CODE-SWITCHING: A TOUCHSTONE OF MODELS OF BILINGUAL LANGUAGE PRODUCTION

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ABSTRACT

The goal of the present thesis was to investigate the production of code-switched utterances in bilinguals' speech production. This study investigates the availability of grammatical-category information during bilingual language processing. The specific aim is to examine the processes involved in the production of Persian-English bilingual compound verbs (BCVs). A bilingual compound verb is formed when the nominal constituent of a compound verb is replaced by an item from the other language. In the present cases of BCVs the nominal constituents are replaced by a verb from the other language. The main question addressed is how a lexical element corresponding to a verb node can be placed in a slot that corresponds to a noun lemma. This study also investigates how the production of BCVs might be captured within a model of BCVs and how such a model may be integrated within incremental network models of speech production. In the present study, both naturalistic and experimental data were used to investigate the processes involved in the production of BCVs. In the first part of the present study, I collected 2298 minutes of a popular Iranian TV program and found 962 code-switched utterances. In 83 (8%) of the switched cases, insertions occurred within the Persian compound verb structure, hence, resulting in BCVs. As to the second part of my work, a picture-word interference experiment was conducted. This study addressed whether in the case of the production of Persian-English BCVs, English verbs compete with the corresponding Persian compound verbs as a whole, or whether English verbs compete with the nominal constituents of Persian compound verbs only. Persian-English bilinguals named pictures depicting actions in 4 conditions in Persian (L1). In condition 1, participants named pictures of action using the whole Persian compound verb in the context of its English equivalent distractor verb. In condition 2, only the nominal constituent was produced in the presence of the light verb of the target Persian compound verb and in the context of a semantically closely related English distractor verb. In condition

3, the whole Persian compound verb was produced in the context of a semantically unrelated English distractor verb. In condition 4, only the nominal constituent was produced in the presence of the light verb of the target Persian compound verb and in the context of a semantically unrelated English distractor verb. The main effect of linguistic unit was significant by participants and items. Naming latencies were longer in the nominal linguistic unit compared to the compound verb (CV) linguistic unit. That is, participants were slower to produce the nominal constituent of compound verbs in the context of a semantically closely related English distractor verb compared to producing the whole compound verbs in the context of a semantically closely related English distractor verb. The three-way interaction between version of the experiment (CV and nominal versions), linguistic unit (nominal and CV linguistic units), and relation (semantically related and unrelated distractor words) was significant by participants. In both versions, naming latencies were longer in the semantically related nominal linguistic unit compared to the response latencies in the semantically related CV linguistic unit. In both versions, naming latencies were longer in the semantically related nominal linguistic unit compared to response latencies in the semantically unrelated nominal linguistic unit. Both the analysis of the naturalistic data and the results of the experiment revealed that in the case of the production of the nominal constituent of BCVs, a verb from the other language may compete with a noun from the base language, suggesting that grammatical category does not necessarily provide a constraint on lexical access during the production of the nominal constituent of BCVs. There was a minimal context in condition 2 (the nominal linguistic unit) in which the nominal constituent was produced in the presence of its corresponding light verb. The results suggest that generating words within a context may not guarantee that the effect of grammatical class becomes available. A model is proposed in order to characterize the processes involved in the production of BCVs. Implications for models of bilingual language production are discussed.

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LIST OF ABBREVIATIONS AND SYMBOLS

Abbreviations

BCV = bilingual compound verb

BIA model = Bilingual Interactive Activation model

CE = Christian Era

CS = code switching

CV = compound verb

Det = determiner

Equi= equivalent

Lit. = literally

N = noun

NEG = pre-verbal negator

Ocm = object case marker

Pl. = plural

POSS = possessive

Prog = progressive

SOA = stimulus onset asynchrony

SPPL model = The Sociopragmatic Psycholinguistic model

V = verb

Vbl = verbalizer

Symbols

ā = /a/ as in ‘arm’

š = /sh/ as in ‘share’

u: = /u/ as in ‘rude’

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CHAPTER 1: INTRODUCTION

1.1 Aim of this study and outline

Each language of a bilingual has its own components, including syntax and lexicon. The components of the two languages interact during language production (Kroll et al., 2006). For example, while in monolingual speakers the selection between two options occurs very occasionally, such as when producing words having within-language synonyms (e.g., Persian "zibā" and "qašang" meaning beautiful), this competition arises in producing almost every word that bilinguals utter, because almost every word has an equivalent in the other language (Gollan & Ferreira, 2009). Bilinguals need to correctly select an item that meets all the linguistic requirements for both form and meaning but belongs to the intended rather than the competing language (Bialystok, 2009). For this and other reasons (see Kroll et al., 2006), some researchers assume that bilingual language production may be different from monolingual speech production.

In the present study, some aspects of bilingual language production, such as language selection and language processing in switched utterances, especially the grammatical encoding and lexical access at lemma level are investigated. This study focuses on the production of Persian-English BCVs. Since the nature of such phenomena (i.e., language selection, lexical access) is obviously different, given that bilingual language production is affected by many different factors, I am adopting a multidisciplinary approach in order to investigate them. Grosjean, Munte and Rodriguez (2003) rightly assume that there is an urge

for researchers in different fields, such as psycholinguistics, neurolinguistics, and sociolinguistics to collaborate in order to better understand the nature of bilingual language production. They assert that the main aim of such collaborative approaches would be to provide an efficient model of bilingual language production.

In this study, I used both naturalistic and experimental data to examine the processes involved in the production of bilingual compound verbs (BCVs) in Persian-English language contacts. In a bilingual compound verb, an element (mostly a noun or a verb) from the other language of bilinguals is used in the place of the nominal constituent of a compound verb. For example, while "modiriyyat kard" (literally meaning manage-did- 'managed' that has a noun+ light verb construction) is a monolingual compound verb, "manage kard" is a bilingual compound verb". As far as I am aware, this is the first study to investigate the processing of BCVs using both naturalistic and experimental data from a psycholinguistic perspective. I used naturalistic data because studying "naturally occurring code-switching does offer a number of insights about the nature of language that either complement existing psycholinguistic findings or suggest new avenues for study" (Myers-Scotton, 2006b: 211). Studying the production of BCVs in experimental conditions helps us understand the on-line processes involved in the production of bilingual compound verbs (BCVs).The main aim of bringing the topics together into the present thesis is to accomplish three major goals. First, this study sets out to examine bilingual language selection from both social-psychological/sociolinguistic and psycholinguistic standpoints. The second goal is to contribute to the understanding of grammatical encoding and lexical access in bilingual language processing, especially during the production of BCVs. I examine what the analyses of the present naturalistic code-switched utterances together with the results of the experiment suggest about lexical access and grammatical processing in bilingual language production. The third goal is to examine how well the existing models of bilingual language

production can account for our code-switching (CS) data. These various aspects of bilingual speech production (language choice, lexical access, grammatical encoding) is integrated into a single perspective in order to present a deeper insight into bilingual language processing.

The structure of the present thesis is as follows:

In Chapter 1, I first discuss the definition of bilingualism in general. Given that about one third of the world's population uses more than one language in daily life with different degrees of language proficiency (Grosjean, 2010), it seems necessary to determine whom I address as a 'bilingual speaker'.

Since I present results on the processes involved in the production of BCVs that occur in the Persian-English language contact situation, it is necessary to present a short introduction of the Persian language and the structure of Persian compound verbs. Moreover, in order to get a better understanding of the structure of BCVs, I also discuss the production of BCVs in other language-contact conditions. Since one of the main aims of investigating the production of BCVs is to examine the encoding of grammatical-class information in bilingual speech production and given that the grammatical class is an unresolved issue in language studies, I present an overview of studies on grammatical class in different disciplines in Chapter 1.

Code-switching (CS) constitutes a matter of interest among different disciplines. Milroy and Muysken (1995:7) proposed that "perhaps the central issue in bilingualism research is code-switching". Therefore, I provide an overview of the purposes of studies on CS from different fields, such as psycholinguistics, sociolinguistics, and neurolinguistics in Chapter 2.

The mixing of two languages is considered one of the possible language choices in bilinguals. In order to better understand the nature of language selection in bilingual speakers,

Chapter 3 adopts a multidisciplinary approach to investigate language selection in bilinguals, and then, moves on to look upon how the processes involved in language selection are embedded in psycholinguistic frameworks of bilingual language production.

I collected naturalistic code-switching data to examine bilingual lexical access and grammatical encoding during the production of Persian-English BCVs, which be analysed in Chapter 4. More specifically, I examine whether words from different categories across two languages can compete for selection. This study addresses the question of how a lexical element corresponding to a verb node can be placed in a slot that corresponds to a noun lemma. I also investigate how the production of BCVs might be captured within a model and how such a model may be integrated within incremental network models of speech production.

In Chapter 5, an experiment is presented that investigates the availability of grammatical-category information during bilingual language processing. In this experiment, I examine whether in the case of the production of BCVs, English verbs compete with their corresponding Persian compound verbs as a whole, or whether the English verbs compete with the nominal constituent of Persian compound verbs only.

Chapter 6, that is the final chapter of the present thesis, provides a summary of the results. More importantly, I discuss whether the current models of bilingual language processing may account for the present CS data. In case where the models were not able to explain some aspects of our code-switching data, I consider what suggestions could be made in order to improve models of bilingual language production.

1.2 Who do I mean by a 'bilingual speaker'?

In many countries (e.g., Switzerland, Canada, the U.S.), living in a society where more than one language is spoken or heard is considered to be a normal way of life. Based on a survey on language use in the U.S. extracted from the American Community Survey (2007), Shin and Kominski (2010) report that in 1980 about 23.1 million people living in the U.S. spoke a language other than English at home. In 2007, however, about 55.4 million people spoke a language other than English at home. The survey indicates that during this period, the U.S. population grew 34 percent. This shows a 140 percent increase in bilingual speakers.

Considering the fact that today about half of the children growing up all over the world are exposed to at least two languages (Crystal, 1997), and given that one third of the world's population uses more than one language for their work or in their family life (Grosjean, 2010), it seems hard to say who is bilingual. There is even a large number of people who use a language other than their native language in some specific situations (e.g., at school or in business meetings). If they are counted as bilingual speakers, answering the question who is bilingual is even more difficult (Wei, 2000).

Primarily, the term 'bilingual' describes a person who possesses two languages, but recently several criteria have been adopted to define a bilingual person (Baker & Prys Jones, 1998). Among them are language proficiency and fluency, speakers' self-assessment of their language proficiency (see Marian et al., 2007), speakers' language use in their everyday life, the time of exposure to two or more than two languages (see De Houwer, 2006), and years of exposure to two languages (see Marian et al., 2007).

There are some potential problems with respect to defining bilingualism. For example, there are speakers who comprehend the other language but cannot speak it. I also met some Persian (L1) speakers in the UK who could speak English fluently but wrote and read it very poorly. Given such a situation, Baker (1988:2) poses the question: "a pupil may be able to understand spoken English and Welsh, speak English fluently but Welsh only haltingly, read in Welsh with a reading age of six and in English with a reading age of eight, write poorly in English and not at all in Welsh. Is that pupil bilingual?"

Some definitions have been presented with respect to specific criteria. 'Balanced bilinguals' and 'dominant bilinguals' were introduced by Peal and Lambert (1962) in order to show different levels of proficiency in bilingual speakers. A distinction has been made between 'early bilingualism' and 'late bilingualism' as to indicate when a speaker acquired a second language (acquiring a second language before or after adolescence). 'Additive bilinguals' and 'subtractive bilinguals' have also been introduced by Lambert (1974) in order to highlight the effects speakers' L2 might have on their mother tongue language (Purmohammad, 2008a). In this view, a 'subtractive bilingual' is a speaker "whose second language is acquired at the expense of the aptitudes already acquired in the first language" (Wei, 2000: 5).

Bloomfield (1933:56) defines bilingualism as "the native-like control of two languages". Weinreich (1953:7) in turn defines it as "the practice of alternately using two languages". As can be seen, the two classic definitions already span the range from meticulous expectations of native-like mastery of the two languages to the looser expectation of simply using two languages (Chin & Wigglesworth, 2007). Baetens Beardsmore (1982, cited in Chin & Wigglesworth, 2007) describes these two opposite approaches to defining bilingualism as maximalist (Bloomfield's definition) and minimalist (Weinreich's definition). Later, as bilingual studies developed, some of these definitions were criticized (see Edwards, 2004 for

review). It has been suggested that a vast range of possible intermediary modes lie between these minimalist and maximalist approaches (Grosjean, 1989). Thus, different definitions were introduced which may better define bilingualism. With respect to the criteria, one finds that there are different degrees of bilingualism.

Wei (2000) lists more than 37 different terms (e.g., additive bilingual, ascendant bilingual, maximal bilingual, asymmetrical bilingual) used in the literature to describe bilingual speakers. In some cases, two different definitions seem to refer to the same population. For example, a 'semibilingual' is the same as a 'receptive bilingual' (Wei, 2000). Looking into the list, one would find that some terms describe particular kinds of speakers only. For example, a 'vertical bilingual' is a speaker "who is bilingual in a standard language and a distinct but related language or dialect" (Wei, 2000:5). I (2009; 2008a) reported that many terms used to define bilingual speakers do not seem to suit bilingualism in Iran. Some researchers did not limit bilingual speakers to those who know or use two languages. Mackey (1962:52) defines bilingualism as "the ability to use more than one language". That is, the term bilingual also includes those who use any number of languages. However, some characteristics of trilingualism, such as the effect of L2 on L3 and vice versa seem to be absent in bilingualism (Barnes, 2006).

Bilinguals are typically considered as those who can speak two languages to some degree of proficiency; however, as in case of Dutch and Flemish, "identifying what counts as a language" (Bialystok, 2001:5) might also be problematic. The discussion above shows that bilingualism is not a concrete phenomenon that can easily be dissected (Chin & Wigglesworth, 2007).

The salient fact is that complete knowledge of two languages is hardly ever achieved (Grosjean, 1996). As Paradis (2004: 3) puts it, "a fortiori, no speaker has complete knowledge of two languages". He states that in the recent bilingual literature a speaker is

considered a bilingual as long as he or she uses two languages with appropriate automaticity and accuracy. In this view, apart from the hazards noted above, in most current literature the term ‘bilingual’ is used to refer to speakers who use two languages in many different situations (Edwards, 2004) with different interlocutors for different purposes in their daily language use (Grosjean, 1992). Taking the same approach, in this study the term ‘bilingual’ refers to the same type of speakers.

1.3 Persian

Persian is an Iranian language that along with Kurdish, Mazandarani, Talysh, Gilaki and Baluchi belongs to the west Iranian language family of Indo-European languages (Windfuhr, 2009). Persian is the official language of Iran. There are three varieties of Persian: Dari Persian spoken in Afghanistan, Farsi Persian spoken in Iran, and Tajik Persian spoken in Tajikistan. According to Beeman (2005: 6) "Tajik, Dari and Persian are languages in the sense that they have concretized canonical forms that are transmitted through institutionalized schooling and reference works, however structurally they are all varieties of Persian".

Three major periods of Iranian languages (i.e. Old Persian, Middle Persian, and New Persian) are generally recognized. The language periods closely correspond to three distinct eras in the history of Iran. Old Persian dates back to the period of the Achaemenid era and after (approximately the 3rd century B.C.). Middle Persian (the 3rd century B.C. to the 9th century CE) corresponds to the Sassanid era, while the New Persian is the period afterward down to the present day (Skjærvø, 2006). Modern Persian uses the Arabic writing system. Since Modern Persian has been developed during the Islamic period, it has been highly influenced by Arabic resulting in many borrowed words.

The basic word order in the Persian language is SOV; however, it exhibits, especially in spoken Persian, free word order. Thus, Persian might be considered a non-rigid language when compared to rigid languages like Japanese (Karimi, 1994). Persian "exhibits head-initial word order in noun-genitive, noun-adjective, and preposition-noun phrases as well as noun-relative clauses"(Naseh LotfAbadi, 2002:71). Demonstratives (e.g., 'in' meaning "this"), numerals, and any measures occur before the head noun. It is a pro-drop language.

Persian is a verb-final language; however, some adverbials may occur postverbally (Gebhardt, 2009).

While Old Persian used three genders and six cases, modern Persian does not use grammatical gender or case. In Old Persian there were inflectional paradigms for future, present negative imperative, conjunctive, and optative expressed with endings. Such an inflectional system no longer exists in Modern Persian. Ergativity is also absent in modern Persian (McWhorter, 2007). All these linguistic changes lead to a modern Persian that can be "described as 'marvellously simple'. Of course it is a complex language as all are" (McWhorter, 2007: 137).

1.4 Persian compound verbs

In order to convey a meaning or a concept in a verb form, the Persian language has two options: it can be conveyed by a simple verb (e.g., "*xord"* meaning "ate") or in a compound verb form (e.g., "*tamāša mikon-am*" lit. "watch do-I", meaning "I watch") (Tabātabāi, 2005). In his influential paper, Dabir-Moqaddam (1997) argues that there are two main lexical processes involved in the formation of Persian compound verbs: 'combination' and 'incorporation'. In compound verbs formed via combination, the nonverbal constituent, which can be an adjective, a noun, a past participle, a prepositional phrase or an adverb, is combined with a light verb. In this form of compound verbs, if the nonverbal constituent is a noun, the verbal constituent is lexicalized and functions as an action-marker. The resulting meaning may not be transparent (Dabir-Moqaddam, 1997) (but see Seyfollāhi & Tabibzādeh, 2013). The structure of Persian compound verbs is a debated issue in linguistics. The taxonomy of Persian compound verbs presented in Lambton (1984/1953) are: N+V, Adj+V, Proposition/Adv+V, propositional phrase+V. However, Seyfollāhi and Tabibzādeh (2013) argue that not all combination of N/adjective/adverb+simple verb make a compound verb. They especially argue that the Adj+V string as in "nārāhat šod" (meaning "became unhappy") form a predicative structure and should not be considered as a compound verb.

(1) and (2) are examples of compound verbs formed by combination:

(1) Rezā *zamin xord*.

Rezā earth ate

Reza fell down

(2) ʔu: *qaš kard.*

He/she faintdid

He fainted.

However, in compounds formed thorough incorporation, a nominal element that functions as a direct object of the verb "loses its grammatical ending(s)" (p.41) such as "rā", the postpositional object case marker (ocm), the plural suffix"–hā", and the possessive pronominal suffix and some prepositional phrases lose their preposition in order to incorporate with the verb (Dabir-Moqaddam,1997).

(3) and (4) are examples of compound verbs formed by incorporation:

(3) *Qazā xor-d-am*.

Food eat-past-I

I ate food

(4) Ānhā *māhi geref-t-and*.

They fish take-past-they

They fished.

Dabir-Moqaddam (1997) recognizes some major differences between the two types of compound verbs. First, there is a corresponding non-incorporated version for every incorporated form. The non-incorporated form of example (1) is shown in example (5).

(5) Man qazā-am rā xord-am

I food-my ocm ate-I

I ate my food.

Second, all incorporated compound verbs are intransitive, while compound verbs formed by combination may be intransitive or transitive. Third, compound verbs that are formed by incorporation are more productive than compound verbs formed by combination (Dabir-Moghaddam, 1997).

In the present study, however, only compound verbs formed through combination will be considered.

Shabani-Jadidi (2012) examined the processing of Persian compound verbs in the light of psycholinguistic models of processing polymorphemic words. One of the main aims of the study was to examine the role of morphological structure and semantic transparency during the retrieval of Persian compound verbs with a N+V structure. Three experiments were reported. In the first experiment, using masked priming paradigm, she examined whether constituents of compound verbs exhibit significant priming and whether semantic transparence provides constraints on the amount of priming. Persian compound verbs (‘komak kardan’ literally ‘help-do’) were used as primes and their nominal or verbal constituents (‘komak’ and ‘kardan’ respectively) were used as targets. The critical targets were matched with one of three prime conditions: 1) morphologically but not semantically related; 2) the prime was both morphologically and semantically related and 3) the prime was not semantically, morphologically and orthographically related to the target. To assess the transparency similarity effect and examine whether transparent compound verbs yield faster recognition of transparent compound verb targets compared to opaque compound verb target, three prime-target pairs were added in which the target was matched by one of the prime conditions: 1) a transparently similar prime (‘kamar bastan’ literally ‘belt-to tie’- to decide), 2) a transparently dissimilar prime (rox-dādan, literally ‘face-to give’- to happen), 3) an unrelated prime (raftan- to go’). 150 nonwords fillers were created by changing two letters of real words. Participants were native speakers of Persian. They did a lexical decision task. They had to decide whether the strings of letter were words or nonwords. The prime was displayed for a very short time (50 ms). The target appeared for 527 ms. Reaction times and error rates were calculated.

No significant constituent priming effect was found for the constituents of the transparent compound verbs. However, the results showed that constituent priming for the nominal constituent of a compound verb was numerically greater than for the verbal

constituent. The same result, i.e., the greater nominal constituency priming effect, was also observed in the opaque condition in Experiment 1, Experiments 2a and 2b. The transparent-transparent condition yielded a greater priming effect for the target compared to the transparent-opaque.

These results imply that it is easier for participants to "recognize transparent compound verbs as existing words in Persian" (p. 68) compared to opaque compound verbs. In opaque compounds, however, the results revealed that there were significant RT differences in opaque compound verb-nominal constituent pairs. Thus, the results from Experiment 1 showed a constituency effect for the nominal constituent, however, this effect was significant in opaque condition but not very significant in transparent condition.

In experiment 2a, the researcher examined the priming of the nominal constituent (non-head constituent) in which the compound verbs were used as the primes. The prime-target conditions were as follows: relatively semantically transparent Persian compound verbs as the prime (e.g., chāi-rixtan literally 'tea-to pour'- to pour tea) and their nominal constituent as the target (chāi- 'tea'); relatively semantically opaque Persian compound verbs as the prime (e.g., zabān-rixtan literally 'tongue-to pour'- to flatter) and their nominal (i.e., nonhead or initial) constituent as the target (zabān 'tongue'); and " primes containing an embedded pseudo-morpheme in the word-initial position and a nonmorphological ending" (p. 78) (e.g., del-bāxtan 'to fall in love') with the embedded pseudomorpheme as the target (e.g., del 'heart'). The results revealed significant constituent priming for the nominal (nonhead) constituents of both opaque and transparent compound verbs. Moreover, there was a significant constituent priming effect for the "initial pseudo-morpheme of the orthographic overlap condition" (p. 84). However, the constituent priming for the nominal constituent of the transparent compound verbs was greater than "the constituent priming for the nominal constituent of the opaque compound verbs as well as for the initial pseudo-morpheme of the

orthographic overlap condition" (p.84). Thus, Shabani-Jadidi (2012) concluded that the constituents of Persian compound verbs are primed, and semantic transparency affects the amount of priming.

In experiment 2b, she examined the priming of the verbal constituent (the head constituent) in which the compound verbs were used as the primes. The prime-target conditions were as follows: relatively semantically transparent Persian compound verbs as the prime (e.g., kādo-dādan literally 'gift-to give'- to give a gift) and their verbal (i.e., head or final) constituent as the target (dādan- 'to give'); relatively semantically opaque Persian compound verbs as the prime (e.g., del-dādan literally 'heart-to give'- to fall in love) and their verbal constituent as the target (dādan- 'to give'); and "primes containing an embedded pseudo-morpheme in the word-final position and a nonmorphological onset (e.g., xandidan 'to laugh') with the embedded pseudo-morpheme as the target (e.g., didan-'to see')" (p. 89). The verbal constituents of both transparent and opaque compound verbs showed significant constituent priming. There was also a significant priming effect "for the final pseudo-morpheme of the orthographic overlap condition" (p. 94), however, the constituent priming for the verbal component (head) of the transparent compound verbs was smaller than the nominal (nonhead) component priming of the transparent compound verbs. Shabani-Jadidi (2012) interprets this discrepancy in transparent condition in terms of the "competing verbs that can match with the noun" (p.101). The semantic transparency effect was observed for the nominal constituent because the nominal constituent in the transparent condition was primed faster than the nominal constituent in the two other conditions, namely the opaque and the orthographic conditions. The verbal constituent of the opaque compound verbs showed the same constituent priming effect as the nominal constituent priming of the opaque compound verbs. According to the researcher, the reason why the discrepancy observed between the

nominal and verbal constituents in the transparent compound verbs is that "competition between verbs does not exist or is weak because they are fixed expressions" (p. 101).

Thus the main findings of the study are: 1) in all conditions, there is a semantic relation between the prime and target; 2) at early stage of processing, Persian compound verbs are decomposed into their components; 3) at early stages of processing, decomposition occurs purely based on orthographic similarity; transparency had an effect on the early stages of processing, however, both opaque and transparent compound constituents were facilitated.

The main characteristic of light verbs in compound verbs is that they possess very little semantic content of their own. Light verbs in multi-word compounds mainly predicate the inflectional information (inflectional morphemes) (Tabātabāi, 2005). In other words, the verbs mainly have grammatical functions, especially carrying the inflectional elements. However, Butt (2010:48) argues that "the verbs are clearly not entirely devoid of semantic predicative content" and may also convey meaning to the whole unit. For example, the light verbs '*kard'* (meaning 'do') and '*šod' (*meaning 'became') in 'estexdām *kard'* and 'estexdām *šod'* carry both grammatical information (/-d/ in '*šod'* and *'kard'* is a past tense affix) and meaning. While the former means 'to employ', the latter means 'to become employed'. Light verbs also provide a verbal characteristic for the whole unit (Samardžić, 2008). Many Persian compound verbs (e.g., 'bāzi kard' lit. 'playing did she/he'- he/she played) are closely the same in meaning to their corresponding simple verbs in English (e.g., played).

'Kardan' (meaning 'do') is the most frequent light verb used in making Persian compound verbs (Tabātabāi, 2005). According to RostamPur (1996), about one third of Persian compound verbs use 'kard-an' as their light verbs. (see Khanlari, 1976 for more details). Other verbs used to form compound verbs are 'dādan'(to give), 'gereftan'(to take), 'dāštan'(to have), 'šodan' (to become), 'kešidan' (to pull), 'zadan' (to strike), 'xordan' (to eat), and 'budan' (to be).

1.5 Bilingual compound verbs

Bilingual compound verbs (BCVs) occur in many languages in contact situations. One of the structures of BCVs in many language contacts is an "alien verb+a light verb". A BCV is formed when the nominal constituent of a monolingual compound verb is replaced by a word, usually a verb, from the bilinguals' other language. The structure of BCVs has been discussed considerably in structural linguistics and contact linguistics (see Muysken, 2000; Romaine, 1995; Edwards & Gardner-Chloros, 2007, Backus, 1996, 1992). "This construction knows no typological or geographic limits" (Myers Scotton 2002: 35), because it occurs in many language contact conditions ranging from Greek and Turkish to Popoloca (spoken in Mexico) and Spanish (Edwards & Gardner-Chloros, 2007). The BCVs occur in a variety of languages with different structures, such as Greek-Australian (Tamis,1986), German-Hungarian (Moravcsik,1975), Japanese-English (Stanlaw,1982), Popoloca-Spanish (Veerman-Leichsenring, 1991), and English-Tamil (Annamalai, 1989) (Edwards & Gardner-Chloros, 2007). Since the structure of BCVs is so productively occurring in many language-contact conditions, I propose the following principle for the production of BCVs:

> BCVs may occur in a language-in-contact condition if at least one of the two languages of a bilingual speaker frequently uses compound verbs. One of the structures used in the construction of BCVs in many language in contact situations is "an alien main verb + a native light verb", however, BCVs may sometimes use "an alien noun + a native light verb" structure or more rarely a structure consisting of "an alien noun/verb + a native light verb + a native light verb".

Many languages, such as Indian languages (e.g., Urdu, Hindi, Bengali, among others), frequently use compound verbs (see Muysken, 2000; Annamalai, 1989). Complex verbs in Indian languages use an N+V constituent structure or a V+V structure. Similar to Persian, in an N+V structure in Indian languages, the noun is followed by a light verb (e.g., "kɔra" meaning "do"), which carries the inflection. In Bengali, 'bikri kɔra' ('sale do' meaning 'to sell') is an example of a compound verb that uses a N + do construction (Chatterjee, in press). According to Tridha Chatterjee (personal communication, 02 October 2013), in monolingual Bengali only nouns can occur before a Bengali 'do verb- kora' such as 'bikri kora' ('sale do'- to sell). With Bengali-English compounds, however, both nominal and verbal lexical elements from English can occur before the Bengali 'do' verb (see Muysken, 2000). Bengali-English BCVs may use a structure consisting of 'an alien noun/verb + a native light verb + a native vector verb' (Chatterjee, in press).

