By manipulating the language mode in our experiment, we expected participants to perform differently under monolingual and bilingual modes. The assumption here was that the experimental items provided in Dutch would activate syntactic representations in Dutch, resulting in cross-language activation during an experimental task that ideally requires a monolingual mode (because the target sentence

needs to be produced only in Turkish). The activation of Dutch syntactic representations were expected to influence participants' subject pronoun choice in their responses in Turkish. Participants were expected to use an overt subject pronoun more often in bilingual mode than in monolingual mode. In sum, finding a cross-language structural priming effect would support the role of bilingualism in contact-induced change, and demonstrate the value of bringing different disciplines together to explain mechanisms underlying language change.

Chapter 2

Methodology

The present study examined the role of structural priming in contact-induced change in subject pronoun expression. Accordingly, a priming experiment was designed to investigate the use of subject personal pronouns by Turkish-Dutch bilingual adults. This chapter describes the methodological aspects of the study in the following sections of Participants, Materials, Measures, Design, and Procedure.

The study utilized was a 2x2 within-subjects factorial design with the factors Language Mode and Primed Structure. The former factor enabled inducing a particular language mode (monolingual or bilingual) while the latter allowed for priming participants with a particular structure (an overt or a null subject personal pronoun). The design resulted in four conditions, and every participant took part in all conditions. The dependent measure was the form in which the subject personal pronoun was used in the elicited responses. The dependent measure was therefore dichotomous (either overt or null).

2.1 Ethics

The current study (EAC file 4067) received ethical approval from the Ethics Assessment Committee Humanities at Radboud University Nijmegen, the Netherlands. Participants gave their written informed consent prior to the experiment and were compensated with a gift voucher worth 10 euros for their participation.

2.2 Participants

The experiment was carried out with thirty-one Turkish-Dutch bilingual individuals (12 males) with an age range between 18 and 49 ($M = 33.90$, $SD = 11.52$). Participants were recruited via poster advertisements, brochures, visits to the neighborhoods where inhabitants with a Turkish origin formed the majority, and through personal contacts. Selection criteria for participation were being between 18 and 50 years in age, having acquired Turkish as their native language, having acquired Dutch as L2, and being able to communicate both in Turkish and Dutch. The motivation behind these criteria was to form a sample that would include a variety of bilinguals, such as early bilinguals, late bilinguals, Turkish-dominant bilinguals, and

TABLE 2.1: Participant information for the sample of this study

Background variable	Country of birth	
	The Netherlands	Turkey
<i>n</i> total (<i>n</i> female)	16 (8 female)	12 (10 female)
Median age (SD)	23.5 (7.27)	47.5 (6.79)
Age range	18 – 45	29 – 49
Level of education		
Primary school	0%	42%
High school	25%	25%
Higher education	75%	33%
Median language dominance (SD)	9.17 (52.82)	-28.65 (44.69)
Language dominance range	[-125.05, 68.01]	[-77.92, 95.71]
Other languages spoken	English (<i>n</i> = 8)	English (<i>n</i> = 3)

Note. Negative values in language dominance represent dominance in Dutch, and positive values dominance in Turkish.

Dutch-dominant bilinguals. All participants were residents of the Netherlands, and they were recruited in the cities of Nijmegen, Rotterdam and Schiedam. They had normal or corrected vision and hearing, and no history of language impairments.

3 participants were excluded from the analyses due to technical problems in running the experiment or because they had a first language other than Turkish. The remaining sample (10 males) had the same age range ($M = 33.64$, $SD = 11.87$).

To be able to examine possible sources of individual variation, participants' language history, use, proficiency, and attitudes were measured using the *Bilingual Language Profile* (BLP; Birdsong, Gertken and Amengual, 2012), a self-report questionnaire developed to assess functional language abilities of bilingual populations. It generates a dominance score based on the answers provided for both languages. Since no version of the BLP was available for the Turkish-Dutch language pair, the questionnaire was translated from English into Turkish and Dutch. Participants were free to fill out the questionnaire in the language that they felt most comfortable with. A set of questions that asked about participants' age, sex, country of birth and level of education were added to the BLP measure to better understand the individual variation within the sample.

2.3 Design and Materials

2.3.1 Design

The experiment employed a 2 x 2 within-subjects factorial design with the factors Language Mode (monolingual vs. bilingual setting) and Primed Structure (overt vs. dropped subject personal pronoun). These factors resulted in four experimental conditions (see Table 2.2 for an illustration of the design and example items of each condition). Every participant received all four experimental conditions. The dependent

TABLE 2.2: Example items of each experimental condition

Language Mode	Primed Structure	
	Dropped	Overt
Monolingual setting	Two of your friends invite you to go to the cinema this evening. But there is a task to be finished by tomorrow morning. <i>[null]</i> Tell your friends that you cannot go to the cinema with them.	Two of your friends invite you to go to the cinema this evening. But there is a task to be finished by tomorrow morning. <i>You</i> tell your friends that you cannot go to the cinema with them.
Bilingual setting	Two of your friends invite you to go to the cinema this evening. But there is a task to be finished by tomorrow morning. <i>[null]</i> Tell your friends that you cannot go to the cinema with them.	Two of your friends invite you to go to the cinema this evening. But there is a task to be finished by tomorrow morning. <i>You</i> tell your friends that you cannot go to the cinema with them.

Note. In the actual experiment, the sentences in bold were in Dutch, and the rest was in Turkish. The subject pronouns of prime sentences are italicized for the readers' convenience.

variable was the form in which the subject personal pronoun was used in the response. This outcome variable was dichotomous; it could be either an overt subject personal pronoun or a null one. Language dominance scores that were obtained through the BLP measure served as a covariate.

2.3.2 Stimuli

A set of stimuli was created taking two aims of this study into account. First, the study aimed to prime the use of subject pronouns while the surrounding pragmatic context allowed for *pro*-drop. All stimulus sentences could grammatically contain an overt or a dropped subject pronoun. Second, we were interested in whether a bilingual speech environment would influence subject pronoun use; therefore, both Turkish and Dutch versions of the stimuli were prepared. We aimed for twelve items per condition, which led us to create forty-eight items in total.

The stimuli were forty-eight short stories and forty-eight prime sentences. The stories consisted of 2 or 3 sentences (with an average word count of 13.62 for Turkish stories and of 20.21 for Dutch stories). They were about typical daily-life events, such as meeting friends, going to a bicycle repair shop, or planning a vacation (see [A](#) for a complete list). These events always included two or more characters who were interacting, and the stories were told as if the participant was one of the characters. Each story was followed by a sentence that instructed the participant to say something out loud to the fictional character(s) from the short story as if they were

directly talking to the character(s). The instruction sentence was the *prime sentence*, and it was manipulated in terms of its subject pronoun (overt or dropped).

The prime sentences had two important functions. First, they facilitated implementing the priming manipulation. The way in which they were integrated into the stories helped the manipulation remain unnoticed by the participants. There was also a variety in the type of subject personal pronoun they could elicit. Specifically, the elicitation was possible for 4 out of 6 subject personal pronouns that can be found in Turkish; 1st person singular *ben*, 2nd person singular *sen*, 1st person plural *biz*, and 2nd person plural *siz*. The third person subject pronouns *o* and *onlar* (singular and plural, respectively) do not code gender and animacy. In cases of more than one same-sex character in a story, participants might prefer using a nominal subject instead of a pronominal one in their responses to avoid ambiguity of the referent. Therefore, third person pronouns were not included. Another important function of the prime sentences was that they included all the lexical items that the participants needed to formulate their own responses. The response that participants were expected to provide was the *target sentence*, and ideally it contained the same set of lexical items as the prime sentence but had the subject personal pronoun, whether null or overt, that was intended to be elicited via a particular story. The example story with its prime sentence **1a** and target sentence **1b** provided below show that prime and targeted response share many words (note that the subordinate clause structures used in the short stories had non-finite verbs, avoiding the use of the subject pronoun that appears in the English translation):

1. Your mother gave you a call and asked you how your meeting went today.
 - (a) Tell your mother that you did not go to work today. (prime)
 - (b) 'I did not go to work today.' (target)

We wanted participants to imagine themselves as one of the characters in the stories. One way to accomplish this was to use the 2nd person singular pronoun *sen* as the subject of the sentences in the short stories so that they would directly address the listener (i.e., the participant). However, it was also important that participants would not be exposed to subject personal pronouns apart from the priming manipulation (i.e., the prime sentence). Therefore, we used a nominal phrase (e.g., *your mother*) or a nominal phrase with an embedded clause as the subject (e.g., *the clothes you bought online*) in the stories. Two example stories (with their prime sentences) provided in **2a** and **2b** below illustrate this strategy:

2.
 - (a) Your brother is coming to your city, and wants to see you as soon as possible. Tell him that you could meet up tomorrow evening.
 - (b) The duration given for paying tuition fees is over. But it is not possible for your family to make a payment now. Tell the Student Affairs that you are going to make the payment next week.

TABLE 2.3: Background information for the sample of the pilot study

Background variable	Production task	Grammatical judgment task
<i>n</i> total (<i>n</i> female)	8 (4 female)	10 (4 female)
Country of birth	Turkey	Turkey
Median age (SD)	25 (7.52)	27.5 (7.04)
Age range	19 – 39	19 – 39
Linguistic background	L2 English (<i>n</i> = 5), L1 Tatar (<i>n</i> = 1)	L2 English (<i>n</i> = 6), L1 Tatar (<i>n</i> = 1)
Level of education	Higher education (<i>n</i> = 6), High school (<i>n</i> = 2)	Higher education (<i>n</i> = 8), High school (<i>n</i> = 2)

Since pronoun use is pragmatically-conditioned in Turkish, it was important to make sure the stimuli contained no pragmatic context in which an overt subject pronoun was the only option. The stories were therefore constructed to create a pragmatic context that would allow *pro*-drop. This way, the participants should be completely free to use an overt subject pronoun or not in their responses, because both of the two options are grammatical in such pragmatic contexts in Turkish.

