



The CASP Model for Bilingualism: Language interactions within and across bilingual minds

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Keywords:	bilingual language processing, bilingualism, complex adaptive system principles (CASP), efficiency, language typology
Abstract:	<p>Aims and objectives/purpose/research question: We propose a model that captures general patterns in bilingual language processing, based on empirical evidence elicited in a variety of experimental studies. We begin by considering what linguistic outputs are logically possible when bilinguals communicate based on the typological features of two languages in the bilingual mind. Our aim is to explain why some outputs are more frequent or more likely than others in bilingual language use.</p> <p>Design/methodology/approach: Our empirically derived multi-factor model combines insights from various empirical studies of different bilingual populations and it includes a variety of methodologies and approaches, such as lexical categorization, lexical priming, syntactic priming, event verbalization and memory, historical language change, grammaticality judgments and observational reports.</p> <p>Data and analysis: We critically discuss both lexical and syntactic processing data, as well as data that reflect bilingual type differences and different communicative situations (i.e. who the bilinguals are talking to and for what purpose). Crucially, we explain when the relevant factors collaborate and when they compete.</p> <p>Originality: There are three main reasons why this paper can be deemed original: 1) it offers a unified model for understanding bilingual language processing that is not focused on a single factor or a single linguistic level, as has most often been the case in the past; 2) it brings together the study of bilingualism from both psycholinguistic and sociolinguistic perspectives and in a unifying fashion, which is rare in the literature, and 3) it creates a platform for testing numerous predictions that are not dependent on any</p>

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	<p>one theory.</p> <p>Significance/implications: This new model opens up new avenues for research into bilingual language processing for all types of bilinguals and in different communicative situations. It captures and explains the variety of outputs in bilingual communication and enables us to make predictions about communicative outcomes.</p>

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Introduction

Bilingualism has been extensively researched in a number of disciplines over many years, yet we still do not have a holistic model of how bilinguals use and process their respective languages. Studies are often based on a single theoretical approach or methodological perspective, or they examine limited numbers of languages and language types. Research is also compartmentalized by linguistic level, e.g. word processing vs. syntactic processing. There is also the problem that different disciplines do not "talk to each other" sufficiently, principally linguistics, psychology and sociology, even though psycholinguistics and sociolinguistics exist as cross-disciplinary bridges that should make bilingualism more amenable to interdisciplinarity. Language is both a psychological and a sociological phenomenon, so it is legitimate to frame the study of bilingual language use within either domain. However, we believe the time has come to try and unify the findings from these fields and to capture the many invaluable insights from different strands of bilingualism research. A general model is now needed that has overarching explanatory power and that can help us understand why we get disparate and sometimes conflicting empirical results in different studies. This paper makes a first attempt in this direction.

The biggest challenge for any overall model of bilingualism is that many factors are in play at the same time, including age of acquisition, proficiency, language dominance, frequency of use, language mode, and power status, to name but a few. It is difficult to capture their respective roles and their different strengths in different communicative situations within a single model in a way that is compatible with the highly variable bilingual speaker profiles that have been observed. Our model incorporates a proposal for how to do this.

We begin with a theoretical discussion of what we term the *logic of bilingualism*, by which we mean the identification of possible outcomes that may manifest themselves in bilingual communication when two linguistic systems are active in one mind. We then seek confirmation for these outcomes from reported empirical studies, our own as well as others, with both a psycholinguistic and a sociolinguistic focus. We propose a **CASP Model for Bilingualism**, which builds on and extends our earlier Complex Adaptive System Principles for second language acquisition (CASP for SLA; see Filipović & Hawkins, 2013), and we show how it can account for the empirical observations and provide theoretical underpinnings for bilingualism. Finally, we indicate some ways in which testable predictions can be formulated and investigated in the future.

Some background: Why this model is needed

A multi-factor model is needed that can provide a unifying platform for past and future research. Our aim is to capture within a single model the bilingual language phenomena that have traditionally been studied under different disciplinary and subdisciplinary umbrellas (SLA, L1 vs. L2 storage and access, heritage languages, language contact, historical language change, etc.) and described using different constructs (e.g. transfer, convergence, bidirectional influence, etc.). Many previous studies have focused on just a single factor at a time (e.g. proficiency, or type of acquisition) and tested predictions related to it, without examining the other factors that play a role in all situations of bilingual language use (such as, for example, who the bilingual is speaking to or how formal the communicative situation is). There is now

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3 a substantial body of research supporting the kind of multi-factor model we outline here. It
4 gives a unifying and forest view of this interdisciplinary field (see Hulstijn, 2013, 2015 for
5 insightful discussion of the plethora of perspectives in SLA research alone).
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7 Research on bilingualism is difficult because of the sheer nature of the variation it
8 must tackle, in the language systems being combined, speakers' acquisition histories and
9 proficiency levels, and because of the social aspects of specific communicative situations.
10 Bilingual studies have examined speakers of various competences and acquisition histories,
11 and this makes it hard to find a single and consistent way in which to interpret the findings.
12 Athanasopoulos (2011) formulates the problem very clearly:
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15 “For example, deviation from monolingual patterns in early bilinguals may be seen as
16 *convergence to a unitary form*, whereas deviation from monolingual patterns in late bilinguals
17 may be seen as “*failure*” to acquire or use the target construction” (Athanasopoulos, 2011:
18 29, our emphasis).
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20 Thus, the same experimental outcomes may be interpreted and labelled differently based on
21 when and how the two languages were acquired by the bilingual populations in individual
22 studies. There is a growing awareness of the need for different disciplines to look at each
23 other's findings. Fields that are ultimately concerned with bilingualism (contact linguistics,
24 heritage linguistics, sociolinguistic typology, translation, language development, bilingual
25 memory, etc.) have been developed largely in isolation from one another. Muysken (2013, p.
26 710) advocates the need for more unification:
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30 “Most researchers will acknowledge that these fields are closely interconnected, through their
31 focus on interaction between languages and its outcomes; however, many of the topics listed
32 have been studied in relative isolation from one another. In actual academic practice, separate
33 conferences are held for most of these sub-disciplines, with different journals and debates, and
34 apparently unrelated conceptual frameworks and terminologies”.
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36 Similarly, Jarvis and Pavlenko (2010 [2007], p. 234-235) suggest that “there is a clear need
37 for more interaction and dialogue between researchers who study cross-linguistic influence
38 phenomena in the areas of language contact, childhood bilingualism, child and adult second
39 language acquisition, and first language attrition”. They go on to say that it would be
40 interesting to compare findings on shared phenomena (e.g. syntactic transfer or borrowing)
41 which are studied from different angles in different disciplines (e.g. SLA research vs.
42 language contact and historical language change).
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44 This is exactly our goal here. We steer clear of conflicting labels, such as
45 “convergence” vs. “failure to acquire”, because they have been used to refer to similar
46 outcomes from two different perspectives (early bilinguals vs. L2 learners). Our model aims
47 to capture all bilingual behavior under one roof, so to speak, and show that it is driven by
48 common processing mechanisms that we define here (see the **General Principles** section).
49 Various social and individual factors then modulate these processing mechanisms accordingly
50 (as we explain in the section **Discussion: Variability and adjustability of bilingual**
51 **language learning and use**). We explain what performance outcomes are most likely
52 depending on the interaction between two linguistic systems, and when we can expect
53 collaboration between different processing principles versus when they are more likely to
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3 compete. Different outcomes depend crucially on the language combinations in question and
4 on the general processing mechanisms that characterize bilingual language use which are
5 flexible and adjustable depending on the specifics of the communicative situation (i.e. *who*
6 *speaks what language to whom and when*, as Fishman, 1965 put it).
7