BCVs frequently take place in switches between Indian languages (e.g., Bengali, Hindi) and English. Romaine's (1986) influential study is based on 77 cases of BCVs produced by 11 Panjabi-English bilingual speakers. She investigated the syntax of BCVs.'Kərna', meaning 'do', was the most frequent light verb used in the BCVs. The researcher reports that in her data most of the BCVs were formed by 'English verbs+Panjabi light verbs' ("operator" for light verb in the Romaine's terminology). Some examples from Romaine's study are reproduced below.

(15) show off hona /kərna

(16) depend hona /kərna

(17) learn kərni

(18) improve kərna

(19) involve hona

(20) appreciate kərna

(21) look down upon kərna (Romaine, 1986)

In Tamil-English BCVs, English verbs are frequently used in the place of the nominal constituent. For example, in Shanmugan Phillai's (1968, cited in Muysken, 2000) list of BCVs in which the Tamil verb 'Paṇṇi' (expressing accomplishment or causation, Muysken, 2000) was used, 194 cases used English verbs, while only 3 English nouns were used.

Chatterjee (in press) also investigated the structure of BCVs. Her data comes from the recording of informal conversations of thirty Bengali-English bilingual speakers residing in Kolkata, India. It is common for Bengali-English compound verbs to use both English nouns and verbs in the place of Bengali nouns. However, she reports that in her corpus English verbs were used much more frequently than English nouns. In such cases, English verbs were used with Bengali light verbs 'kɔra', meaning 'do', and 'hɔwa', meaning 'be', in active and stative constructions respectively (see examples 22-24).

(22) O ʈui already **apply** **kor-e** **pʰel-ecʰi-ʂ**
Oh 2SG already apply do-PFV.PTCP throw-PFV-2P

(23) are Pritam gaan-ʈa **delete** **kor-e** **boʂ-ecʰ-e**
So Pritam song-DEF delete do-PFV.PTCP sit-PFV-3P
'Pritam has (unintentionally) and suddenly deleted the song.'

(24) Professor solution-ʈa **simplify** **kor-e** **ɖi-l-o**
Professor solution-DEF simplify do-PFV.PTCP give-PST-3P
ar **explain** **kor-e** **ɖi-l-o**
CONJ explain do-PFV.PTCP give-PST-3P
'The professor simplified and explained the solution."

Chatterjee (in press, p. 10-12)

If one had to express each of the English words occurring ('apply', 'delete', 'explain', and 'simplify') in Bengali, one would use either 'Bengali nouns + Bengali do verb' or just a Bengali simple verb (Tridha Chatterjee, personal communication, 02 October 2013). For example:

English: 'to renovate'

Bilingual: ‘renovate kora’

Bengali: ‘sharano’ (V) or ‘notun kora’ (N+V)

Annamalai (1989) goes further and claims that the structure that a speaker uses in BCVs can be used as a standard in order to distinguish between unbalanced and balanced Tamil-English bilinguals. He assumes that while unbalanced bilinguals (weaker at English) tend to use the “N + the dummy verb paNNu” structure such as “reservation paNNu” in BCVs, the balanced bilinguals tend to use the “V + the dummy verb paNNu” construction (e.g., reserve paNNu). He suggests that the reason for selecting different structures might be that the unbalanced bilinguals tend to preserve the basic structure used in the monolingual compound verbs, because the “N + the dummy verb paNNu structure” “goes with the Tamil pattern” (p. 51) (see example 25).

(25) Balanced bilinguals: avan enne confuse-paNNiTTaan

Unbalanced bilinguals: avan enne confusion-paNNiTTaan

He me did

He confused me. Annamalai (1989:195)

Kishna (1979, cited in Muysken, 2000) studied the effect of Dutch on the Sarnami (Hindustani) language. She analyzed the language production of 31 Dutch-Sarnami speakers from a structural perspective. She found cases of BCVs in which Dutch verbs were used with Sarnami verbs (Dutch verb+Sarnami verb) (see examples 26 & 27). In Sarnami ‘*ho:ve’* means ‘be’ and ‘*kare*’ means ‘*do’*. ‘*Kare*’ is the most frequently used Sarnami light verb in the BCV construction (Muysken, 2000).

(26) luk ho:ve succeed succeed

(27) schoon-maak kare clean make clean (Muysken, 2000: 198)

Bilingual compound verbs are also produced in Greek-English language contact. Tamis (1986; cited in Muysken, 2000:212) reports that English verbs occur after ‘Káno’

(‘*do*’) to construct the BCVs (Examples 28-31). The same concepts are expressed in a V+N structure in monolingual compound verbs (see Fotiu, 2010 for the production of English-Cypriot Greek BCVs).

(28) Káno enjoy

(29) Káno decorate

(30) Káno examine

(31) Káno explain (Tamis, 1986, cited in Muysken, 2000: 212)

1.6 Grammatical class: An unresolved issue in language studies

The concept of parts of speech is one of the oldest discoveries in linguistics "with a continuous tradition going back at least to the *Téchnē grammatiké* of Dionysius Thrax (*c*. 100 BC)" (Baker, 2003:1). Traditionally, grammatical class has been recognized as one of the best cases for being a linguistic universal (Vigliocco et al., 2008). As almost all languages draw a distinction between nouns and verbs (Crepaldi et al., 2011), this led many researchers to consider the two parts of speech as a "privileged status among grammatical classes" (p.33). In other words, the verb-noun distinction is regarded as of utmost importance compared to the other word class distinctions such as adverb-verb and adjective-noun (Bhat, 2000). However, grammatical class, especially the verb-noun distinction, has been a debated issue in different disciplines including linguistics and psycholinguistics. Whereas the noun-verb distinction is generally viewed as a language universal, there are many linguists (e.g., Anderson, 2004; Laudanna & Voghera, 2002) who assume that such a distinction is not universal in the world's languages or is at least a matter of controversy, because there are languages such as Polynesian and Nootkan languages that "lack the noun-verb distinction" (Croft, 2000: 67).

There is also a wide variation among languages with respect to the function of grammatical class. While in some languages, words' grammatical category constraints their functions, some languages permit their words to "occur freely in any of the sentential positions without undergoing any modification" (Bhat, 2000:47). Accordingly, there is a gradation among languages with respect to the noun-verb distinction with some languages exhibiting sharp distinctions between these two classes and some languages showing no distinction (Bhat, 2000). For example, whereas in English not every word (e.g., pronoun, proper name) can take verbal inflections; in Mundari - an Austro-Asiatic language - every given word can be used as a predicate and can "directly take verbal inflections" such as tense

and agreement markers (Bhat, 2000). Baker (2003:3) argues that Chomsky's (1970) goal to propose the X-bar theory was to account for "the observation that nouns take the same range of complements and form the same types of phrases as verbs do. From then till now, the job of X-bar theory has been to account for the sameness of the various categories, but not for their differences".

Interestingly, some words can be categorized as both a noun and a verb. Luuk (2010:349) argues that stems, such as 'walk', 'love', and 'kill' that are ambiguous in terms of "noun/verb distinction are neither nouns nor verbs but flexibles". This view also shows that there is not a general agreement about the noun-verb distinction in the field of linguistics. As Sasse (2001:507) puts it, "whether or not 'nouniness' and 'verbiness' in the sense usually understood are really universal cognitive entities has yet to be shown".

As in the linguistic studies on grammatical class, the results appear to be quite inconsistent in both the psycholinguistic and the neuropsychological literature. Bleser and Kauschke (2003) argue that some neurolinguists and psycholinguists have taken grammatical categories for granted in their attempt to examine the processing of word categories without enough "consideration of the theoretical controversy on the universal status of different word categories" (p.214). Whereas the effect of grammatical class was observed in some circumstances, for instance, in word substitution and exchange errors (see Garrett, 1980), this effect becomes less clear in some other conditions, for instance, in the processing of single words (Vigliocco et al., 2008). The neuropsychological literature, especially on aphasic patients presents evidence concerning the role of grammatical class in organizing lexical knowledge in speakers' mental lexicon. However, as Vigliocco, Vinson, Arciuli and Barbers (2008) put it, given that the existence of a close correlation between grammatical class and semantics (objects vs. actions/events) influences the bulk of imaging and neuropsychological studies, it is not clear whether the results can be unquestionably ascribed to grammatical

class. They argue that the main inconsistency existing in the literature is due to the fact that most verbs are words used to express actions, whereas most nouns are used to speak about objects. Therefore, it appears difficult to "match and control for relevant semantic differences between the lexical classes" (Moseley & Pulvermüller, 2014: 28). Moreover, as Moseley and Pulvermüller argue, it is not surprising to trace verb/noun distinctions in brain activation patterns to a semantic origin.

A number of proposals have been put forward to explain access to the phonological information of words, but less work has been done to investigate how the syntactic features of lexical items, for instance, grammatical class are retrieved from memory (Schiller & Caramazza, 2003). Each lexical item has some specific syntactic features, including number, gender (in German, for instance, every noun has an arbitrary linguistic gender feature), category information (e.g., noun, verb), featural information (e.g., singular, plural), information on case, and combinatorial information (e.g., prenominality and postnominality in the case of adjectives). Many researchers postulate that at least all of the inherent features, the features that inherently belong to a lexical item, such as category information and combinatorial information, are retrieved during language processing (see Hartsuiker & Pickering, 2008). The unfortunate fact, however, is that we do not know much about access to this information during language processing. For example, an unresolved issue in speech production is the role that word category information plays in lexical access (Janssen, et al., 2010). Recently, some researchers have addressed this problem by means of the picture-word interference paradigm (e.g., Pechmann, et al., 2004; Pechmann & Zerbst, 2002; Vigliocco, et al., 2005); however, the results are inconsistent.

Pechmann and Zerbst (2002) examined whether there is a reliable effect for word class information. In Experiment 1, there were four distractor conditions: identical (e.g., picture: TRUMPET / distractor: trumpet), noun, closed-class (e.g., TRUMPET / although),

and neutral distractors. In the noun condition, the noun distractor was neither semantically nor phonologically related to the target name (e.g., picture: TRUMPET / distractor: bag). The results showed that the grammatical category of the distractor words did not affect subjects' naming latencies. The authors increased the effect of syntactic processing in Experiments 2 and 3. Participants were asked to name pictures of objects in the context of a noun or an adverb as distractor. They had to name pictures together with the definite article (e.g., den Apfel 'the apple'). Thus, they did the tasks in a sentence context (e.g., Thomas beschreibt "die Ente", Thomas describes "the duck"). Participants were slower in the context of a noun than of an adverb distractor only when they named pictures in a sentence context. In the bare noun naming condition, however, naming latencies were not affected by the manipulation of the distractor word class. Thus, grammatical category information was activated when the target word was embedded in a syntactic frame. The authors assume that the results of the study provide evidence for grammatical class constraints in a picture-word interference task (Pechmann & Zerbst, 2002). However, the finding that the grammatical class effect was observed in the sentence condition only reflects the role of such syntactic information in sentence planning processes (Duràn & Pillon, 2011).

In Janssen, Melinger, Mahon, Finkbeiner and Caramazza's (2010) study, however**,** a grammatical category effect was observed in both the bare noun condition and in the sentence condition (Experiment 1). Participants named pictures of objects in the context of adverb and noun distractors. Naming occurred in bare noun and sentence frame contexts. A word class effect was observed in "both bare noun and sentence frame naming conditions, suggesting a semantic origin of the effect" (p.1233). In Experiment 2, participants named pictures of objects in the context of noun and verb distractors "whose word class relationship to the target and imageability were orthogonally manipulated" (p.1233). As in experiment 1,

naming occurred in the bare noun and sentence frame naming contexts. The results indicated that in both naming contexts, distractor imageability but not grammatical class influenced picture naming latencies. In both experiments, the results showed that "a semantic interpretation of the word class effect cannot be ruled out and that when semantic variables are controlled, no word class effect emerges" (p.1234). They concluded that word class effects in the picture-word interference paradigm "cannot be used to support a word class constrained theory of lexical selection" (p.1234) proposed in some studies, such as in Dell et al. (2008), because the picture-word interference paradigm is not sensitive to distractor grammatical category.

Pechmann, Garrett and Zerbst (2004), however, reported that the production of a noun phrase (determiner+noun) yielded grammatical class effects in the picture-word interference paradigm. They used noun and adverb distractor words. Participants named pictures in the presence of four distractor conditions (non-noun, identical, noun, and neutral distractors) and 6 different SOAs (stimulus onset asynchronies). The noun distractor was neither semantically nor phonologically related to the picture name. In the non-noun condition, the distractor word was an adverb. Both the nouns and the adverbs were "fully grammatical continuations of the initial sentence fragments" (p.273). Each picture was displayed once in each SOA. Pechmann and colleagues observed that in Experiment 1 determiner+noun naming latencies were slower in the context of noun distractor words compared to adverb distractor words. In other words, the data indicated that the syntactic demands to produce a noun phrase suffice to yield the grammatical class effect. In Experiment 2 and 3, they examined whether the grammatical class effect emerges in English when participants' picture naming is embedded into the processing of a sentence and a simple NP context respectively. In both experiments, there was a grammatical class effect.

In several studies, the effect of the grammatical class was observed only in context. In the picture-word interference paradigm, when participants name pictures of objects in a condition in which no context is available, no word class effect is expected. Pechmann and Zerbst (2002) assumed that when an item is inserted into an existing syntactic structure (i.e. sentential or phrasal contexts), the word class of the item must be available. Accordingly, a word class effect was reported for picture-word interference experiments in which participants named pictures in a given syntactic structure. However, for the processing of single words, the effect of grammatical class is less clear (Vigliocco, et al., 2008).

As stated above, the results regarding the effect of word class are inconsistent. Duràn and Pillon (2011:1) also conducted a set of experiments with "a blocking paradigm in picture and written word naming experiments" to provide additional experimental evidence for the view that grammatical class information could affect word retrieval processes. They reported that in Experiments 1, 3, and 4, the naming of target words from pictures or written words was faster when the target words were named within a homogeneous category list (all nouns) where only words from the same grammatical class had to be produced compared to when they had to be produced within a heterogeneous category list (nouns and verbs) including words from another grammatical category. Duràn and Pillon (2011) found no significant facilitation effect within a homogeneous gender list (all masculine nouns) compared to a heterogeneous gender list (both masculine and feminine nouns). In other words, naming latency was not affected by whether the stimulus list included only masculine nouns or both masculine and feminine nouns. The authors suggest that these findings support the hypothesis that grammatical category information impacts word retrieval processes in speech production "even when words are to be produced in isolation" (Duràn & Pillon, 2011:1). They argue that the finding of a grammatical class effect in the context of single word production strongly

suggests that grammatical class information affects "word retrieval *per se*, not merely phrase and sentence syntactic encoding processes" (p.11).

Melinger and Koenig (2007) also examined whether syntactic features, specifically part-of-speech information, can affect lexical processes. They used a word naming task. Participants were presented "orthographically ambiguous but phonologically distinct English nouns and verbs" (p.472) (e.g., "*convict"* that can be pronounced *CONvict* [noun] vs. *convict* [verb]) that "were preceded by unambiguous noun, verb and letter (control) primes" (p.472). They found that the lexical category of the prime word affected the production of the target word, i.e., participants produced the form of the same grammatical class as the preceding word (prime). Therefore, Melinger and Koenig (2007) assume that grammatical class information is primeable.

The results of electrophysiological, neuropsychological, and neuroimaging studies applying various paradigms to examine the effect of grammatical class are also inconsistent. Vigliocco, Vinson, Druks, Barber, and Cappa (2011) reviewed studies that investigated whether processing lexical items from different grammatical categories, particularly nouns and verbs engages different neural systems. Their studies show that once the confounding of grammatical distinction (verbs vs. nouns) and semantic distinctions (actions vs. objects) present in many studies and the inconsistencies between studying single words and studying words in context are taken into account, the emerging picture is that word class effects become stronger for tasks that demand greater processing and that "grammatical class per se is not an organizational principle of knowledge in the brain" (p.408). The authors assume that once semantic correlates of grammatical word classes are controlled, no or only limited differences in processing between these nouns and verbs emerge, both in production and comprehension – unless the task requires integration processes. They assert that the critical factors that can account for the inconsistent results of imaging studies on the effects of

grammatical category are "semantic confounding, the nature of the task and how this may interact with language-specific processes" (p. 408).

Moreover, there is no consensus about whether grammatical class information is accessed automatically whenever a lexical item is processed. Many models of language production posit that activation of a lexical item leads to the activation of the category node. For example, Pickering and Branigan (1998) assume that whenever a lemma such as "eat" is activated, its category node (verb) is activated. The verb node is "inherently activated whenever the lemma is activated" (p.634). Caramazza (1997) states that not all syntactic properties of a word can be automatically activated by the semantic network. For example, while gender features are not automatically activated by the semantic network, grammatical category (e.g., noun, verb) and verb tense features "do receive activation from the semantic network" (p.195).

On the contrary, Vigliocco, Vinson, Arciuli and Barbers (2008) suggest that grammatical class is not accessed automatically. They assume that the results of their study, presented above, combined with results that they found in previous studies in speech production (e.g., Vigliocco et al., 2005) show that a grammatical effect is observed "only when a frame (even a minimal one) is processed" (p.181). The researchers suggested that the findings provide compelling evidence against a rigid lexicalist view to grammatical category according to which grammatical category is automatically accessed and retrieved when a lexical item is retrieved.

The main aim of the present study is to investigate the processing of grammatical class in the production of BCVs of the type V+V. As stated above, in this type of BCVs, the non-verbal constituent of a monolingual compound verb is replaced by a verb from the other language of bilinguals. As far as I am aware, the grammatical class effect in the production of BCVs has not yet been investigated. To do so, I collected both naturalistic and experimental

data. More generally, the effect of word class in bilingual speech production has hardly been addressed. Through this study, I hope to shed light on the processing of grammatical category in bilingual language production. The results of the present study were expected to fit into a model of bilingual lexical access and syntactic encoding in bilingual language production.

CHAPTER 2: Current approaches to the study of code-switching

The CS phenomenon has attracted different disciplines in language studies. Nilep (2006) reports that a survey of Linguistics and Language Behaviour Abstracts database in 2005 indicates that more than 1800 papers on CS were published in almost every discipline of linguistics. However, many controversies exist in the research on CS, because it has been approached from various disciplinary perspectives, and consequently has evaded a uniform explanation (Bullock & Toribio, 2009).

In this Chapter, the main topics of research on CS in sociolinguistics, structural linguistics, neurolinguistics and psycholinguistics are overviewed. Since the focus of my present work is the processing of bilingual (switched) compound verbs, given that the structure of BCVs is a specific type of CS, the present Chapter is aimed at providing a better insight into the general nature of CS.

2.1 Sociolinguistics

Code-switching is defined as "the alternate use of two or more languages in the same utterance or conversation" (Grosjean, 1982:145). It is generally asserted that the first most influential research on CS was carried out by Blom and Gumperz (1972) who claimed that language switching should not be viewed as a deficit and hence it should not be stigmatized (Cantone, 2007). The main aim of this and some early studies (e.g., Weinreich, 1953) was to discuss "the conversational functions and the social psychological motivations of CS" (Mahootian, 2006: 515). What makes Blom and Gumperz (1972) study very important is that

they showed that CS is, indeed, a complex and skilled linguistic strategy that is used by bilingual speakers in order to convey "social meanings above and beyond the referential content of an utterance" (Gross, 2006:509).

A number of factors have been recognized that cause bilinguals to code-switch. Among them are the topic of conversation, interlocutors, and situations. Gumperz (1982) distinguishes between "we-code" and "they-code". The former is associated with in-group activities such as home and relative, whereas the latter is associated with more formal relations. The adoption of a "we-code" and "they-code" strategy may also represent an act of identity construction (Myers-Scotton, 2002). The distinction between the two strategies highlights "the kind of linguistic alternation that occurs in situational code-switching" (Gross, 2006: 509).

Code-switching, as the most common feature of bilinguals' speech, corresponds with a variety of sociolinguistic factors, such as identity, power, intimacy, and group membership that might interact spontaneously (Gardner-Chloros, 2009a) (see Purmohammad, 2009; 2008b for more details). Gardner-Chloros (2009b) assumes that several sets of factors determine whether or not CS occurs in a given language contact situation. One of these sets would affect all bilingual speakers within a community, such as overt prestige and covert prestige, and power relations. She suggests that a second set of factors, however, is directly associated with the speakers, such as speakers' social networks and relationships, their self-perception and perception of others and their attitudes and ideologies. I (2008b) also assumed that sometimes bilinguals code-switch deliberately in order to show their belongings to the community of the guest language.

Ritchie and Bhatia (2004) summarized (see Table 1) the social factors that lead bilingual speakers to code-switch. According to the researchers, language switching including CS indicates socio-psychological changes. These changes could occur, for instance, by the

presence of a participant who does not belong to the group, by a change of topic or situation, by changing speakers' social relations or their identities, by considering the intended message (whether the message is a quotation, reiteration, or taboo), language attitudes, and finally by the immediate need to make a special effect or what is known as stylistic effects in terms of socio-psychological accounts within the sentence boundaries or beyond it, i.e. at discourse level (Ritchie & Bhatia, 2004). Other social variables, such as age and class were also reported to affect bilinguals' mixing both quantitatively and qualitatively (Muysken, 2004).

Participants	Situational factors	Socio-psychological factors	Linguistic/pragmatic considerations
indexical (speaker/addressee's social class, gender, age, etc.,)	formality, settings private vs. public world, etc.	dominance, group membership, neutrality, speech accommodation	repetition, clarification, contrast, quotation, paraphrase, message qualification, deep-rooted cultural knowledge, topic-comment, hedging, language trigger

Table 1 Social motivation of language mixing, Adapted from Ritchie and Bhatia (2004). Social and Psychological Factors in Language Mixing. In T.K., Bhatia & W.C. Ritchie (Eds.). The Handbook of Bilingualism (p. 336-352). Oxford, UK: Blackwell.

2.2 Structural Linguistics

The main aims of studying CS from a structural perspective have been to examine (i) how the elements of the two languages of a bilingual speaker are used together;(ii) how the grammar of one language influences the grammar of the other language (Myers-Scotton, 2006a); (iii) whether there are the same grammatical regularities in code-switched utterances as in monolingual utterances, and finally, how the code-switched utterances provide linguistic theory with information about the syntactic or morphologic levels (Mahootian, 2006). Woolford (1983) assumes that what is interesting to theoretical linguistics is to investigate how the two grammars can be switched in mid-tree, or how the two distinct grammars of a bilingual speaker team up to create a hybrid phrase structure tree and "still end up with a coherent and interpretable sentence" (p.522).

Most structural studies look for formulating some constraints on CS. For about thirty years now, the main aim of positing the constraints has been to formulate the interaction between the two grammars of a bilingual speaker in code-switched utterances (Mahootian, 2006). Evidence from CS has led researchers to a consensus that this phenomenon is not indicative of deficiency or weakness in either or both language(s). Instead, they view it as a structurally rule-governed linguistic behaviour (Mahootian, 2006). Thus, as she puts it, one of the main topics in the structural studies of CS has been to explain the structural regularity underlying CS utterances.

Since Pfaff (1979) and Poplack's (1980) works on the grammar of CS, much research on switches between various language pairs (e.g., Bentahlia & Davies,1983-Arabic-French CS; Naseh LotfAbadi, 2002-Persian-Swedish CS) were carried out to examine the validity of the proposed constraints on CS (McSwan, 2005). In the earlier structural studies on CS (e.g., Pfaff, 1979), the main proposal was that the grammars of both languages involved in CS must be respected (cf. McSwan, 2009). In other words, CS must not violate the grammars of the two languages (see Pfaff, 1979). While some researchers provided counter-examples against the constraints (e.g., Mahootian, 1993; 2006; McSwan, 2005; 2009; Purmohammad, 2009); some scholars supported them. However, most of the proposed constraints on CS "have been widely debated in the last 30 years, ending up in ruling out almost all proposals" (Cantone, 2007: 53). The author states that "earlier theories failed to provide universal predictions of what is possible when two grammars (languages) are mixed. They ended up either giving wrong predictions of what is disallowed, or establishing new rules, which resulted in a third grammar of code-switching"(p.74).

2.3 Neurolinguistics

The main aims of functional neuroimaging studies on CS have been to examine the neural basis of switching; how language control operates during bilingual language processing and which areas of the brain are involved in language switching (Abutalebi & Green, 2008) (see Abutalebi et al., 2005 for more details). Functional neuroimaging studies investigated the neural basis of language control processes in bilinguals using various language paradigms (Abutalebi et al., 2007). Current neurolinguistic studies have indicated that the complex process of language switching depends on various cerebral structures (see Abutalebi et al., 2007; Wager et al., 2004). In detail, it has been proposed that the neural system underlying CS is part of a more general cognitive control system (Abutalebi & Green, 2007). Early studies reported that only some dedicated regions are involved in language switching. For instance, Price, Green, and Von Studnitz (1999) carried out a positron emission tomography study on bilinguals performing switching tasks and translation. They reported that Broca's area and the supramarginal gyrus are activated during language switching. Hernandez, Dapretto, Mazziotta and Bookheimer's (2001) study showed that the dorsolateral prefrontal cortex is highly activated in the switching conditions, suggesting that left dorsolateral prefrontal is involved in language switching mechanism. Rodriguez-Fornells, Rotte, Heinze, Nosselt, and Munte (2002, cited in Abutalebi & Green, 2008) also examined how bilingual speakers inhibit the unintended language during lexical access. The researchers used ERPs and FMRI to address this issue. In this study, participants were asked to "select L1 or L2 nouns following a cue" (bilingual contexts) or "select L1 nouns or L1 verbs following a cue in monolingual contexts" (Abutalebi & Green, 2008: 568). The results were compared to monolinguals. Rodriguez-Fornells, Rotte, Heinze, Nosselt, and Munte (2002) report that the left anterior prefrontal region is activated in bilinguals only.

Several studies reported 'costs' when switching from one language to another (see next section for switch costs). That is, using some elements from the other language yields in aftereffects that are generally referred to as "switch cost" (Branzi et al., 2015). Recent neuroimaging studies presented some important information about why these neural effects arise. Recent studies have shown that "switching requires time and cognitive effort to establish new S-LR bindings, by overcoming the binding established before" (Branzi et al., 2015:2) … and "shifting between 2 different S-LR sets" (p. 2).

Studies on bilingual aphasia also shed light on our understanding of processing CS. For example, Fabbro, Skrap and Aglioti (2000, cited in Abutalebi & Green, 2008:570) report that "bilinguals with prefrontal lesions were often reported to suffer pathological language switching". (see Abutalebi & Della Rosa, 2008 for using functional neuroimaging techniques to study the neural architecture of the bilingual brain).

2.4 Psycholinguistics

Recent psycholinguistic studies on bilingual speech production have focused on language control (e.g., Green, 1986; 1998), cognitive modelling issues (e.g., de Bot, 1992), and the formulation of output (e.g., Myers-Scotton, 1993) (Karousou-Fokas & Garman, 2001). CS is an important phenomenon that can present information for all three approaches. The phenomenon presents important information on the mechanism that controls lexical access in bilingual language production and how bilinguals "restrict their lexicalization process to only one language" (see Costa & Santesteban, 2004: 491). Research on bilingual language processing (e.g., Meuter, & Allport, 1999; Costa & Santesteban, 2004) found that there is a "switch cost" when bilinguals are asked to switch between the two languages. In detail, more time is needed in order to switch into the more dominant language compared to the less dominant language (Meuter, 2005). One explanation for this asymmetry in language

switching was proposed by Meuter and Allport (1999). They asserted that "the inhibition of L1 is considerably powerful. Therefore, the cost that arises from its removal is considerably large" (Purmohammad, 2012: 29). The presence of asymmetrical language switching patterns is considered the main evidence supporting the use of inhibitory process in bilingual language production (Costa & Santesteban, 2004). See Costa et al. (2006a) for more details.

Grosjean (1998; 2008) used a psycholinguistic approach to investigate language mixing in bilinguals. He proposed that in CS, either for a word or a whole sentence, a complete shift from one language of bilinguals to the other language occurs. He also assumed that the activation level of the two languages of a bilingual speaker differ depending on several factors such as the presence of the interlocutor. Grosjean (2001) suggests that bilinguals experience different language modes (unilingual or bilingual mode). When speaking to a bilingual speaker, they may experience the bilingual mode, in which case, both languages are activated. However, if a bilingual speaker is in a monolingual context, the activation level of the two languages will differ. In a monolingual context the unselected language is deactivated, however, a language is never fully deactivated in bilinguals (Grosjean, 2008). Language mode is considered to be "a continuum on which the bilingual moves" (Cantone, 2007: 56). Code-switching mostly occurs when a bilingual speaker is in a bilingual mode. In a bilingual situation, both languages of bilinguals may be fully activated and will therefore permit CS. However, due to the fact that the other language is never fully deactivated (Grosjean, 1998), CS may occur even when bilinguals are in a monolingual mode.