The stories were constructed in Turkish, and then translated into Dutch to be used to invoke a bilingual mode. Two additional stories were developed to be used in a practice session preceding the actual experiment. Digital audio recordings of the stories, both in Turkish and Dutch, were created using the audio software Audacity v2.2.2 in a soundproof recording booth with a female native speaker for each language reading the stories out loud. The audio files (sampled at 44100 Hz; two channels; duration of Turkish stories: $M = 6.39$, $SD = 0.97$; duration of Dutch stories: $M = 7.81$, $SD = 1.57$) were processed and normalized to make them have the same peak amplitude on Audacity.

2.3.3 Pilot test of the stimuli

To test whether the constructed stories created a pragmatic context that would make speakers feel free to use an overt subject or not, a pilot test was conducted with 10 monolingual Turkish-speaking participants to see how successfully the stimuli would elicit this particular pragmatic context.

The pilot test was designed and implemented through the Qualtrics questionnaire tool. Participants needed to perform two tasks. The first was a production task and simulated the experiment. The story-prime pairs were presented on the screen in written form. Participants were asked to read them and provide a written response as requested via prime sentences. Two variants of this task were created to make sure that every story was paired both with an overt and a null subject personal pronoun in the prime. The second task was a acceptability judgment task. Participants read the same set of story-prime pairs again, but this time each pair was followed with two possible answers. One answer had an overt subject personal pronoun and the other a null one. Participants were asked to rate each sentence on a

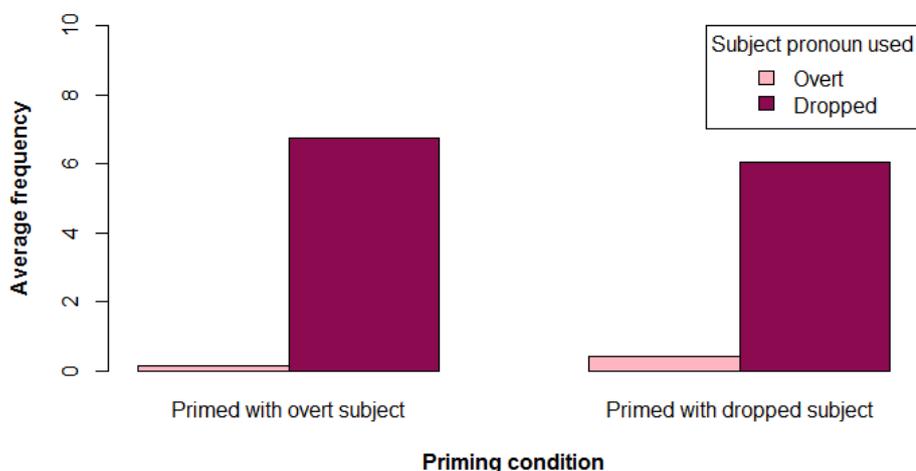


FIGURE 2.1: Pilot test results - Production task

7-point-scale in terms of how appropriate it was to use that sentence in the situation depicted in the story. Table 2.3 presents background information for the sample of the pilot study. Two participants misunderstood the instructions in the production task; their production data were excluded from the analyses.

Results for the production task confirmed the expectation that Turkish speakers tend to use null subject personal pronouns. Figure 2.1 demonstrates the average frequencies for overt and null pronouns in each priming condition. Speakers almost never used overt subject pronouns in their responses. Moreover, no difference was observed in the frequency of subject pronoun use across different conditions. Many explanations can be possible for this result. First of all, it is possible that the priming manipulation was not successful in inducing a priming effect. The questionnaire was distributed to these participants online; there was no experimental control over them while they were filling in the questionnaire. Additionally, participants were asked to provide their responses in written form, which in turn may have provided them with sufficient time to plan their responses. Another possibility is that the priming manipulation was successful but that speakers were not affected by it. Subject pronoun expression might be a domain that, given its frequent realization in daily life, entrenched so well for speakers of *pro*-drop languages that no priming is strong enough to dislodge the tendency to use null pronouns. The pilot test was useful in two ways. It allowed the modification of the design by revealing its problematic aspects: Instead of using written language materials and asking for written responses, it was decided to use spoken language materials and to elicit responses in the form of speech.

A similar pattern was observed in the results of the acceptability judgment task. Figure 2.2 shows the average ratings for both answer options in each priming condition. On average, participants seemed to rate the answers with a dropped subject

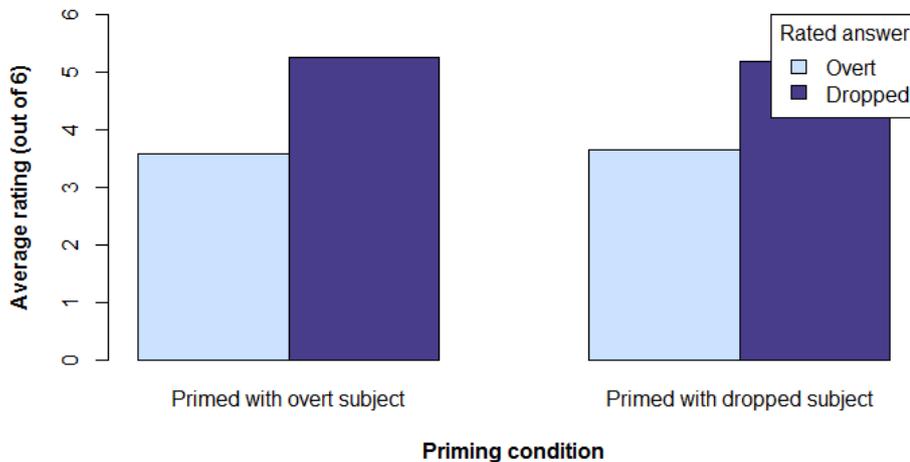


FIGURE 2.2: Pilot test results: Acceptability ratings

personal pronoun as more appropriate than the ones with an overt subject personal pronoun in both priming conditions. This observation was also confirmed with a two-way analysis of variance (ANOVA) test. Table 2.4 presents the output of this analysis. The only variable that could influence the ratings given by participants was the answer itself. Yet, it could explain only 37% (or 32% when adjusted) of the variance in the model. More than half of the variance remained unexplained, and this variance probably due to individual variation (see Table 2.3 for R^2 values).

TABLE 2.4: Summary of two-way ANOVA results testing the effects of priming, the rated structure and their interaction

Source	df	Sum Sq	Mean Sq	F-value	p-value
Priming condition	1	0.00	0.00	0.00	1.0000
Rated answer	1	0.72	0.72	21.17	0.0001
Priming*Rated answer	1	0.00	0.00	0.05	0.8225
Error	36	1.23	0.03		

Note. $R^2 = 0.371$, Adjusted $R^2 = 0.318$.

The findings may seem surprising at first, given that the stories were constructed to "allow" *pro-drop*, not to "promote" it. The pragmatic context elicited through the stories was meant to make speakers free to use the subject pronoun in either form (overt or dropped), with both options equally plausible. Accordingly, one could expect the ratings given to the two answer options to be the same and the high (6 out of 6) on the scale. However, the results point out that speakers of Turkish have the tendency to not use overt pronominal subjects when it is pragmatically possible. The strong preference of monolingual speakers of Turkish to use the null subject personal pronoun (compared to using the overt form, its competing variant) in pragmatic contexts that allow *pro-drop* may have influenced the ratings they gave in the acceptability judgment task. Yet, this influence did not decrease the ratings

dramatically: The average ratings in each condition remained to be within the upper part of the rating scale (> 3 , which was the middle ratings of the scale). In sum, the pilot test confirmed the tendency of monolingual Turkish speakers to use null subject pronouns when the pragmatic context allowed the use of both overt and null subjects. It also revealed that their performance and their metalinguistic judgments did not completely match.

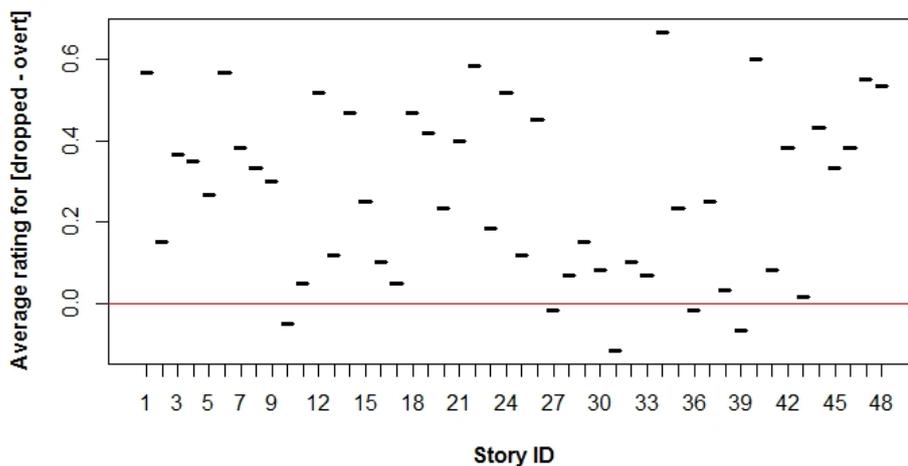


FIGURE 2.3: Average ratings given to each story

As mentioned before, the main motivation behind conducting a pilot study was to check whether the stimuli were successful at eliciting the specific pragmatic context that would allow *pro*-drop. The average ratings given to each condition were rearranged to check for item variation in successful elicitation of this pragmatic context. Figure 2.3 shows the variation between stories in terms of how well they elicited the pragmatic context in which participants would prefer to drop the pronoun. The y-axis represents the average rating value given to each item, and this value was calculated by subtracting the rating given for overt pronoun from the rating given for the dropped pronoun for each item. Therefore, the obtained value represented the *pro*-drop elicitation success of the items. The majority of the stories (the ones above the red line in Figure 2.3) were rated by participants as eliciting a context in which it was more appropriate to drop the subject personal pronoun. Only the stories numbered as 10, 27, 31, 36 and 39 were rated as eliciting a context that was more appropriate for overt pronominal subject use, but the difference between the average rating given to the dropped and the overt option was still small. The item-specific elicitation values were kept to be used as a predictor variable that could help to account for any possible variation caused by differences between the items. To create a variable out of the ratings, we subtracted the average ratings given to the answer option that contained *pro*-drop from the average ratings given to the answer option that contained an overt subject personal pronoun for each item. The resulting

variable was named as *item pretest scores* and used in the analyses.