8 There have been some prior attempts to model the general ways in which bilinguals
9 learn and use their languages. They have mainly been concerned with a single linguistic level
10 at a time (most often the lexicon; see the Revised Hierarchical Model, Kroll et al., 2010; Van
11 Hell and Kroll, 2013) or their aim has been to extend insights about monolingual language use
12 to bilinguals (see e.g. de Bot's (1992) extension of Levelt's Speaking Model (Levelt, 1989)).
13 In this paper we view bilingual language behavior as a form of *complex adaptive system* in the
14 sense of Gell-Mann (1992) in which multiple factors interact to produce a range of observable
15 outcomes and different kinds of interlanguages. Some other proposals within this general
16 emergentist framework have also been put forward (see, for example, Ellis, 1998; Ellis and
17 Larsen-Freeman, 2009; Larsen-Freeman, 1997; Mellow, 2008; O'Grady, 2005, 2008).¹ More
18 recently, Muysken (2013) has put forward a proposal for a model in the context of historical
19 language change within the framework of Optimality Theory. This model addresses language
20 contact phenomena and the different bilingual "optimization strategies" in specific contact
21 situations. Four different strategies are proposed in order to explain outcomes of language
22 contact, namely i) maximize L1 structural coherence, ii) maximize L2 structural coherence,
23 iii) match L1 and L2 patterns where possible, and iv) rely on universal principles of language
24 processing. Muysken (2013, p. 709) contends that "different outcomes correspond to different
25 interactions of these strategies in bilingual speakers and their communities."
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28 All these works recognize the need for multiple interacting factors in understanding
29 second language acquisition and bilingualism. They differ in the number and nature of the
30 principles proposed, in their precise formulation, in the predictions they make for
31 interlanguage data, and in the range of data on which they have actually been tested. The
32 empirical support offered hitherto is encouraging but still limited. Since our approach in this
33 paper is a multi-factor and integrative one, similar in spirit to Muysken (2013) and not an
34 oppositional one as in e.g. Long (1993), we do not engage in a critical discussion of the
35 shortcomings of other theories and approaches. Rather, we propose a model that is theory-
36 free, as it were, since it is driven primarily by what the empirical data in numerous
37 methodologically varied studies have shown.
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40 We do not have space here to delve deeply into psycholinguistic and ultimately
41 neurolinguistic issues such as how bilinguals store their languages and whether the store is
42 separate or shared, or both separate and shared for different aspects of the lexicon and syntax
43 (see de Groot, 2011 for insightful summaries). Many issues such as this are still unresolved in
44 the field, as are central concepts such as, for example what is an early bilingual? As Myers-
45 Scotton (2003) points out, different studies assume different cut-off points for early bilingual
46 acquisition, ranging from 5 to 12 years of age. Recent research (e.g. Abutalebi et al., 2009)
47 has shown that it is proficiency rather than age of acquisition that is the decisive factors in
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54 ¹ See also Dornyei, 2009 for an extensive critical overview of different models, in particular with reference to
55 second language acquisition; see also Basnight-Brown, 2014 for an overview and discussion of models of lexical
56 access and bilingualism.
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3 assessing bilingual competence.² In addition, some studies have shown that for certain aspects
4 of language late acquisition can be better (see Dornyei, 2009 for detailed discussion), so age
5 of acquisition may be a less decisive factor. Furthermore, early acquisition is not much help if
6 the relevant language is not reinforced constantly by frequent use. Incomplete acquisition or
7 attrition can negatively impact proficiency in spite of early acquisition.
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9 Given the near impossibility of placing bilinguals into clear groups and categories,
10 especially across different studies, we think that bilingualism is best conceived of as a cline.
11 Thus, we analyze the linguistic outputs reported in a number of studies dealing with bilinguals
12 who are equally or almost equally proficient in both languages³, as well as with those that
13 have better proficiency in one of their two languages (because, for example, they live in an
14 environment where only one of their languages is spoken by the community and or because
15 they are second language learners at different stages of L2 acquisition.⁴). We will focus
16 mainly on adult bilingualism studies and refer only occasionally to some studies of child
17 bilingualism in order to indicate how our findings may apply there as well.
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22 **Introducing CASP for Bilingualism**

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24 We build here on our earlier Complex Adaptive System Principles for SLA (Filipović &
25 Hawkins, 2013), which addressed second language acquisition specifically. CASP for
26 Bilingualism is a more general model of how bilinguals process and use their languages. We
27 still include issues pertaining to second language, and also general issues of native language
28 learning, since we aim to capture a number of different bilingualism types within a common
29 model. We focus here on what the different types of outputs by different types of adult
30 bilinguals tell us about their knowledge representations and processing mechanisms. We will
31 refer to certain studies of child bilingualism only to indicate how our findings can be
32 supported and expanded further.
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34 CASP for Bilingualism, like CASP for SLA, consists of four very general principles
35 which work in sync, sometimes competing and sometimes collaborating, enabling us to make
36 predictions about possible and likely bilingual outcomes in different communicative
37 situations. They are slightly redefined here to encompass all types of bilingual learning and
38 processing. The main difference between CASP for Bilingualism and CASP for SLA lies in
39 the formulation of an additional, fifth general principle, *Maximize Common Ground*. It
40 subsumes previous instances of positive and negative transfer in the SLA context and what we
41 see as the very similar instances of merger and accommodation between two linguistic
42 systems in the bilingual mind. How exactly mergers and accommodations take place, and to
43 what extent, depends on how our CASP principles work together in conjunction with the
44 various social and individual circumstances that we refer to as adjustability and variability
45 factors (see the **Discussion** section). We explain our general principles in turn.
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50 ² The notion of proficiency is not uncontroversial itself. Hulstijn (2012, p. 423) points out that it is often taken
51 for granted, though there is a great variety of approaches in classifying informants (see also Treffers-Daller,
52 2015, p. 236 for discussion on this topic, and also p. 239 on the difference between proficiency and dominance).