Early models of cross-language processing (e.g., Kroll & Stewart, 1994; Potter, et al., 1984) focused on the way in which lexical items and concepts are interconnected in the two languages of bilinguals (Schwartz & Kroll, 2006). Different models have been proposed recently from a psycholinguistic perspective in order to illustrate the characteristics of

bilingual language production, especially lexical access (see La Heij, 2005; de Bot, 1992) and syntactic processing (see Hartsuiker & Pickering, 2008). The central questions concerning bilingual lexical access have been whether selection is language-specific or language non-specific (see de Bot, 2004; La Heij, 2005) and whether lexicon is shared between the two languages. With respect to syntactic processing in bilingual speech production, psycholinguists investigate the syntactic interaction between the two languages during language production; whether bilinguals store two distinct representations of constructions (Bernolet, et al., 2007), or whether they store a shared integrated representation of structures that are similar across the two languages (see Bernolet, et al., 2007; Hartsuiker et al., 2004; Hartsuiker & Pickering, 2008). As we will see in Chapter 4, CS is an interesting phenomenon that provides information on lexical access and syntactic processing in bilinguals' speech production.

The psycholinguistic approach uses different paradigms such as picture-word interference experiments (e.g., Hermanns, et al., 1998), switching tasks (e.g., Purmohammad, 2012; Selles, 2011), and the picture-picture interference paradigm (e.g., Colomé & Miozzo, 2010) to study bilingual language processing (see Vorwerg, 2012 for more details). Compelling evidence from psycholinguistic research (see Bob et al. 2008; Schwartz et al., 2007 for a review) on bilingual's speech production indicates that both languages of bilinguals "are activated even when only one language is used" (Purmohammad, 2012:8). Various models (e.g., de Bot, 1992) developed to explain bilingual language processing propose that speech processing is grounded on an "integrated system in which elements from both languages are represented" (Koostrata, 2012: 6). Such an integrated system permits the co-activation of lexical items from the two languages and CS.

CHAPTER 3: Language selection in bilinguals: A multidisciplinary approach

3.1 Introduction

The twentieth century saw much research on bilingualism in different disciplines including linguistics, psycholinguistics, neurolinguistics, sociolinguistics, and applied linguistics. Some of the aspects of language contact phenomena (e.g., CS, interference, language selection) are of interest to different disciplines. Generally, each individual discipline has pursued its own interests using its own particular methodologies. However, what is obvious is that studying some aspects of speech processing including language choice, lexical access, etc. requires taking into account different factors such as sociolinguistic aspects of bilingual language production. It seems that employing a unique approach to study bilingual language processing is less informative. Adopting an interdisciplinary approach gives us, of course, a better insight into our understanding of bilingual language processing. However, the unfortunate fact is that there have been sharp dividing lines between different disciplines including structural linguistics, psycholinguistics, and sociolinguistics in bilingual research (Isurin et al., 2009). Isurin, Winford and de Bot (2009) assume that each discipline has done research using different methodologies and descriptive frameworks without adequate dialogue across their own boundaries. The question arises here whether findings of various disciplines can be accommodated within a single account.

According to Giles (2001: 212), social psychologists of language are concerned with how people use language in order to communicate message to other people, "what message can be sent and which ones are sent by whom, where, when and how, and finally why they are being sent". Sachdev and Bourhis (2001) state that the encoding and decoding of language choices in bilingual communication depend largely upon the interaction of sociolinguistic factors. Due to the fact that bilingual communication do not take place "in a sociostructural vacuum" (Bourhis et al., 2007:189), it is not surprising to assume that bilingual language production is affected by various social factors in different levels of language production from the intention to speak to articulation.

As switching between two languages is one of the language choice strategies in bilinguals, it is necessary to examine the processing of bilingual language selection. In this Chapter, a multidisciplinary approach will be adopted to investigate language selection in bilinguals. I will then move on to place the processing of language selection into a psycholinguistic model of bilingual language production.

3.2 Language choice during the speech production in bilinguals[1]

Both bilinguals and monolinguals map the intentions to speak onto language. While they need to consider the same aspects such as stylistic choices, only bilingual speakers decide what language to use for a situation (Purmohammad, 2012). Neuroimaging studies (e.g., Abutalebi & Green, 2007; Hernandez, et al., 2001) have identified a set of cortical and subcortical regions in the brain that are responsible for selecting one language rather than the other (Reverberi et al., 2015). De Houwer (2006) also assumes that for every utterance a bilingual speaker produces, he or she decides whether it will be unilingual in language A, B or mixed. Thus, as Kroll, Bobb and Wodnecka (2006) put it, at least one of the crucial aspects that differentiate bilingual planning for speaking from monolinguals' speech planning is that bilinguals must select the language of production (Purmohammad, 2012). (see Reverberi et al., 2015 for more details).

Bilingual speakers make language choices based on a number of factors such as 'with whom', 'about what', and 'where' and 'when' a speech act occurs (Ritchie & Bhatia, 2004). A considerable body of research (e.g., Gumperz & Hymes, 1972; Giles & Johnson, 1981) demonstrates that language choice in bilingual speakers is not a "neutral means of communication" (Sachdev et al., 2012:393) and has an important role in bilingual verbal behaviour. According to Wei (2012:43), speakers "maintain and change ethnic-group boundaries and personal relationships, and construct and define self and other" through language choice. For Walters (2005), language choice is a significant determinant of social identity. He assumes that bilingual language production consists of various choices from among different social identity options, participants, settings, topics, and discourse patterns, all of which highly depend on language choice. For many bilinguals, intimate settings such as

[1] - This section has been accepted for publication.

home, neighbourhood, or familiar people like close friends most probably activate the dominant or the primary language, while less familiar contacts activate the other language (Walters, 2005).

Children as young as one year and three months old who grow up based on the one-person-one-language input strategy use language A exclusively with monolinguals of language A and language B with monolinguals of language B (Sinka & Schelleter, 1998, cited in De Houwer, 2006). As De Houwer (2006) puts it, this linguistic behaviour indicates children's high sensitivity to the addressees' language choice. She states that children's ability to accommodate such language choices indicates a level of sociolinguistic and pragmatic development that is usually not observed in their monolingual peers until at least a year later. The researcher assumes that bilingual children learn which type of utterances they can or should use in each situation "through language socialization practice in the family" (p.784).

The present study first reviews the sociolinguistic aspects of bilingual language selection, then moves on to investigate the topic of language choice as presented in existing models of bilingual language production (e.g., Green, 1986; Hartsuiker & Pickering, 2008; de Bot, 2004; 1992; Walters, 2005) and comprehension (e.g., Dijkstra & Van Heuven, 2002). I will explain what conclusions can be drawn from the results of the studies on bilingual language selection. The processing of language selection in a dialogue setting has hardly been discussed from a psycholinguistic perspective. Bilingual language selection during a course of dialogue will also be investigated.

3.3 Bilingual language choice as a social issue

Bilingual language choice has been widely discussed in sociolinguistic studies. Fishman (1965) identifies three factors as the determinants of bilingual language choice. The first controlling factor is 'group membership'. According to the researcher, by using the appropriate language, a bilingual speaker identifies herself or himself with a different group to which he or she belongs, is willing to belong, and from which he or she seeks acceptance. It is quite common to find that a bilingual selects different languages in different situations. For example, a government functionary in Brussels generally prefers to speak standard French in the office, standard Dutch at the club near his home and a "distinctly local variant of Flemish" (Fishman, 1965: 95) when he is at home. He might use a mix of French and Dutch when addressing a French-Dutch speaker. This situation might "be replaced by any one of a number of others such as Standard German, Schwytzertüsch and Romansch" (p. 87) in some parts of Switzerland. Thus, the main aim of adopting such convergence strategy is the speakers' desire to achieve approval from another, namely the social networks to which she or he is believed to belong (Sachdev et al., 2012). Such language shifts during conversation reveal "much about the intentional nature of multilingual communication and the speakers' responsiveness to social and linguistic contexts" (Meuter, 2009: 28).

Social category memberships are sometimes negotiated during bilingual interaction through the accommodation process (Sachdev et al., 2012). Bourhis (1984, cited in Sachdev et al., 2012) reports an example of this in bilingual community in Montreal Canada where Anglophones (English speakers in countries where other languages are also spoken) perceive Francophones (French speakers) much more favourably when "the Francophones converge toward English rather than continuing in French and also vice versa" (Bourhis,1984: 34). Both interlocutors use each other's weaker language to communicate. Their linguistic behaviour demonstrates that speakers may use mutual language convergence as a strategy to improve ethnic harmony (Bourhis, 1984). In this view, it is not even uncommon to find, for

instance, that speakers of High German may choose to speak Swiss German rather than High German in German-speaking states (cantons) in Switzerland even if they are understood very well when they speak High German. Selecting Swiss German may help them be more integrated into the Swiss community because the more similar speakers are to their interlocutors, the more they will like or respect each other and the more social reward they can expect (Sachdev & Giles, 2004).

A second regulating factor that affects language selection in bilinguals is the 'situational context' (Fishman, 1965). Indeed, linguistic behaviour of speakers may be affected by the immediate context and the presence of participants. Situational factors refer to the fact that one of the languages of a bilingual speaker is more suited to certain participants and social groups than the other language (Ritchie & Bhatia, 2004). Situation might impose certain regularities in bilinguals' language choice on certain social occasions. One of the situations that affects language choices is when a monolingual speaker is among the participants of communication. In this situation, a bilingual speaker may select the language of the monolingual speaker. Selecting a language that the monolingual participant cannot speak might be an indicator of disrespect for the monolingual speaker. Such linguistic behaviour of bilinguals shows "a mutual understanding of the obligations and rights of participants" (Ritchie & Bhatia, 2004: 339).

Of course, the same situation can elicit the opposite language choice if a monolingual speaker is to be excluded from the conversation. In order to exclude one of the addressees from the conversation, bilinguals might choose the unshared language (Grosjean, 1982). For example, when Mazandarani-Persian bilinguals (Mazandarani is a local language spoken across the Caspian Sea in northern Iran) have guests who do not know Mazandarani, they may select to speak Mazandarani in order to talk about more private matters (e.g., the shortage of food).

Some other non-linguistic factors have also been recognized to play a role in bilingual language choices. Among them are religion, occupation, the content of discourse, gender, and ethnicity (Grosjean & Li, 2013 for discussion about factors which determine language selection in bilinguals). Walters (2005) classifies them as the intrapersonal factors that determine language choice. For example, according to Backus (2004) there is a firm link between religion and language choices among Turkish bilingual speakers. Turkish bilinguals have been reported to use Turkish exclusively in the mosques.

Once a language is selected, it needs to be maintained for production (Meuter, 2009). However, as Meuter (2005) states, bilinguals may become linguistically disoriented as a result of external cues. "Bilinguals do use, involuntarily, an inappropriate language when cued by something in the environment" (p. 358). For example, when they use some cognate words or proper names corresponding to the non-selected language, or when they hear the other language, the exogenous cues trigger shifting from the selected language to the non-selected language (Meuter, 2009). Thus, as discussed above, exogenous factors play a crucial role in the processing of language selection.

I suggest that in some situations bilingual speakers may decide among four language choice options, unilingual in language A, unilingual in language B, using both languages for communication but each typically with different speakers (see Green & Abutalebi, 2013 and Green, 2011a for dual language context), or a mix of the two languages. As stated above, their choices may be affected by some external sociocultural factors such as the addressee, (e.g., addresses' language proficiency, his or her attitude toward language mixing) and the conversational situation. This is because the sociopragmatic knowledge may affect language production at different levels from the intention to speak to articulation. Fishman (1965: 67) speculates that "proper usage, or common usage, or both" determine that only one of the available languages will be chosen by particular interlocutors in a particular situation.

However, I suggest that based on such variables (i.e., the proper usage, or common usage, or both) a bilingual speaker might also recognize that a mix of the two languages is appropriate for a given occasion. When a speaker recognizes that her or his addressee does not have a negative attitude toward language mixing, she or he might be encouraged to use a mix of the two languages. In contrast, when a bilingual speaker finds that even one of the addressees does have a negative attitude toward language mixing, she or he may not use language mixing. The idea that sometimes a mix of languages is preferred in some contexts is in line with Green's (2011a) assumption that in some situations it is socially accepted for bilinguals to mix languages, because "the behavioural ecology of bilingual speakers" (Green, 2011a: 1) does affect the processes of language control. In this view, the interactional context determines whether there must be a stronger control over the language-not-in-use or a weaker control suffices. A weaker language control (open control mode) permits language switching (Green & Abutalebi, 2013 and see Green & Wei (2014).

3.4 Language choice in the models of bilingual language production

As language choice is one of the most important characteristics of bilingual speech production, the way it is achieved needs to be clearly determined in a model of bilingual language production. Models of bilingual speech production adopted different approaches to explain the process of language selection in bilinguals. Green's (1986; 1998) inhibitory control (IC) model posits a language tag for each lemma. The model holds that producing a word in a particular language requires that the intention to do so be included in the conceptual representation (Green, 1986). The model suggests that each individual lemma in the mental lexicon has an associated tag for L1 or L2 with all other lemmas in the language sharing the same associated tag. The selection mechanism, thus, operates on language tags that are associated with lemmas (Green, 1998). In the IC model, the activation of a language tag

together with the conceptual information about the intended language leads to the selection of a relevant lemma (Green, 1986). Moreover, language task schema targets the language tags to suppress competitors (Green, 1998). In this model, "competition for output from the lexico-semantic system occurs at the level of the language task schemas, either inhibiting or activating lemmas according to the task relevance of their associated language tags" (Meuter, 2005:352). In Persian-German bilinguals, for instance, when Persian is selected as the base language, the language tag corresponding to the other language (here, German) is inhibited. Green (1998) assumes that language tag is just one cue that allows speakers to control output. The output is controlled by suppressing (inhibiting) lemmas with inappropriate tags.

De Bot (1992:8) assumes that a preverbal message includes "all the possible relevant information for all possible languages". Accordingly, one way to include information about language selection "is to label parts of the message according to the language" (de Bot & Schreuder, 1993:201). The verbalizer (Vbl) receives language information from the preverbal message. In order for the preverbal messages to be lexicalized, they are required to be divided into chunks. Each of the chunks is labelled depending on the value of the language cue (de Bot & Schreuder, 1993). There are, however, some arguments with respect to the proposal. As the researchers state, in some settings the mixing of the two languages can be done almost at random. Furthermore, sometimes when bilinguals encounter a lexical problem, they may use words from their L1 as a compensatory strategy (de Bot & Schreuder, 1993). In these situations they use words from their L2; however, they are aware that the interlocutor is monolingual. Thus, bilingual's language processing does not always follow the initial language selection. Moreover, de Bot (1992:7) suggests that one possibility of which part of the language system is responsible for selecting the base language is to assume that "the knowledge component is involved in this choice: it contains a discourse model, a list of

limiting conditions for the speech which is to be generated, however, the role of the knowledge component is not very clear".

In his recent study, de Bot (2004) has proposed that the intention to speak in a specific language originates from the conceptual level; however, it is based on both the information in the preverbal message and the language node. Thus, information about the language to be used comes from two different sources: from the lexical concepts and the language node. de Bot (2004) suggests that the problem with the earlier proposal that "all information about language choice has to be included in some form in the preverbal message" (de Bot & Schreuder,1993: 201) is that some aspects of production such as "deliberately speaking with a foreign accent" appears to be difficult to control in such a way. In this model, the language node system can control language choice at the lower level of production. Language node will inform the relevant components including the syntax, lemma, and word form (de Bot, 2004). Thus, language membership information might be available at multiple levels: conceptual, syntactic, lemma, and word form. "The language node conveys information about language selection both from the conceptual level to lower level components and between components at these lower levels" (de Bot, 2004:29).

In some models of bilingual language production (e.g., Hartsuiker & Pickering, 2008) and comprehension (e.g., Dijkstra & Van Heuven, 2002) language nodes are the main determinants of language selection. In Bilingual Interactive Activation (BIA) model (see Dijkstra & Van Heuven, 1998; 2002), each individual word node is connected to one language node. According to the model, in German-English bilinguals, for instance, activated word nodes (e.g., Zug meaning train) send activation on to the relevant language node (here, German language node). Activated language nodes also "send inhibitory feedback to all word nodes" (Dijkstra & Van Heuven, 1998: 177) in the other language (here, English). The language nodes, thus, collect activation from lexical items in the language they represent and

suppress active words in the other language (Dijkstra & Van Heuven, 2002). The BIA model holds that a suppression process is applied to the non-intended language as a whole (Dijkstra & Van Heuven,1998). To put it differently, the model posits global inhibitory processes on the non-intended language (Meuter, 2005). In the BIA model (Dijkstra & Van Heuven, 1998), language nodes have four primary functions: (a) they function as a language tag for each individual item in order to identify to which language an item belongs; (b) they collect activation from words within a language. Based on the model, language nodes function as linguistic representations in the first two functions; (c) they function as a "language filter (rather than an all-or-none language switch)" (p.177) that modulates language activation; (d) language nodes collect information from outside the language system (the linguistic context) such as information on participants' expectations with respect to the appropriate language (Dijkstra & Van Heuven, 2002). Dijkstra and Van Heuven (1998) assume that in the last two functions language nodes serve as non-linguistic functional mechanisms. In this view, language nodes have both linguistic and non-linguistic functions. However, Dijkstra and Van Heuven (2002) indicate that combining all these aspects (linguistic and non-linguistic) "in one mechanism is too ambitious" (p.186). This led the researchers to restrict the functions of language nodes to "language membership representations […]. Being just representations, the language nodes can no longer function as language filters […] nor as collectors of non-linguistic contextual pre-activation" (Dijkstra & Van Heuven, 2002:186).

Likewise, Hartsuiker and Pickering's (2008) integrated model postulates a language node for any lexical item. Accordingly, each lemma node (e.g., eat) is linked to one language node (e.g., English) (Purmohammad, 2012). Note that in Green's (1998) IC model, language nodes are equivalent to language tags. In Hartsuiker and Pickering's (2008) model, items are tagged for the languages (e.g., Persian, German) by linking, for instance, to Persian or German language nodes respectively. In this model, some nodes such as language nodes are

inherently activated. While Hartsuiker and Pickering's (2008) model is explicit about the functions of combinatorial node, featural node and category node (see Pickering & Branigan, 1998 for discussion), it is not explicit about the functions of language nodes.

Walters (2005) proposed the 'Sociopragmatic Psycholinguistic (SPPL) Model'. The SPPL model is grounded in sociopragmatic bases. He states that the main aims of proposing the SPPL model were to account for various sources of sociopragmatic information in bilingual language production and to integrate this information with psycholinguistic aspects of bilingualism. In the SPPL model, there are seven sources of information. The language choice module is assumed to run vertically, because it has interactions with other sources of information, suggesting that language choice is available at every level of speech production. The central foci of the SPPL model are the language choice module and its interaction with the other sources of information (Walters, 2005). In the left-to-right direction of two-headed arrows (Figure1), it shows that the language choice module provides the following LI and L2 information to bilinguals "(1) the construction of identity, (2) the choice of where to speak, and in preferences for interlocutors and genres, (3) the formulation of an intention, (4) the retrieval of concepts and words, and, finally, and (5) the articulation of an utterance" (p.11).

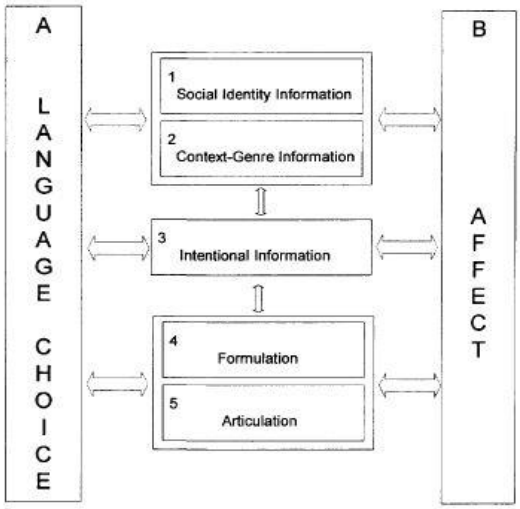


Figure 1. The Sociopragmatic Psycholinguistic (SPPL) Model. Adapted from Walters (2005:93). Bilingualism: The Sociopragmatic-Psycholinguistic Interface. Lawrence Erlbaum Associates, Inc., Publishers.

In this model, the language choice module selects, regulates, and retrieves information from the internal components and "integrates them with the speaker's language choices" (Walters, 2005: 11). In the SPPL model, a language choice component makes language tags available at different levels of speech production including the conceptual, lemma, and lexemic levels of representation. Walters (2005) assumes that while the language choice module selects and retrieves elements from the two languages including features of identity, genre, morphosyntax, phonology, lexis, and discourse; in other accounts of language choice (e.g. Albert & Obler, 1978; Poulisse, 1997), especially in Green's (1986) account in which language tag is responsible for language choice, the function of language choice is limited to the lexicon only. Thus, Walters assumes that with respect to the function of language choice, the major difference between the SPPL model and other approaches (e.g. Albert & Obler, 1978; Green, 1986, 1998; de Bot, 1992; Poulisse, 1997) is that whereas in the SPPL model

the language choice module functions at every stage of bilingual language production and supplies that information to the identity, pragmatic, morphosyntactic, phonological, lexical, contextual, and discourse information components; in the other approaches the verbalizer or language tag is responsible to assign information on language (Walters, 2005). As stated above, in their earlier account on language choice information, de Bot and Schreuder (1993: 201) assumed that "all information about language choice has to be included in some form in the preverbal message". Walters (2005) argues that in de Bot and Schreuder's (1993) account, even data at the phoneme and syllable levels of processing require the verbalizer to determine language to phonemes and syllables. Thus, the researcher assumes that "there is no resolution to this problem in a framework where all the work for language specification is carried out by the verbalizer" (Walters, 2005: 85).

3.5 Discussion

Bilingual language choice has been discussed across different disciplines including sociolinguistics (e.g., Fishman, 1965; Walters, 2005), and psycholinguistics (e.g., Green, 1986; 1998; Dijkstra &Van Heuven, 2002; Hartsuiker & Pickering, 2008; de Bot, 2004; 1992). The results from the studies reviewed above suggest that one of the two languages needs to be selected as the base language for any linguistic context. Including language choice information in the preverbal message (Green, 1986; de Bot, 1992) may provide an efficient solution on how the intended concept is channelled to a specific language of a bilingual speaker. Treffers-Daller (2009) assumes that most bilingual researchers agree that the decision to select one language as the base language of dialogue increases the likelihood of the lemmas belonging to that language receiving more activation. As discussed, findings from the sociolinguistic studies of bilingualism demonstrated that factors of different nature

affect bilingual language choice. Language selection is, thus, something more than the mere selection of one of the two languages.

As noted above, some models postulate that language nodes are responsible for language selection. There might be two problems with respect to the language node account, especially if it is considered as the main determinant of bilingual language choice. The first problem is that it may not explain the language-mixing phenomenon, the most frequent phenomenon in bilingual speech production (Paradis, 2004). As stated above, I suggest that bilingual language choice includes four options, unilingual in language A, unilingual in language B, using both languages for communication but each typically with different speakers, or a mix of the two languages. Because in some linguistic contexts, especially in a dense code-switching context (see Green & Abutalebi, 2013) where the partners know the two languages and the speaker is aware of his or her partner's positive attitude toward language mixing, he or she may decide to switch between the two languages. The assumption that language choice information also includes language switching permits us to account for a wider range of bilingual linguistic behaviours such as CS and translation. However, language nodes may not account for language mixing (Paradis, 2004). We will return to it later.

A second problem concerning language nodes may be that language information is available very late for language processing (Dijkstra & Van Heuven, 2002), especially too late to direct the preverbal message to the intended language. As Dijkstra and Van Heuven (2002: 177) put it, language nodes are not able to "enforce language selective lexical access from the very beginning of word recognition". The same problem holds for language production, because in order to decide which language must be selected as the language of conversation, language processing is required to reach the lemma level. I suggest that although language nodes to which all the lemma nodes of a given language are linked are not

responsible for language choice formulation; they rather have a facilitatory role in order for an intended message to be channelled to a certain language of a bilingual speaker.

As we have seen, in the BIA model proposed by Dijkstra and Van Heuven (2002) language nodes are responsible for inhibiting active non-target language words. For example, in the case of a German-Persian bilingual, when speaking in German, a German word activates the German language node and this language node feeds activation back to all German words and suppresses all words from the Persian lexicon (Dijkstra & Van Heuven, 2002). However, if language nodes are considered the main determinant of bilingual language choice, it is unclear what mechanism directs language processing from the conceptualizer level to the intended lemma level in which lexical items of individual language are to be accessed, because this account speculates that the process of language selection and inhibiting words from the other language is determined only after the first item is selected (Dijkstra & Van Heuven, 2002). In the BIA+ model the function of language nodes is limited to membership representations. It should be mentioned that whereas important modifications have been made with respect to the functions of language nodes in the BIA+ model, one existing problem is that language information is available very late for language processing, too late to direct the preverbal message to the intended language (Dijkstra & Van Heuven, 2002). In other words, language cue cannot be assigned at the very late stage of language processing.

Paradis (1987; 2004) proposed the 'Subsystems Hypothesis'. This hypothesis holds that each automatized language forms a "subsystem of the larger language neurofunctional system" (Paradis, 2000:55). The language system consists of independent subsystems. Each subsystem contains its own module including phonology, morphosyntax, lexicon and semantics (Paradis, 2004). Based on the hypothesis, the two language subsystems (say, Persian, English) are totally separated. That is, "no part of any subsystem shares an item with

the other subsystem" (Paradis, 2007: 8). If the two subsystems can be said to share a feature, "it can only mean that the same feature is redundantly represented in each respective subsystem" (Paradis, 2007:8). Paradis (2009) assumes that the language tag construct (Green, 1986, 1998) "can easily be adapted to fit the subsystems hypothesis in which languages are represented in distinct neurofunctional language subsystems"(p.166). Accordingly, a subsystem can be selectively inhibited as a whole when the other language subsystem is in use (Paradis, 2004). However, he assumes that the choice of a given language is not determined by the subsystems but by the conceptualizer. That is, language selection is determined within the non-linguistic cognitive system. "The conceptualizer determines which language is appropriate to the situation and activates elements of that subsystem in the same way that it determines the appropriateness in a given context, of the register" (Paradis, 2004: 210).

Paradis (2004) also argues that Green's (1986) notion of a "language tag" is not explicit about the language mixing choice. Accordingly, if a language specification tag determines which language is to be selected, there must be a "switch tag" rather than a "language tag" available in the preverbal message when a bilingual speaker selects to use a mix of the two languages (Paradis, 2004). We will return to it later. He also assumes that "the means of selection need not be different" (p.112) from those used by a monolingual speaker to select formal-register words rather than baby-talk words. According to the researcher, if speaking one language rather than another requires that a bilingual speaker provides a language tag at the preverbal message as proposed by Green (1998), then a similar tag seems to be necessary for monolingual speakers to select lexical "items from among their various registers" (Paradis, 2004:112) from among within-language synonyms. He proposed a direct-access hypothesis (Paradis, 2004). According to the hypothesis, the intended language is accessed without the need for a language tag in the preverbal message to first identify which

language is to be selected (Paradis, 2004). The same process used by monolingual speakers suffices to account for bilinguals' selection of lexical items, structures or pronunciation, allowing them to select to speak in unilingual mode (see Grosjean, 1985) or to freely mix the two languages (Paradis, 2004).

There is a strong link between Paradis' activation threshold hypothesis and the direct-access hypothesis. The activation threshold hypothesis supports the idea that the intended language is accessed directly without the need for a language tag (Paradis, 2004). Accordingly, when one language is selected over another; the activation threshold of the non-intended language is raised automatically. This leads the preverbal message to direct to the intended language without the need for a language tag (Paradis, 2004; 2009).