2.4 Procedure

In order to provide an automated experimentation experience that would be identical for every participant, the experiment was programmed in OpenSesame v3.2.5 (Mathôt, Schreij & Theeuwes, 2012). Instead of the default audio player of OpenSesame, we used an external plugin that was developed for playing and recording audio files with minimal delay. This low latency audio plugin can be found on https://github.com/dev-jam/opensesame_plugin_-_audio_low_latency.

Every participant was individually tested and randomly assigned to one of the four variants of the experiment. An informed consent form was distributed to each individual that briefly explained the purpose of the study and the requirements at each step of the experiment. Information provided through the informed consent form was also given orally.

Participants were told that this study aimed to explore how people complete stories, and they would be listening to a set of stories through headphones. They were also told that each story would end by asking them to say something or ask a question. They were instructed to listen to the stories carefully and produce a sentence as a response to each story vocally. They were told that their vocal responses would be recorded with an audio recorder. As this paradigm could elicit responses that might not be comparable across different individuals, participants were told to avoid summarizing the whole story or being creative in terms of the content or the style of their responses. The experimenter repeated a few times that they were supposed to formulate a sentence as a response, and in terms of content it should be limited to what exactly each story asked them to say.

After the instructions were conveyed to the participants, the experimenter invited them to work on a practice block together. The practice block included two monolingual trials (i.e., two practice stories in Turkish), and aimed to simulate the experimental task. Participants listened to each practice story and provided their responses. At the end of each trial, the target sentence that belonged to that trial appeared on the screen as feedback. Participants were told that this sentence was a prototypical answer that was expected from them. The prototypical answer always had a null subject pronoun as the null subject was accepted as baseline condition throughout the study. The practice block also served as a final opportunity for participants to ask clarification questions to the experimenter if they still needed to. When the practice block was completed, the experimenter left the room and let the participant proceed to the experimental blocks on their own. When they finished going through all experimental blocks, they were asked to fill out the language dominance questionnaire online. They were free to choose to the language that they felt most comfortable with. The experimental blocks including the practice session took approximately 30 to 40 minutes to complete whereas the questionnaire took 10 to

15 minutes. After both tasks were completed, participants were thanked for their participation, handed a gift voucher, and informed that no deception or invasive methods were used in the study. They were offered to receive debriefing about the experiment via e-mail after the data collection stage was over.

To investigate priming in monolingual and bilingual settings, the experiment consisted of two blocks. In the first (monolingual) block, both the story and prime sentence were in Turkish. In the second (bilingual) block, the story was always in Dutch but the prime sentence was in Turkish (see Table 1 for example items of each condition). Participants always had to respond in Turkish.

Each block consisted of 24 items. The monolingual block always came first. Using a fixed order to present the blocks was preferred due to the possibility that the language co-activation induced by a bilingual trial might not completely fade away in a subsequent monolingual trial. Keeping the order of blocks fixed, a 4×4 Latin Square was used to counter-balance the presentation of the stories and prime sentences in each condition across participants. In other words, every story was used both in monolingual and bilingual settings, and primed both by an overt and a null subject personal pronoun. As a result of the 4×4 Latin Square, four variants of the experiment were created. Within each block, the experimental items were presented in a random order that was unique for each participant.

TABLE 2.5: Sample responses for each level of each coding category

Coding category	Sample response
Subject: NP	[Sol-da-ki] daha iyi bir ürün. [Left-DAT-one] more good one product 'The one on the left is a better product.'
Subject: Other	Temmuz ay-ın-da ol-abil-ir. [It] July month-GEN-LOC be-ABIL-AOR. 'It is possible in July.'
Pronoun: Null	[pro] Yarın akşam görüş-ür-üz. [We] tomorrow evening meet-AOR-1.PL 'We can meet tomorrow evening.'
Pronoun: Overt	[Sen] yarın evde misin? [You.SG] tomorrow home-LOC Q 'Will you be at home tomorrow?'

2.5 Coding of responses

The main coding category to be used for scoring the responses was the form of subject personal pronoun used in them. It was also possible that participants could produce responses without using a subject personal pronoun at all. Yet, the total exclusion of all responses that did not include a subject personal pronoun would be a mistake, because it might have been the case that participants' use of pronominal subjects vs. other types of subjects could vary systematically across conditions. In this case, the use of different types of subject would be informative and need to be included in the analyses. Therefore, we decided to code responses for two variables;

the type of subject a response had, and the form of the subject personal pronoun. Table 2.5 demonstrates the levels of each variable and the responses given as an example per level. The sample responses are taken from the actual data set.

Chapter 3

Results

The previous chapter outlined the methodology used in the present study: We used structural priming as our method to investigate the on-going change in subject pronoun expression in NL-Turkish. The experiment had a 2×2 within-subjects design in which we manipulated the language mode of participants and we primed them with overt or null subject personal pronouns. Additional to the experiment, we measured participants' language dominance by using a self-report questionnaire and collected information regarding their sociolinguistic background. The current chapter presents the analysis of the data collected in this experiment.

3.1 Preparing the data for analysis

The participants produced a total of 1344 responses (for 48 items and 28 participants; $48 \times 28 = 1344$). These responses were first coded for the type of subject they had (subject personal pronouns or other types, such as NP-subjects and dummy pronouns). In case a response contained a subject personal pronoun, it was also coded for *pro*-drop; for whether it had a null or an overt subject personal pronoun. Yet, a preprocessing stage preceded the data coding stage. The dataset was first examined for missing or noncodable observations.

Missing data. During the experimental session, participants sometimes did not pay attention to some stories they listened to and they failed to provide a response to those stories. This resulted in a total of 8 missing data points.

Eligibility for coding. Of the remaining responses, 68 responses were excluded because they were not *eligible* for coding. Given that the experimental task used in this study was a free production task, participants' responses varied in the syntactic structure they had. This situation necessitated the exclusion of responses that were not eligible for further coding. A response was considered as ineligible and excluded from further analyses if it

- was not a complete sentence (e.g., *Dört kişilik oda, lütfen* 'A room for four, please'),
- had a subject personal pronoun due to a topic change in discourse (e.g., *Sen aradığında ben babamla sinemadaydım* 'When you called, I was at the cinema with my dad'),

- had the target sentence in the form of a relative clause in the sentence (e.g., *Bir hafta sonra ödeyeceğimi söylerdim* 'I would say that I was going to make the payment next week'),
- was not semantically related to the target sentence because the participant got distracted or misunderstood the story (e.g., *Ben istersen yardım edebilirim* 'I can help if you want', when the target sentence of the same story was 'Can you help me with painting the house?'),
- had a subject personal pronoun that was part of a "false start" (a change of thought in the middle of the utterance; e.g., *Ben- yarın evi temizlemem lazım* 'It is necessary for me to clean the house tomorrow'),
- consisted of more than two sentences, because in such cases it was difficult to interpret the pragmatic context behind the use of subject personal pronouns (e.g., *Sen beni birkaç sefer aramışsın ama bulamamışsın, o anda ben sinemadaydım, onun için duymamışım* 'You called me a few times but could not reach me, at that time I was at the cinema, that was why I did not hear it').

Multi-sentential responses. Despite the detailed instruction provided to participants, they did not always produce single sentences as their responses. A total of 171 responses consisted of more than one sentence. To be able to decide which part of the whole utterance should be included in the analyses, two criteria were applied. If any of the sentences had a subject and resembled the target sentence in terms of semantics, that sentence was kept and the rest of the utterance was excluded (e.g., *Ben evimi boyatmak istiyorum, rica etsem evimi siz boyar mısınız?* 'I would like to have my house painted, would you paint my house?'). The priority was always given to the first sentence. If the first sentence did not meet the conditions stated above, the second sentence was checked. If the second sentence did not meet the conditions either, the utterance was excluded from further analyses.

3.2 Examination of non-target responses

Although the experimental design aimed to elicit from participants responses that contained a subject personal pronoun, they did not always produce utterances as such. As mentioned before, it is possible that the distribution of responses with different types of subjects across conditions might reveal a meaningful pattern. In that case, it would be useful to include them in further analyses. To check for this possibility, we examined the distribution of non-target responses as a function of language mode and priming.

According to Table 3.1, NP-subjects and other types of subjects seem to be used with a similar frequency across the experimental conditions. The total percentages of each type of subject do not change much across different conditions of language

TABLE 3.1: Distribution of non-target responses across conditions

Language mode	Priming	NP-subjects	Other types of subjects
Monolingual	Overt	26 (.26)	2 (.02)
	Pro-drop	22 (.22)	1 (.01)
Bilingual	Overt	21 (.21)	3 (.03)
	Pro-drop	26 (.26)	0 (.00)

Note. Numbers in parentheses indicate total percentages.

mode and priming. As the present study did not primarily concern the use of different types of subjects, and their distribution did not reveal any relation between subject use and language mode or priming, only the responses with a subject personal pronoun were included in further analyses.

3.3 Mixed-effects logistic regression analysis

Table 3.2 presents the total percentages of the target responses per experimental condition. Participants' use of overt subjects seemed to change across language modes but to remain almost the same across different priming conditions.