53 ³ We bear in mind however that perfectly balanced bilinguals with entirely equal proficiency in both languages
54 may be somewhat of a myth, a fictional rather than a realistic construct (Romaine, 1989; Cook, 1995).

55 ⁴ See Treffers-Daller, 2015, p. 248 on defining balanced bilingualism not as an overall category but with respect
56 to specific criteria; e.g. vocabulary scores, percentage of use across different domains or similar.
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General Principles

Here we define the five general principles A-E that we believe underlie bilinguals' language behavior.

(A) Minimize Learning Effort (MiL)

Bilinguals prefer to minimize learning effort when they learn the grammatical and lexical properties of their languages, just as monolinguals do.

Learning effort can be minimized in a number of ways. It is minimized when grammatical and lexical properties are shared between L1a and L1b, and preexisting knowledge of items learned first in one language can be exploited when learning the other. Learning effort is also minimized when properties in both languages are frequently occurring in the input, which increases their exposure and with it the ease of learning. It is minimized when structural and semantic properties of the languages are simple rather than complex.

There is no suggestion here that learners consciously or intentionally strive to comply with (A), or are taught to comply with it, for this principle or any of the others in this article.

(B) Minimize Processing Effort (MiP)

Bilinguals prefer to minimize processing effort when using the grammatical and lexical properties of their languages, just as monolinguals do.

Even when more complex properties have been acquired, bilingual speakers will still prefer to use simpler properties, just like monolinguals do. Infrequent items in the input are not only harder to learn but also harder to access and process. Complex grammatical and lexical properties are also harder to both learn and process. This principle is in essence a principle of least effort.

Some specific principles following from these more general principles that are defined for SLA in Filipović & Hawkins (2013) apply here as well. *Maximize Structurally and Semantically Simpler properties* means that we can expect simpler forms and meanings to be more readily learned and used in both languages compared to more complex forms and meanings. Similarly, *Maximize Frequently Occurring Properties* drives the acquisition and use of more frequent forms in both languages more than less frequent ones.

(C) Maximize Expressive Power (MaE)

Bilingual learners prefer to maximize their expressive power, i.e., to be able to formulate in each language whatever thoughts they wish to express, and to perform the same language functions in each language, just as monolingual learners do.

This principle stands in partial opposition to principles (A) and (B), since achieving full expressive power requires sometimes more and sometimes less processing effort, e.g. more complex as well simpler expressions, and less frequent ones, contra (B). Complex and less frequent items are also harder to learn, contra (A).

There is another general principle that is sometimes opposed in its predicted outputs to principles (A) and (B), and that involves not expressive power per se, i.e., semantics, but the efficient delivery of meanings in real time between interlocutors.

(D) *Maximize Efficiency in Communication (MaC)*

Bilinguals prefer to maximize efficiency in communication with their interlocutors (production and comprehension), just as monolinguals do.

Hawkins (2004, 2009, 2014) has argued that **efficiency** plays a central role in all communication and that grammars and cross-linguistic patterns show clear evidence for its conventionalization in their rule systems and lexicons. Efficiency as he defines it relates to the basic function of language, which is to communicate information from the speaker (S) to the hearer (H) (Hawkins, 2014, pp. 34-35):

- a. Communication is efficient when the message intended by S is delivered to H in rapid time and with minimal processing effort;
- b. Acts of communication between S and H are generally optimally efficient; those that are not occur in proportion to their degree of efficiency.

There are a number of specific principles that make for efficient communication and for efficiency in grammars in Hawkins' system (see his Minimize Domains, Minimize Forms and Maximize Online Processing) and that lead to testable predictions for both usage and grammars. These principles are supported by performance and grammatical data showing a clear preference for: *speed* in delivering linguistic properties in online processing; *fine-tuning* of structural selections to frequency of occurrence, accessibility and inferencing; and *few online errors* or garden paths. These factors interact, sometimes reinforcing sometimes opposing one another. The main point to be made in the present context is that efficiency is a measure of how quickly, with how little processing effort and with how much online error reduction the message can be delivered by the speaker and understood by the hearer.

There is an interesting relationship between efficiency and complexity (see Hawkins, 2004): efficiency generally results in a preference for structural and grammatical simplicity, and for simplicity of all linguistic items. But sometimes communicative efficiency requires the use of structures that are more complex, for example when the hearer needs more detailed and explicit information about a referent or event. If the referent is unfamiliar to the hearer, the speaker must use a more complex phrase to identify it rather than a simple pronoun, e.g. "the man I talked to last night" instead of a simple "he". Efficiency can be maximized by using simple forms when this is possible, and it can also be maximized by using complex forms if necessary. This kind efficiency-driven model involves considerable hearer sensitivity on the part of the speaker, in accordance with the insights about cooperation in conversation that have been formulated by Grice (1957) and developed further in neo-Gricean (Levinson, 2000) and post-Gricean theories (Sperber & Wilson, 1986).

Certain uses of language and different genres, such as poetry or narratives, will purposefully delay key information, or exploit ambiguity and other rhetorical devices and will not strive primarily for efficiency in communication. Grice was very clear that these are departures from normal communicative practices that adhere to his Quantity and Quality maxims, and they involve "implicatures" of various kinds whereby the hearer recognizes the speaker's intention to give too little or too much information or to say something that is only partially true or downright false. Similarly, in the present context, efficiency is the norm, and departures from it need special contexts and conventions.

With respect to bilingualism, an efficiency approach will describe not only its role in communication, as just illustrated, but also, and primarily, the relationship between different linguistic systems in the bilingual mind and their observable outputs in communication. It is our contention that bilinguals strive for an efficient resolution of two grammars in one mind.