David Green (personal communication, January 20, 2014) presented more details about the notions of "tag specification". David Green assumes that there are different ways in which the notion of language tag might be specified and implemented and what its actual sense might be. Language tag might not reflect formally defined languages, such as German or Farsi but might also reflect other aspects of language use such as the language that speakers use in communication with their relatives. The essential point is that there is a practical way to distinguish the languages where those languages are distinguished within a given language community (the behavioural ecology of the speaker). The problems proposed by some researchers (e.g., Paradis, 2004) with respect to the notion of tag specifications may be resolved by the above explanation, because David Green (personal communication, 20 January, 2014) assumes that since the function of tag specification is broader than selecting formally defined languages such as "German" or "Farsi", even speaking one language demands tag specifications which include information on the appropriate register or style within a given context. "Some form of tagging may also be used to label vocabulary or

structures associated with particular registers or styles of speech within a language" (Green,1986: 217).

As stated above, in the SPPL model presented by Walters (2005) as the language choice module runs vertically, it functions at every stage of bilingual language production including the conceptual, lemma, and lexemic levels of representations. The language choice module also selects and retrieves information from the two languages of bilinguals and supplies the information to the identity, pragmatic, morphosyntactic, phonological, and lexical information components (Walters, 2005). The problem that the language choice module may have is that it is too big to be included in bilingual language processing. Moreover, I assume that including all these functions of different nature in one single module is likely too ambitious, since the language choice module needs to interact with several sources of information including (a) formulation for the retrieval of words and access to the morphosyntactic information, (b) articulation for phonology, (c) intentional information for speakers' intention to speak, and (d) social identity information for features of identity, style, and genre (Walters, 2005). As mentioned, the language choice module in the SPPL model selects, regulates, and retrieves information from the internal components and integrates them with the speaker's language choices (Walters, 2005). However, it is unclear how the language choice module interacts with such different sources of information. The problem is highlighted by three facts: first, the sources of information with which the language module interacts are very different in nature, second; they may engage many different brain regions; third and more importantly, the way the language choice module interacts with these different sources of information remains unclear.

With respect to the language choice mechanism, there are still some points that need to be clarified. First, since bilingual language selection is affected by several non-linguistic factors (e.g., topic, interlocutor, situation, group membership, etc.), I suggest that language

choice is preliminarily formulated outside the bilingual language systems; while they may be distinct, there is a close interaction between the language system and the metalinguistic and sociopragmatic knowledge (see Rickheit, et al., 2008; Paradis, 2004). David Green (personal communication, 12 February 2014) assumes that there is debate about where the intention to speak in a particular language is formulated, because it must make use of the linguistic context. I agree with Paradis' (2004) account that language selection occurs within the non-linguistic cognitive system, however, I suggest that language choice is not formulated in the conceptualizer, because selecting a specific language to speak is not an inherent function of the conceptualizer at the conceptual level. I suggest that while language choice is formulated outside the language system, the output of tag specification formulation is sent to the conceptualizer where it is included in the preverbal message. As Costa (2005: 312) states, the decision about which language to use to convey the intended message is "based on different types of information (pragmatic, contextual, etc.), information that has little to do with the lexical system".

Second, the language cue (tag specification) has various values depending on several linguistic and non-linguistic factors (de Bot & Schreuder, 1993). The value of the language cue depends on which language mode the bilingual is expecting to experience (see Grosjean, 1985, 2008 for language modes). In the bilingual settings, the value of such a language cue is not very high (de Bot & Schreuder, 1993). This permits bilinguals to switch between the two languages. The question arises why while sometimes the value of the language cue is high (i.e., when bilinguals are in the monolingual mode) they still use words from the other language. This may be because some words from the other language have lower activation threshold levels (Paradis, 1993; 2004) than their competitors in the base language. Thus, they may be easier to select for their use. The value of language tag may also change (de Bot & Schreuder, 1993). For example, when the topic of conversation changes (e.g., a bilingual

speaks about a topic which is more related to the other language) or when a new addressee enters the conversation, people may use words from the other language regardless of which language cue was included in the preverbal message. As de Bot and Schreuder (1993: 202) put it, in such circumstances random CS may occurs as not every code-switching "may be initiated and controlled by some higher level process".

Third, recent studies have shown that language membership information at the lower level of processing from both lexical and sublexical level facilitates language processing (Kesteren et al., 2012) suggesting that language information is also available at the lower levels. For example, Lemhöfer, Koester and Schreuder (2011) reported that both native and nonnative speakers used bigrams (e.g., English bigram wh) at the morpheme boundary as a cue while reading Dutch compound words. Participants were faster to respond in compound words that included such orthotactic cues. In other words, participants used the orthographic parsing cues in order to direct higher level processes. According to Kesteren, Dijkstra and Smedt (2012), sublexical and lexical information sources could potentially codetermine the language membership of a specific word. Studies (e.g. Poulisse & Bongaerts, 1994) showed that lexically orthographic or lexically phonological representations are connected to particular "language membership" representations or tags that indicate the language to which a lexical item belongs (Dijkstra & van Heuven, 2002). I suggest that language information including information on language choice at the higher level of processing, language membership information, and language nodes at the lower level of processing construct a "language choice information network" during bilingual language processing. The "Language choice information network" regulates bilingual language production. The results of Kesteren, Dijkstra and Smedt's (2012: 2131) study indicated that sublexical language membership information (e.g., the words' orthographic representations in the two languages of bilinguals) "could be used to speed up bilingual identification processes or decision

making". Their accounts are focused on perception; however, I believe that extensions to production are quite possible. Interestingly, Vaid and Frenck-Mestre (2002) report that French-English bilinguals were more sensitive to the orthographic cues for their second language than their first language. The idea that language membership information is also available at the lower level of processing is consistent with de Bot and Schreuder's (1993: 205) account that it is unlikely that "Vbl [verbalizer] specifies the language for each individual phoneme or sound which clearly cannot be the case". Moreover, the account that some information about language exists at the lower levels through language membership information and language nodes would allow us to tackle the problem proposed by Walters (2005). As stated above, Walters (2005) argues that in de Bot and Schreuder's (1993) account even data at the phoneme and syllable levels of processing require the verbalizer to determine language to phonemes and syllables. He assumes that "there is no resolution to this problem in a framework where all the work for language specification is carried out by the verbalizer" (p.85). Thus, both language membership information and language node functioning as language cues at the lower level of processing facilitate bilingual language processing.

Finally, I believe that a language cue does not need to be included in the preverbal messages for every utterance bilinguals produce during a course of dialogue. The automaticity existing in dialogue affects bilingual speech production to a great extent. Language choice mechanism may be formulated at the very early stage of language production in dialogue settings, but there is no need for interlocutors to select a language for any dialogue turn. Considering the fact that in most exchanges "inter-turn intervals are extremely close to 0 ms"(Garrod & Pickering, 2009: 300), speakers may not decide to speak in one language rather than the other language for every dialogue turn. Like other aspects of language production (e.g., word selection) language choice mechanism also undergoes the automaticity in dialogue. As Code (1994: 137) states:

> "much of our speech activity is not under ongoing, moment-to-moment control, with each segment being individually planned and sequentially executed. It would be physiologically impossible for us to produce speech with the rapidity and the proficiency that we are able to if we had to plan and perform each segment individually".

Several studies showed that speakers' linguistic behaviour is affected by interlocutors during the course of dialogue. (see Vorwerg, 2013; Garrod & Pickering, 2007; 2009; Pickering & Garrod, 2006; Purmohammad, 2015a for the priming effect and the interactive alignment model in L1-L2 dialogue). Kees de Bot (personal communication, 21 July, 2014) agrees that in conversation there is no need for language choice at a high level. He goes on further stating that "a deeper question is whether bilinguals need to choose between languages at all". Kees de Bot (personal communication, 21 July, 2014) thinks that speakers "have a repertoire of situation specific utterances that may include words from different languages but is extracted in this form". When speakers are in an English-speaking environment, they use English words or utterances, because that is what they have learned is appropriate. Thus, the selection is not at the utterance level, it is the setting that leads to specific utterances. In my opinion, bilinguals do not have to decide which language to use for every utterance. In cases where they need to formulate language selection, language selection follows from the processing mechanism discussed above.

Due to the fact that bilingual speech production is indeed dynamic (Hermans et al., 2011), the formulation of language selection in bilingual speech production should not be viewed as an all-or-none phenomenon (see Vorwerg, 2015 for the notion of adaptability as one of the main features of communicative competence). The linguistic context determines whether or not language selection is formulated at a higher level. During a course of dialogue, the interlocutors do not need to determine a choice for every utterance they produce

as a function of the alignment processes and automaticity. When there is a language history between the participants (see Grosjean & Li, 2013), bilinguals use their "repertoire of situation" to communicate with each other. As a personal empirical experience, I know a couple, M and N, in Switzerland. M is a Mazandarani-Persian bilingual and his wife is an Azeri Turkish-Persian bilingual. Since I am a Mazandarani-Persian bilingual and due to the fact that at my first meeting with M we both had a positive attitude toward speaking in Mazandarani, M and I decided to continue communicating in the Mazandarani language. Now, based on the language history, I do not need to formulate language choice for every conversation with M.. Whenever his wife is present, however, we use Persian in order to include her in the conversation. Since speaking with M in Persian is not what I normally do, the initial language choice needs to be formulated at a high level.

3.6 Conclusion

Since language selection in bilinguals is affected by many exogenous factors (Meuter, 2009), it is formulated outside the bilingual language systems. However, the output of tag specification formulation is sent to the conceptualizer where the information about language is included in the preverbal message. Language information including information about language choice at the higher level of processing, language membership information, and language nodes at the lower level of processing construct a "language choice information network" during bilingual language processing. The intention to use a particular language is, thus, relayed to both the system at the higher level of processing, which produces lexical concepts and the language node (de Bot, 2004). The idea that some information about language exists at the lower level through language membership information and language nodes provides an elegant solution to the problem proposed by Walters (2005) that in de Bot and Schreuder's (1993) account even data at the phoneme and syllable levels of processing

require the verbalizer to determine language to phonemes and syllables. When a specific language is selected, the language node at the lower level informs all corresponding components in which information on syntax or form is required to be selected (Dijkstra & van Heuven, 2002). Thus, a link is made between the information on language at the higher level and the language nodes and language membership information at the lower level of language processing (lemma and lexeme levels). In other words, the language choice information included in the preverbal message (Green, 1986;1998; de Bot,1992) together with language nodes and language membership information from the sublexical structure of lexical items (e.g., English bigram wh) (Kesteren, et al., 2012) regulate bilingual language processing. Lastly, I have proposed that there is no need to include information on language choice for every utterance during a course of dialogue.

CHAPTER 4: The production of bilingual (switched) compound verbs: Implications for bilingual production models

4.1 Introduction

Some researchers view the differences between words' grammatical categories as one of the main sources of organizing principles of syntactic representations in the mental lexicon (Marian, 2009). As Marian (2009) puts forward, nouns are different from verbs in several ways. Nouns characterize entities, but verbs characterize relations between sets of entities. Verbs express relation and actions. Studies on naturally occurring substitution errors (e.g., I put the table on the book) reveal that speakers consider the categorical information of lexical items in their spontaneous speech production (Vigliocco & Hartsuiker, 2002). Substitution errors respect a strict word class constraint, because the error in the spontaneous speech production almost always has the same grammatical category as the intended item. The words involved in the exchanges belong to the same grammatical class "in 85% of the word exchanges in the MIT corpus" (Garrett, 1980:447, cited in Vigliocco & Hartsuiker, 2002).

According to Gentner (1981), with respect to memory less difficulty was reported for processing nouns than verbs. As she puts it, nouns are remembered better than verbs whether as cue (see Thorndyke, 1975), as item-to-be-recalled (see Kintsch, 1974), or as lexical items to-be-recognized (see Reynolds & Flagg, 1976). Nouns are learned earlier than verbs (Gentner,1982).

The verb-noun dissociation in the bilingual mental lexicon has not received a lot of attention. However, Gentner (1981) used the relative translatability measure to examine cross-linguistic variability of word class. The results indicated that nouns had greater stability than verbs across languages. Van Hell and de Groot (1998) also asked Dutch-English bilinguals to associate to nouns and verbs that differed in terms of concreteness and cognate status, once in within-language and once in between-language associates. They found that nouns elicited more translations than verbs. Retrieving an associate was easier with nouns compared to verbs in both within-language and between-language association. Van Hell and de Groot (1998:193) suggest that in bilingual memory conceptual representation "depends on word-type and grammatical class".

Fausey, Gentner, Asmuth and Yoshida (2006) examined to what extent the processing patterns for verbs and nouns are universal across languages. English and Japanese speakers were asked to paraphrase sentences of the form "The noun verbed" (e.g., "The blender talked"). They examined the degree to which each group of speakers adjusted the default meanings in their paraphrases by asking another group of speakers to read their paraphrases and to retrace which word had occurred in the original sentence. English speakers retraced more nouns compared to verbs suggesting that in the paraphrases verb meanings were more adjusted than noun meanings. However, the authors report that Japanese speakers did not differ between verbs and nouns. They assume that the results provide no evidence for a universal difference between nouns over verbs in sentence processing.

Moreover, studies on the linguistic performance of aphasic patients (e.g., Shapiro et al., 2000; Shapiro & Caramazza, 2003) report that some of them are impaired at producing certain grammatical classes. Grammatical category-specific deficit is the case in which an aphasic patient "exhibit(s) a disproportionate impairment for processing verbs vs. nouns or vice versa" (Hernandez et al., 2007:286). Accordingly, while some patients are good at

producing verbs, they show problems producing nouns (Shapiro & Caramazza, 2003). As Shappiro, Shelton and Caramazza (2000) state, opposite pattern of impairment was also reported in some studies (e.g., Silveri & di Betta, 1997; Rapp & Caramazza, 1997). The data from some studies on aphasic patients also showed that when producing a verb-noun construction, more verbs are omitted than nouns (e.g., Semenza et al. 1997; Nilipour & Raghibdoust, 2001). However, the results of studies on verb-noun dissociations in aphasic patients seem to be inconsistent. Mätziga, Druksa, Masterson and Viglioccoa (2009) investigated the phenomenon of noun-verb dissociations by reviewing all previous lesion studies that reported noun-verb dissociations in picture naming and by conducting an object-action picture naming experiment with a group of aphasic patients with different severity levels and different clinical diagnoses. They argued that the results of the study, as well as the different diagnostic categories and the lesion sites involved in the noun and verb impaired patients show that previous claims made in the literature with respect to "the implications of noun-verb double dissociation have often been made without strong enough and/or appropriate evidence" (Mätziga et al., 2009: 757). Mätziga, Masterson and Viglioccoa (2009) also suggest that "these claims are only justified when it can be shown that the impairments to the two categories occur for the same underlying reason and that the differences between the two categories are large" (p.738). (see Leek, et al., 2003 for more details).

The effect of grammatical category is unclear, especially when considering the processing of single words (Vigliocco et al., 2008). (see Pechmann & Zerbst, 2002; Pechmann et al., 2006; Vigliocco et al., 2005). Vigliocco, Vinson, Arciuli and Barber (2008) argue that given that there was a strong correlation between semantic features and grammatical class in the majority of imaging and neuropsychological studies (e.g., Tyler et al., 2001) and that in recent neuroimaging studies (e.g., Siri et al., 2007) in which the semantic correlates of grammatical class were controlled no regions of specific activation for

either verbs or nouns was observed, it is not clear whether the results observed in these studies can be unquestionably ascribed to grammatical class. “As one variable of interest, word meaning or semantics, has frequently been discussed as an underlying determinant of noun/verb dissociations” (Moseley & Pulvermüller, 2014: 28) (see Berlingeri et al., 2008 for more details).

The interpretation of the results is more complicated when considering that recent studies have shown that topographical differences in brain activation seem to be “driven by semantics and not by lexical class” (Moseley & Pulvermüller, 2014:28). They argue that while the evidence regarding verb and noun processing cannot replicate clear brain activation differences between these two categories and is commonly confounded by semantics, there is strong evidence for the view that “semantic associations alone, when disentangled from and unconfounded by lexical category differences, differentially activate cortical areas” (p.29). Moseley and Pulvermüller (2014) assume that whereas neural differentiation between various semantic categories is well-supported, the effect of grammatical class in modulating brain activity remains undetermined. As Crepaldi, Berlingeri, Paulesu and Luzzatti (2011:33) put it, the main reason for the existence of inconsistent data is that the cerebral circuits underlying verb and noun processing “are not spatially segregated, at least for the spatial resolution currently used in most neuroimaging studies”.

As stated above, another problem concerning the effect of grammatical category is that some researchers found the grammatical category effect only when a context was available. (see Chapter 1; Pechmann & Zerbst, 2002; Vigliocco et al., 2005). For example, Pechmann and Zerbst (2002) assume that when an item is inserted into an existing syntactic structure (i.e. sentential or phrasal contexts), the word class of the item must be available. Accordingly, the grammatical category information is activated when the target word is embedded in a

syntactic frame. Vigliocco, Vinson, Arciuli and Barbers (2008) also assert that grammatical class is not accessed automatically.

4.2 The present study

This study is concerned with the natural occurrence of BCVs and its processing. BCVs are compounds that may occur in language contact situations. Since compounding is so prevalent in most languages, understanding the process of compounding and of accessing compounds is critical to our understanding of the mental lexicon as a whole (Gagne & Spalding, 2006). This is because the study of how compounds are represented and processed is crucial to the way in which speakers store and organize multimorphemic items and retrieve them from the memory (Jarema, 2006). Since compounding is a very productive process of word-formation in all languages, "the likelihood of encountering a compound that one has neither seen nor heard before is very high" (Libben, 2006: 6). The same account holds true for the production of BCVs. Bilinguals may produce a BCV that they have never produced or heard before. Whereas compounding is highly productive, most studies in both monolingual and bilingual lexical representation use single words as experimental stimuli (Semenza & Mondini, 2006). Cross-linguistic studies on compound words are still rare (Jarema, 2006). The present study aims to contribute to our understanding of the processing of BCVs.

Whereas there is general agreement on how grammatical features such as grammatical class and gender are represented in the memory, the processes of their encoding are still unclear (Bordag & Pechmann, 2009). In this chapter, I use naturalistic data to study the encoding from grammatical categories information during the processing of BCVs. I investigate how a lexical element corresponding to a verb node can be placed in a slot that corresponds to a noun lemma. I examine whether lexical access is mediated by the grammatical category of a word and whether words of different classes across the two

languages of bilinguals can compete for selection in the case of the production of BCVs. Moreover, one of the main aims of the present study is to examine how the production of BCVs may be captured within a model of BCVs and how such a model may be integrated within incremental network models of speech production. The construction of BCVs has received a lot of attention in structural studies (see Chapter 1). To the best of my knowledge, the present thesis is the first to study the encoding of grammatical category information and bilingual lexical access during the production of BCVs from a psycholinguistic perspective.

As monolingual Persian compound verbs consist of a native noun and a native light verb whereas their bilingual compound verb equivalents have a verb+verb constituent structure, I hypothesize that words from different classes across the two languages of bilinguals compete for selection. In other words, with respect to the production of BCVs, it is hypothesized that lexical nodes that correspond to verbs from the other language enter into competition with the lexical nodes that correspond to nouns category. Further, I suggest that word's grammatical class does not provide a rigid constraint on lexical access during the production of BCVs.

4.3 The present data

I used a corpus of naturalistic data to study the production of BCVs. I selected 2298 minutes of a very popular Persian TV program series produced by a TV channel based in London. Overall, 101 YouTube videos were used in this study. There were 132 Persian-English participants. They used informal Persian. Most of the participants were residing in the UK, especially in London. Thirty-three participants talked about the number of years they had been living abroad. The mean length of their residence was 11.5 years. They frequently switched from Persian to English. 962 switching cases were recorded. They produced almost all types of code-switched utterances and inserted all types of English words into their

Persian utterances. Nouns, adjectives, verbs, adverbs and pronouns (intra-sentential switching) from English were inserted into their Persian utterances. Sometimes an English noun phrase (e.g., new development) or a whole English sentence (inter-sentential switching or alternation) were inserted into the Persian utterances (see Table 2 for the characteristics of participants' switchings). As Table 2 shows, in the present data 210 switched words were adjectives. In 10% of the cases, English adjectives were used after Persian nouns. That is, the prenominal English adjective was used after the Persian noun.

I found 83 cases of switched-utterances (8% of the data) in which the participants code-switched inside the Persian compound verb structure and formed BCVs. Sometimes switches were deliberate and controlled (see Paradis, 2009). As proposed by Paradis (2009), controlled switching involves the general mechanisms of explicit task-switching that depends on declarative memory. For intentional switching (i.e., conscious switchings), lexical items are not inserted from the other language automatically and are "subserved by cerebral structures that sustain declarative memory processes" (Paradis, 2009:155). Speakers mostly use controlled switching for further clarification. Table 2 shows the characteristics of participants' language switches.

Table 2
The characteristics of participants' code-switchings

adjective	adverb	noun	noun phrase	intersentential switching	pronoun	verb	conscious switching	phrase	conjunction
208(21%)	29(3%)	499(51%)	68(7%)	48(5%)	1(0.10%)	83(8%)	6(0.62%)	18(2%)	2(0.20%)
									Total = 962

Participants' CS patterns are indicative of their level of language proficiency. As we have seen, the participants produced almost all types of CS, suggesting that they have a high level of proficiency in their L2. They produced 48 cases of inter-sentential switching which

requires a high level of proficiency because it often "entails the production of full clauses in each language" (Bullock & Toribio, 2009:3). Table 2 shows that they produced 920 cases of intra-sentential CS. Many researchers assume that speakers' "ability to switch at the intra-sentential level correlates with increased mastery of linguistic structures" (p.8), because intra-sentential CS requires a high degree of proficiency in both languages (Bolonyai, 2009). Accordingly, it is safe to consider them highly proficient bilinguals.

4.4 Data analysis

For the purpose of analysing the data, I first interpret the interactional context in terms of the adaptive control hypothesis proposed by Green and Abutalebi (2013). Based on the hypothesis, there are three different interactional contexts that can be viewed as "three different recurrent patterns of conversational exchange as a way to contrast demands on control processes" (p. 517). In a single-language context, one of the languages is used in one linguistic environment and the other in another distinct environment. For example, a non-dominant language may be used exclusively in the work environment, whereas the dominant language may be spoken exclusively at home with family members. In such a context no frequent switching is expected to occur (Green & Abutalebi, 2013). In contrast, in a dual-language context both languages of bilinguals are assumed to be used for communication but typically with different speakers. Switching within a conversation occurs but not within an utterance (Green & Abutalebi, 2013). Finally, in a dense code-switching context speakers frequently mix their languages within a single utterance and more importantly adapt words from language B in the context of language A and create a "congruent lexicalization or dense CS" (Green & Wei, 2014:500) (see Muysken 2000 for the notion of congruent lexicalization). A complex morphological or morphosyntactic adaptation (congruent lexicalization) typically occurs in a dense code-switching context (Green & Abutalebi, 2013). Green and Abutalebi

(2013) present an example from Edwards and Gardner-Chloros' (2007) study, in which in a switch between French and Alsatian (an Alemannic German dialect spoken in Alsace in eastern France) a bilingual adapts French verbs by adding a "German particle (-ieren) as in 'choisieren' from the French 'choisir' rather than switch to the German word for 'chose' ('wählen')" (p.518).

Based on the qualities and the quantities of the present code-switching data it is feasible to suggest that many participants were in a dense code-switching context, as they produced a lot of code-switched utterances (962 cases of switches). Moreover, as stated above, participants produced almost all known types of CS such as insertion, alternation, and especially the "congruent lexicalization or dense CS". The hypothesis holds that in CS the partners implicitly agree that the two languages are in play (Green & Wei, 2014). In this view, the control schemas cooperate to "determine the items that enter the planning layer" (Green & Wei, 2014:503). Thus, such a process is cooperative rather than a competitive one (Green & Abutalebi, 2013). While alternation involves no adaptation, insertion typically requires varying degrees of adaptation and congruent lexicalisation (dense CS) "covers items that include affixes/suffixes and structural adaptation" (Green & Wei, 2014:503). Such a congruent lexicalization can be seen in example (6) from our data in which the English item (fruit) is suffixed with both the Persian plural suffix /-hā/ and the Persian possessive clitic pronoun /-š/.

(6) Fruit-hā-š xeyli tāzeh bud-and
-Pl-POSS very fresh were-they
His/her fruits were very fresh.

In example (7) from our data, items from the two languages were used alternately and one can see how the two languages are morphologically interwoven:

(7) Bā friend-hā-ye jadid-e-š honest bāš-e.
With -Pl-link new- linking enclitic-Poss to be
[One] must be honest with his/her new friends.

As mentioned above, participants produced 83 BCVs overall. The most important characteristic of BCVs in our corpus is that the nominal constituents of Persian compound verbs were replaced by English verbs in all cases. (see examples 8, 9, and 10).

(8) bāyad xodam ro *protect kon-am*.
Should myself ocm do-I
I should protect myself.
Persian equivallent of the BCV:hefāzat/hemāyat kon-am
N N

(9) Man aslan *insist na-kar-d-am.*
I at all NEG-do-past-I
I did not insist at all.
Persian equivallent of the BCV: esrār nakardam
N

(10) alān man starter-am ro *prepare mi-kon-am*.
now I starter-my ocm pres-do-I
Now I prepare my starter.
Persian equivallent of the BCV: āmādeh mikonam
N

As in monolingual compound verbs, Persian light verbs carry the inflectional information (featural information) including tense and number in the construction of BCVs. Accordingly, the participants never produced an utterance like example (11) in which the past tense form of an English verb was used. In our data, all the BCVs followed the same patterns as in examples (12) and (13), instead. A (*) indicates that such a structure was not used by the participants.

(11) *Mā hamdigeh ro yeh bār *met kar-d-im*.
We each other ocm once do-past-we
We met each other once.

Persian equivallent of the BCV: molāqāt kard-im

(12) Mā hamdigeh ro yeh bār *meet kard-im*.

We each other ocm once do-past-we

We met each other once.

Persian equivallent of the BCV: molāqāt kard-im

(13) az xodam *create kard-am*.

From myself did-I

I created it myself.

Persian equivallent of the BCV: dorost kardam

The analysis of our data shows that in (85%) of the BCVs subjects used the same light verbs as used in the monolingual Persian compound verbs. In the remaining cases, in which the same light verbs were not accessed, participants used "kard-an", meaning 'do', instead. "Kard-an" is the most frequent light verb used in Persian compound verbs (see example 14). This linguistic behaviour also shows that participants used elements from the two languages in BCVs systematically.

(14) man Christmas ro *celebrate ne-mi-kon-am*.

I ocm NEG-pres-do-I

I do not celebrate Christmas

Persian equi: jašn ne-mi-gir-am

The analysis of the data also indicates that bilinguals only retrieved the information that was necessary to construct well-formed switched utterances. As an example, producing utterances such as example (15) is much well-formed than the utterance exhibited in example (16), because in example (15) no redundancy (expressing information about tense twice) occurred.

(15) Xeyli xošhāl šodam bachcheh-hā ro did-am , *enjoy kard-am*.

Very happy become-I guys ocm saw-I did-I

I became very happy when I met the guys. I enjoyed it.

Persian equi: lezzat bordam

(16) * Xeyli xoshāl šodam bachcheh-hā ro did-am , *enjoyed* kard-am

4.5 Discussion

The processing of BCVs has not been addressed from a psycholinguistic perspective, despite, as will be discussed in this section, it provides important insights into bilingual grammatical encoding and lexical access. Before discussing the processing of BCVs, I summarize the basic characteristics of Persian-English BCVs: (a) the nominal constituent of a compound verb is replaced by a verb from the other language (English); (b) some of the morpho-syntactic properties of the English verbs that correspond to a given context may not be retrieved or may be locally inhibited); (c) the inserted verb is not integrated into the base language (here Persian); (d) the Persian light verbs that follow the English verbs are inflected for tense, number and person (see Fotiou, 2010); (e) the majority (85%) of the BCVs used the same Persian light verbs as in the non-switched (monolingual) compound verbs. In the remaining cases, participants used "*kard-an*" instead, that is the most frequent light verb in Persian.