TABLE 3.2: Total percentages of response types as a function of language mode and priming

Participant,	Monolingual mode	Bilingual mode
when primed with an overt subject pronoun,		
- uses an overt subject pronoun	.05	.05
- uses a null subject pronoun	.18	.18
when primed with <i>pro</i> -drop,		
- uses an overt subject	.05	.02
- uses a null subject pronoun	.18	.20

To assess whether the use of an overt pronominal subject varied as a function of language mode, priming, pretest scores for items, and participants' language dominance scores, a mixed logit model was fitted using the `lme4` package (Bates, Mächler, Bolker & Walker, 2015) in R version 3.5.1 (R Core Team, 2018). Mixed logit models are tailored to analyze binomially distributed outcomes, and they can account for subject and item variance in the model (see e.g., Baayen, Davidson and Bates, 2008). The outcome variable was whether the response had a dropped subject personal pronoun (0) or an overt one (1). Subjects ($n = 28$) and items ($n = 48$) were added to the model as random intercepts. Categorical variables of language mode and priming were coded as taking 'monolingual mode' and '*pro*-drop' as baseline conditions, respectively. Therefore, coefficients in the model output (see Table 3.3) reflected each predictor's contribution (i.e., contribution of a bilingual mode or a prime sentence

with an overt subject) on the log odds that the target utterance would contain an overt subject personal pronoun.

The final model was reached through a series of model comparisons. First, a model including the fixed factors motivated by the experimental design and all possible random effect structures was fitted. Then, the contributions of predictor variables (and their interactions) to the model was checked by making model comparisons, and the model was simplified accordingly. When the model with the fully specified random effect structures failed to converge, the following strategy used by Segal et al. (2016) was adopted until the model converged again: Random slopes were removed from the model before random intercepts, and interaction terms were removed from the model before main effects. When the final model was built, the random effect structures were left out one by one and checked for their contribution to the model. As a result of this process, the random effect structures included in the final model were random intercepts for participants and items. The statistics of beta coefficients and their z and p values for the models were obtained by using the `lmerTest` package (v3.0.1) in R (Kuznetsova, Brockhoff & Christensen, 2017). Each of the main effects and interaction effects obtained from the mixed-effects logistic regression analysis were plotted by using the `Effects` package (v4.0.2) in R (Fox, 2003). Model summary of the final model can be found in Appendix B. Table 3.3 demonstrates the results of the mixed-effects logistic regression analysis on the participants' likelihood to use an overt subject personal pronoun.

TABLE 3.3: Summary of the mixed-effects logistic regression analysis for variables predicting overt subject pronoun use

Predictor	β	$SE \beta$	z -value	p -value
(Intercept)	-1.32	0.42	-3.19	0.0014 **
langmode	-1.04	0.28	-3.66	0.0002 ***
priming	-0.20	0.25	-0.81	0.4194
itempretest	2.40	0.69	3.46	0.0005 ***
dominance	-0.01	0.01	-1.28	0.2009
langmode \times priming	1.26	0.38	3.23	0.0009 ***
priming \times dominance	0.01	0.01	2.01	0.0440 **
langmode \times priming \times dominance	0.01	0.01	0.86	0.3878

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

cross-language structural priming. The mixed-effect logistic regression analysis revealed significant interaction effects of language mode with priming. The priming effect was stronger in the bilingual than in the monolingual setting. Compared to the monolingual setting, using an overt pronoun after being primed with *pro*-drop was less likely in the bilingual setting. Similarly, priming of overt pronoun resulted in a higher probability of using an overt pronoun in the bilingual setting than in the monolingual setting (see the right panel in Figure 3.1b).

Different performance in monolingual and bilingual settings. The analysis revealed significant effects of language mode. In general, the participants used an

overt subject personal pronoun more frequently in the monolingual than in the bilingual setting (see Figure 3.1a).

Within-language structural priming. Among the fixed effects that were of critical importance to the experimental design, no main effects were found for within-language priming (see Appendix C).

Modulation of priming effects by language dominance. The analysis yielded no main effects for language dominance. Participants' language dominance did not modulate the effects of cross-language priming, but it influenced the effects of within-language priming. Language dominance scores were obtained from the self-report questionnaire Bilingual Language Profile (see section 2.2). These scores could take both positive and negative values; positive values represented Turkish-dominant participants, and negative values represented Dutch-dominant participants. Within-language priming, interacting with language dominance, influenced participants' likelihood of using an overt subject pronoun in their responses. The within-language priming effect was found to be stronger for Turkish-dominant participants. After hearing a prime sentence that contained *pro*-drop, Turkish-dominant participants (represented as positive values on x-axis) tended to drop the subject in their responses more than Dutch-dominant participants (represented as negative values on x-axis) did (see the left panel of Figure 3.1d). On the other hand, after being primed with an overt subject pronoun, Turkish-dominant participants tended to use overt subjects more than Dutch-dominant participants did. In overall, Turkish-dominant participants were influenced by the within-language effect more than Dutch-dominant participants were.

Item pretest scores. Another variable that predicted overt subject pronoun use in participants' responses was the item pretest scores. The ratings collected through the acceptability judgment task of the pilot study were used to obtain these scores. Specifically, for each item, the ratings given to the answer option that contained *pro*-drop were subtracted from the ratings given to the answer option that contained an overt subject personal pronoun. The resulted scores formed the variable "item pretest", which turned out to be a significant predictor in the model. The variable "item pretest" could take both positive and negative values. If, for example, the ratings given to a particular item were higher for the answer option with an overt subject than for the option with *pro*-drop, then the resulting score would be positive. Therefore, the negative values of this variable represented speakers' preference towards the answer option with *pro*-drop as an appropriate sentence to say in the pragmatic context elicited by a particular experimental item (i.e., story). There was a significant main effect of item pretest scores on the likelihood of using an overt subject pronoun: The participants tended to use an overt subject pronoun more after experimental items of which the overt-pronoun answer option was rated with higher ratings compared to other items with lower ratings given to their overt-pronoun answer option (see Figure 3.1c).

Random effects. The final model that was used to conduct mixed-effect logistic

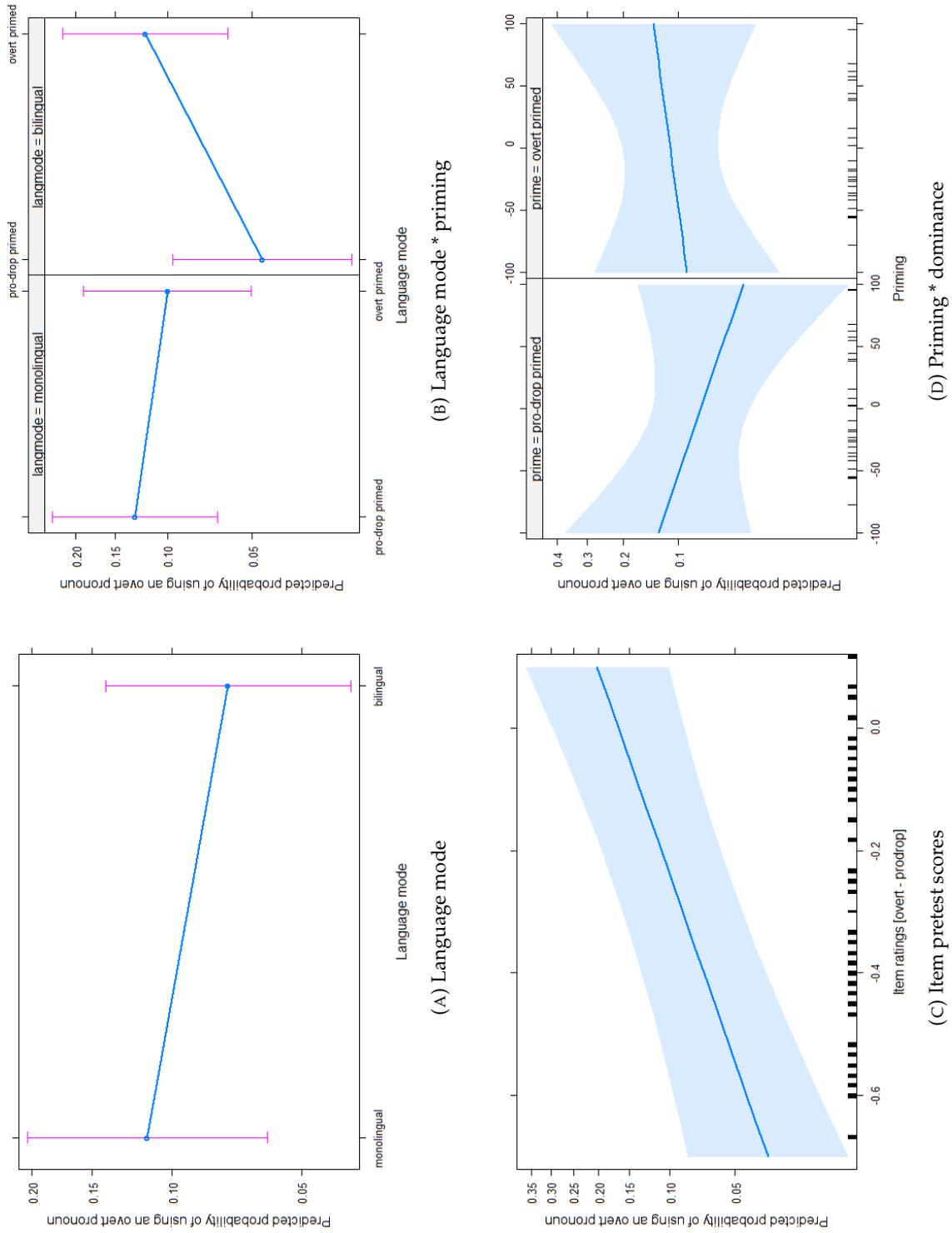
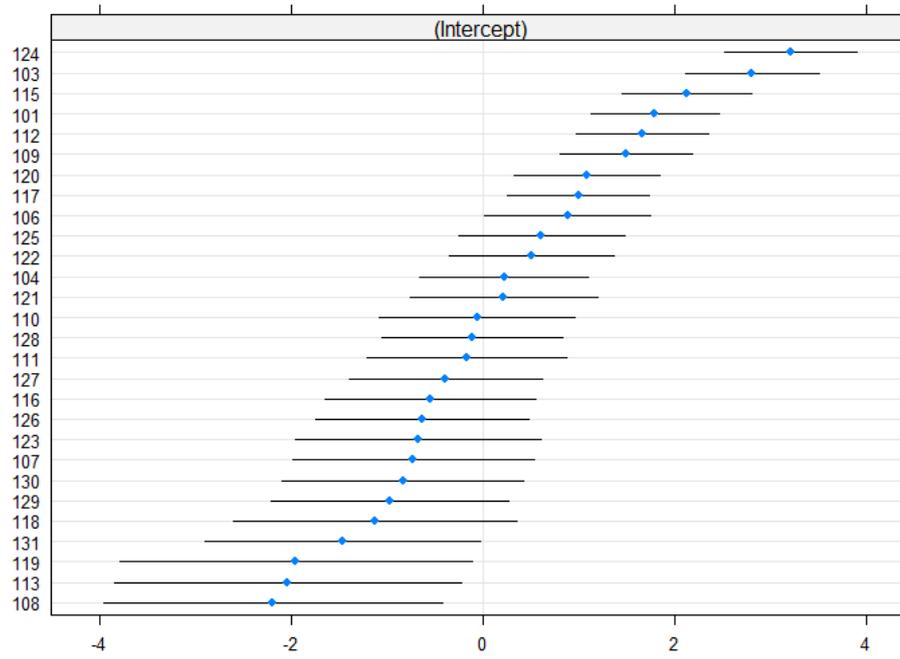
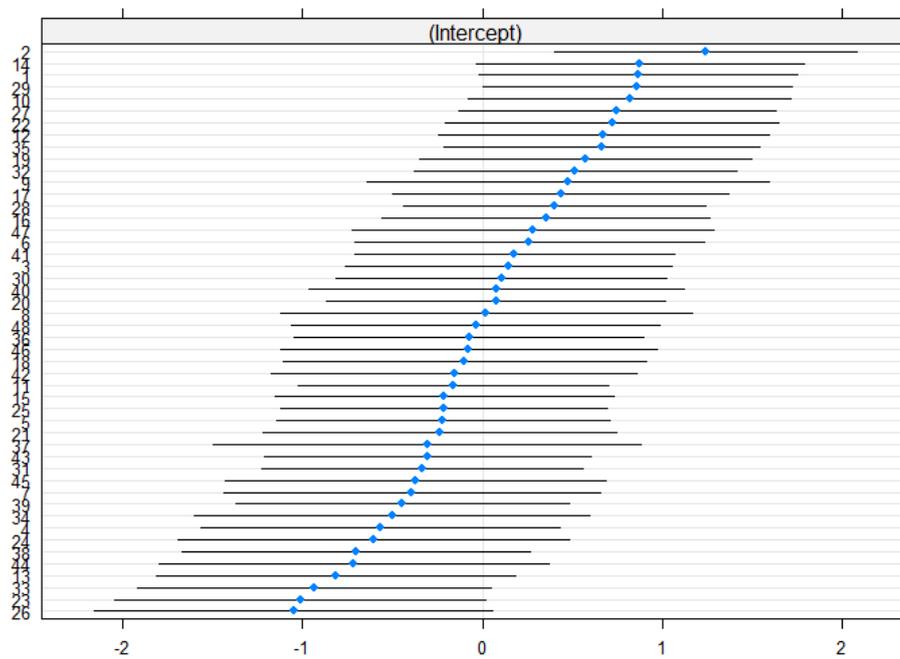