(E) Maximize Common Ground (MCG)

Bilingual learners and speakers maximize common grammatical and lexical representations and their associated processing mechanisms in two languages, L1a and L1b, within the grammatical constraints and conventions imposed by each. Specifically:

(i) if L1a and L1b share a given construction, grammatical rule or word meaning, and associated processing mechanisms, then these shared entities will be used more frequently in both languages. (These entities may be the preferred or majority pattern in one language and a minority or dispreferred in the other, but they will still be the pattern of choice in the bilingual's use of both languages.)

(ii) if L1a and L1b do not share a given construction, grammatical rule or word meaning, and associated processing mechanisms, then common ground will be created by introducing entities from one language into the other. New shared entities will be introduced wherever possible within the constraints of current grammatical and usage conventions for the relevant language.

(iii) any violations of a grammatical or usage convention in L1a or L1b that occur when maximizing common ground will be in proportion to the environmental and psycholinguistic factors enumerated and discussed in the **Discussion** section below.

Bilingual linguistic behaviors: Possible outcomes

The principle of Maximize Common Ground enables us to understand numerous phenomena that have been previously described as "convergence", "positive transfer", "bidirectional influence", "bilingual-specific language use" or "in-between performance" (e.g. see Pavlenko, 2014, p. 73), and as "matching L1 and L2 patterns" in Muysken (2013). They are all driven by efficiency, as we see it, and specifically by the efficiency principles we define and exemplify here. Maximize Common Ground can also explain why some outputs previously classified as "negative transfer" can arise and why in most cases there is nothing *negative* about them (unless they impede communication by being severely ungrammatical for example).⁵ They stem from the interaction of the same principles put forward here. Importantly, efficiency also helps us understand those outcomes in bilingual performance where there does not seem to be any apparent influence of one language onto another even though it could be expected (e.g. as in Kupisch, 2014).

The most efficient way for bilinguals to deal with two linguistic systems at the same time is to use as many of their shared resources as possible. This makes sense because bilinguals need to alleviate the cognitive load of simultaneously processing two languages, as Silva-Corvalán (1994, p. 206) explains: "in language-contact situations bilinguals develop

⁵ The term "transfer" does not quite reflect what is going on in the bilingual mind because nothing is actually *being transferred* (i.e. "taken from one place and placed in another").

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3 strategies aimed at lightening the cognitive load of having to remember and use two different
4 linguistic systems”.

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6 It is therefore important for our MCG principle to determine as a first step whether
7 common ground is available or not in the grammatical and lexical representations of the two
8 languages (compare (Ei) and (Eii) above, within our principle *E: Maximize Common Ground*).
9 By focusing initially on the typological relationship between them, we do not neglect other
10 relevant factors (see (Eiii)). It is impossible to isolate a bilingual speaker from his personal
11 language history and acquisition background and socio-economic environment, because these
12 factors, as is well-known, play an important role in how the two languages manifest
13 themselves and affect one another. Our point of departure is justified, however, by the fact
14 that the first step for *predicting logically possible outcomes* has to be the establishment of the
15 typological background about the two languages, namely what structures and meanings are
16 available in each for the bilingual mind to use.

17
18 When two languages have a word or structure in common, the most likely outcome is
19 for them to be used in both. Sometimes this does not happen, as Kellerman (1986) points out:
20 L2 learners may not believe that a word or a structure from their L1 can be perfectly mapped
21 onto a corresponding word or structure in L2. With balanced bilinguals this should be less of
22 an issue because more of the correspondences between languages will have been made due to
23 equal or near equal exposure to contexts in which words and structures from both are
24 applicable.

25
26 More often however, a perfect match will not be available between linguistic systems
27 due to a lack of equivalence in meaning, in form or in form-meaning mapping, or due to a
28 difference in general frequency of use (i.e. a given pattern may be dominant in one language
29 but minor in the other). Even similar languages differ in many subtle yet important ways (see
30 for example Filipović & Ibarretxe-Antuñano, 2015 on some intratypological distinctions). In
31 addition, when it comes to frequency of use, we know that bilinguals may underuse or overuse
32 certain structures (see Hawkins & Filipović, 2012 for a succinct overview and discussion).
33 Such speakers exhibit different linguistic behavior from monolinguals, and this is to be
34 expected since bilinguals are not two monolinguals in one (Grosjean, 2001). But what are they
35 then if not two monolinguals in one? And why can they be more monolingual-like on some
36 occasions but not on others?

37
38 Most often there are some lexical and grammatical distinctions that are made in one
39 but not the other language of the bilingual. The logical options in this case are two: maximize
40 common ground or keep the two systems separate and do not maximize common ground.
41 When common ground is made, there are again two options: express the same meaning in
42 both or do not express the relevant meaning in either. Forms and meanings can be added to
43 the relevant language that does not have them with the result that both languages have them,
44 or they can be “lost” in the language that has them with the result that both languages end up
45 not having them. We will discuss all these situations below.

51 **CASP for Bilingualism at work**

52
53 In this section we illustrate how many apparently different outcomes reported in different
54 studies, both at the lexical and grammatical levels, can be shown to follow from the same
55 underlying principles of bilingual processing.

Ways to Maximize Common Ground

Maximizing Common Ground means resorting to the same means in both languages if they exist and using them with possibly greater frequency than in monolingual populations. Frequency of use will be particularly high when the bilingual is actively using both languages in the so-called bilingual mode (see the **Discussion** section). If structures and meanings are shared they can become connected in bilingual minds, more reinforced and more readily accessible in both languages than language-specific alternatives.⁶ Whether they will actually be accessed or not in specific situations will vary, as we explain in the **Discussion** section. If a specific form exists only in the one language but not the other, the most straightforward way to maximize common ground might seem to be by directly importing forms from one language into another (i.e. calquing). Trudgill (2011, p.49) reports on an example of this in the context of sociolinguistic language change driven by bilingualism. It seems that Afghan Arabic has imported some structural features from its co-territorial neighbors, such as the interrogative suffix *-mi*, an identical form and function of which is available in Turkish but not in mainstream Arabic. But this kind of direct structural borrowing does not happen frequently, judging by published reports. The much more widespread strategy for maximizing common ground involves making the same kind of form-meaning distinctions or using the same patterns in both languages. For instance, if certain meanings are expressed that use grammatical devices found in only one of their languages, bilinguals can often express these meanings lexically in the other language. This results in a more frequent use of certain lexical items or combinations of lexical items, which can lead to their narrower specialization, and finally to the grammaticalization of these lexical items and constructions (see Heine & Kuteva, 2005 for a discussion of many case studies that exemplify this).