In this section, I attempt to show how the production of BCVs might be captured within a model of BCVs and how such a model might be integrated within incremental network models of speech production (e.g., de Bot, 1992; Poulisse & Bongaerts, 1994; Costa, 2005; La Heij, 2005; Levelt, 1989; Levelt, et al., 1999; Roelofs, 1992). In these models, the intended concept spreads activation to the corresponding lemma nodes. Selection is necessary because all current models agree that "lexical access does not result in the activation of a

single representation" (La Heij, 2005:291). Then, at the lemma level, the preverbal message is converted into a speech plan by retrieving the right lexical units and applying the grammatical and phonological rules. Lexical units consist of lemma and morpho-phonological form (lexeme) (de Bot,1992). The lemma information includes the specifications of lexical items' use including pragmatic conditions, morpho-syntactic information such as the lemma's syntactic category (e.g., noun, adjective, verb) (de Bot, 1992), and its grammatical functions (e.g., passive, active, transitive, intransitive), as well as information needed for lexical syntactical encoding (e.g., number, aspect, mood, tense, case) (Roelofs, 1992). The analysis of our data reveals that in BCVs some of the morpho-syntactic information of the inserted English verbs corresponding to the context may not be retrieved from memory (see examples 12, 13, 14 and 15). As Paradis (2004) puts forward, any language module including the morpho-syntax module "can be selectively inhibited" (p.134). Accordingly, in examples 13, 14, and 15 the English past tense morpheme /-ed/ was not retrieved even though the sentences were in the past tense. In example 9, while "insist+ the past tense morpheme" had to be retrieved due to the context requirement, only the lemma node "insist" was retrieved suggesting that the demands of the grammar (Formulator in the word of de Bot, 1992) of the base language (Persian) determined the characteristics of the inserted English items. That is, the production of the BCVs shows that the serial order from the parallel representations of the two languages emerges in such a way that is consistent with the morphosyntactic requirements of the base language (Green & Wei, 2014).

Moreover, the production of BCVs suggests that since each component "can be selectively inhibited" (Paradis, 2004:134) or activated, the morphosyntactic information of a given lemma including information about its syntactic category and featural information (e.g., number, tense) is stored and retrieved separately (see Caramazza, 1997 and Paradis, 2004 for the same account). The present data also demonstrates that the "syntactic information is

represented independently of both lexical-semantic and word form information" (Caramazza, 1997:185). Figure 2 is a schematic representation of language processing of BCVs at lemma level.

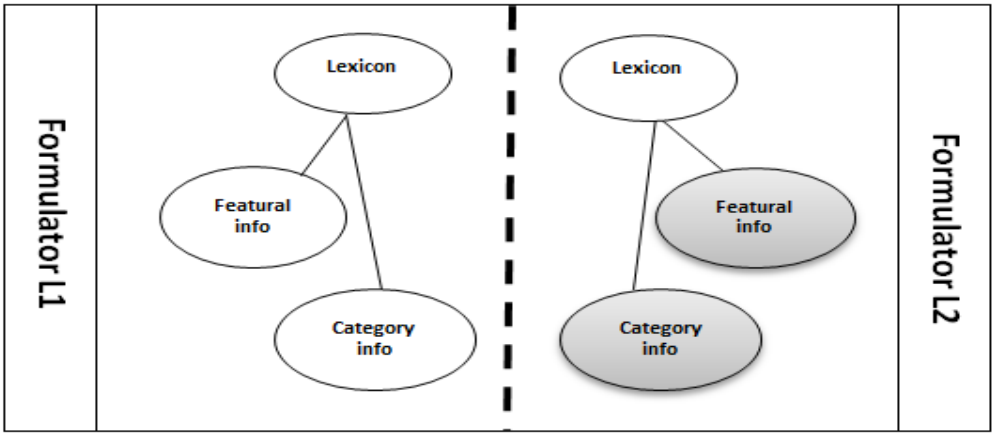


Figure 2. A model showing the processing of BCVs at lemma level. The lemma includes morphosyntactic information such as the lemma's syntactic category (e.g., noun, adjective, verb), featural information (number, tense) and grammatical functions (e.g., transitive, intransitive). At lemma level, the conceptual representation is linked to an English verb from the L2 lexicon in order to be used as the non-verbal constituent of the compound verb. To fit into the Persian compound verb structure, the grammatical category node of an English verb and sometimes the featural information of the inserted verb undergo a local reactive inhibition. As the light verb following the alien verb carries the featural information (number, tense), the featural information of the English verb may be locally inhibited. The dotted black line in the middle shows the weaker inhibitory control. The dark components indicate that they may selectively be inhibited.

In incremental network models (Levelt, 1989; Bloem & La Heij, 2003; Roelofs, 1992), "the mental lexicon is a network of nodes and links" (Roelofs et al., 2013:346). In these models, the conceptual node that is language-independent is connected to the corresponding lexical node. The lexical node is linked to the language node (represented, for instance, by P and E respectively for Persian and English in Figure 3), to the relevant category node (e.g., noun and verb), and to the featural node (e.g., tense, number) at the lemma level (Roelofs, 1992). Figure 3 is a model characterizing the production of BCVs. I consider BCVs as "single-concept-multiple-lemma cases" (see Levelt, et al., 1999 for more details on accessing morphologically complex words). With respect to the production of

BCVs such as “insist kard” (lit. insist did she/he- he/she insisted), activation of a concept (e.g. ‘ESRĀR KARDAN’- to insist) “spreads its activation to its all connected nodes” (Bock & Levelt,1994: 954). Thus, when the ‘ESRĀR KARDAN’ concept is activated, the lemmas ‘esrār’(meaning “insistence”) and ‘kardan’ (meaning “do”) in the Persian subsystem and ‘insist’ and ‘insistence’ in the English subsystem receive activation with ‘insist’ and ‘kardan’ receiving stronger activation which in turn result in the activation of the corresponding language nodes (P for items from Persian and E for the item from English) and category nodes (Verb for the ‘insist’ and ‘kardan’ lemmas and Noun for the ‘esrār’ and ‘insistence’ lemmas). ‘Insist’ and ‘kardan’ have the category links to the verbs nodes and ‘esrār’ and ‘insistence’ have the category links to the noun nodes (see Bock & Levelt, 1994; Roelofs, 1992). According to the models, activation of a lemma node automatically leads to the activation of the relevant language node and category node (Roelofs, 1992). However, as discussed, with respect to the production of the BCVs, whereas the featural node and the category node of the English verb receive activation from the corresponding lemmas, they may undergo a local reactive inhibition.

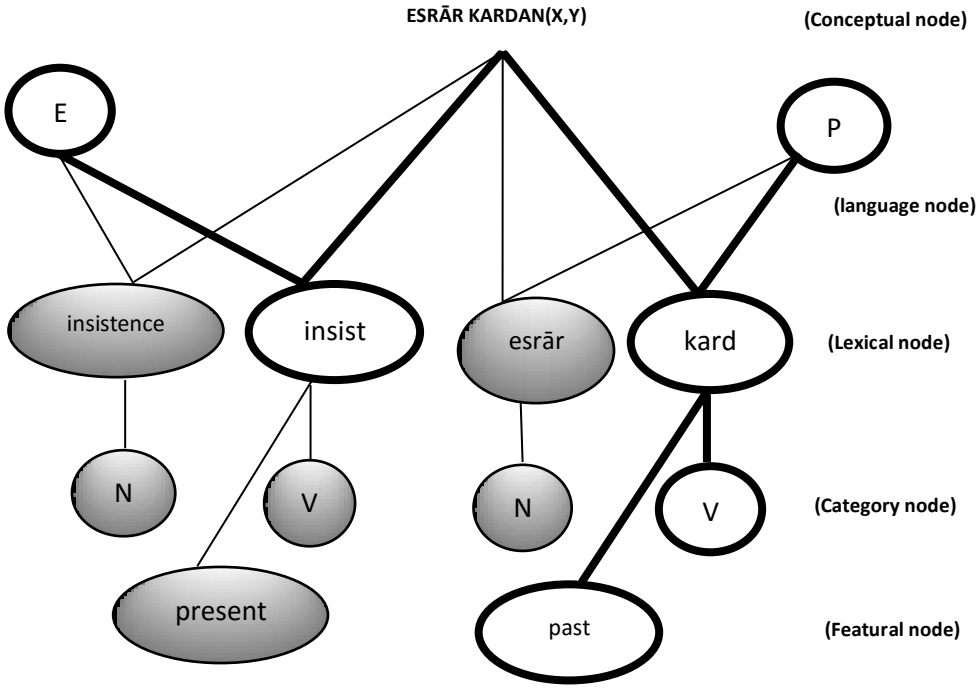


Figure 3. A model characterizing the production of BCVs. In BCVs, the intended concept activates words of different class across the two languages of bilinguals. Each lemma node is linked to a category node, a language node, and a featural node. The thick lines indicate the strong links between the nodes. The dark circles indicate that the nodes received weaker activation (e.g., insistence) or underwent a local reactive inhibition (e.g., the category node of "insist") during the production of BCVs.

The production of the nominal constituent of BCVs involves the lexical nodes corresponding to the verb category rather than the noun category from the other language (here English) entering into competition with the lexical nodes that correspond to the noun category in Persian (see Roelofs & Piai, in press, for the lexical access by competition hypothesis). In other words, whereas a lexical node corresponding to nouns is activated in the Persian language subsystem when a speaker intends to produce the nonverbal constituent of monolingual compound verbs, the production of the nominal constituent of BCVs involves activating lexical nodes that correspond to verbs in the other language (here English) and a noun from the base language (Persian). This suggests that grammatical class does not provide a rigid constraint on lexical access during the production of BCVs. To produce a BCV, words

from different categories across the two languages (an English verb and a Persian noun) enter into competition.

As proficient bilingual speakers switch between two languages, the changing linguistic context may affect the encoding of verbs and nouns and may yield in different patterns of cross-linguistic interaction for the two grammatical classes (Marian, 2009). But given that nouns might be processed easier than verbs both in within-language and between-language statues (see Van Hell & de Groot, 1998), the questions that arise with respect to the production of BCVs why and how a verb is selected from the other language rather than a noun? A satisfactory psycholinguistic model of the production of BCVs needs to explain, for instance, what mechanism allows using a verb from the other language in the place of a noun from the base language, whether more activation is spread to the lexical node corresponding to the verbs than to the nouns in the other language of bilinguals, and more importantly whether the category information of the activated verb used as the nominal constituent is also activated, or whether it is activated but inhibited as a function of the local reactive inhibition process. In the following section, I will present some possible explanations with respect to using a verb from the other language in the place of a noun in the construction of BCVs.

One possible scenario is that selecting a verb from the other language in the place of a native noun is an unsuccessful retrieval of the appropriate lemma or "occasional selection error-lapse" by using the words of La Heij (2005:299). To put it differently, in the case of the production of BCVs, whereas the lemma corresponding to the noun node from the other language (here English) has to be selected to enter into the competition with the corresponding noun in the base language, the lemma corresponding to the verb node is selected as a function of the unsuccessful retrieval of the appropriate lemma. If this is the case, one would need to explain why a large amount of unsuccessful retrieval of appropriate lemmas occurs during the production of BCVs in various language contact situations (see

Chapter 1 for the production of BCVs in the other language contacts). Moreover, I find that BCV construction is highly productive. A bilingual speaker may produce a BCV that he or she has never heard or produced before. Thus, selecting an alien verb instead of a noun from the other language of a bilingual speaker may not be explained in terms of an unsuccessful retrieval of the appropriate lemma.

Moravcsik (1975) presents a second possible explanation. The researcher suggests that verbs cannot be borrowed from the other languages. Thus, she proposes a grammatical class constraint on borrowing. I, however, do not consider this process to be borrowing but rather I view the insertion of the verb within the compound verb structure as CS. As Wohlgemuth (2009:279) states, Moravcsik assumes that "verbs can never be borrowed as verbs but are borrowed as nouns, instead". Moravcsik (1975) views the production of BCVs as evidence for the claim she made (Muysken, 2000). In this view, the alien verbs such as "manage" and "prepare" from our data used in the construction of BCVs are actually nouns rather than verbs. I strongly believe that Moravcsik's (1975) account is not a satisfactory explanation, because the category feature of lexical items is considered to be a feature that is inherently associated with a lexical item (see Caramazza, 1997). The inherent features of lexical items may not be subject to change. Moreover, as Muysken (2000:197) states "there is a conceptual problem with Moravcsik's unitary analysis. While inserting verbs as such may well be problematic for both morphological and syntactic reasons, there is nothing in universal grammar that forces the way they are inserted to be nominal".

An alternative explanation is that as access to a lexical item at the lemma level does not automatically lead to access of its grammatical features, the grammatical category feature of a lemma node (here the alien verb) is not activated during the production of BCVs. However, there is no consensus about whether the grammatical class information is accessed

automatically whenever a lexical item is processed. Many models of language productions posit that activation of a lexical item leads to the activation of the corresponding category node. For example, Pickering and Branigan (1998) postulate that whenever a lemma belonging to the verb category such as "eat" is activated, the verb node is activated. The verb node is "inherently activated whenever the lemma is activated" (p.634). However Caramazza (1997) notes that not all syntactic properties of a word are automatically activated by the semantic network. He distinguishes between "intrinsic" grammatical features and "extrinsic" grammatical features. The former refers to the features (e.g. grammatical category) that are inherently associated with a lexical item; the latter refers to some grammatical features (e.g. number and tense) that are not inherently associated with a word and are determined contextually (Caramazza, 1997). He also distinguishes between "the more and the less arbitrary features within the set of intrinsic features" (p.186). Accordingly, while 'gender' is mainly an arbitrary property; 'noun' is not an arbitrary feature of a word. In this account, the accessibility of different grammatical properties for a lexical item is not uniform (Caramazza, 1997). For example, while features of gender are not automatically activated by the semantic network, grammatical category (e.g., noun, verb) and tense features "do receive activation from the semantic network" (Caramazza, 1997:195). On the other hand, Vigliocco, Vinson, Arciuli and Barbers (2008) postulated that grammatical class is not accessed automatically. They suggested that the results of the study, combined with the results that they found in their previous studies (Vigliocco et al., 2005) showed that grammatical effect was observed "only when a frame (even a minimal one) is processed" (Vigliocco et al., 2008:181). The researchers posited that the findings provide compelling evidence against a lexicalist approach to grammatical class according to which grammatical class is automatically accessed and retrieved when a lexical item is retrieved.

I suggest that with respect to the production of the nominal constituent of BCVs, lexical nodes corresponding to a verb grammatical category have a higher level of activation than those competing lemma nodes that have the noun grammatical category, because in our data there was not any case in which an English noun was a candidate to be selected for the non-verbal elements of BCVs. The same holds for the production of BCVs in many other language contact situations. In the case of the production of "insist kard" (insist did- insisted), the lemma 'insist' in the other language receives more activation than both 'esrār' (N) and 'insistence' from the concept 'ESRĀR KARDAN'. As the lemma node connected to the V category (i.e. 'insist') from the other language is more activated than a lemma node that is connected to the N category (i.e., 'insistence') due to the higher frequency of the verbs compared to the nouns, it is selected to be retrieved from memory (see Luria, 1974 for the effect of frequency on word retrieval). Thus, receiving a stronger activation from the conceptual representation is a function of a higher activation level of a lexical item (Paradis, 2004) rather than its category node at least in the case of the production of the nominal constituent of BCVs. In this view, "the ease of access to various items is proportionate to the recency and frequency of their use" (Paradis, 2004:31).

I propose that the production of the first constituent of BCVs involves the following sequence of events: the intended concept spreads activation to the corresponding lemma nodes (La Heij, 2005). However, the lemma node corresponding to the verb from the other language that has a higher activation level (see Paradis, 2004) than both its competing nouns in Persian and English receives more activation. Activation also spreads to the syntactic category node (verb) but a local reactive inhibition is applied after the category node of the

selected lemma is activated[2]. Thus, a lemma node with a different grammatical category enters into the competition queue in case it has a higher level of activation. Such a mechanism allows two words from different categories across the two languages of bilinguals to compete for selection. Therefore, one important implication that follows from the results of the present study is that the grammatical category of a word does not provide a rigid constraint on lexical access in the case of the production of BCVs.

I also suggest that some verbs might be phonologically easier to be fitted into the BCVs' constituent structure compared to their corresponding English nouns, because in our data most of the inserted verbs have fewer syllables than their corresponding nouns. Examples from our data are 'enjoy vs. enjoyment', 'insist vs. insistence', 'observe vs. observation', 'create vs. creation', 'add vs. addition', 'expect vs. expectance', 'entertain vs. entertainment', 'accept vs. acceptance', 'repeat vs. repetition', 'decorate vs. decoration', 'manage vs. management', and 'generate vs. generation'. Granting that is assumption is correct, it would entail that there is feedback from word-form level to lemma level in language production (see Vigliocco & Hartsuiker, 2002). One view of production is that "encoding proceeds in a strictly top-down fashion with no feedback from lower to higher levels" (Bock, 1995:193). In Levelt's model "auditory-perceptive self-monitoring is the only form, albeit very limited, of feedback" (Mildner, 2010:84). In incremental network models, language production is assumed to be uni-directional (Vigliocco & Hartsuiker, 2002). Since

[2]- According to Colzato, Bajo, van den Wildenberg, Paolieri, Nieuwenhuis, La Heij & Hommel (2008) researchers used the term "reactive" differently. Green (1998) uses the term "reactive" to refer to "the moment at which inhibition is applied by a central inhibitory system" (Colzato et al., 2008: 303), however, Colzato and colleagues (2008: 303) use the term "reactive inhibition" to refer to "local (lateral) inhibitory links between activated word representations". Costa and Santesteban (2004: 493) state that the term "reactive" means "inhibition is only applied after the lexical nodes of the non-response language are activated from the semantic system". I use the term "reactive inhibition" to refer to the process in which inhibition is applied after the syntactic information of lexical items such as the category information is activated at lemma level.

in Levelt's model there is no feedback from the word-form to the lemma-level, syntax functions independently from phonology (see Vigliocco & Hartsuiker, 2002 for more discussion). The alternative proposal presented by Dell (1986) is that activity at lower-level may affect higher-level processing. According to Dell's (1986) model, "in the cases of word and sound error, the competition is regulated not only by events at higher levels but also by those at lower levels of processing, simulated in terms of feedback of activity within a connectionist lexical network" (Bock, 1996:410) (see Alario & Caramazza, 2002, and Janssen & Caramazza, 2009, for the influence of phonological information on a word's grammatical encoding). Thus, the analysis of the present data does not support a solid grammatical basis of lexical selection in the production of the nominal constituents of the BCVs. In other words, grammatical class may not act as the only organizing principle that underlies the processing of the nominal constituent of BCVs.

Studies of compounds have indicated that various factors such as the semantic transparency of constituents, an individual's language history, frequency and productivity of compounds in a given language, orthographic and phonological characteristics of compounds affect the processing and representation of compounds (Levy, et al., 2006). The same account may hold for the production of BCVs. As stated above, it is more likely that the phonological and more importantly the frequency features of the lexical items determine which word is used in the place of the nominal constituent of Persian compound verbs regardless of its grammatical category and language membership. Further research is, thus, invited to test the proposals by investigating the production of BCVs in other language contact situations.

Inconsistent with studies that posited a grammatical class constraint on lexical access (e.g., Dell, et al., 2008; Gordon & Dell, 2003), the main contribution of the present study is that in the case of BCVs, grammatical class (syntactic category) does not provide a rigid constraint on lexical selection. In Experiment 2 in Mahon, Costa, Peterson, Vargas and

Caramazza (2007), the researchers examined the interaction between grammatical category and semantic relatedness. Subjects named objects in the context of four different types of distractors: semantically related verbs, semantically unrelated verbs (e.g., picture "book": read vs. go respectively) and "semantic-category coordinate noun distractors versus unrelated nouns" (p.509) (e.g., picture "cow": sheep vs. bag respectively). The results indicated a significant interaction between semantic relatedness and words' grammatical class; however, semantically related verb distractors exhibited less interference compared to unrelated verb distracters. While there was a semantic interference for noun distractors, semantically related verb distractors facilitated naming objects. Mahon, Costa, Peterson, Vargas & Caramazza (2007) suggested that one way to interpret the results is to assume that as there are grammatical category constraints on lexical access, lexical nodes that correspond to verb distractors do not compete with the names of objects. They also suggested that an alternative way to explain the results is to assume that neither the related verb distractors nor unrelated verb distractors "satisfy the task-determined response-relevant criteria demanded by the target pictures (i.e., name an object)" (p.510). The results of the present study are, however, inconsistent with the strong version of the criteria. As indicated above, in the cases of producing BCVs, an English verb competes with a Persian noun, however, "the task-determined response-relevant criteria" demands an alien noun to enter into competition with a noun from the base language. In other words, the task-determined response-relevant criteria require the slot to be filled with a noun; however, an alien verb was selected in the place of a noun slot.

The Division of Labour (DOL) model proposed by Gordon and Dell (2003) may not be able to account for the processing of BCVs. The DOL model is based on a learning algorithm that yields in a division of labour between semantic and syntactic inputs for lexical activation (Gordon & Dell, 2003). The main structure exhibited in Gordon and Dell's (2003) model is

"The NOUN (sing.) VERBs" (determiner noun verb)". According to the model, when the state of Det is activated, the other states (NOUN and VERBs) are inactive. After a noun is encoded, NOUN is turned off and VERBs becomes active (Dell et al., 2008). The syntactic-sequential units are responsible to "keep track of where the formulation process is in the sentence" (p.591). In essence, the model's operation is based on an inhibitory-excitatory mechanism. At one point, the units excite nouns when a noun is required and inhibit all non-noun items (Dell et al., 2008). Accordingly, words that do not belong to the proper category receive little activation (Gordon & Dell, 2003). Gordon and Dell (2003) posit that "the slots are specified by their syntactic category with the result that only lexical items of the proper category can be inserted" (p.3). As shown above, the model cannot explain the processing of BCVs, because in BCVs after a VERB from the other language is encoded, a VERB from the base language is activated. It means that contrary to the Dell, Oppenheim and Kittredge's (2008) account, after a VERB is encoded, VERB may not be turned off. Moreover, the production of BCVs exhibits that words that belong to an improper category may receive more activation from the conceptual system.

Vigliocco, Vinson, and Siri (2005) also investigated the separability of syntactic and semantic correlates of grammatical category. In this study, speakers of Italian were asked to name pictures of action as a verb in the bare form or as a verb in the third person singular/plural form. Pictures were presented in the context of distracter words that were either semantically related or unrelated to the picture names and were of within or different grammatical classes (verbs or nouns). Half of the participants had to name the actions as verbs in the citation form (naming the action using the infinitival form of the verb), the other half named the actions as verbs inflected for third person. They reported that the effect of grammatical class was available only when words had to be integrated in syntactic frames in the third person inflected form (sentence-level integration processes), but not in the bare

(citation) form. The researchers concluded that grammatical class information only affects when speakers have to produce a phrase. Vigliocco, Vinson, Arciuli & Barber (2008) also suggested that the results of the imaging study invite the hypothesis that the impact of grammatical class should only occur when participants have to process words within a context at least in minimal phrases than in the production of bare words.

I suggest that with respect to the production of BCVs, as the Persian-English ones, participants may have constructed a mental task schema in their long term memory (see Green, 1998 for mental task schema account) in which words from different categories across the two languages can compete for selection when producing BCVs, the effect of word class was not found, however, they processed words within a context. This is inconsistent with some studies (e.g., Pechmann & Zerbst, 2002; Vigliocco, et al., 2005) that assume that word class effect must be available when processing words within a context. Thus, based on the production of BCVs I propose that producing words within a context does not guarantee that the grammatical category of a word is both activated and selected, because all the production of BCVs occurred within a context. The analysis of the present data suggests that word class effect may be absent even when speakers have to process words within a context which demands word class information.

The results are in contrast with Marian's (2009:171) account that since verbs are more tied to a linguistic context, nouns are likely to be more portable across languages and contexts. The present analysis of the production of Persian-English BCVs, combined with evidence of cases of BCVs in the other language contacts such as Greek-English (Tamis,1986), Tamil-English (Shanmugan Phillai,1968), shows that verbs tend to be remarkably "more portable across languages and contexts" in some circumstances.

It should be noted that language production is affected by the characteristics of the languages speakers are using. In the current study and in many cases in the other language

contact situations (see Chapter 1), verbs were used in the place of nouns within the compound verb structures. In other words, in the case of the production of Persian-English BCVs, a verb from the other language (English) enters into competition with a noun; However, Ido (2006) shows that some of the Iranian languages, such as Tajik, Sariqul, Talysh and Kurdish borrow Uzbek or Turkish verbs in the form of "-miš participles" and combine them with "kardan" as the light verb of compound. In example (32) the Uzbek participle consists of the stem bitir (meaning finish) and the participle-forming suffix –miš. Then, while Persian-English bilinguals can simply use English verbs in the place of Persian nouns in the BCV structure, they may never use an English participle in the place of a noun within the BCV structure.

(32) bitir-miš kard-an

finish-ptpl did-inf

To finish (Ido, 2006)

4.6 Conclusion

The present study revealed that in the case of the production of BCVs, words from different classes across the two languages of bilinguals compete for selection. I proposed that the production of the first constituent of BCVs involves the following sequence of events: the intended concept spreads activation to the corresponding lemma nodes. However, the verb from the other language that has a higher activation level than both its competing nouns in Persian and English receives more activation. Activation also spreads to the syntactic category node (verb) but a local reactive inhibition is applied after the category node of the selected lemma is activated. Thus, I suggest that in some conditions, grammatical category does not provide a rigid constraint on bilingual lexical access. In other words, the facts that BCVs occur in many language contacts and that in all cases in our study and in many cases in the other language contact situations a native noun is replaced by an alien verb in a BCV

structure jointly imply that in the case of the production of BCVs bilingual lexical access does not strictly depend on grammatical class. The production of BCVs in Persian-English language contacts and also in many different language contacts reveal that a verb from the other language can be produced in a slot requiring a noun. I also proposed that the phonological and more importantly the frequency features of the lexical items determine which word, regardless of its grammatical category and language membership is used in the place of the nominal constituent of Persian compound verbs.

What the results of the present study add to the literature is that in some linguistic contexts, two words from different classes across two languages of bilinguals compete for selection. An important contribution of the present study is presenting a set of new proposals that can be used as ideas for further research on the processing of BCVs.

CHAPTER 5: Experiment: Competition of words from different categories in the production of the nominal constituent of BCVs

5.1 Introduction

As we have seen in Chapter 4, I used a corpus of naturalistic data to study bilingual language processing, especially the processing of BCVs. I summarize the results here again in order to provide a background for the presentation of the experiment. As stated in Chapter 4, 2298 minutes of a very popular TV series were selected. Participants frequently switched from Persian to English.962 switching cases were recorded. I found 83 switched utterances (8% of the switched cases) in which the participants code-switched inside the Persian compound-verb structure and formed BCVs. In the BCVs, the Persian nominal constituents were replaced by English verbs. In Example (33), 'concentrate kon-am' (lit. concentration-do I- to concentrate) which has a N+V structure is a monolingual compound verb. In Example (34) 'concentrate kon-am', which has a V+V constituent structure, is an example of a BCV. As can be seen in Example (34), the nominal constituent of a Persian compound verb was replaced by an English verb.

(33) Aslan nemitun-am *tamarkoz* kon-am.

At all cannot-I concentration do-I

I cannot concentrate at all.

(34) Aslan nemitun-am *concentrate* kon-am.

At cannot-I concentration do-I

I cannot concentrate at all.

Thus, the results of the analysis of naturalistic data presented in Chapter 4 allows for a new generalization that in the case of producing the nominal constituents of BCVs, bilingual lexical access is not strictly mediated by the grammatical word category. In other words, since the naturalistic study presented in Chapter 4 found that words from different grammatical categories across the two languages of bilinguals compete for selection, the following hypothesis on bilingual language processing arose: lexical access is not mediated by the grammatical category of a word when producing the nominal constituent of BCVs.

5.2 The present study

This study investigates the availability of grammatical-category information during bilingual language processing. I focus on the processing of BCVs. As we have seen in Chapter 1, whereas some studies have examined the effect of grammatical category in monolingual language processing (e.g., Pechmann & Zerbst, 2002; Vigliocco et al., 2005; Vigliocco et al., 2008), studying the effect of grammatical category in bilingual language processing is rare indeed (see Van Hell & de Groot, 1998). For example, in Van Hell and de Groot (1998), the researchers used a bilingual variant of the word association task. They asked Dutch-English bilinguals to associate to nouns and verbs that differed in terms of concreteness and cognate status, once in the same language and once in the other language than the stimuli. They found that nouns elicited more associations that were translations of one another than verbs did. Retrieving an associate was easier with nouns compared to verbs in both within-language and between-language association. Moreover, to my knowledge, no study has investigated the encoding of grammatical category information in the processing of

BCVs from a psycholinguistic perspective. In this experiment, the picture-word interference paradigm was used. Psycholinguistic research on language production uses tasks such as picture naming, where the time-course of lexical access can be examined (Hall, 2011). The paradigm is used in bilingual language production studies in order to examine cross-language activation at the lexical level (see Vorwerg, 2012; Hermans et al., 1998). "The picture-word interference paradigm has not only been used to provide evidence of cross-language activation in bilingual speech production, but also as a window into the role of competition in lexical selection" (Giezen & Emmorey, 2015:3). That is, the picture-word interference paradigm is used to investigate whether the activation level of lexical candidates of the non-intended language affect lexical access in the target language (Giezen & Emmorey, 2015). The language non-specific selection account (see Costa, 2005, for language specific and non-specific selection accounts) holds that lexical alternatives from both languages compete for selection. This account straightforwardly explains why between-language semantic distractors result in semantic interference effects (Giezen & Emmorey, 2015).