FIGURE 3.1: Effect plots of the main effects and interactions

regression analysis contained a random intercept for participants and a random intercept for items as random effect structures. Model comparisons had revealed that their inclusion in the model significantly improved the model fit. Figure 3.2 depicts the random variation between participants and between items by plotting the random intercepts defined in the model. Figure 3.2a demonstrates the difference between the average predicted response for the fixed-effects and the response predicted for each participant whereas Figure 3.2b exhibits the difference between the average predicted response for the fixed effects and the response predicted for each experimental item in the study. The range of blue dots in the plot 3.2a is wider than that in the plot 3.2b, suggesting a higher amount of variation between participants than between items. Together, these plots support what has already been found out with model comparisons, that the inclusion of random intercept for participant and random intercept for item improved the model fit by accounting for variance between participants and between items.



(A) Random intercepts for participants



(B) Random intercepts for items

FIGURE 3.2: Random effect structures in the model

Chapter 4

Discussion

In the current study, we investigated the role of structural priming in subject pronoun expression in a language production experiment with Turkish-Dutch bilinguals. In particular, we wanted to see whether an increase in the use of overt subject pronouns can be induced as a function of cross-language structural priming. This is the very first study that used structural priming as its method to examine the contact-induced change in subject pronoun expression in NL-Turkish. Earlier studies have found no systematic differences between monolingual speakers of Turkish and Turkish-Dutch bilinguals in terms of the frequency of the use of subject personal pronouns but did observe some instances of unconventional use of subject pronouns (e.g., Doğruöz, 2014). With this study we aimed to find out whether the change going on in subject pronoun expression in NL-Turkish (i.e., the increase in the use of overt subject pronouns) may be simulated by using cross-language structural priming.

Specifically, we aimed to answer four questions; (1) whether structural priming as an experimental method can be used to investigate priming of subject personal pronouns, (2) whether inducing a cross-language structural priming can simulate the contact-induced change in subject pronoun expression, (3) whether subject pronoun expression varies in monolingual and bilingual settings, and (4) whether priming effects are modulated by the language dominance of bilingual speakers. To answer these questions, we designed a language production experiment in which we used structural priming as our method. Turkish-Dutch bilinguals listened to a set of audio-taped stories in Turkish or Dutch, and then they were presented with a prime sentence in Turkish containing either an overt or a null subject pronoun. We constructed these stories to elicit a certain pragmatic context that would allow *pro*-drop so that participants could be free to drop the subject personal pronoun or use it in an overt form in their responses. After each story, participants were asked to prepare a response in Turkish to be said to an interlocutor from the story. This instruction was conveyed to the participants via prime sentences. They were integrated into the stories both structurally and semantically, which in turn helped to make sure that participants would not notice the priming manipulation. We investigated these priming effects both in a monolingual and a bilingual setting by having participants listen to Dutch translations of the stories in the latter.

We found a significant effect of language mode, and a significant interaction between language mode and priming on the likelihood of using an overt subject pronoun. The analysis did not yield any effects, however, of within-language priming nor of language dominance. Language dominance was found to interact with the within-language priming but not of the cross-language priming effect. In the following sections, each finding will be discussed separately to understand how they answer our research questions.

4.1 The effect of cross-language structural priming

We expected to find a cross-language structural priming effect in the condition where the participants were in the bilingual mode and primed with an overt subject pronoun (question 2). If participants were primed with *pro*-drop in Turkish, we expected them to use overt subject pronouns less than they would if primed with an overt subject pronoun. The results revealed a significant interaction between language mode and priming in our analysis. A closer look at this effect confirmed our hypothesis: The likelihood of using an overt subject pronoun was higher in the bilingual mode if primed with an overt subject pronoun (see the right panel of Figure 3.1b). We propose that the observed effect of cross-language structural priming provides evidence for the accounts that proposed cross-language structural priming as a possible mechanism underlying contact-induced change (Fernández et al., 2017; Kootstra & Doedens, 2016; Pickering & Garrod, 2017; Travis et al., 2017). It supports the argument that structural priming as a psycholinguistic mechanism may be one of the factors responsible for structural changes that occur in language contact settings. The present study also provides evidence for this argument from a language and a structure that have not been investigated much with regard to structural priming.

The findings presented here are also in line with the accounts that embrace psycholinguistics besides other traditions to contact-induced language change (Muysken, 2013; Kootstra & Muysken, 2017), and the usage-based frameworks to language which view language change as a consequence of "actual usage and generalizations made over usage events" (Ibbotson, 2013, p. 1). As proposed by Backus (2014) in his usage-based account to contact-induced change, cognitive mechanisms of processing and storage together with sociolinguistic mechanisms leading to change or variation determine linguistic competence, and their integration is useful to investigate contact-induced change instead of studying change in separate traditions. With the study presented here, we succeeded in showing that integrating psycholinguistics into the field of contact-induced change has the potential to explain the mechanisms involved in the conventionalization of individual-level changes within the speech community. Acknowledging the cognitive component involved in language change by adopting structural priming as our method, we could show the involvement of the cognitive mechanisms in the on-going change in the use of overt subject pronouns in NL-Turkish.

What does finding a cross-linguistic structural priming in our data mean in terms of the on-going change of subject pronoun expression in NL-Turkish? That structural priming might be a cognitive base for contact-induced change has often been discussed in relation to the implicit learning accounts to structural priming, which view priming as a persistent and cumulative effect instead of a short-lasting, immediate effect (e.g., Bock and Griffin, 2000; Hartsuiker and Bernolet, 2017). Speaking more than one language on a regular basis has similar implications with cross-language structural priming effect for language change. In the case of bilingualism, regular use of and exposure to two languages influence and even transform bilinguals' linguistic competence in the long run. By adopting an implicit learning account to structural priming, we speculate that structural priming as a cognitive mechanism will shape the linguistic competence of Turkish-Dutch bilinguals, and the on-going change of subject pronoun expression in NL-Turkish may be fully conventionalized and become visible even without the online involvement of Dutch in later stages of Turkish-Dutch contact.

4.2 Subject pronoun use as a function of language mode

We also expected to see variation in subject pronoun expression as a function of the language mode the participants were in (question 3). We did observe variation as a function of the language setting but the observed pattern was the reverse of what was expected. The likelihood that participants would use an overt subject personal pronoun was found to be lower when they were in a bilingual setting (see Figure 3.1b). This finding contradicts our hypothesis. A possible explanation could be that the participants made conscious efforts to speak Turkish "properly" because they had difficulty switching from a monolingual mode to a bilingual mode, resulting in a more TR-Turkish-like speech of which null subject use is the default option (remember the production task results from the pilot test). During the testing stage, many participants complained about the bilingual condition by telling how they found it difficult to switch to Turkish to provide their responses after hearing the stories in Dutch. That they were challenged by being forced to separate their languages might have affected their responses to be more TR-Turkish-like due to their conscious efforts to form proper sentences. All participants were proficient speakers of both languages but most of them were insecure about the level of their Turkish. This insecurity might have been worsened due to having communicated with a TR-Turkish-speaking experimenter during the testing stage. This situation may account for the lower likelihood of overt pronoun use in the bilingual condition.