A different situation is when a common pattern does exist in both languages but does not work equally or equally well in both and bilinguals expand or diminish usage in the one language to match or approximate to the other. The pattern in question may be the majority one (i.e. preferred/default/high-frequency) in one case and the minority one (dispreferred/marked/low-frequency) in the other, or there may be greater specificity in one language and greater generality in the other e.g. in some lexical field covered by both languages.

Various phenomena have been identified of these different types and discussed under the rubrics of *cross-linguistic influence*, *interference* or *unidirectional transfer*; or in the event that the accommodation works in both directions the terms *convergence* and *bidirectional transfer* have been used. We illustrate below how they can be explained using our MCG principle and how our model predicts the different outputs in this context.

Finally, common ground can be made through a loss of distinctions in both languages. This seems to be the preferred and the most attested option in different experiments on lexical categorization. In grammar however, losing distinctions can lead to ungrammaticality and is thus likely to be avoided as much as possible (in proportion to the proficiency-driven ability to avoid ungrammaticality). This outcome may be efficient (if it does not breach grammaticality

⁶ The nature and degree of overlap can vary, as Pavlenko (2009) pointed out, e.g. it can be complete or only partial (see Duyck & Brysbaert, 2004 for an example of connectionist modelling for semantic overlap at word level; see also de Groot, 1992; van Hell & de Groot, 1998 and Basnight-Brown, 2014 on the different degree of overlap in translation between concrete and abstract nouns).

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3 in either language) but the loss of some lexical and constructional meanings then leads to
4 weaker expressive power. We exemplify all these situations in detail in the following sections.
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7 *Maximizing common ground at the level of form*
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10 At the level of grammatical form, both addition and loss are logically possible, but we see
11 from the available evidence that the loss of grammatical structures and paradigms is mainly
12 characteristic of bilinguals who have lower proficiency in one of the two languages. The
13 addition of grammatical forms is normally characteristic of proficient bilinguals rather than of
14 second language learners (see Trudgill, 2011 for details from a historical language change
15 perspective).
16