In this experiment, I investigate whether words from different categories across the two languages of bilinguals can compete for selection. More precisely, this study addresses whether in the case of the production of BCVs, the English verbs compete with the corresponding Persian compound verbs as a whole, or whether the English verbs compete with the nominal constituent of the Persian compound verbs only. Persian-English bilinguals were asked to name pictures of actions in their L1 (Persian) in four different conditions while ignoring distractor words printed in English.

In Condition 1, participants named pictures of actions using the whole Persian compound verb in the context of its English equivalent distractor verb. In Condition 2, only the nominal constituent was produced in the presence of the light verb of the target Persian compound verb and in the context of a semantically closely related English distractor verb. In

Condition 3, the whole Persian compound verb was produced in the context of a semantically unrelated English distractor verb. In Condition 4, only the nominal constituent was produced in the presence of the light verb of the target Persian compound verb and in the context of a semantically unrelated English distractor verb.

I suggest the use of bilingual constructions would be best explained in terms of lexical competition between words from both languages. I conjecture that there should not be a facilitatory effect when participants complete the nominal constituent of a Persian compound verb in the context of a semantically closely related distractor verb from the other language (English), because when completing the nominal constituent of Persian compound verbs, the semantically closely related English verb enters into competition with the nominal constituent of Persian compound verbs. Thus, it is hypothesized that since two words from different grammatical classes across the two languages of bilinguals compete for selection in the case of the production of BCVs, there should not be a facilitatory effect when participants complete the nominal constituents of compound verb in the context of a semantically closely related distractor verb from the other language (English).

Based on the results of the analysis of naturalistic data (see Chapter 4), I hypothesize that as the grammatical class of a word does not provide a rigid constraint on lexical access during the production of the nominal constituent of BCVs, the naming latencies of target pictures should increase in Condition 2 in which participants complete the nominal constituent of a compound verb in the context of a semantically closely related distractor verb. In other words, as the English verbs compete with the nominal constituent of compound verbs, the naming latencies of target pictures will increase when they name pictures of action by completing the nominal constituent of a compound verb in the context of its semantically closely related English distractor verb. Naming latencies will be faster when they complete the nominal constituent of a compound verb in the context of an unrelated English distractor

verb compared to when they name pictures of action by completing the nominal constituent of a compound verb in the context of its semantically closely related English distractor verb.

If an inhibitory effect is found when participants complete the nominal constituent of Persian compound verbs in the context of its semantically closely related English distractor verb, this provides the evidence that words form different categories across the two languages of bilinguals compete for selection during the production of BCVs. That is, this provides evidence that in the case of the production of BCVs, the corresponding English verb competes with the nominal constituent of a Persian compound verb. If more facilitatory effects are observed when participants complete the nominal constituent of Persian compound verbs in the context of its semantically closely related English distractor verb, this provides the evidence that words form different categories do not compete for selection, because the language non-specific predicts facilitatory effects when there is no competition between two cross-language lexical items (see Costa, 2005).

Furthermore, in order to investigate whether there is a correlation between participants' language status (e.g., their self-reported ratings of language proficiency, their daily exposure to English) and their linguistic performance, I used the Language Experience and Proficiency Questionnaire (LEPQ) developed by Marian, Blumenfeld and Kaushanskaya (2007).

5.3 Methods

5.3.1 Participants

Participants were 22 Persian-English bilinguals. The mean age of participants was 30.5 with a range from 21 to 45. The mean year of their formal education was 17.2. Twelve participants were male and 10 participants were female. At the time of testing, all participants were residing in Switzerland. They were paid 10 CHF for their participation. Before, the

experiment, participants filled out the Language Experience and Proficiency Questionnaire (LEPQ) developed by Marian, Blumenfeld and Kaushanskaya (2007)[3]. However, I did not include all the questions from the questionnaire in the present analysis. Participants' self-reported measures of English proficiency (speaking, comprehension and reading) revealed that they were proficient in English (see table 3). They also reported specified patterns of use for each language (Persian and English), extent of language exposure, years of education and their vision health. They all reported having normal vision. In a separate questionnaire, participants were asked to self-report the amount of BCV use on a scale of zero to ten. Table 3 shows the language history and proficiency characteristics of the participants.

Table 3
Means for Participants' Demographic Data

Characteristics	Mean	SD
Age in years	30.6	(5.67)
Education in years	17.29	(3.95)
Self-reported amount of using BCVs on a scale of 0-10	4.6	(1.99)
Percentage (out of 100%) of daily exposure to English	33	(16)
Self-rated L2 understanding of spoken language on a scale of 0-10	7.36	(1.39)
Self-rated L2 speaking proficiency on a scale of 0-10	6.77	(1.26)
Self-rated L2 reading proficiency on a scale of 0-10	7.45	(1.47)

5.3.2 Materials and design

As stated above, in this experiment participants named a series of pictures of actions in their L1 (Persian) using either a Persian compound verb or by completing the nominal constituents of Persian compound verbs while ignoring the English distractor verbs. In order to construct the materials for the experiments, 40 pictures of actions were presented to eight

[3] - The Questionnaire was adapted for Switzerland by Purmohammad and Freeman. The questionnaire is available on http://www.bilingualism.northwestern.edu/leapq/.

Persian native speakers. It is worthy to note that the monolingual equivalents of those BCVs from our naturalistic data that were picturable were selected as the target compound verbs. They were asked to write down the names of the actions as accurately as possible. 20 pictures with a high level of naming agreement were selected as the target pictures (see Appendix A for the naming agreement questionnaire). 40 English verbs were selected as distractor words. As in Condition 2 and 4 the light verbs of the Persian compound verbs were presented to the participants, 20 light verbs from the target Persian compound verbs were selected to be presented below the target pictures (see Appendix B for target picture names and distractor words used in the experiment). 80 pictures of actions were used as fillers.

The experiment consisted of four different conditions: in Condition 1, participants named pictures of actions using a Persian compound verb in the context of its English equivalent distractor verb (e.g., target: 'qezāvat kard' lit., judgment did–to judge; distractor verb: judge). (2) In Condition 2, only the nominal constituent was produced in the presence of the light verb of the target Persian compound verb and in the context of the same verb as in Condition 1, which always was a semantically closely related English distractor verb to the Persian nominal constituent (e.g., target: 'qezāvat'-'judgment'; distractor verb: judge). (3) In Condition 3, the entire Persian compound verb was produced in the context of a semantically unrelated English distractor verb. (e.g., target: 'qezāvat kard' lit., judgment did-to judge; distractor verb: prefer). (4) In Condition 4, only the nominal constituent was produced in the presence of the light verb of the target Persian compound verb and in the context of the same verb as in Condition 2, which always was a semantically unrelated English distractor verb to the Persian nominal constituent (e.g., target: 'āzmāyeš'-'examination'; distractor verb: dislike).

To find distractors that are acceptable translation of the target compound verb, a 7-point Likert scale judgment task was conducted. A group of 5 Persian-English bilinguals

were asked to rate the translation accuracy of the distractor words. Word pairs rated above 5 were used as the experimental items (see Appendix C for the Translation accuracy questionnaire).

In order to ensure that no distractor word would be included that can be used as both a noun and a verb with the same meaning in English (e.g., chop), I used the Cambridge Advanced Dictionary (3rd edition). Distractor words that may be used as both a noun and a verb in English were discarded. Moreover, like many languages, Persian has borrowed many words from English. Sometimes a borrowed English verb is combined with a Persian light verb (e.g., 'kard' meaning 'did') and forms a compound verb (e.g., 'telephone kard' lit. telephone-did- telephoned; 'reserve kard', lit. reserve-did- reserved; 'fax kard', lit. fax-did – faxed). Since I believe that the borrowed words are parts of the Persian mental lexicon of speakers and do not have competitors both within and between languages, I did not use them as the target words in this study.

The distractor words were presented in citation form. Participants named pictures of action using an inflected form of the verbs (third singular past tense). Phonological overlap between the distractor words and the target words was minimized as far as possible (see Vigliocco et al., 2005).

Each participant received a total of 160 trials (80 critical and 80 filler trials). Distractors appeared in boldface lowercase letters (font size 28, Arial) and were superimposed on the target pictures, however, the distractors' positions varied randomly to prevent subjects from anticipating the position of distractors. For a given picture, the distractor words were always positioned in the same location in all conditions. Light verbs along with dotted lines were presented in boldface (font size 32, Arial) below the pictures. Pictures were presented on a white background with 340×340 display resolution. Thus, the target pictures appeared in a fixed location in the centre of the screen.

The experiment included four blocks of 40 items (20 critical and 20 filler items in each block). Two presentation lists were constructed. Each list consisted of 20 items of each condition. Thus, an equal number of items from each condition was presented in each list. Half of the participants received the presentation list 1 (henceforth the CV version) and the other half received the presentation list 2 (henceforth the nominal version). In the CV version, a mix of items of Conditions 1 and 3 (production of compound verbs) were presented in the first two blocks followed by a mix of items of Conditions 2 and 4 in blocks 3 and 4. In the nominal version, participants were first presented a mix of items of conditions 2 and 4 (production of nominal constituents) in blocks 1 and 2 followed by mix of items of conditions 1 and 3 in blocks 3 and 4. In each block, items were presented to the participants in a random order. By doing so, the position effects were minimized.

5.3.3 Procedure

Each trial was structured as follows. First, a row of 6 Xs appeared as a fixation mark for 400 ms in the centre of the screen. Second, a picture appeared along with an English distractor word. The picture remained on the screen until the participant responded, or for a maximum of 4000 ms, whichever came first. A blank page appeared for 500 ms after each trial. In the one half of the trials in which participants produced only the nominal constituents of compound verbs, the light verbs of the corresponding Persian compound verbs were presented below the pictures. In the other half, in which participants produced the whole compound verbs, including the nominal constituent and the light verb, no light verb was presented below the target pictures.

In order to obtain participants' self-ratings of their English proficiency and language history, they were asked to fill out the Language Experience and Proficiency Questionnaire developed by Marian, Blumenfeld and Kaushanskaya (2007). Prior to the experiment proper,

they were presented with all of the target pictures along with their expected names in Persian in a random order and were asked to use these names in the actual experiment. In this phase, however, the target pictures were presented with no distractor words. Then they were given a set of 10 practice trials including all four conditions in order to familiarize themselves with the experimental tasks. Pictures and distractors presented in the warm-up trials were not used in any of the experimental trials. Participants were instructed to use a Persian compound verb to name pictures or complete the nominal constituent of a Persian compound verb when the light verb was presented below the pictures. They were also instructed to name pictures as quickly and accurately as possible in Persian. Instructions were given in Persian. Item presentation and data collection were done using the Experiment Builder software (2004-2007 SR Research Ltd.). Naming latencies were then measured using an Experiment Builder input unit. Participants' responses were recorded for analysis of accuracy. Participants were tested individually. The experimental session lasted approximately thirty minutes.

I manipulated two factors: linguistic unit and relation. Each factor has two levels. Linguistic unit includes compound verb as a whole (henceforth the CV linguistic unit) and the nominal constituent of compound verb (henceforth the nominal linguistic unit) levels. Relation includes semantically related or unrelated levels. The semantically related level indicates that the distractor is semantically closely related to the target name, whereas in the semantically unrelated level, the distractor is semantically unrelated to the target name. As stated above, two presentation lists were constructed in the experiment: the CV version and the nominal version (see materials and design section).

5.3.4 Data Analyses

Mean response latencies (RTs) on correct trials were analyzed. Response latencies were measured from the onset of the stimulus to the beginning of the response. Items named erroneously were discarded from the analysis of naming latencies (4.7%). Moreover, verbal disfluencies (e.g., responses preceded by nonverbal sounds) and missing responses were excluded from the analyses (3.4%). Naming latencies exceeding three standard deviations from the conditions' means were also removed from the analysis (1.9%).

Correlations (2-tailed) between all variables over participants were calculated. I used the two versions of the experiment (i.e., the CV and the nominal versions) and self-reported ratings of language proficiency as between-participants factors. A repeated measures ANOVA was carried out over participants (F1), and over items (F2) with linguistic unit and semantic relation as independent variables, and with mean RT as the dependent variable.

Moreover, on the basis of participants' self-reported ratings of language proficiency (the mean of participants' self-reported ratings of proficiency in speaking, reading and comprehension), they were grouped into 3 categories. In order to have a better understanding of the role of language proficiency in bilingual speech production, an additional four-way ANOVA was conducted with linguistic unit (compound verb and nominal constituent of compound verb) and relation (semantically related or unrelated distractors) as within-participants variables, and version of the experiment (the CV version and the nominal version) and proficiency level as between-participants variables.

5.4 Results

5.4.1 The correlational results

The correlation between participants' self-reported ratings of language proficiency and their self-reported amount of using BCVs proved to be significant (r = .632). Note that the significance level is 0.01. I also found a significant correlation (r =.623) between

participants' self-reported ratings of language proficiency and self-reports of daily exposure to English. Moreover, the analysis yielded a significant correlation between participants' self-reports of language proficiency and years of formal education (r = .571). The correlation between self-reported ratings of daily exposure to English and self-reported amount of using BCVs was significant (r = .608), too. In addition, there was a significant correlation between years of formal education and self-reports of daily exposure to English (r = .527). The results showed that the participants who were slower in the related CV linguistic unit were also slower in the semantically unrelated CV linguistic unit (r = .922). The same holds for the nominal conditions. Participants who were slower in the semantically related nominal linguistic unit were also slower in the semantically unrelated nominal linguistic unit (r = .716). The results also revealed that when highly proficient bilinguals did the nominal task, they exhibited less interference in the semantically related CV condition in the following two blocks (r = -.696) (see Table 4 for the correlational results).

Table 4
Correlations across participants between L2 experience and proficiency variables

	Language proficiency	BCVs	Exposure to English	Years of education

Language proficiency	1	.632**	.623**	.571**
Exposure to English	.623**	.608**	1	.527*
Amount of BCV use	.623**	1	.608**	.411
Years of education	.571**	.411	.527*	1
	CV unrelated	CV related	Nominal unrelated	Nominal related
CV unrelated	1	.922**	.371	.336
CV related	.922**	1	.411	.393
Nominal unrelated	.371	.411	1	.716**
Nominal related	.336	.393	.716**	1

5.4.2 Discussion of the correlational results

There is a significant correlation between participants' ratings of daily exposure to English and self-reported amount of using BCVs (see Table 4). This result may be interpreted in terms of the activation threshold hypothesis proposed by Paradis (2004). The hypothesis holds that the selection of items from the two languages is "automatically driven by their activation threshold levels" (p. 165), especially when bilinguals are in a bilingual mode of communication. Accordingly, items from the other language may be selected from memory as a function of their lower activation threshold level compared to their competitors in L1 (Paradis, 2004). I have also found a significant correlation between participants' self-reports of language proficiency and years of formal education. Participants with more formal education, especially those who study in an L2 environment, are typically more exposed to English than participants with less years of formal education. With more exposure to L2, some elements from the other language possess a lower activation threshold than their equivalents in L1 "due to more frequent and/or more recent use" (Paradis, 2009:156). More exposure to L2 lowers the activation thresholds of the elements in L2 which in turn leads to using words from the other language. Our results provide support for the activation threshold

hypothesis, because the results suggest that participants with more exposure to L2 use more words from the other language when speaking in L1 as a function of more frequent or more recent use of L2 words.

The results revealed a significant correlation between bilinguals' self-report of daily exposure to English and their language proficiency (see Table 4). This pattern of results is consistent with Marian, Blumenfeld, and Kaushanskaya's (2007) study. Their study was aimed at developing a "valid questionnaire of bilingual language status with predictable relationships between self-reported and behavioural measures" (p. 940). In study 2, they established criterion-based validity based on language tests and self-reported measures from fifty Spanish–English bilinguals. They reported that current exposure to L2 including exposure to L2 during reading and interaction with friends is one of the most important variables that constitutes speaker's L2 competence. Jia, Aaronson and Wu (2000:599) also investigated variables that "related to US immigrants' long-term attainment in English, their second language (L2), and their native language (L1)". They examined eight environmental variables, such as the number of L2 speakers at home, work language, father's L2 proficiency, and mother's L2 proficiency. They found that the frequency of speaking L2 at home and mothers' L2 proficiency were predictive of bilingual performance. The results of the present study are consistent with their findings, because I found a significant correlation between bilinguals' self-report of daily exposure to English and their language proficiency (see Table 4). That is, bilinguals with the highest self-reported ratings of daily exposure to English rated themselves the highest L2 proficiency. Then, our results suggest that more exposure to L2 yields in more proficiency in L2.

This study demonstrated a significant correlation between participants' language proficiency and their self-reported ratings of using BCVs (see Table 4). That is, more proficient bilinguals use more BCVs. However, CS is frequently viewed by the general

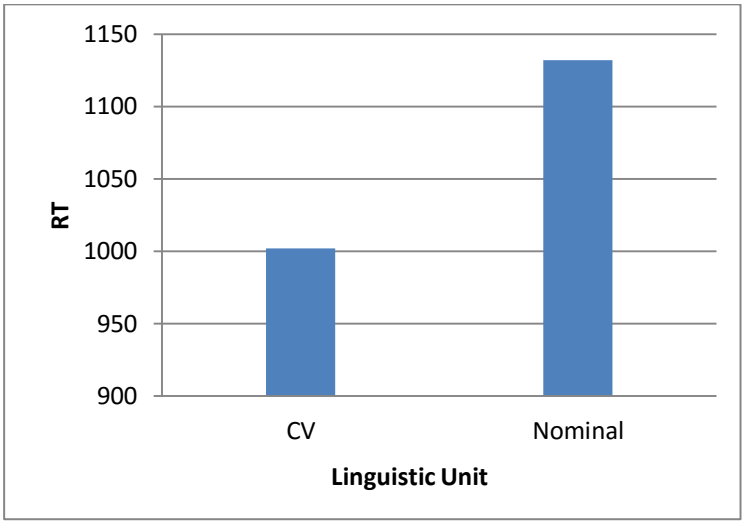
public as indicative of bilingual's inability to separate the two languages or of a lack of language proficiency (cf. Bullock & Toribio, 2009). It is also often perceived as linguistic confusion, especially in bilingual children (cf. Miccio et al., 2009). In this view, when bilinguals have some difficulties in finding the appropriate words from the target language, they may use words from the other language as a compensatory strategy. Bullock and Toribbio (2009) argue that CS is not "indicative of the bilingual's inability to separate his languages or a lack of proficiency. Rather it is an additional communication resource available to bilinguals" (p.8). Evidence from CS has led researchers to a consensus that this phenomenon is not indicative of deficiency or weakness in either or both language(s). Instead, it is viewed as a structurally rule-governed linguistic behaviour (Mahootian, 2006). Bullock and Toribio (2009) also suggest that CS shows bilingual speakers' fluency in both languages, because CS requires their high degree of competence in both languages (Sebba, 2009). As in this study participants used words from the other language while speaking in their L1, CS may not be viewed as an indicative of lack of knowledge in L1 but rather it indicates their language proficiency in L2. The significant correlation between participants' language proficiency and their self-report of using BCVs found in this study, with highly proficient participants using more BCVs as one type of CS, provides support for Bullock and Toribio's (2009) hypothesis that CS is indicative of bilinguals' language proficiency in L2.

5.4.3 The ANOVA results

A repeated measures ANOVA was carried out over participants (F1), and over items (F2) with linguistic unit and semantic relation as independent variables, and with mean RT as the dependent variable. The main effect of linguistic unit was significant by participants ($F1(1,16)=13.616$, $p < .05$). Naming latencies were longer in the nominal linguistic unit

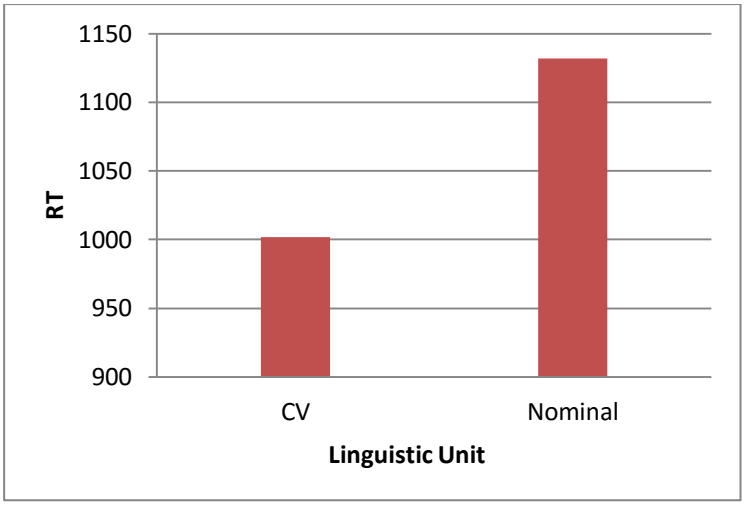
compared to the CV linguistic unit. That is, participants were slower to produce the nominal constituent of the compound verbs compared to producing the whole compound verbs. Figure 4 reports the distribution of naming latencies as a function of linguistic unit.

Figure 4. The main effect of linguistic unit by participants



The main effect of linguistic unit was also significant by items ($F2(1,19)=71.542$, $p < .05$) (see Figure 5 for the main effect of linguistic unit by items). Participants were slower to respond in the nominal linguistic unit compared to responding in the CV linguistic unit.

Figure 5. The main effect of linguistic unit by items



The analysis yielded a significant interaction between linguistic unit and version of the experiment in both analyses (*F1*(1, 16)=14.365, p <.05; *F2*(1,19)=24.265, p <.05). As Table 5 shows, while there is not much difference between naming latencies for the two linguistic units when the CV version was presented to the participants first, naming latencies were longer in the nominal linguistic unit when the nominal version was presented to the participants first.

Table 5
The interaction between linguistic unit and versions of experiment by participants.

Version of Exp.	Linguistic unit	RT
CV first		
	CV	1117
	Nominal	1114
Nominal first		
	CV	888
	Nominal	1131

The three-way interaction between version of the experiment, linguistic unit, and relation was significant by participants (*F*1(1, 11)=5.561, p <.01). In both versions, naming latencies were longer in the semantically related nominal linguistic unit compared to the response latencies in the semantically related CV linguistic unit, but no significant main effect of relation was observed (see Table 6). That is, the analysis of naming latencies

revealed a significant effect of linguistic unit such that naming latencies were longer in the nominal semantically related linguistic unit (i.e., Condition 2) in which only the nominal constituent was produced in the presence of the light verb of the target Persian compound verb and in the context of a semantically closely related English distractor verb compared to the semantically related CV linguistic unit (i.e., Condition 1) in which the whole compound verb was produced in the context of a semantically closely related English distractor verb. Naming latencies were faster in the semantically related CV linguistic unit when the nominal version was presented first compared to when the CV version was presented first (see Table 6). That is, I observed a facilitatory effect (+210 ms.) in the semantically related CV linguistic unit when the nominal version was presented first. However, there is not much difference in naming latencies between semantically related and unrelated CV linguistic units in both versions (see Table 6).

Table 6
The mean RTs in different linguistic units and relations in two versions

Version of Exp.	Linguistic unit	relation	RT
CV first			
	CV		
		semantically related	1085
		semantically unrelated	1087
	Nominal		
		semantically related	1136
		semantically unrelated	1045
Nominal first			
	CV		
		semantically related	875
		semantically unrelated	890
	Nominal		
		semantically related	1140
		semantically unrelated	1117

Table 6 also shows that naming latencies were also longer in the semantically related nominal linguistic unit when the nominal version was presented first compared to when the CV version was presented first. Naming latencies were faster in the semantically unrelated

CV linguistic unit when the nominal version was presented first than when the CV version was presented first.

In both versions, naming latencies in the semantically related nominal linguistic unit were longer compared to response latencies in the semantically unrelated nominal linguistic unit. (see Table 7 for the mean RTs in different semantically relations in the nominal linguistic unit in two versions of the experiment).

Table 7
The mean RTs in different semantic relations in the nominal linguistic unit in two versions

Version of Exp.	Linguistic unit	relation	RT
CV first			
	Nominal		
		semantically related	1136
		semantically unrelated	1045
Nominal first			
	Nominal		
		semantically related	1140
		semantically unrelated	1117

The three-way interaction between language proficiency (grouped into 3 levels), version of the experiment and relation was significant by participants ($F1(2, 16)=4.815$, $p <.01$). The results revealed that highly proficient bilinguals were faster (975 ms.) to name in the semantically related conditions when the nominal version was presented to them, however, less-proficient participants were the slowest in this condition (1082 ms.). Highly proficient bilinguals were also found to be faster (1031 ms.) to name in the semantically unrelated condition when the CV version was presented to them first compared to less-proficient participants (1065 ms.) and the participants with mid-level of proficiency (1229 ms.).

5.5 General Discussion

In this study, I reported an experiment in which the performance of Persian-English bilingual speakers in a picture-naming task was tested. I investigated whether in the case of the production of BCVs, the English verbs competed with the corresponding Persian compound verbs as a whole or whether the English verbs compete with the nominal constituent of the Persian compound verbs only. More specifically, I investigated whether words from different categories across the two languages competed for selection. In this experiment, a novel task was used in which in one of the critical conditions the grammatical class of the target word was a noun, however, the distractor word was a verb from the other language. A paradigm involving switching or competing between a noun and a verb may be an artificial task for monolingual speakers, because they do not experience it in their daily language use (Abutalebi & Rietbergen, 2014). However, as much as bilinguals who use BCVs experience competition between a noun and a verb across the two languages, it is feasible to consider the task I used in this experiment a real task.

The crucial condition in this experiment was when participants named pictures of actions by completing the nominal constituent of a Persian compound verb in the context of a semantically closely related distractor verb from the other language (English). It was argued in the Introduction that if words from different categories across two languages of bilinguals compete to be used in the place of the nominal constituent of BCVs, one should have observed inhibition in Condition 2 (i.e., the semantically related nominal linguistic unit). However, if the competition occurs between the English verbs and the Persian compound verbs as a whole, a facilitation effect is expected in this condition, because in this case a verb from the other language does not compete with a noun in the base language during the production of the nominal constituent of compound verbs. The results tend to confirm the former hypothesis as the results of the experiment (see Table 6) showed that participants were

numerically slower when they named pictures of actions by completing the nominal constituent of a Persian compound verb in the context of a semantically closely related distractor verb from English (i.e., the semantically related nominal linguistic unit) compared to when they used a Persian compound verb as a whole in the context of its English translation equivalent (i.e., the semantically related CV linguistic unit). The results of the experiment allow us to draw the following generalization: a word's grammatical class does not provide a rigid constraint on lexical access during the production of BCVs. Thus, the results of the experiment confirm the analysis of our naturalistic data (see Chapter 4). As far as I know, the results provide the most direct evidence that lexical access is not restricted by words' grammatical categories when producing the nominal constituents of BCVs.

I interpret the results obtained in this study as reflecting the competition between two words from different categories across two languages of bilinguals. Accordingly, the degree of activation of lexical competitors (non-intended lexical nodes) "affects the ease with which the target word will be selected - the greater the degree of activation of competitors the greater the difficulty in selecting the target node" (Costa & Caramazza, 1999:232). According to the 'selection by competition' account, "the ease with which a target lexical node is selected depends not only on its own activation level, but on the activation level of competing lexical nodes as well" (Finkbeiner et al., 2006:153). This account, thus, holds that "as the difference between the activation levels of target and non-target lexical nodes decreases, it becomes increasingly difficult (and time consuming) to select the target lexical node" (p.153). In picture-naming experiments, for example, more activation of the competing lexical nodes (i.e., the intended and non-intended lexical nodes) yields in longer naming latencies.