4.3 Absence of the within-language priming effect

In contrast to earlier experimental studies which reported structural priming effects both within the same language and across languages (e.g., Bernolet et al., 2013;

Schoonbaert et al., 2007), we did not observe a within-language structural priming effect for subject personal pronouns (question 1). The absence of a within-language priming effect is surprising, especially given the high amount of lexical overlap between the prime and target sentences in our study. Lexical overlap between prime and target sentences in a structural priming experiment with a production task has frequently been shown to modulate the magnitude of priming effects (e.g., Segaert et al., 2011). In our study, the target sentences we expected the participants to produce in their responses had a maximal lexical overlap with the prime sentences. However, whether or not there is a lexical boost effect is unclear in our study because our design did not have a control condition which did not involve the priming manipulation, but also because it depends on the theoretical approach to subject personal pronouns. They can be viewed as syntactic structures independent of their context (e.g., Kaltsa, Tsimpli and Rothman, 2015) or as an integral part of the constructions in which they are used (e.g., Doğruöz, 2014). We defend the latter position given the convincing evidence in the literature demonstrating how pronoun use is determined by their surrounding discourse-pragmatic context (e.g., Graf, Theakson, Lieven and Tomasello, 2015).

The absence of an effect of within-language priming even in the presence of a maximal lexical overlap between prime and target sentences may be due either to (1) the failure of the priming manipulation, or to (2) the frequent use of subject personal pronouns in daily speech insulating this structure from priming effects. We may assume that in daily speech speakers produce or encounter many utterances that contain a subject personal pronoun (overt or null), because most of the conversations we have during the day is about 'people', either ourselves or others. From the point of view of usage-based accounts, this high frequency of use of subject personal pronouns in daily speech may have helped to maintain this grammatical structure even in a language contact context (Bybee, 2006). On the other hand, the cross-language priming effect found in our study points out that the presence of another language (i.e., the bilingual mode) can penetrate into this well-preserved system. Moreover, the cross-language priming effect demonstrates that the priming manipulation in the condition where the effect was found was successful. The cross-language priming effect cannot be only an extension of the effect of language mode; the effect of language mode predicted the use of overt pronouns to be higher in the monolingual mode whereas the cross-language priming effect predicted it to be higher in the bilingual mode. Another possibility is that subject personal pronouns may not be a "structure" as much as grammatical voice, or, let us say, dative constructions, because their presence is determined by their surrounding pragmatic context. Therefore, they may not be suitable for structural priming. We do not agree with this possibility, because in our study the priming manipulation did make a difference when the participants were in the bilingual mode. We instead propose that the absence of a within-language structural priming effect was not due to the failure of the priming manipulation or to that subject personal pronouns are not suitable

for structural priming but instead to the fact that subject personal pronouns are still well-maintained in this particular bilingual community.

A closer look at the characteristics of our sample and of the language contact situation we examine here reveals further support for our argument that subject personal pronouns are still well-maintained in NL-Turkish but nonetheless prone to change in the presence of other language(s). Our hypotheses regarding the effects of language mode, priming, and their interaction were mostly based on the study by Travis et al. (2017), who reported significant effects of both within-language (i.e., Spanish to Spanish) priming and cross-language priming in overt subject pronoun use. The differences in characteristics of the sample in their study and our sample can also explain the absence of a within-language priming effect in our data.

Travis et al. (2017) investigated priming effects in a bilingual speech corpus collected from northern New Mexican Hispanic Spanish-English bilinguals, who were at least third-generation immigrants living in New Mexico. The contact between Spanish and English has existed for almost 200 years whereas Turkish and Dutch have a history of contact for just over 50 years. Due to the relatively short history of contact and the continuous influx of new migrants, bilingual speakers that formed our sample consisted of first- and second-generation immigrants. The bilingual speakers in the corpus used by Travis et al. (2017) were also reported to regularly use both Spanish and English in their daily lives, and to use both languages with the same interlocutors. The priming effects they observed might be due to the intensive and regular bilingual language use in the daily life of that particular bilingual community. The contexts and interlocutors of daily speech in the case of Turkish-Dutch bilingualism have been repeatedly reported to show great variation across speakers, both in first- and second-generation immigrants (e.g., Sevinç, 2014). Since our sample consisted of first- and second-generation immigrants, our sample can be assumed to have a greater variance in terms of the contexts in and the interlocutors with which they use Dutch and Turkish compared to the sample in Travis et al. (2017). The large variation observed among individuals, the relatively short history of contact between Turkish and Dutch, and the considerable preservation of subject pronoun expression in our sample altogether may have led the speakers to be less vulnerable to the priming manipulation in our study. We expect to observe a within-language structural priming effect in further stages of the contact, e.g., in future studies that can be conducted with third- and further-generation immigrants.

4.4 Language dominance

With regard to language dominance, a recent study from Kootstra and Doedens (2016) reported cross-language structural priming effects from the dominant to the non-dominant language. Accordingly, we hypothesized that participants' dominant language would modulate the priming effects (question 4). We did not find an effect of the within-language priming but we observed that participants were

influenced by the within-language priming differently as a function of their language dominance. In particular, Turkish-dominant participants were found to be influenced by the within-language priming more than Dutch-dominant participants were: Compared to Dutch-dominant individuals, Turkish-dominant speakers were more likely to use an overt pronoun if primed with an overt pronoun and to drop the subject pronoun if primed with *pro*-drop. This finding is expected given that the within-language priming was about the priming of subject pronouns in Turkish. Interestingly, the results revealed that language dominance did not modulate the cross-language priming effect. These findings may have to do with the differences in characteristics of their sample and our sample. The speakers tested in the study of Kootstra and Doedens, 2016 were native speakers of Dutch, residing in the Netherlands, who learned English as a second language and had been moderately proficient in English based on the self-ratings collected from them. All participants were dominant in Dutch. On the other hand, our sample consisted of immersed bilinguals, who were born into a Turkish-speaking family (regardless of the country they were born in) and started learning Dutch in a full immersion context. We suggest that the language dominance in the context of immigration is a much more multi-faceted, complex phenomenon than in the context of second language learning. Cross-linguistic effects have been often shown to be stronger from the more dominant to less dominant language in the lexical domain (van Hell & Tanner, 2012), but we do not know about how the effects would change in the structural domain and in L2 immersed bilinguals.

Chapter 5

Concluding remarks

Using a structural priming experiment, we found a cross-language but not a within-language structural priming effect on the use of overt subject pronouns in Turkish spoken by Turkish-Dutch bilinguals. Contrary to our expectation, the participants were less likely to use an overt subject pronoun in the bilingual than the monolingual mode. These findings together show how structural priming as a cognitive mechanism plays a role in the on-going change of subject pronoun expression in NL-Turkish, and they are in line with the usage-based approaches to language change (e.g., Backus, 2014) and with the accounts which emphasized the role of cognition besides other factors in contact-induced language change (e.g., Fernández et al., 2017; Pickering and Garrod, 2017). Our study contributes to the field of contact-induced change by being the very first study which adopted structural priming to experimentally investigate the change in subject pronoun expression, and by providing data from a language (i.e., Turkish) that has not been investigated in relation to structural priming before. The results presented here lend support to the argument that cross-language priming may be a cognitive mechanism of implicit learning which drives language change in the long run and leads to language contact phenomena, such as contact-induced language change.

Future studies to follow up our study may make use of code-switched material instead of combining Turkish and Dutch sentences. Given that code-switching is a typical way of communication used among Turkish-Dutch bilinguals, using such materials might result in higher ecological validity and may produce results that are more representative of daily language use of this particular community.

Future research may also usefully focus on linguistic variables that may have to do with subject pronoun expression and cross-language structural priming, such as the type of verbs used in prime sentences and the pragmatic contexts that determine the presence of overt subject pronouns. It is also relevant to investigate within-language priming of overt subject pronouns in a monolingual Turkish-speaking community to better understand the limits to which structural priming as a method to various structures including subject personal pronouns and to various languages including non-Western languages such as Turkish can be generalized. It may be the case that not every structure is equally amenable to the effects of priming, or that not every language pair is equally prone to structural priming effects.

Appendix A

Complete list of the stories and prime sentences

ID	Story in Turkish	Story in Dutch	Prime Sentence
Practice 1	Bu sabah müdürünle bir toplantın var. Radyoda işe gitmek için kullandığın yolda bir kaza olduğunu söylüyorlar. İnternette satın aldığın ürünler kargoyla gelecek. Ama kargonun geleceği gün başka bir yerde olman gerekiyor.	[Not used in Dutch]	Müdürüne toplantıya yetişemeyeceğini söyle.
Practice 2		[Not used in Dutch]	Komşuna senin yerine paketi alıp alamayacağını sor.