17 If both languages have the same option at the level of form, this option will be the
18 preferred output in both languages even though one of the languages may have other
19 structures, perhaps even more frequent ones. Consider first so-called pro-drop vs. non-prodrop
20 languages (for alternations corresponding to *went to the movies* versus *she went to the*
21 *movies*). If one language of the bilingual has the option to drop the subject (pro-drop) and the
22 other does not (non-pro-drop), we tend to see more overt subjects in the pro-drop language,
23 this being the common ground between the two systems. This is a well-confirmed finding in
24 many studies and is discussed as “pro-drop resetting” among immigrant communities in the
25 USA (Heine & Kuteva, 2005, p. 99) such as Russian (Schmitt, 2000), Spanish (Myers-
26 Scotton, 2002) and Serbian immigrants (Savić, 1995). It is also documented elsewhere within
27 heritage linguistics research (Polinsky, 1995 for Polish, Tamil and Kabardian; Rappaport,
28 1990 for American Polish and Fenyvesi, 1994 for American Hungarian). We have a situation
29 here in which a language with two options reduces one of them in order to be aligned with the
30 other, with the result that one common form (the overt subject) can be regularly used in both
31 languages. The principles of Minimize Processing Effort (B), Maximize Efficiency in
32 Communication (D) and Maximize Common Ground (E) are all at work here and lead to the
33 use of common grammatical forms for the expression of common meanings in both
34 languages. On this occasion there is no competition among these principles.
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36 Similarly, for adjective positioning, Nicoladis (2006) has shown that French-English
37 bilingual children are more likely to depart from the dominant French pattern of noun before
38 adjective ordering (*étudiant intelligent* 'student intelligent', i.e. *intelligent student*) when
39 speaking both French and English. French also allows the adjective before noun pattern,
40 which is the only acceptable pattern in English, though in French it is much less frequent.
41 Therefore, bilingual children who have both languages active use a pattern that works in both,
42 even though it is the less frequent ordering in one of the languages, resulting in less common
43 or even unlicensed patterns compared to those of monolingual French. The key point here is
44 that French allows both patterns while English is more restrictive and allows only one,
45 adjective before noun. Thus, the non-shared pattern is avoided, and common ground is made
46 using the pattern that is shared. Children acquiring both languages thus stretch common
47 ground beyond its limits and this may result on occasion in erroneous uses.
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50 Erroneous uses are rarer with adult bilinguals. For instance, adult French-German
51 bilinguals generally avoid erroneous uses in French if their French proficiency is very high
52 and French their stronger language. If it is not, then they do produce erroneous adjective
53 placement in French though the errors are restricted to certain specific contexts only (see
54 Kupisch et al., 2013). This is not surprising. Bilinguals can indeed perform like monolinguals
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3 in their respective languages on certain occasions, especially if they are required to use only
4 one of their languages in experiments and observations in which they are highly proficient
5 (see again Kupisch et al., 2013). Highly proficient bilinguals can control their outputs better
6 and know exactly when common ground can or cannot be made (see the **Discussion** section
7 for further details).
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9 Syntactic priming studies with bilinguals (Hartsuiker et al., 2001; Hartsuiker &
10 Pickering, 2008; Loebell & Bock, 2003) provide evidence that bilinguals are aware of what is
11 or is not shared across two grammars. Processing in one language has been shown to have an
12 effect on processing syntactically similar sentences in the other. Traxler (2012) explains that
13 reactivating the same syntactic structure representation is easier than activating an entirely
14 new representation (see also Tooley et al., 2009; Traxler, 2008; Weber & Indefrey, 2009).
15 However, this sharing appears to be sensitive to the consistency in the order of elements in a
16 sentence. German and English passives do not appear to prime one another because the
17 passive verb in German appears at the end of the clause while in English it is typically at the
18 beginning of the verb phrase following the auxiliary (Loebell & Bock, 2003). On the other
19 hand, German and English double object/prepositional datives do prime one another because
20 they have the same types of words in the same order in both languages. Thus, the bilingual
21 mind seems to “know” what is and what is not shared when it comes to the common ground in
22 word order processing.
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25 These psycholinguistic priming studies help us to understand what happens when word
26 orders are complete mirror image opposites of one another. Maximizing common ground is
27 almost impossible in these cases, for instance when one language is English, rigorously SVO
28 and head-initial and the other is Japanese, SOV and head-final. Bilingual speakers of these
29 languages do not maximize common ground, even in the early stages of second language
30 acquisition when their respective language proficiencies are unbalanced.⁷ However,
31 diachronically we know that things can happen that lead precisely to the making of common
32 ground even in this extreme case, namely under conditions of intense language contact and
33 social influence. If a language does not have a ready grammatical construction that is the
34 direct or unambiguous counterpart of a construction in the other language, it can generally
35 come up with one. There is generally some pattern, no matter how minor or obscure in every
36 language, that can serve as a match for a major pattern in another language, or else there are
37 lexical resources that can be recruited to capture the meaning in question. Heine & Kuteva
38 (2005) cite a number of case studies of this type from their research on historical language
39 change to illustrate this point. In New Guinea there have been widespread shifts from VO in
40 the coastal Austronesian languages to the OV of the indigenous New Guinea languages (Ross,
41 1996, 2001). The reverse shift from OV to VO can be seen among Uto-Aztecan languages like
42 Nahuatl in contact with VO Mesoamerican languages (Gast, 2007), see Hawkins (2014, p. 85-
43 89 for general discussion). Heine and Kuteva (2005) point out that a minor word order in one
44 language can be generalized into a major pattern to match the other language. Similarly,
45 Polinsky (1995, p. 108) reports that in two strict SOV languages, Tamil and Kabardian spoken
46 by heritage speakers in America, “there seems to be a variation between SVO and SOV,
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52 ⁷ Ungrammatical outputs in VP word order are costlier to understanding than those in NP word order since they
53 impact the communication of the whole message more severely (see Filipović & Hawkins, 2013 for details). NP
54 word order errors are reported for both children (Nicoladis, 2006; Yip & Matthews, 2007) and adults with one
55 stronger language (Kupisch et al., 2013), though adult bilinguals exhibit ungrammaticality in the NP word order
56 in more restricted contexts (Kupisch et al., 2013) than children (Yip & Matthews, 2007).
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3 which in itself is an indication that the verb-final order is weakening” (ibid.). Maximizing
4 common ground in bilingual usage has become a pathway for major language change under
5 language contact in these cases.
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8 *Maximizing common ground for grammatical and lexical meanings*
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10 As with the grammatical forms discussed in the previous section, form-meaning mappings and
11 distinctions that are regularly made in one language but not the other can be introduced by
12 bilinguals from one into the other. Alternatively, one of the languages in bilingual usage can
13 “lose” relevant semantic distinction in order to align better with the other language. At the
14 lexical level, we find evidence for both addition and loss of distinctions so that both languages
15 either end up with the same distinctions or else neither has them because the one that had
16 them lost them in order to maximize common ground.
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18 For instance, we find that evidentiality in an L1a like Turkish, which makes regular
19 grammatical distinctions between statements depending on their source and reliability and on
20 the speaker’s confidence in their truth, can be expressed using more general constructions and
21 lexical items that are present in L1b (e.g. English). This can be done in different ways, e.g. by
22 prefacing statements with “it seems that ...” or “it may be that...” or by using certain modal
23 verbs and constructions with much greater frequency (e.g. *may have been*) or by adding
24 adverbials such as “apparently” etc. A bilingual speaker might use multiple strategies on
25 different occasions or just stick to a single strategy. Heine and Kuteva (2005, p.73-74) give an
26 example of Tariana-Portuguese bilinguals. Tariana is a North Arawak language of northwest
27 Amazonia that has an obligatory paradigm for tense and evidentiality marking. Tariana
28 speakers all use Portuguese, the official language of Brazil, as a lingua franca. Heine &
29 Kuteva point out that Tariana speakers tend to replicate their evidentiality system when
30 speaking Portuguese “using them more frequently and developing them into what appear to be
31 incipient categories for which there is no equivalent in Standard Portuguese” (Heine &
32 Kuteva, 2005, p. 73). Aikenvald (2002, p. 315-316) provides examples from Tariana
33 Portuguese showing how evidentiality marking is proceeding from being an incipient category
34 to becoming a full category. Slobin (2016) reports that the introduction of evidentiality from
35 Turkish into English is driven by recency effects. In our terms, maximizing common ground
36 by extending English usage in this way is particularly common after a holiday to Turkey or
37 after a trip to a place where use of both languages was constant and intense. Maximize
38 Common Ground operates here, along with Maximize Efficiency in Communication, to create
39 a common and efficient set of grammatical and lexical representations for the two languages
40 in the bilingual mind which can serve as a basis for “thinking for speaking” (to use Slobin’s
41 term). This makes possible similar encoding strategies in the production of both languages,
42 and whatever extra processing effort is then required in the language (here English) that adds
43 extra evidential distinctions that would not normally be expressed by monolinguals is offset
44 by the greater advantages of making the common ground. MCG operates constantly to
45 reconcile the grammatical and lexical representations of two whole languages and finding and
46 maximizing their common ground makes for more efficient mental representations of both.
47 Thinking for speaking then becomes more efficient for bilinguals, since only one common
48 system needs to be accessed and produced. The result is plausibly less processing effort
49 overall, and greater efficiency, even when it leads to the expression of some non-obligatory
50 forms that require additional processing effort on specific occasions.
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Putting this in terms of our CASP model of cooperating and competing principles, Maximize Common Ground, Maximize Efficiency in (Bilingual) Communication and Minimize Processing Effort all work together to encourage shared mental representations and shared thinking for speaking among bilinguals. These principles confer general benefits for bilingual storage and usage, and evidential marking then becomes favored in a system where it would not normally be used by English monolinguals. The processing effort required for this particular structure (and other non-obligatory form-meaning mappings like it) is clearly trumped by the general efficiency advantages afforded by the other principles, including Minimize Processing Effort. The extent to which common ground will be made in cases such as this depends again on the specific internal and external factors which we lay out in the **Discussion** section, but the key claim is that a range of possible outputs is predicted in our model. Bilinguals exhibit this common ground behavior to different degrees based on their circumstances. The fact that they make common ground at all when they do not have to (when speaking a language without the relevant obligatory distinctions) indicates that habitual bilingual language use favours the common ground pattern.