I observed more interference between English verbs and the nominal constituents of Persian compound verbs than between English verbs and the compound verbs as a whole (see

Table 6 and Figure 4), suggesting that verbs from bilinguals' L2 are more activated when competing with the nominal constituents of the Persian compound verbs compared to when competing with the Persian compound verbs as a whole, because the ease with which a lexical item is selected is a function of the activation level of competing lexical items (Costa & Caramazza, 1999). I also observed that the participants exhibited a facilitation effect (+210 ms.) for the CV linguistic units after they did the nominal tasks (see Table 6). That is, naming latencies were shorter in the CV linguistic units after the participants did the nominal tasks. The results are consistent with the global results of the present study, as I found that when producing the BCVs, the main competition occurs between the nominal constituents of compound verbs and the corresponding English verbs (see Figures 4 and 5). This suggests that when participants switch from the task which involves the intense competition for selection (i.e., naming in the nominal linguistic unit condition) into a task which involves less competition (naming in the CV linguistic unit condition), they exhibit less interference. As stated above, the degree of activation of lexical competitors affects the ease with which the intended lexical item word will be selected (Costa & Caramazza, 1999). The results also show semantic interference for the nominal constituents after participants did the CV tasks, however, the semantic interference was not significant in this condition.

The results of the experiment revealed a difference in response time between semantically related and unrelated distracters, such that in the nominal linguistic unit in both versions naming latencies increased when the distractors were semantically closely related to the target words (see Table 7). The results confirm our hypothesis that naming latencies will be faster when the participants complete the nominal constituent of a compound verb in the context of an unrelated English distractor verb compared to when they name pictures of action by completing the nominal constituent of a compound verb in the context of its semantically closely related English distractor verb.

As stated above, several studies reported that an effect of grammatical class was observed only when a syntactic context was available (see Pechmann & Zerbst, 2002; Vigliocco et al., 2005). For example, Pechmann and Zerbst (2002) assumed that when an item is inserted into an existing syntactic structure (i.e. sentential or phrasal contexts), the word class of the item must be available. I suggest that there was a minimal context in Condition 2 (semantically related nominal linguistic unit) in which the nominal constituent was produced in the presence of the light verb that corresponded to the target compound verb, however, not only not only did the difference between the grammatical class of distractors and target words not yield a facilitatory effect, but on the contrary, it caused an inhibitory effect in this condition. This effect seems to suggest that words from words from different categories across the two languages competed for selection (see Figure 4 and Table 6). To put it differently, if the word class of a lexical item must be available when it is inserted into an existing syntactic structure, naming latencies should have been shorter when producing the nominal constituent of compound verb in the presence of its semantically closely related English verb (Condition 2) compared to producing the whole compound verb in the presence of its translation equivalent verb (Condition 1), because in the former condition the grammatical classes of the target words and distractors were different, whereas in the latter condition the grammatical classes of target words and distractors were the same. I suggest that since the grammatical class of the distractors underwent a local reactive inhibition (see Chapter 4), it allowed two words from different categories to compete for selection, which in turn yielded in longer response latencies in this condition (see Table 6) compared to producing the whole compound verb, however, a minimal context was available in condition 2. Thus, producing words within a context does not guarantee that the grammatical category of a word is both activated and selected (see also examples 12-15 in Chapter 4). To put it

differently, generating words within a context does not guarantee that an effect of grammatical class emerges.

Based on the findings from word-level errors such as substitution errors (see Garrett, 1975), Dell (1986) posits that in order to produce a grammatical sentence, each lexical item must be labeled as to their grammatical class. Dell (1986:287) views the marking of lexical nodes with syntactic information as a basic precondition for insertion rules that "specify what nodes can be inserted into categorized slots in frames". According to the model, "if the speaker wants to produce a noun the selection mechanism would consider for selection only lexical items corresponding to nouns" (cf. Costa & Sebastian, 2004:492). The claim seems to be very strong with respect to the processing of BCVs, because the results of the experiment and also the analysis of the naturalistic data reveal that it is possible that in some circumstances such as the production of BCVs, grammatical class does not provide a rigid constraint on the selection mechanism. This allows the selection mechanism to select a verb where the slot demands a noun.

5.6 The effect of language proficiency on bilinguals' linguistic performance

Based on the 'language non-specific selection hypothesis', interference is predicted in bilinguals when distractor words in the picture-word interference paradigm are translation equivalents or semantically closely related verbs (see Roelofs & Piai, in press, for the language non-specific selection hypothesis). This is because the mechanism that is responsible for lexical selection inspects the two mental lexicons of bilinguals (here Persian and English) and thus in each trial "encounters two highly activated lexical items" (Costa & Caramazza, 1999:234) that compete for selection. The two competing lexical nodes across the two languages will be highly activated because in a picture-word interference paradigm,

they "receive activation both from the picture and the distracter word" (Costa & Caramazza, 1999:233). When the distractor words are from L2, encoding the semantic information from the distractor words may occur automatically as a function of a direct link between L2 words and concepts (Kroll & Stewart, 1994) or by translating from L2 to L1 in low-proficient bilinguals depending on the bilinguals' level of language proficiency (Kroll & Stewart, 1994). Among the models proposed to account for this issue are the word association model (Scarborough, et al., 1984; Potter, et al., 1984), the concept mediation model (Potter, et al., 1984), and the hierarchical model (Kroll & Curley, 1988; Kroll & Stewart, 1994).

All three models of representation agree that there is a single conceptual system and the lexicons of the two languages are stored separately (Kroll & Stewart, 1994). What makes the models different from each other lies "in the assumptions on the direction and strength of the links that connect these three memory stores with one another" (Hatzidaki & Pothos, 2008:126). The word association model holds that access to the meaning of a given word is always mediated by the L1 lexicon. In the concept mediation accounts, however, L2 words are directly linked to the corresponding concepts. In these models of representation, the concept mediation occurs regardless of a bilingual's level of proficiency in L2 (Kroll & Stewart, 1994). However, a number of studies (e.g., Kroll & Stewart, 1994; Kroll & Curley, 1988) have shown that bilinguals' level of proficiency in L2 plays a prominent role in whether concepts mediate the links between the two languages.

In the Revised Hierarchal model (RHM) proposed by Kroll and Stewart (1994), lexical and conceptual connections are both active, however, the strengths of the links differ depending on the level of proficiency in L2 (Kroll & Stewart, 1994). The model postulates that there is a stronger link from L1 words and concepts as compared to the link from L2 words to concepts. However, "a developmental shift from word association to conceptual mediation" (p.152) was also predicted in the model. Accordingly, as speakers become more

proficient in their L2, they acquire direct conceptual connections. The model posits that less proficient bilinguals are required to access the L1 translation in order to facilitate understanding the meaning of the L2 word, but once L2 proficiency increases direct access to that meaning becomes possible (Kroll & Stewart, 1994). As speakers become more proficient in L2, they "bypass reliance on the L1 translation equivalent" (Van Hell & Kroll, 2013:126). That is, the Revised Hierarchal model proposes a shift "from reliance on lexical links to reliance on conceptual links as L2 proficiency increases" (p.152). I assume conceptual L2 links for all of the participants in my study; however, as Costa and Santesteban (2004) suggested, only low-proficient bilinguals rely on inhibitory control system during lexical selection, whereas highly proficient bilinguals rely on a language-specific selection mechanism which in turn led highly proficient bilinguals to be faster to name using the nominal constituent in the presence of semantically closely related distractors, however, less-proficient participants were the slowest in this condition.

Finally, it is worth noting that (a) the results of the analysis of the present data reflect only bilingual lexical access when speaking in their L1. In other words, in this study I dealt with a cross-language interaction during speaking in L1; (b) I investigated the production of BCVs only. Whereas the results may generalize to the production of BCVs in the other language contacts, it may not generalize to bilingual lexical access in other linguistic contexts. The main contribution of the present study is that in some linguistic contexts, two words of different classes across the two languages compete for selection. To put it differently, in some conditions, grammatical class (syntactic category) does not provide rigid constraints on bilingual lexical selection. The results observed in the present study may, thus, be due to two variables: the effect of grammatical class in bilingual lexical access when speaking in L1, and the production of BCVs. Many studies on the effects of grammatical

class focused on monolingual language production rather than bilingual speech production. (Vigliocco, et al., 2005; Pechmann & Zerbst, 2002; Pechmann et al., 2004).

As seen in Chapter 1, BCVs occur in many languages in contact conditions (see also Edwards & Gardner-Chloros, 2007). The last 30 years saw much research on the structure of BCVs (see Edwards & Gardner-Chloros, 2007; Muysken, 2000; Romaine, 1995; Backus, 1996). This study, however, is the first to examine the effect of word class in the processing of BCVs. I propose the competition of a verb from the other language of bilinguals with a noun from the base language allows the formation of BCVs. Further research is invited to test the proposal by investigating the production of BCVs in other language contact situations.

5.7 Conclusion

The experiment demonstrated that two words from different categories across the two languages of bilinguals compete for selection during the production of the nominal constituent of BCVs. The production of the nominal constituent of BCVs involves that the lexical nodes corresponding to verbs from the other language (here English) enter into competition with the lexical nodes that correspond to the noun category in Persian. These results suggest that a word's grammatical class does not provide a rigid constraint on lexical access during the production of BCVs. The results also suggest that word class effects may be absent even when speakers process words within a context that demands word class information.

CHAPTER 6: Implications for models of bilingual language production

6.1 The present data vs. bilingual models of language production

One of the main aims of carrying out the present study was to examine whether current models of bilingual language production can account for some specific linguistic behaviour of bilingual speakers, such as CS. In case the models would not be able to explain some aspects of language processing (such as the present code-switching data), what suggestions could be made in order to improve a comprehensive model of bilingual language production?

Several models of bilingual memory representation (e.g., Kroll, 1993; Kroll & Stewart, 1994; de Bot, 1992) have been designed in the area of psycholinguistics. The main aim of proposing the models was to characterize the mechanism of language processing in bilingual speakers. As Gardner-Chloros (2009a:128) states, with respect to the proposed models, important questions arise "as to the exact relationship of the components within the model to one another and also of the model overall to the behaviour which it proposes to schematize". Walters (2005:69) assumes that "a model of bilingual production,[…] needs to account for uniquely bilingual aspects of processing such as[….] a host of language contact phenomena such as code-switching, interference, and translation". However, the fact is that several such models explained bilingual speech production in general rather than CS (Gardner-Chloros, 2009).

In what follows, I will examine whether the proposed models can account for the present code-switching data.

6.2 The spreading activation principle vs. models of bilingual speech production

Models that adopt the principle of spreading activation (e.g., de Bot, 1992; Poulisse & Bongaerts, 1994; Costa, 2005; La Heij, 2005; Costa, Ivanova & Santesteban, 2006a; Roelofs, 1992; Levelt, 1989) assert that when the intended concept (e.g., DOG) is activated, it spreads activation to the target lemma (e.g., dog) along with a number of semantically related lexical representations (e.g., cat) (Costa et al., 2008). However, the level of activation varies, usually with the strongest activation of the lexical node corresponding to the intended preverbal message (Costa, 2005). As La Heij (2005: 291) states, all current models of speech production hold that "lexical access does not result in the activation of a single lexical representation". He further states that the next step is the lexical access process in which the most appropriate word is selected among the activated lemmas. Models of bilingual language production that adopt the principle of spreading activation (e.g., Green, 1986, 1998; de Bot, 1992; Poulisse & Bongaerts, 1994; Costa, 2005; La Heij, 2005; Costa, Ivanova & Santesteban, 2006a) posit that the conceptual system spreads activation to the lexical representations of the two languages of bilinguals (Costa et al., 2008). In this view, in the case of Persian-English bilinguals, when the concept "DOG" is activated, the conceptual system spreads activation to 'dog' and the semantically related lexical representations in English (e.g., 'cat'). The semantic system also spreads activation to ('sag'-dog) and its semantically related lexical candidates in Persian (e.g., 'gorbeh'-cat) (see La Heij, 2005 for discussion).

The question arises whether activation flow from the semantic system to the lexical level is restricted to the semantically related lexical representations with the same

grammatical class, or whether the conceptual system also spreads activation to semantically related lexical representations belonging to a different grammatical class. For example, does a concept such as 'DOG' also activate 'bark' at the lemma level? Does a concept such as 'DOG' spread activation to 'pārs kardan' (meaning bark) in the bilingual case in which two languages such as Persian and English are present? Most models of language production, whether monolingual or bilingual, do not address this issue. However, Roelofs (1992) proposed that when the concept "DOG" is activated, activation spreads to semantically related nouns, such as 'dog', and 'cat' and also semantically related verbs such as 'bark'. He showed the links between the conceptual node 'DOG' and the lemma node 'bark' using the labelled pointer 'CAN' in such a way that a 'dog CAN bark'. I assume that in this model activation from the semantic system to the lexical representations is not constrained by the grammatical class of lexical items. It should be noted that even though Roelofs (1992) proposes that activation spreads to words from different categories; he assumes that selection respects word class. Note that no model of bilingual language production predicted activation of two lexical items with different grammatical category across the two languages of bilinguals. In the model presented in Chapter 4, activation and competition of words from different categories for selection were predicted.

I believe that what is important with respect to this stage of processing is that a verb is included as a potential member of the response set. To put it differently, a vital process is that a verb enters into the competition queue through spreading activation. As Costa, Albareda and Santesteban (2008:138) state, "spreading activation is a functional principle that characterizes the dynamics of lexical access at all levels of representation".

I also think that retrieving a verb from the other language in order to be used in the place of a noun would be a simple process as a function of the existing mental task schema. In other words, I propose that the mental task schema (see Green, 1986) should affect also

which of the competing lemmas is a permitted response for a given context even if the slot originally belongs to a particular category (e.g., noun). In this view, when a semantically very closely related but categorically different verb is activated more strongly compared to its corresponding noun in both the base language and the other language, the selection of a verb occurs, especially when the selection does not violate the production patterns in a language contact situation. If selecting a verb from the other language among the activated lexical items is considered a normal way of producing BCVs, then the selection system makes it according to the established language norm. Given that the 'ecology behaviour of the community' (Green, 2011a; b) of bilinguals permits this construction, such a circumstance makes the process of using a verb in the place of a noun in the construction of BCVs a very simple process.

The analysis of the production of BCVs in the present naturalistic data and also the results of the experiment revealed that it is possible that two words from different categories across the two languages of bilinguals compete for selection. Whereas this type of lexical processing, in which two words from different grammatical class compete for selection, occurs in many languages in contact situations (see Muysken, 2000), it has not been reported in the monolingual language production. As reviewed in the introduction, some languages do not respect the verb-noun distinction. However, as far as I am aware, no study on the monolingual language production has reported that two words from the same language but a different category can compete for "selection". As stated above, Roelofs' (1992) model proposes that a target concept activates two words from different categories; however, the competition between two words from different classes for selection is not predicted in this model (Ardi Roelofs, personal communication, 10 February, 2015). Moreover, no model of bilingual language production predicted the competition of two words from different categories across the two languages of bilinguals. Thus, a satisfactory model of bilingual

speech production needs to account for the fact that two words from different categories across the two languages of bilinguals can compete for selection.

6.3 Green's (1998) model of inhibitory control (IC)

6.3.1 Syntactic processing of CS

Green (1986; 2000) presented the inhibitory control model of bilingual language production. Some important aspects of the model were discussed in his later works (e.g. Green, 1998). With respect to the CS phenomenon, the model mainly concerns itself with (a) the inhibitory mechanism involved in CS and the presence of asymmetrical language switching patterns; (b) the syntax of CS and (c) the social-psychological factors that affect the production of code-switched utterances (see Green, 2011a; 2011b). However, I do not deal with the presence of asymmetrical language switching patterns here. With respect to the syntax of CS, Green (2000: 380) assumes that:

> "in the case of normal speech a word cannot be produced unless it fits the syntax of the utterance. Accordingly, for example, an adverb will not be produced in a slot requiring a noun. Switches then will obey the syntactic properties of the two languages. […]. Since any words produced must meet the structural conditions, such a scheme predicts that code-switches will preserve the word order in both languages".

Green's statement that switches need to respect the syntactic properties of the two languages might stem from structural linguistics (see McSwan, 2009; 2005 for a discussion of syntax in code-switching utterances), in which some constraints on code-switched utterances were proposed. In contrast to Green's statement, many studies (e.g. Gardner-Chloros, 2009a; Purmohammad, 2009; Mahootian,1993; McSwan, 2009; 2005, Naseh LotfAbadi, 2002 among others) have shown that bilingual speakers may violate language-specific

requirements of one of the two languages involved in CS. For example, in a study with Persian(L1)-English(L2) bilinguals (Purmohammad, 2012, Experiment 3), participants had to switch within an NP structure including a noun and an adjective. They were asked to use adjectives from the other language. The adjective placement rule of the two languages differs (Persian uses adjectives postnominally, but English uses adjectives prenominally). In 28% of the responses, the placement rule of the adjective language was not respected (see example 35).

(35) "tu-ye in kif-e *brown* chizi nemisheh gozasht.

In this bag brown nothing can be put

Nothing can be put in this brown bag". Purmohammad (2012)

In the present naturalistic data, 210 switched words were adjectives (see Chapter 4). In 10% of the cases, the English adjectives were used after the Persian nouns. The analysis of the present naturalistic data indicates that sometimes switches do not obey the syntactic properties of the two languages (see examples 36 to 39). It is not clear how it is possible that switches obey the syntactic properties of both languages when the two languages involved have different syntactic features. For example, while one language (e.g., Persian) uses an N+A word order, the other (e.g., English) may use an A+N word order. If the two languages use different word orders, the switches only obey the syntactic properties of one language.

In examples (36) to (39) from our naturalistic data, the English adjectives were used after the nouns.

(36) Yeh čiz-e *creative* beh nazar ne-mi-reseh.

A thing creative seem Neg-it-reach

It does not seem to be a creative thing.

(37) un kasi keh mizbān-e mā bud xeyli doxtar-e *honest*-i bud.

The one that host our was very girl honest was

The one who was our host was a very honest girl.

(38) Dust dā-št-am yeh čiz-e different-i dorost kon-am

like-ed-I a thing different make-I

I liked to make (cook) a different thing (food).

(39) Xeyli pesar-e nice-i bud.

Very boy nice was

He was a very nice boy.

Green's (1986: 380) assertion that "[…] code-switches will preserve the word order in both languages" may entail that CS does not occur when the two languages have different word order. As stated above, this idea may be derived from the structural studies of CS. In one of the earliest studies on CS, Pfaff (1979) states that a mixture of Spanish and English (or any language pairs) in code-switching of clauses and sentences is not allowed, and subject to linguistic constraints. According to Pfaff (1979), mixing adjectives and nouns inside NPs is strictly limited, subject to the surface constraint:

"Adjective/noun mixes must match the surface word order of both the language of the adjective and the language of the head noun" (p. 306).

Pfaff (1979) strongly suggests that cases of mixing in which a Spanish adjective follows an English noun, such as in example (40), do not occur:

(40) *I went to the house chiquita.

I went to the little house. (p.307)

As stated above, with respect to the syntax of code-switching, Green (1986; 2000) assumes that as in the case of the normal speech, in the CS "….] an adverb will not be produced in a slot requiring a noun" (p. 380). It is feasible to assume that Green's account is not restricted to the adverb-noun category. The results of the analysis of our naturalistic CS

data revealed that in contrast to Green's (1986; 2000) account, a verb can be produced in a slot that demands a noun (see example 41& 42) (see Chapter 4).

(41) man bištar tarjih midam guš bedam, observe mi-kon-am.

I often prefer to listen, observe pres-do-I

I often prefer to listen, I observe.

Persian equi: mošāhedeh/ negah mikonam

N N

(42) man barā-t repeat mi-kon-am.

I for you repeat pres-do-I

I repeat it for you

Persian equi: tekrār mikonam

N

6.3.2 The community language, control patterns, and bilingual language production

One of the advantages of Green's model (2011a; 2011b) lies in the fact that he takes into account the social-psychological aspects of bilingual language production. (Green, 2011b) assumes that language is considered an absolute fundamental to peoples' practical action as it permits them to coordinate with one another. The role of the "behavioural ecology of bilingual speakers" in their use of the two languages has received a lot of attention in Green's (2011a; 2011b) and Green and Abutalebi's (2013) recent works. Accordingly, the precise pattern of using two languages in different contexts may affect how language is processed and controlled in bilingual speakers (Green, 2011a). Green (1998) asserts that the addressee and the topic of conversation affect the activation of the non-target language.

Green assumes that in communities where CS predominates in interaction, switching back and forth between languages exhibits automatic processes and "restrict[s] the engagement of executive control mechanism in language selection" (Green, 2011b:235). Green (2011a) also suggests that the neural base of speakers from code-switching communities is different from speakers from a non-code-switching community. For this reason, language control may be different between communities where speakers code-switch freely and communities in which CS is not common. He posits that in communities where individuals code-switch freely, bilingual speakers do not require "to avoid switching rather they freely exploit the activation of both languages. Their skill lies less in avoiding language conflict than in utilizing the joint activation of both languages and adapting their utterances appropriately" (Green, 2011a:2). Accordingly, it is safe to assume that bilinguals who live in a L2 environment, where their L2 is expected to be more activated compared to a L1 environment, code-switch more often than in a L1 environment. As I have shown in Chapter 5, there was a significant correlation between participants' self-reported ratings of daily exposure to English and self-reported amount of using BCVs. That is, more exposure to L2 lowers the activation threshold levels of elements in L2 which in turn leads to using words from the other language.

Moreover, the difference in switching patterns in bilinguals is caused by differences in the norms for inserting words from the non-target language (de Bot & Schreuder, 1993). Accordingly, a model of bilingual language production should consider that bilinguals' language production in an L2 environment or more specifically in a code-switching community may be different from their production in an L1 environment as a result of different language control patterns and a different "behavioural ecology of bilinguals" (Green, 2011a).

The participants in the TV series analysed were residing in the United Kingdom where English is the dominant language. They used mostly English outside home. Moreover, I assume that their Persian-English addressees had a much less negative attitude toward switching compared to many monolingual Persian speakers who are residing in Iran (L1 language environment). These situations may have affected their language production, leading the TV show participants to frequently use English in their Persian utterances. Thus, consistent with Green's (2011a) account that the precise pattern of using two languages in different contexts, "the behavioural ecology of bilingual speakers", influences how language is processed and controlled in bilingual speakers, our data reveals that as the community in which the participants are living permits CS, and given that they are not required to avoid code-switching rather they freely activate both languages (Green, 2011a), they used a lot of English words in their Persian utterances. I have recorded 962 cases of code-switched utterances. The same bilingual participants may not code-switch as much if they speak Persian in Iran, because the Iranian community -as a L1 environment- is not the same code-switching community as the UK (a L2 environment) where Persian-English bilinguals feel more comfortable to switch between Persian and English. The results are also consistent with Green's (2011:1) account that "different contexts impose a different load on components of the control circuit". Participants may reflect different linguistic behaviour in different contexts. In other words, "the pattern of the control mechanism (Abutalebi & Green, 2008) may change depending on the context in which a bilingual speaker uses the two languages" (Purmohammad, 2012:25).

6.3.3 The IC model vs. using translation equivalents in the same utterances

In our naturalistic data, I found that in 62 (6%) cases participants used translation equivalents in the same utterances (see examples 43-45). In this section, I attempt to interpret the results in terms of the "activation threshold level" hypothesis and the IC model. The inhibitory control (IC) model proposed by Green (1986; 1998) holds that multiple levels of control exist in the speech production of bilinguals. According to the model, "regulation in language use is achieved through the change in levels of activation of language networks or items within those networks" (p. 68). Green (2000) assumes that when bilinguals are in a bilingual mode both languages are activated, but "the output can be free to vary according to which words reach threshold first" (p. 380). The same holds for the lexical items of the two languages. Access to the lexical items of the two languages depends on the "resting level of activation of a given lexical node" (Runnqvist et al., 2012:245). In this view, items with lower activation threshold are accessed. The IC model postulates that each language of a bilingual speaker and each lexical item within it has an "activation threshold level" (see Paradis, 2004; 2009). The activation threshold level of an individual language or a lexical item within the language largely depends on speakers' language proficiency, and how recently or how frequently they have been used (Paradis; 2009) (see also Paradis, 2004, 1993; Luria, 1974).

In 62 (6%) cases of the present data, participants used the translation equivalents in the same utterance. That is, in 62 cases they used a Persian word together with its English translation in the same utterance. (see examples 43-45).

(43) Gušt-hā-ye xeyli *fresh o tāzeh*-i dāreh.

Meat-Pl very fresh and fresh has

[The shop] has very fresh meat.

(44) A: Ki bištar well-done mixād? B: *Me, man*.

Who more well-done wants? Me, me.

Who wants more well done? Me, Me.

(45) Man xodam vaqti stake dorost mikonam *potato yā sibzamini* kenāreš migzāram. (noun)

I myself when stake make potato or potato beside put

When I make steak, I put potato or potato beside the dish.

In 63% of the cases in which participants used translation equivalents in the same utterance, the English items were produced first, followed by their Persian equivalents (see example 43). In the case of using cross-language equivalents in the same utterance, I suggest that the item with lower activation threshold level across the two languages is retrieved first; its equivalent is retrieved later as a function of activation spread from its translation equivalent. Then, the results suggest that in many cases, because some items from the other language (English) have lower activation threshold level than their competitors in the base language, bilinguals use translation equivalents in the same utterance with an English word retrieved first from memory.

It is generally recognized that the overall links between the L1 words and the conceptual system are stronger than the links between the L2 words and the conceptual representation (Kroll & Stewart, 1994). The strength between a concept node and the L2 nodes will presumably be weaker than the links between the concept node and the L1 nodes at least in the non-balanced bilingual speakers (Kroll & Stewart, 1994); however, the links between some of the L2 words and their corresponding concepts might be stronger than the links from their equivalents in L1 to the respective concepts. The present data shows that in 63% of the cases, English words were produced, and possibly also retrieved, first, followed by their equivalents in the L1 language, suggesting that they might have had stronger links to

the concepts than their L1 equivalents. This also suggests that the retrieval of some of the L1 words may be more effortful than the retrieval of their L2 equivalents.

There is a debate about whether using a word from one language has a negative (inhibitory) or a positive (facilitatory) effect on the memory retrieval of its equivalent in the other language (Runnqvist et al., 2012). According to Runnqvist, Fitzpatrick, Strijkers and Costa (2012), to date only one study (Levy et al., 2007) reported a negative effect. In contrast, a replication of the study (Runnqvist & Costa, 2012) yielded a facilitatory effect. As our data demonstrates, using a word from one language may also have a facilitatory rather than a negative effect on the memory retrieval of its equivalent in the other language. The analysis of our naturalistic data indicated that using a word from the non-target language may facilitate the retrieval of its translation equivalent in the L1. Retrieving items from English first, followed by their equivalents in the L1, suggests that speakers had difficulties accessing the lexical items in their L1. In this view, a model of bilingual language production should account for the fact that not only a facilitatory effect from L2 to L1 is available, but it might even be stronger than the other way round for some items, especially with bilinguals who are living in the L2 environment. This shows the dynamic nature of the representations of the two languages (Runnqvist et al., 2012).

Moreover, the results showed that in 86% of the cases, the translation equivalents used in the same utterances were abstract rather than concrete words, suggesting that more facilitation occurred in abstract words compared to concrete words. De Groot (1992; 1993) suggests that as concrete words have more similar concepts (more common semantic features) than abstract words, more facilitation would occur in translating concrete words than abstract words. However, the results from the analysis of our data indicate that the availability and translatability of items across languages largely depends on the words'

activation threshold level, and their frequency and recency of use (Green, 1998; Paradis, 2009; Luria, 1974) rather than just the abstractness or concreteness of lexical items.

6.4 de Bot's (1992) model of bilingual language roduction

de Bot (1992) proposes that a model of bilingual language production should meet some essential requirements. The model must account for the fact that the two languages of a bilingual speaker can be used mixed. He assumes that the model he proposed can account for CS and bilingual retrieval of lexical items from memory. However, de Bot and Schreuder (1993) stress that the model cannot describe all types of CS. In de Bot and Schreuder's (1993) study, they presented some examples of CS in order to explain the processing of lexicalization during CS. The model postulates that each language of a proficient bilingual speaker has its own network. Once Vbl[4] (verbalizer) activates a Persian item, the Persian words are much more activated than the words in the other language (e.g., English). However, for those who code-switch frequently, the links between "words from different languages may be just as strong as the connections within a particular language" (de Bot & Schreuder, 1993:199). de Bot & Schreuder (1993) assume that in communities where individuals code-switch frequently, they may "develop a subset in which words from different languages are used together" (p.198).