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ID	Story in Turkish	Story in Dutch	Prime Sentence
1	İki arkadaşın seni akşam sinemaya davet ediyor. Ancak yarın sabaha kadar bitirmen gereken bir iş var.	Twee van je vrienden nodigen je vanavond uit om naar de bioscoop te gaan. Maar er is een taak die morgenochtend moet zijn afgerond.	(Sen) arkadaşlarına onlarla sinemaya gidemeyeceğini söyle.
2	Kız kardeşin öğle yemeği için bir restorana gidecek. Ama oranın yemeleri çok kötü.	Je zus gaat om te lunchen naar een restaurant. Maar het eten is er verschrikkelijk.	(Sen) kız kardeşine o restoranın yemelerini beğenmediğini söyle.
3	Bisikletinin zinciri koptu. Tamircinin yakınlarında komşun seni gördü ve ne olduğunu sordu.	De ketting van je fiets is gebroken. In de reparatiewerkplaats zag je buurman je en vroeg je wat er gebeurd was.	(Sen) komşuna bisikleti tamirciye getirdiğini söyle.
4	Kütüphanede yanında oturan insanlar yüksek sesle konuşuyor. Çok gürültü var.	Mensen die naast je in de bibliotheek zitten praten luid. Er is zoveel lawaai.	(Sen) onlara yaptıkları gürültüden rahatsız olduğunu söyle.
5	Yarınki proje toplantısına herkes kendi bilgisayarını getirecek. Ama bugün sırtın çok ağrıyor.	Iedereen neemt morgen zijn eigen computer mee naar de vergadering met je groepsnoten. Maar vandaag doet je rug pijn.	(Sen) arkadaşlarına toplantıya bilgisayarını getiremeyeceğini söyle.
6	Yakın zamanda bitmesi gereken bir grup projesi var. Ama grup arkadaşın şu an şehir dışında.	Er is een groepsproject dat binnenkort moet worden afgerond. Maar je groepsgenoot is nu de stad uit.	(Sen) arkadaşına buluşmak için ondan haber beklediğini söyle.

Continued from previous page

ID	Story in Turkish	Story in Dutch	Prime Sentence
7	Eşin marketten yumurta almanı istemişti. Markette her şey vardı ama yumurta yoktu.	Je partner wilde dat je eieren zou kopen bij de supermarkt. Alles was er in de supermarkt maar geen eieren.	(Sen) eşine hiç yumurta bulamadığını söyle.
8	Kuzenin bu yaz seni ziyaret etmek istiyor. Bu ziyareti planlayabilmek için uygun zaman bulmak gerek.	Je neef wil je deze zomer bezoeken. Om dit bezoek te kunnen plannen, moet er een beschikbare periode zijn.	(Sen) kuzenine temmuz ayında uygun olacağını söyle.
9	Arkadaşın yarın hava güzel olacağı için piknik yapmayı öneriyor. Fakat yarın tek boş günün.	Omdat het weer morgen leuk wordt, stelt een vriend van je voor om te gaan picknicken. Maar morgen is je enige vrije dag.	(Sen) arkadaşına yarın evi temizlemek zorunda olduğunu söyle.
10	Markette bir müşteri sana farklı markalardan iki ürün gösteriyor ve hangisinin daha iyi olduğunu soruyor.	Een klant in de supermarkt toont twee producten van verschillende merken en vraagt je welke van de twee beter is.	(Sen) ona soldakini tercih ettiğini söyle.
11	Annen seni cepten aradı ve bugünkü toplantının nasıl geçtiğini sordu.	Je moeder belde je op je mobiele telefoon en vroeg je hoe je vergadering vandaag is gegaan.	(Sen) annene bugün işe gitmediğini söyle.
12	Eşin mutfak dolabını tamir etmek istiyor ve sana alet kutusunun nerede olduğunu soruyor.	Je man wil het keukenkastje repareren en vraagt je waar de gereedschapskist is.	(Sen) arkadaşına hediye beğenip beğenmediğini sor.

Continued from previous page

ID	Story in Turkish	Story in Dutch	Prime Sentence
13	Bugün en yakın arkadaşının doğum günü. Annesi ona hediye olarak mor renkte bir gömlek almış.	Vandaag is de verjaardag van je beste vriend. Zijn moeder gaf hem een paars shirt als cadeau.	(Sen) arkadaşına hediyeyi beğenip beğemediğini sor.
14	Mutfaktaki musluk bozuldu. Tamircinin gelebileceği zamanda ise bir toplanta var.	De kraan in je keuken is kapot. Er is een vergadering die je bij moet wonen op het tijdstip dat de monteur zou kunnen komen.	(Sen) ev arkadaşına yarın evde olup olmayacağını sor.
15	Arkadaşın seni bir ödev yapmak için kütüphaneye çağırdı. Uzun bir çalışmadan sonra akşam yemeği saati geldi.	Een vriend van je heeft je gevraagd om naar de bibliotheek te komen om aan het groepsproject te werken. Na vele uren studeren is het tijd voor het avondeten.	(Sen) arkadaşına ne zaman yemek yiyeceğini sor.
16	Evde kirli çamaşırlar birikmiş. Ev arkadaşının bugün boş günü ve çamaşırları yıkama sırası onda.	De wasmand bij je thuis is vol. Vandaag is het de vrije dag van je huisgenote, en het is haar beurt om de was te doen.	(Sen) ev arkadaşından bugün çamaşırları yıkamasını iste.
17	Bir arkadaşın uzun zamandır iş arıyor. Internette ona çok uygun bir ilan yayımlanmış.	Een vriend van jou is al lang op zoek naar een baan. Een advertentie die zeer geschikt is voor hem is zojuist gepubliceerd.	(Sen) arkadaşına bu ilanı görüp görmediğini sor.

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ID	Story in Turkish	Story in Dutch	Prime Sentence
18	Ünlü bir müzik grubu yaşadığın şehirde konser verecek. Biletler yarın sabah satışa çıkacak.	Een beroemde band gaat optreden in jouw stad. De kaartjes zijn morgen te koop.	(Sen) kardeşine yarın bilet almaya gidip gidemeyeceğini sor.
19	Ödevin için bir kitap gerekli, ama bu kitap hiçbir kitapçıda bulunmuyor. Bugün bir arkadaşın aynı kitabı sınıfa getirdi.	Er is een boek nodig voor je huiswerk, maar het is niet verkrijgbaar in boekwinkels. Vandaag bracht je klasgenoot het boek mee naar de klas.	(Sen) bu arkadaşına kitabı nereden bulduğunu sor.
20	Bu akşam tüm çalışanlar için bir şirket yemeği var. Ancak öğleden sonra birdenbire kar yağmaya başladı.	Vanavond is er een bedrijfsdiner voor alle medewerkers. Maar in de middag is het plotseling gaan sneeuwen.	(Sen) iş arkadaşına akşam yemeğine gidip gitmeyeceğini sor.
21	Çok sigara içen bir kuzenin var. Geçenlerde doktoru ona sigarayı bırakmasını söylemiş.	Je neef is een zware roker. Onlangs zei zijn arts dat hij moest stoppen met roken.	(Sen) kuzenine sigarayı bırakıp bırakmadığını sor.
22	Tüm gün boyunca kardeşin telefonunu açmadı, ama geceyarısı eve geldi.	Je broer heeft de hele dag zijn telefoon niet opgenomen maar kwam om middernacht thuis.	(Sen) kardeşine tüm gün nereden olduğunu sor.
23	Eşinin doğum günü için planlanan bir parti var. Eşinin ablası sana yardım etmek için davetlileri aramaya başlamış.	Er is een feestje gepland voor de verjaardag van je man. Om je te helpen is de zus van je man begonnen de gasten te bellen.	(Sen) ona partiye kimleri davet ettiğini sor.

Continued from previous page

ID	Story in Turkish	Story in Dutch	Prime Sentence
24	Bu sabah çocuğun hastalandı. Bakıcının gelmesine daha iki saat var. Toplantınsa bir saat sonra başlıyor. Okul ücretini ödemek için tanınan süre bitti. Ancak ailen şu an ödeme yapabilecek durumda değil.	Afgelopen maandag is je kind ziek geworden. Het duurt nog twee uur voordat haar babysitter komt. Je vergadering begint over een uur. De termijn voor het betalen van het collegegeld is voorbij. Maar het is voor uw gezin niet mogelijk om nu te betalen.	(Sen) ona bugün biraz erken gelip gelemeyeceğini sor. (Sen) okula ödemeyi bir hafta sonra yapacağınızı söyle.
25	Kardeşin yarın sabah senin yaşadığın şehre gelecek ve seninle en yakın zamanda görüşmek istiyor.	Je broer komt naar jouw stad en wil je zo snel mogelijk zien.	(Sen) ona yarın aksam görüşebileceğinizi söyle.
26	Arkadaşın ailesini götürmek için bir restoran önermeni istedi. Ailenin çok sevdiği bir yer var.	Je vriend vroeg je om hem een restaurant aan te bevelen om zijn gezin mee naar toe te nemen. Er is een plek waar je familie erg van houdt.	(Sen) arkadaşına o restorani ailecek çok sevdiğinizi söyle.
27	Yarın buluşmak isteyen arkadaşın bisikleti bozulmuş. Arabanızda bir kişilik yer var.	De fiets van de vriend die morgen met je wil afspreken is kapot. Er is nog een plek vrij in je auto.	(Sen) arkadaşına onu arabayla alabileceğinizi söyle.

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ID	Story in Turkish	Story in Dutch	Prime Sentence
29	Bir arkadaşın seni ve aileni düğününe davet etti. Düğün başka bir şehirde olacağı için kalacak yer bulmak gerek.	Een vriendin van jou heeft jou en je familie uitgenodigd op haar bruiloft. Omdat de bruiloft plaatsvindt in een andere stad, is accommodatie nodig.	(Sen) arkadaşına düğünden sonra bir otelde kalacağınızı söyle.
30	Bu ayki maaşın hesabına yatmamış. Bazı iş arkadaşların da bu durumdan şikayet etti.	Deze maand is je salaris niet op je rekening gestort. Sommige van je collega's hebben ook geklaagd over deze situatie.	(Sen) şirket muihasebecisine maaşlarınızı hala alamadığınızı söyle.
31	Ev arkadaşın sana köpeği yürüyüşe çıkarmayı önerdi. Parkta biri yanınıza gelip köpekleri ne sıklıkla dolaştırmak gerektiğini sordu.	Je huisgenoot stelde voor om met de hond naar het park te gaan. Iemand in het park benaderde je en vroeg je hoe vaak honden moeten worden uitgelaten.	(Sen) ona köpeği günde iki kez dışarı çıkardığınızı söyle.
32	Arkadaşların tatil için bir otel rezervasyonu yapmanı istedi. Telefondaki görevli kaç kişilik oda istediğini soruyor.	Je vrienden vroegen je om een hotelreservering voor de vakantie te maken. De persoon aan de telefoon vraagt je hoeveel mensen er op de kamer zullen verblijven.	(Sen) bu kişiye odada dört kişi kalacağınızı söyle.