There are many further examples in the literature of bilinguals adjusting their form-meaning mappings and distinctions from one language to another. This has been observed among Spanish-English bilinguals who introduce a clear-cut distinction between intentional and non-intentional constructions into English in order to capture an important meaning difference that is regularly made in Spanish. Spanish has two different constructions, one for intentional events, *(Ella) rompió la botella* (“She broke the bottle”) and the other for non-intentional events, *Se le rompió la botella* (“It happened to her that her bottle broke”). They are used consistently to map onto the two different event types by monolingual Spanish speakers and by bilinguals who have either nearly equal proficiency in both languages (Filipović, under review) or stronger proficiency in Spanish than in English (Filipović, 2018). English monolinguals as well as English L1/Spanish L2 bilinguals do not draw these distinctions consistently and they use constructions that are ambiguous (e.g. *She broke the glass* - on purpose or not?) or underspecified constructions (*The glass broke* - no information on agency or intentionality). Note that in English both *She broke the glass* and *The glass broke* can be used in descriptions of either event type (intentional or non-intentional). English speakers may assign less intentionality to the inchoative construction *The bottle broke* than to *She broke the bottle* but inchoative constructions are still used by native speakers to describe stimuli that depict intentional events (as in *She crushed the plastic cup and it broke*) in the same way that SVO constructions can be used for non-intentional events (*The woman knocked the bottle off the table*, see Filipović, 2013, 2018 for details).

As in the case of grammatical forms, bilinguals can make common ground by using the pattern that is applicable in both languages. In a study of caused motion lexicalization in English and French, Engemann et al. (2012) point out that the verbalizations of bilinguals differ significantly from those of monolinguals. Namely, bilinguals overuse cross-linguistically overlapping patterns, in this case the common strategies available to both English and French for describing caused motion events, which in this case is the English-style “manner verb + direction particle” pattern as in: *X pulls the case to the bottom* = *X tire la valise jusqu'en la bas* (see Engemann et al., 2012 for details).

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3 Therefore, the patterns that work in both languages seem to be reinforced. This finding is
4 confirmed in numerous other studies in various domains in addition to that of motion events,
5 e.g. Muller & Hulk, 2001; Nicol et al., 2001; Lai et al., 2014, Filipović, 2011; Flecken, 2010;
6 Torbio, 2004. The findings from these studies all support Maximize Common Ground in our
7 terms and interestingly its effects can be seen not only in preferred language usage, but in
8 bilingual event encoding and memory as well, indicating more generally that grammatical and
9 lexical representations strive for common ground in the bilingual mind. Filipović (2011) has
10 shown that regardless of whether L1a or L1b is the stronger language, the pattern for motion
11 lexicalization that is shared by speakers of both languages is the one that guides their behavior
12 in experiments and also their memory for motion events. Bilinguals in this study used the
13 Spanish pattern (“*salió corriendo*” = “*exited running*”) and not the English one (“ran out”)
14 both for encoding in production and as an aid for memory regardless of which language they
15 were speaking during the experiment (i.e. English or Spanish). Clearly these bilinguals were
16 maximizing common ground because it is the Spanish pattern that is licensed in both
17 languages while the English pattern is blocked in Spanish (see Talmy, 1985; Slobin, 1996;
18 1997, 2003; Filipović, 2007, 2008).

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21 Similar patterns stemming from MCG are found in bilingual lexical categorization and
22 lexical use whereby bilingual outputs have often been observed to illustrate a kind of “in-
23 between performance” in comparison to the outputs of monolingual populations. These
24 outcomes are usually termed “convergence”. For example, Ameel et al. (2005) have shown
25 that if one language uses a general term when the other prefers to make more fine-tuned
26 distinctions, the most common specific term will be extended in the direction of the general
27 term in the other language, thus making the mapping from words to concepts more similar in
28 online language use. Thus, while the referents of Dutch *fles* are typically differentiated by
29 French monolinguals into *bouteille* (larger bottle) and *flacon* (smaller bottle), Dutch–French
30 bilinguals assign most bottles to the category *bouteille* in French and only a few to the
31 category *flacon*. Pavlenko (2014) states that it may be language dominance in Dutch that
32 drives this outcome. Similar findings have been reported by Pavlenko and Malt (2011) in the
33 naming of kitchen objects in English and Russian whereby the English L2 affects the
34 categorization in Russian L1. Alfernik and Gullberg (2014) present related results with regard
35 to bilingual use of posture verbs in Dutch and French, where the more distinctive Dutch
36 categories become less so under the influence of a single category in French. This kind of
37 shared bilingual lexical categorization is driven by the Minimize Processing Effort principle
38 and by Maximize Efficiency in Communication in addition to Maximize Common Ground.
39 Processing effort is minimized by having a single and shared set of lexical categories, and the
40 resulting mental representations and their outputs in communication are more efficient since
41 one set of distinctions works for both languages. These principles may sometimes act against
42 Maximize Expressive Power in one of the languages because of the loss of distinctions that
43 monolinguals have at their disposal. But since more general terms like Dutch *fles* can always
44 be used for more specific types of bottles, the disadvantage of not drawing finer distinctions is
45 relatively weak and the advantages of Maximize Common Ground, Minimize Processing
46 Effort and Maximize Efficiency in Communication evidently prevail.

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What is the basic cause of these changes in the ways bilinguals recategorize objects
and events across different semantic systems? Alfernik and Gullberg (2014) note that different
approaches have been proposed in attempts to define the kinds of overlaps that are necessary
between meanings, such as closeness in conceptual space (Gathercole & Moawad, 2010),

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3 conceptual equivalence (Berthele, 2012), or rough translation equivalence (Ameel et al.,
4 2009). Alfernik and Gullberg (2014) also point out that such general descriptions do not say
5 much about the degree of change, for instance whether there is a slight shift in category
6 boundaries vs. a complete drop of a semantic feature, or about the precise type of change,
7 such as a shift in distributional frequencies of use vs. merging two categories into one.