In de Bot (1992), the plausible suggestions made by Green (1986) with respect to the three activation levels (i.e., selected, active, and dormant) of the languages of a bilingual or a multilingual speaker have also been extensively discussed. de Bot (1992:13) assumes that the level known as "active level", in which "the active language plays a role in ongoing

[4] -"Vbl is a many-to-many mapping that maps pieces of conceptual structure to semantic representations of lemmas in the mental lexicon" (de Bot & Schreuder,1993: 193).

processing, works parallel to the selected language and does the same things in fact, but has no access to the outgoing speech channel", can account for CS. In this view, similar to the selected language, the active languages also select words, provide the syntax and the surface structure for the intended sentences, and a phonetic plan (de Bot, 1992). Thus, the model posits that CS is the result of parallel activation of the two languages during production.

de Bot (1992:19) discusses the universal constraints proposed on CS. One is the equivalence constraint which "postulates that the syntax on either side of a switch must be grammatical for the language concerned". de Bot (1992:19) states that in his model, "in cases where a speaker can make a choice between two possible constructions in a language, that construction will be selected that is closest to the equivalent in the other language". As indicated above, in contrast to de Bot's model, many studies (see MacSwan, 2005 for review) showed that the grammar of one of the two languages may be violated in CS. The statement that "in cases where two options are available, the closest option to the equivalent in the other language of bilinguals will be selected" is unclear. I asked Kees de Bot (personal communication, January 8, 2014) the following questions:

What happens, for instance, in cases where the two languages involved in CS use different adjective placement rules? How can the above assumption account for this situation? Moreover, the present data shows that while speakers use a N+V structure in the monolingual compound verbs, a V+V structure may be used in the construction of BCVs. How is it determined which structure "is closest to the equivalent in the other language" (de Bot,1992: 19). Kees de Bot replied that "of course there is no measure for establishing what is closest, that is ultimately an individual speaker's decisions, what he/she feels to be closest matters". Thus, it remains unclear how bilinguals select the grammatical constructions in cases where the two languages have different constructions.

In de Bot's model, each language of a bilingual speaker possesses its own Formulator. The researcher suggests that there could be an interaction between the two Formulators depending on the speakers' proficiency (with highly balanced bilingual speakers sharing the Formulator) and the degree of linguistic distance (more related languages do share the formulator); however, the mechanisms of such integration are not clear. As de Bot (1992:8) states, the major problem that positing a separate Formulator for each language has is that it is not clear how the two languages of bilinguals "can be used simultaneously during code-switching". In this model, some important aspects of syntactic processing in code-switched utterances, especially using a word from language A and the grammar from language B (syntactic interference), and the interface of the two Formulators in code-switched utterances remains unclear. For example, the model cannot account for the code-switched cases from our data in which a prenominal adjective from language A is used postnominally. The model also cannot account for the processing of BCVs in which a verb from the other language enters into competition with a noun from the base language.

6.5 Hartsuiker and Pickering 's (2008) integrated model of syntactic representations

Hartsuiker, Pickering and Veltkamp's (2004) model focuses on how syntax is represented in bilingual speakers. In particular, the authors examined whether bilinguals have completely separate syntactic representations for each language, or whether the two languages of bilinguals share some syntactic information. Hartsuiker, Pickering and Veltkamp's (2004) model is concerned with "the interface between the mental lexicon and syntactic encoding in bilingualism" (Hartsuiker & Pickering, 2008:480). A more detailed explanation of the cognitive stages and syntactic representations posited in the model was

presented in Hartsuiker and Pickering's (2008) review article. Hartsuiker and Pickering (2008) reviewed the evidence on the question to what extent sentence production processes are integrated between the two languages and to what extent the processes are kept separate. They concluded that the evidence supported "the integrated model of syntactic representation" proposed by Hartsuiker and colleagues (2004). The model holds that whenever grammatical rules are similar, they are shared between the two languages. The idea of a shared-syntax account is in part based on the assumption that it reduces redundancy. Moreover, "sharing syntax might be efficient for bilinguals who code-switch between languages during a conversation, so that they do not need to change which store of information they access midstream" (Hartsuiker & Pickering, 2004: 409).

The researchers assume that the demonstrations of cross-language priming found in some studies (e.g., Pickering & Branigan,1998) for different languages and grammatical structures provide "support for a view of syntactic representation as integrated between languages"(Hartsuiker et al., 2004:409). Moreover, they provide evidence for the syntactic influence from one language of a bilingual to the other language. Accordingly, the cross-language syntactic influence reported in many studies (e.g., Nicoladis, 2006) indicates that bilinguals' syntactic choice in language A might be influenced by language B (Hartsuiker & Pickering, 2008).

The integrated model is based on the assumption that the lemma level contains lemma nodes. Each lemma node is linked to one conceptual node. The lemma nodes are connected to language nodes (e.g., English) as well as to nodes that capture syntactic information. For example, the adjective "GOOD" is linked to a node that indicates it is an adjective (category node), to the language node (English) and to a combinatorial node (prenominal) that indicates the way it can be combined with a noun (Hartsuiker & Pickering, 2008).

The model can account for some aspects of the cross-linguistic grammatical influences in the present data. In this section, I attempt to explain language processing underlying some of the code-switched utterances found, such as the example 38 above that is reproduced here (example 46) based on the Hartsuiker and Pickering's (2008) model. However, as some aspects of language interference are not clear in the model (see below), additional processes that were not predicted in the model will also be dealt with. In our data, 210 switched words were adjectives (see Chapter 4). In 10% of the cases, English adjectives were used after Persian nouns. In example (46) from our data, the prenominal English adjective was used after the Persian noun.

(46) Dust da-št-am yeh čiz-e different-i dorost kon-am

like-ed-I a thing different make-do

I liked to make (cook) a different thing (food).

In the case of the adjective word order (see examples 36 to 39 from our data), when a Persian-English bilingual intends to convey the meaning of 'different', the concept of 'DIFFERENT' sends activation to the lexical representations of both languages (see La Heij, 2005 for spreading activation account). Then the corresponding lemma nodes, the Persian 'motefāvet' lemma and the English lemma 'different', become activated (Purmohammad, 2015b). However, since the lemma 'different' has a lower activation threshold level than its competitor (motefāvet) in the base language (see Paradis, 2004, for an activation threshold level account), it receives more activation. Thus, 'different' is both activated and selected (see Roelofs, et al., 1998). Activation of the lemma node 'different' automatically leads to the activation of the category node (adjective), the language node (English) and the combinatorial node (prenominal adjective) (see Pickering & Branigan, 1998, for the activation of syntactic information). Hatzidaki, Branigan and Pickering (2011) state that even little activation of an adjective such as 'different' leads to the activation of the combinatorial

node. But as the prenominal adjective "different" was used postnominally (see Figure 6), I propose that a temporary link was made between the lemma "different" and the postnominal combinatorial node after a local reactive inhibition was applied on the intrinsic combinatorial node of the adjective "different". I also adopted the model proposed in Purmohammad (2012; 2015b) in order to account for the syntactic interference in noun phrase structure (see Figure 6).

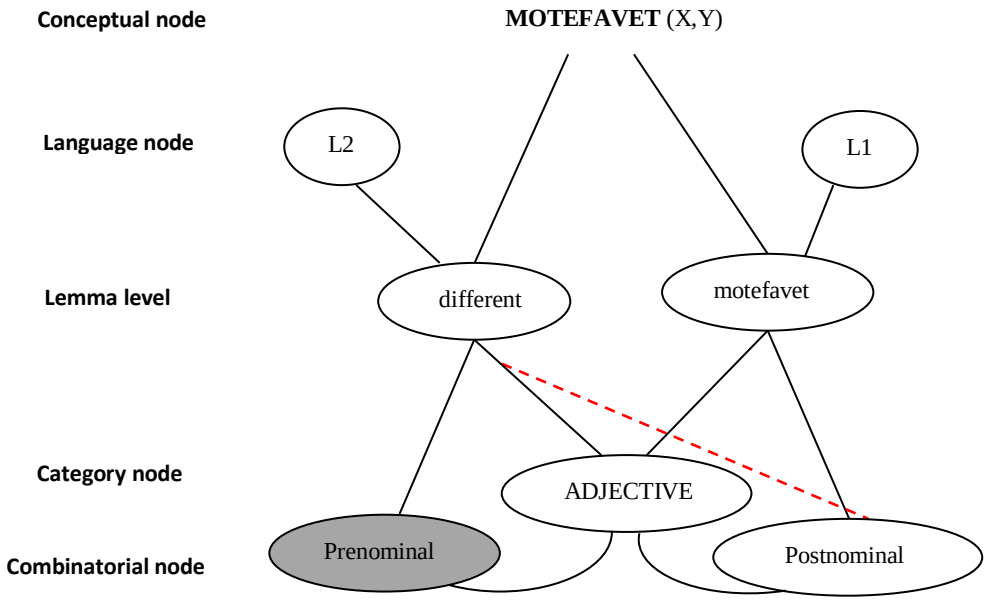


Figure 6. A model showing the processes involved in using a prenominal adjective postnominally. The model was integrated into the Hartsuiker and Pickering's (2008) model of syntactic representation. The model was adapted from Purmohammad (2012:27; 2105b). The dotted red line indicates the temporary link between a Persian adjective with the combinatorial node of an English adjective. The dark line indicates that there was a local reactive inhibition on the combinatorial node.

The model advocated by Hartsuiker and Pickering (2008) can account for many aspects of syntactic interference in the switched utterances. For example, Hatzidaki, Branigan and Pickering (2011) investigated whether the number feature activation in the non-target language might influence grammatical processes of subject-verb agreement in the other

language. They also interpreted the results in terms of Hartsuiker and Pickering's (2008) model. However, some other aspects of syntactic interference are still unclear in this model. For example, in this model, it remains to be solved what mechanism inhibits the inherent feature of a lexical item when interference occurs, for instance, when a prenominal adjective is used postnominally (see Hatzidaki et al., 2011, for the same problem). That is, it is not sufficiently clear whether the syntactic properties of lexical items, especially the inherent syntactic features, need to be suppressed in cases where lexical items use syntactic properties from the other language. If this is the case, the question arises how such inhibition occurs.

6.6 Grosjean's language mode theory: A focus on the effects of external factors on bilinguals' speech production

Grosjean (1982; 1998; 2001) presented the language-mode theory. Language mode is "the state of activation of the bilingual's languages and language processing mechanisms, at a given point in time" (Grosjean, 2004:40). The language mode determines how much of the non-selected language is needed. If the other language is not needed at all, thus, it will not be activated. If it is needed, then, it will be activated to a lesser degree, but its level of activation will be lower than that of the base language (Grosjean, 2008). In this account, "language mode corresponds to various levels of activation of the two languages" (Grosjean, 1982:4).

There are three hypothetical positions in the language-mode continuum. In all linguistic situations, however, the base language is the most active and language B (the other language of a bilingual) is activated to lesser degrees (Grosjean, 2004). In position 1 in the language-mode continuum, language B can only be very slightly active, and the bilingual is in a monolingual language mode (Grosjean, 1998). When bilinguals are interacting with monolingual speakers, they are typically in a monolingual mode. The model holds that in a

different position (i.e. position 2 in the language-mode continuum), language B is more active compared to the previous position and in this case the bilingual speaker will be in an intermediate mode (Grosjean, 2008). Bilinguals experience the intermediate position, especially when the partner knows the other language but either is not very proficient in language B or does not have a positive attitude toward language mixing. In position 3 (bilingual language mode), language B is highly active, but its level of activation is not as active as language A (the base language) (Grosjean, 1998). Speakers select the bilingual mode when they are conversing with bilinguals who know their two languages and the interlocutors do not have negative attitude toward mixing languages (Grosjean, 2008).

One of the main issues in the contemporary theories on language control is whether and to what extent the activation level of the two languages of bilinguals is affected by language-external sources (De Groot, 2011). De Groot (2011) claims that the fact that language-external sources (top-down factors) have the power to affect the activation level of the two language subsets is the central tenet in Grosjean's language mode theory, because Grosjean (2001) assumes that some factors, mostly external to the language system (top-down factors), determine the activation level of each language during language processing. Among these factors are the participants, their language mixing habits and attitudes toward language mixing, and the function of the speech act (e.g., to transfer information, to simply request something, to provide a social distance between the interlocutors, and the conversation situation) (Grosjean, 2001). For example, when a bilingual is watching a TV program in which only one language is used, he or she is in a monolingual mode. But when "two bilinguals who share the same languages and who feel comfortable mixing languages are interacting with one another" (Grosjean, 2001:4), the bilingual is more likely in a bilingual mode. The intermediate positions will be selected when different combinations of the factors are available. For example, if the interlocutor in a conversation is not proficient in

the other language, if a bilingual does not like to mix languages, then an intermediate language mode is expected (Grosjean, 2001). The activation level within the language subsets is affected by various sources that are external to the language system (De Groot, 2011). Since the factors mentioned above are external to language system, the theory of language-mode "can account for the situational dependency of the number of switches" (De Groot, 2011: 291). De Groot (2011) assumes that Grosjean's notion of bilingual's language mode was an attempt to account for the view that the "bilingual's speech responds to the environment and to changes therein" (p.288).

In this section, I attempt to interpret the linguistic behaviour of the participants in terms of the language-mode theory. I investigate to what extent Grosjean's theory of language mode can account for the present data. The way the participants interacted clearly shows that most participants had not known each other before they met and hence they were not aware of their interlocutors' attitude toward language mixing. That is, there was no language history between the participants (see Grosjean & Li, 2013). But the situation in which the interlocutors code-switch frequently and do not show a negative attitude towards language switching may lead to the raising of the activation level of the other language (here, English). Such a linguistic environment provides a "bilingual code-switched speech mode" (Soarec & Grosjean, 1984:381). As Grosjean (2008) suggests, only one factor mentioned above or a combination of two or more factors can move bilinguals away from the monolingual mode to the bilingual mode. Such a shift in the language mode may enhance CS. Thus, during dialogue, the bilingual language mode can be reinforced when both the speaker's output (production) and the interlocutor's input (perception) are bilingual in nature (Grosjean, 1998). As stated above, such a situation occurs especially when either both the input and output systems contain language mixing or both the speaker and his interlocutor do not have a negative attitude toward language mixing (Grosjean, 2001).

As the linguistic behaviour of the participants shows, the L2 environment may also lead to a decrease of the activation level of the L2. That is, L2 is typically more active in an L2 environment than in an L1 environment. In this case, more language switching is expected to occur in the L2 environment compared to the L1 environment, because in the L2 environment many objects, events, and proper names are more likely associated with the L2. Such a situation may trigger CS. Moreover, bilinguals, at least the Persian-English bilinguals who are in the L2 environment, are typically more comfortable with inserting words from their L2 into their L1 utterances compared to when they are in the L1 environment (see Grosjean, 2001). In other words, language switching may be considered to be a more typical manner of interaction in an L2 environment than in an L1 language environment. As Grosjean (2008) rightly points out, we still do not know the strength of each individual factor that affects language mode selection. However, as discussed above, based on the language production of the participants, I assume that the language environment is quite a strong factor that affects to what extent bilinguals switch among languages.

Soares and Grosjean (1984) emphasize that a psycholinguistic model of speech processing is required to account for the language production in different language modes. The model will have to describe the actual interaction of the components of the two languages during processing in the bilingual mode. Grosjean's model can account for different interactional contexts in bilinguals' communities and the effects of external factors on bilinguals' speech production. For Grosjean, CS is a "complete shift to the other language for a word, a phrase, a clause, or a sentence" (1998:175). However, the model is not explicit on how such a shift occurs and what mechanism underlies it, how the syntax and lexicon of the two languages interact in different language modes. In other words, the model does not explain how the components of the two languages such as syntax and semantics of the two languages interact at the lemma level, especially during the bilingual language mode and in

code-switched utterances. I, hence, suggest developing a model of speech processing that can account for the language production in the bilingual's different language modes.

6.7 Conclusion

In the present chapter, I have attempted to examine whether the current models of bilingual speech production can account for the present CS data. In case the models were not able to explain some aspects of language processing of the present CS data, what suggestions could be made in order to improve models of bilingual language production? I present some suggestions with respect to developing a satisfactory model of bilingual language production below.

1) The main finding of the present study is that a verb from the other language of bilinguals may enter into the competition queue when producing the nominal constituent of a compound verb. The analysis of the production of BCVs as well as the results of the experiment revealed that it is possible for two words from different categories across the two languages of bilinguals compete for selection. The results, thus, provide the compelling evidence that grammatical category does not provide a rigid constraint during the production of BCVs. As far as I am aware, no model of bilingual language production has predicted the competition of two words from different categories across two languages of bilinguals. Thus, a satisfactory model of bilingual speech production needs to account for the fact that two words from different categories across the two languages of bilinguals may compete for selection and that a verb from the other language of bilinguals may be used in the place of the nominal constituent of a compound verb in a language contact situation. Moreover, in the present study, some proposals were presented with respect to the production of the nominal

constituent of BCVs (see Chapter 4). Further studies will be needed to test the proposals in other language contact settings.

2) One of the important aspects of bilingual speech production is the interface between the two syntactic systems during the mixed utterances. As Hartsuiker and Pickering (2008) put it, whereas lexical processing has received a lot of attention in most studies of bilingual language production, syntactic processing in bilingualism has not been addressed sufficiently. Many models of bilingual language production are not clear about the syntactic interaction of the two languages of bilinguals. It is, thus, unclear how CS occurs. As Gardner-Chloros (2009a) states, several such models that have been developed in order to characterize bilingual performance explained bilingual speech production in general rather than code-switching in particular. De Bot (1992:198) assumes that Green's model is unclear on "how code-switching actually takes place" and how the linearization of items from the two languages is achieved. Similarly, in de Bot's (1992) model, it is not sufficiently clear how the syntax of the two languages interact. Given that this model posits two separate formulators for the two different languages of bilinguals, Hartsuiker and Pickering (2008) assume that the strongest version of de Bot's (1992) model predicts that the grammatical rules of one language should not influence grammatical processing in the other language of bilinguals. What is obvious from the models of bilingual language production is that the syntactic interaction between the two languages, especially the syntactic transfer in which the syntactic processing of language A is affected by the syntactic properties of the other language has received less consideration (but see Purmohammad, 2012; 2015b; Hatzidaki, et al., 2011; Selles, 2010; Nicoladis, 2006).

I suggest that a model of bilingual speech production should account for the fact that the grammar from language B can affect the production in language A and vice versa, especially in mixed utterances. Thus, I suggest developing a model of bilingual language

production that can account for the syntactic interference, especially in bilinguals' production of mixed utterances. As Walters (2005) states, a model needs to account for aspects of processing that are unique to bilingual language production such as language contact phenomena and CS. Soares and Grosjean (1984) also suggest that a psycholinguistic model of bilingual speech processing will have to account for language production in different language modes. It will have to describe the actual lexical and syntactic interaction of the two languages during speech processing.

3) One of the important aspects of bilingual language processing is that bilinguals' linguistic behaviour may differ dependant on several external factors, such as the setting, the participants and the "behavioural ecology of bilingual speakers" (Green, 2011a:1). Gardner-Chloros (2009b) assumes that "sociolinguistic factors are the prime source of variation in CS behaviour" (p.98). As mentioned above, one of the advantages of Green's model lies in the fact that the researcher takes into account the social-psychological aspects of bilingual language production. I assume that consistent with Green (2011a; 2011b; Green & Abutalebi, 2013), a model of bilingual language production should account for the fact that the precise pattern of using two languages in different contexts may influence how language is processed and controlled in bilingual speakers. Accordingly, language control in bilinguals may be different between the communities where speakers code-switch freely and the communities in which CS is not common (Green, 2011a). I found 962 cases of code-switched utterances. If the "behavioural ecology of speakers" did not permit language mixing, they would not produce this amount of switched utterances. In line with Green (2011a, b) I suggest that exogenous factors such as the addresses' attitude towards the use of languages affect their language control patterns which in turn may lead to different linguistic behaviours. Thus, these external factors need to be included in a satisfactory model of bilingual language production. The way the exogenous factors interact with the language system during speech

production in different language modes needs to be determined using different methods in different disciplines that are concerned with bilingual language processing.

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Appendix A. Naming agreement questionnaire

			
			
			
			

APPENDIX A















APPENDIX A

			

Appendix B: Target picture names and distracter words used in the experiment

	Target	English distractor verbs	Literally translation of the target words	English translation of the target verbs	Pronunciation of the target verbs
Condition 1					
1	قضاوت کرد	judge	Judgment-did	Judged	Qezāvat kard
2	ملاقات کرد	meet	Meeting-did	met	Molāqāt kard
3	تزریق کرد	inject	injection-did	injected	Tazriq kard
4	بازیافت کرد	recycle	recycle-did	recycled	Bāzyāft kard
5	تکرار کرد	repeat	Repetition-did	repeated	Tekrār kard
6	تنبیه کرد	punish	punish-did	punished	Tanbih kard
7	رد کرد	reject	Reject-did	rejected	Rad kard
8	پرداخت کرد	pay	Payment-did	paid	Pardāxt kard
9	تمرکز کرد	concentrate	Concentration-did	concentrated	Tamarkoz kard
10	تصور کرد	imagine	Imagination-did	imagined	Tasavvor kard
11	آماده کرد	prepare	Preparation-did	prepared	Āmādeh kard
12	ثبت نام کرد	register	Registration-did	registered	Sabte nām kard
13	تحویل داد	deliver	Delivery-did	delivered	Tahvil dād
14	هضم کرد	digest	Digestion-did	digested	Hazm kard
15	آموزش داد	train	Training-did	trained	Āmuzeš dād
16	عوض کرد	replace	Replacement-did	replaced	a'vaz kard
17	مشاهده کرد	observe	Observation-did	observed	mošāhedeh kard
18	آزمایش کرد	examine	Examination-did	examined	Āzmāyeš kard
19	تشویق کرد	encourage	Encouragement-did	encouraged	Tašvi:q kard
20	حساب کرد	calculate	Calculation-did	calculated	Hesāb kard
Condition 2					
21	قضاوت	judge		Judgment	Qezāvat
22	ملاقات	meet		Meeting	Molāqāt
23	تزریق	inject		Injection	Tazriq
24	بازیافت	recycle		Recycling	Bāzyāft
25	تکرار	repeat		Repetition	Tekrār
26	تنبیه	punish		injected	Tanbih
27	رد	reject		Rejection	Rad
28	پرداخت	pay		Payment	Pardāxt
29	تمرکز	concentrate		Concentration	Tamarkoz
30	تصور	imagine		Imagination	Tasavvor

APPENDIX A

31	آماده	prepare		Preparation	Āmādeh
32	ثبت نام	register		Registration	Sabte nām
33	تحویل	deliver		Delivery	Tahvil
34	هضم	digest		Digestion	Hazm
35	آموزش	train		Training	Āmuzeš
36	عوض	replace		Replacement	a’vaz
37	مشاهده	observe		observation	mošāhedeh
38	آزمایش	examine		examination	Āzmāyeš
39	تشویق	encourage		encouragement	Tašvi:q
40	حساب	calculate		calculation	Hesāb
Condition 3					
41	قضاوت کرد	Prefer	Judgment-did	Judged	Qezāvat kard
42	ملاقات کرد	Expand	Meeting-did	met	Molāqāt kard
43	تزریق کرد	agree	injection-did	injected	Tazriq kard
44	بازیافت کرد	depend	recycle-did	recycled	Bāzyāft kard
45	تکرار کرد	obey	Repetition-did	repeated	Tekrār kard
46	تنبیه کرد	pretend	punish-did	punished	Tanbih kard
47	رد کرد	remain	Reject-did	rejected	Rad kard
48	پرداخت کرد	destroy	Payment-did	paid	Pardāxt kard
49	تمرکز کرد	damage	Concentration-did	concentrated	Tamarkoz kard
50	تصور کرد	Scream	Imagination-did	imagined	Tasavvor kard
51	آماده کرد	Admit	Preparation-did	prepared	Āmādeh kard
52	ثبت نام کرد	Affect	Registration-did	registered	Sabtenām kard
53	تحویل داد	Decide	Delivery-did	delivered	Tahvil dād
54	هضم کرد	Allow	Digestion-did	digested	Hazm kard
55	آموزش داد	Choose	Training-did	trained	Āmuzeš dād
56	عوض کرد	Come	Replacement-did	replaced	a’vaz kard
57	مشاهده کرد	Reduce	Observation-did	observed	mošāhedeh kard
58	آزمایش کرد	Dislike	Examination-did	examined	Āzmāyeš kard
59	تشویق کرد	Promise	Encouragement-did	encouraged	Tašvi:q kard
60	حساب کرد	develop	Calculation-did	calculated	Hesāb kard
Condition 4					
61	قضاوت	Prefer		Judgment	Qezāvat
62	ملاقات	Expand		Meeting	Molāqāt
63	تزریق	agree		Injection	Tazriq
64	بازیافت	depend		Recycling	Bāzyāft

65	تکرار	obey		Repetition	Tekrār
66	تنبیه	pretend		injected	Tanbih
67	رد	remain		Rejection	Rad
68	پرداخت	destroy		Payment	Pardāxt
69	تمرکز	damage		Concentration	Tamarkoz
70	تصور	Scream		Imagination	Tasavvor
71	آماده	Admit		Preparation	Āmādeh
72	ثبت نام	Affect		Registration	Sabte nām
73	تحویل	Decide		Delivery	Tahvil
74	هضم	Allow		Digestion	Hazm
75	آموزش	Choose		Training	Āmuzeš
76	عوض	Come		Replacement	a’vaz
77	مشاهده	Reduce		observation	mošāhedeh
78	آزمایش	Dislike		examination	Āzmāyeš
79	تشویق	Promise		encouragement	Tašvi:q
80	حساب	develop		calculation	Hesāb

qualtrics

Please rate the translation accuracy of the word pairs(the highest score 7)

Judge = قضاوت کردن

1 2 3 4 5 6 7

compete = رقابت کردن

1 2 3 4 5 6 7

meet = ملاقات کردن

1 2 3 4 5 6 7

add = اضافه کردن

1 2 3 4 5 6 7

invite = دعوت کردت

1 2 3 4 5 6 7

inject = تزریق کردن

1 2 3 4 5 6 7

follow = دنبال کردن

1 2 3 4 5 6 7

protect = حفاظت کردن

1 2 3 4 5 6 7

recycle = بازیافت کردن

1 2 3 4 5 6 7

repeat = تکرار کردن

1 2 3 4 5 6 7

fry = سرخ کردن

1 2 3 4 5 6 7

melt = آب شدن

1 2 3 4 5 6 7

punish = تنبیه کردن

1 2 3 4 5 6 7

relax = استراحت کردن

1 2 3 4 5 6 7

reject = رد کردن

1 2 3 4 5 6 7

accept = قبول کردن

1 2 3 4 5 6 7

cook = آشپزی کردن

1 2 3 4 5 6 7

connect = وصل کردن

1 2 3 4 5 6 7

enjoy = لذت بردن

1 2 3 4 5 6 7

Pay = پرداخت کردن

1 2 3 4 5 6 7

concentrate = تمرکز کردن

1 2 3 4 5 6 7

spread = پخش

1 2 3 4 5 6 7

imagine = تصورکردن

1 2 3 4 5 6 7

generate =تولید کردن

1 2 3 4 5 6 7

prepare =آماده کردن

1 2 3 4 5 6 7

present = ارائه کردن

1 2 3 4 5 6 7

discuss = بحث کردن

1	2	3	4	5	6	7
○	○	○	○	○	○	○

donate =اهدا کردن

1	2	3	4	5	6	7
○	○	○	○	○	○	○

complete = کامل کردن

1	2	3	4	5	6	7
○	○	○	○	○	○	○

register =ثبت نام کرد

1	2	3	4	5	6	7
○	○	○	○	○	○	○

deliver = تحویل دادن

1	2	3	4	5	6	7
○	○	○	○	○	○	○

digest = هضم کردن

1	2	3	4	5	6	7
○	○	○	○	○	○	○

train = آموزش دادن

1	2	3	4	5	6	7
○	○	○	○	○	○	○

publish = چاپ کردن

1	2	3	4	5	6	7
○	○	○	○	○	○	○

exaggerate = غلو کردن

1	2	3	4	5	6	7
○	○	○	○	○	○	○

replace= تعویض کردن

1	2	3	4	5	6	7
○	○	○	○	○	○	○

observe = مشاهده کردن

1	2	3	4	5	6	7
○	○	○	○	○	○	○

examine = آزمایش کردن

1	2	3	4	5	6	7
○	○	○	○	○	○	○

encourage = تشویق کردن

1	2	3	4	5	6	7
○	○	○	○	○	○	○

calculate = حساب کردن

1	2	3	4	5	6	7
○	○	○	○	○	○	○