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ID	Story in Turkish	Story in Dutch	Prime Sentence
33	Kardeşin seni ve iki arkadaşını yemeğe çıkardı. Buluşma saati geldi ama arkadaşları geç kaldı. Garson masanıza yaklaşıyor.	Je broer nam jou en zijn twee vrienden mee uit eten. Het is nu de afgesproken tijd, maar zijn vrienden zijn laat. De ober komt naar je tafel.	(Sen) garsona sipariş vermek için arkadaşlarınızı beklediğinizi söyle.
34	Kız kardeşlerin kahvaltısı etmek istiyor. Hava çok güzel olduğu için dışarıda yemek mümkün.	Je zussen willen ontbijten. Omdat het weer zo lekker is, is het mogelijk om buiten te eten.	(Sen) onlara evin bahçesinde kahvaltısı edebileceğinizi söyle.
35	Bu sabah çalan telefon seni uyandırdı. Görüntüye göre arkadaşın dün akşam seni defalarca aramış ama bulamamış.	Een telefoontje heeft je vanochtend wakker gemaakt. Blijkbaar heeft je vriend je gisteravond vaak gebeld maar je niet kunnen bereiken.	(Sen) arkadaşına dün o saatlerde babanla sinemada olduğunuzu söyle.
36	Yaşadığın apartmana yeni biri taşındı. Bu kişi sana ve eşine bu mahallede çöplerin hangi gün toplandığını sordu.	Iemand is met jou in hetzelfde gebouw gaan wonen. Deze persoon vroeg jou en je vrouw wanneer in deze wijk het vuilnis wordt opgehaald.	(Sen) komşuna çöpleri pazartesi akşamı dışarı çıkardığınızı söyle.
37	Eşin bankadan kredi almak istiyor. Banka çalışanları gerekli belgeleri getirirse kredi alabileceğini söylüyor.	Je man wil een lening bij de bank krijgen. Medewerkers van de bank vertellen dat sommige documenten nodig zijn om een lening aan te vragen.	(Sen) onlara hangi belgeleri istediklerini sor.

Continued from previous page

ID	Story in Turkish	Story in Dutch	Prime Sentence
38	İkinci el giysilerin satıldığı bir pazar var. Arkadaşların bu pazarda bir şeyler satmak istiyorlar.	Er is een markt waar tweehands kleding wordt verkocht. Je vrienden willen wat dingen op deze markt verkopen.	(Sen) onlara ne satmak istediklerini sor.
39	İş yerinden birinin doğum günü yaklaşıyor. Ofisteki insanlar hep beraber bir hediye almak istiyor.	Een collega is bijna jarig. Je andere collega's willen samen een cadeau voor hem kopen.	(Sen) onlara ne hediye almak istediklerini sor.
40	Uçağınızın kalkmasına 20 dakika kaldı. Ancak uçakta sizin koltuklarınızda başka insanlar oturuyor.	Er zijn nog 20 minuten over voor je vliegtuig opstijgt. Maar in het vliegtuig zitten andere mensen op jouw stoel.	(Sen) onlardan biletlerini kontrol etmelerini iste.
41	Üniversiteden birkaç arkadaşın sana yemeğe gelecek. Menüde bir et yemeği var.	Een paar vrienden van de universiteit komen voor het avondeten. Er staat een vleesgerecht op je menu.	(Sen) arkadaşlarına et yiyip yemediklerini sor.
42	Yeni çamaşır makinesinin kullanım kılavuzu sadece İspanyolca. Yan komşuların İspanyolca konuşabiliyor.	Je nieuwe wasmachine heeft alleen een handleiding in het Spaans. Je buren spreken Spaans.	(Sen) onlara kılavuzu senin için okuyup okuyamayacaklarını sor.

Continued from previous page

ID	Story in Turkish	Story in Dutch	Prime Sentence
43	Yeni evinin yakınlarında bir kafe var. Bu kafenin duvarlarında çok güzel resimler asılı. En sevdiğin mağaza sana bir zarf yollamış. Zarfın içinde uzun bir değerlendirmeye formu var. Kardeşin yakında evleniyor. Annem amcalarına davetiyeye gönderme görevini sana verdi. Yeni evinin duvarlarına boya yapılıması gerekiyor. Yakınlarda yaşayan iki kuzenin var. Patronun bir iş gezisine gitmeni istiyor. Evinde her gün sulanması gereken çiçekler var.	Er is een café in de buurt van uw nieuwe huis. Er hangen prachtige foto's aan de muren van dit café. Je favoriete winkel heeft je een enveloppe gestuurd. In de enveloppe zit een lang evaluatieformulier. Je zus gaat trouwen. Je moeder heeft je gevraagd om uitnodigingen naar je ooms te sturen. De muren van je nieuwe huis moeten worden geverfd. Twee van je neven wonen in de buurt. Je baas wil dat je op zakenreis gaat. Er zijn een aantal bloemen in je huis, die elke dag water moeten krijgen. Je ouders zijn naar een andere stad verhuisd. Na je eerste bezoek je telefoonoplader in hun huis was achtergebleven.	(Sen) kafenin sahibine bu resimleri nereden aldığını sor. (Sen) çocuklarına bu formu senin için doldurup dolduramayacaklarını sor. (Sen) amcalarına davetiyeyi alıp almalarını sor. (Sen) kuzenlerine evi boyamaya yardım edip edemeyeceklerini sor. (Sen) çocuklarından çiçekleri sulamalarını iste. (Sen) onlara şarj aletini geri yollayamayacaklarını sor.
44			
45			
46			
47			
48	Ailen başka bir şehre taşındı. İlk ziyaretinden sonra telefonunun şarj aleti onların evinde kalmış.		

Appendix B

Model summary of the final model

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) [glmerMod]

Family: binomial (logit)

Formula: $\text{pro} \sim (1 \mid \text{participant}) + (1 \mid \text{item}) + \text{langmode} + \text{priming} + \text{langmode}:\text{priming} + \text{itempretest} + \text{dominance} + \text{langmode}:\text{dominance} + \text{priming}:\text{dominance} + \text{langmode}:\text{priming}:\text{dominance}$

Control: glmerControl(optimizer = "bobyqa")

AIC	BIC	logLik	deviance	df. resid
881.8	927.4	-431.9	863.8	1164

Scaled residuals

Min	1Q	Median	3Q	Max
-2.3314	-0.3755	-0.2161	-0.1004	11.8910

Random effects

Groups	Name	Variance	Std. Dev.
item	(Intercept)	0.5714	0.7559
participant	(Intercept)	2.5240	1.5887

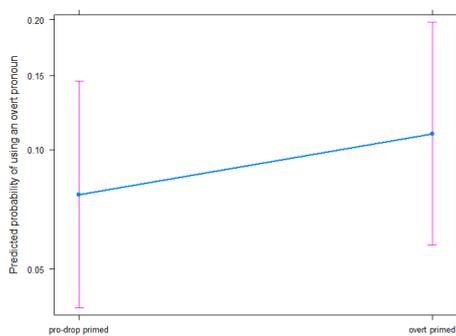
Number of obs: 1175, groups: item, 48; participant, 28

Fixed effects	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	-1.32	0.42	-3.19	0.0014 **
langmode	-1.04	0.28	-3.66	0.0002 ***
priming	-0.20	0.25	-0.81	0.4194
itempretest	2.40	0.69	3.46	0.0005 ***
dominance	-0.01	0.01	-1.28	0.2009
langmode × priming	1.26	0.38	3.23	0.0009 ***
priming × dominance	0.01	0.01	2.01	0.0440 **
langmode × priming × dominance	0.01	0.01	0.86	0.3878

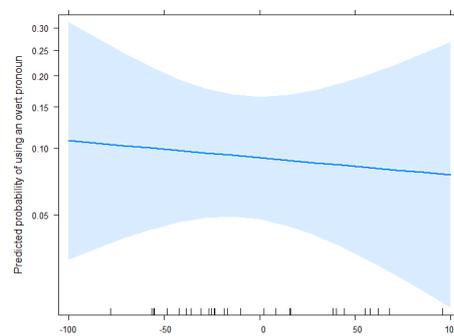
*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Appendix C

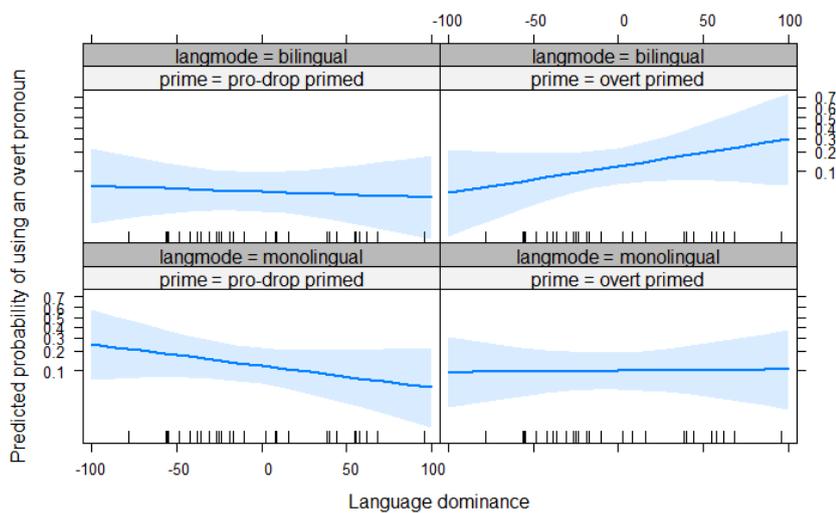
Absent effects



(A) Priming



(B) Language dominance



(C) Language mode * priming * dominance

FIGURE C.1: Effect plots of the nonsignificant predictors included in the final mixed logit model

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