8
9 A potential underlying principle has been proposed by Muysken (2000), who suggests
10 that “processing economy” is a possible force behind the move towards a more general system
11 (also voiced in Ameel et al., 2009). We suggest that it is processing efficiency rather than
12 processing economy that underlies this “uniformizing tendency” (Muysken, 2000, p.277), or
13 these cases of maximizing common ground as we call them here. As we explained in the
14 **General Principles** section, processing simplicity or economy is not always more efficient.
15 More complex and less economical structures for processing are sometimes more efficient,
16 e.g. when using *the man I talked to last night* instead of *he* as a referring expression, and also
17 plausibly when adding evidential distinctions to a language like English in bilingual
18 interactions with Turkish. Efficiency does not equal economy, therefore. Economy is only one
19 part of efficiency.
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22 Overall, “losing” distinctions in both languages in order to maximize common ground
23 is a less optimal alternative to gaining or adjusting meaning distinctions in one or the other
24 since it can lead to a loss in expressive power, and also to not sounding authentic in each
25 language. More severely it can lead to ungrammaticality. Some distinctions are easier to
26 “lose” than others, however. For instance, major word order differences cannot be swept
27 under the carpet, but bilingual speakers can avoid using certain grammatical structures that are
28 available in only one of their two languages (e.g. avoidance of Spanish-specific non-agentive
29 affective dative *se*-constructions by English learners of L2 Spanish; see Filipović, 2018).
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32 There are other types of situations where two patterns are equally available to
33 bilinguals. In such cases the preference can be driven by external factors (see further details in
34 the **Discussion** section), such as language dominance or the language of the environment in
35 which they live. An example of this can be seen in studies of the processing mechanisms that
36 are associated with grammatical representations in the different languages bilinguals use. In
37 syntactic processing, Dussias (2001, 2003) found that Spanish-English bilinguals use a single,
38 shared parsing mechanism (favored by the language of their living environment) for relative
39 clause attachment in sentences such as *the waiter shot the brother of the actress who was*
40 *standing on the balcony*. This is significant because different parsing preferences have been
41 observed in monolingual populations (high attachment in Spanish (i.e. to the noun *brother*) vs.
42 a low attachment preference in English, i.e. to the noun *actress*). All these outcomes are
43 compatible with our model. It is more efficient to use one and the same syntactic processing
44 mechanism (regardless of which one in the case of syntactic attachment, because both can
45 succeed in resolving ambiguities through a default preference) rather than having to
46 constantly switch between them, especially when both are available in different parts of the
47 processing system.
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52 **Discussion: Variability and adjustability in bilingual learning and use**

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54 The principles we have put forward are modulated by both **internal and external factors**.
55 Internal factors include age of acquisition, proficiency, learning environment, type of input,
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3 frequency of use, which can all sway our predictions in different ways and make bilingual
4 outputs *variable* (see especially Jarvis & Pavlenko, 2008 for detailed discussion of a number
5 of these factors). External factors are driven by the inherently *adjustable* nature of bilingual
6 linguistic behavior, which depends on the interlocutor types involved (i.e. who bilinguals are
7 talking to) or the type of communicative situation a bilingual is involved in (e.g. formal vs.
8 informal; see Dewaele, 2001). For instance, the same bilingual speaker will produce different
9 outputs when talking to another bilingual speaker of the same two languages compared to
10 communicating with a monolingual of one of the two languages (see also discussion in
11 Muysken, 2013, p.714 on different factors that impact outputs in language contact situations).

12
13 We have put forward a CASP model for Bilingualism with the initial premise that both
14 languages in the bilingual mind are readily available and accessible in any given
15 communicative situation. This assumption is supported by substantial evidence from
16 contemporary research on bilingualism, whereby both comprehension and production studies
17 have shown that bilinguals (highly proficient and second language learners) “activate
18 information about both languages when using one language alone” (Kroll & Bialystok, 2013,
19 p. 497). Our focus has been on the *logically possible outcomes when multiple linguistic*
20 *options are each “vying for supremacy” on-line*. We discussed the empirical manifestations
21 of the competition and collaboration among principles in our model. We have noted
22 repeatedly that the reported outcomes and the ways in which the principles operate seem to
23 vary across the different situations that involve different kinds of bilingual speakers and
24 different circumstances in which they interact. We believe, and we propose here, that the same
25 principles still apply in all bilingual language processing, except that the degree to which they
26 are active is **modulated by a) the linguistic profile of our bilingual speaker** (which is
27 variable; bilinguals have different backgrounds and competencies) **and b) who our bilingual**
28 **is talking to** (and bilinguals adjust to the situation as best they can depending on their
29 linguistic profile). In the terminology of this paper, we need to consider bilingualism both
30 *within and across minds*. Long-term language change is also crucially dependent on these two
31 factors because, for example, when certain types of bilinguals, e.g. L2 users interact with
32 monolingual speakers of the bilinguals’ L2 and crucially, if the bilinguals outnumber the
33 monolingual speakers in a community, then the monolinguals’ language may change under
34 the influence of those that speak it as an L2 (see Trudgill, 2011).

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36 Our model can readily accommodate and incorporate internal factors such as relative
37 language proficiency in each language, and it does so in the definition of MCG above (see
38 (Eiii) within the principle *E: Maximize Common Ground*). Proficient bilinguals are expected
39 to make greater and more accurate maximization of the common ground because they have
40 more (unconscious) knowledge of what is shared and grammatical in both languages. In less
41 proficient bilinguals, such as L2 learners, exposure to and knowledge of the L2 is still
42 incomplete and so the full potential of this principle may not yet be realized and thus the
43 efficiency benefits deriving from it may not be there yet either. Some bilingual speakers can
44 still try to maximize common ground even though it can lead to ungrammaticality and
45 communication breakdown because their language proficiency is uneven. Perhaps with
46 explicit instruction that raises awareness about the typological similarities and differences
47 between languages the beneficial processing strategies for L2 learners can be enhanced (see
48 Filipović, 2018 for discussion). The best pedagogy for second language teaching is one of the
49 applications of our model that merits future research. Our model also makes predictions for
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3 different outcomes in balanced vs. unbalanced bilinguals that can be tested
4 psycholinguistically (see below).

5 External factors such as who the bilingual is talking to and with what purpose also
6 affect how our principles operate. For instance, we expect fewer instances in which Maximize
7 Common Ground is active when our bilingual is talking to a monolingual, and more instances
8 when he or she is talking to two monolinguals in the two different languages. The profile of
9 the communicative situation can also affect the outputs, as Dewaele (2001) has pointed out. A
10 more formal situation can result in fewer instances of common ground than an informal one
11 since the output monitor (see de Groot, 2011) may be on a higher alert in the former rather
12 than the latter. Finally, these situation-driven outputs are also compounded by the internal
13 factors of relative proficiency: bilinguals with balanced proficiency in both languages can be
14 more successful in output monitoring than those whose proficiency in both languages is
15 unbalanced.
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18 The construct of *language mode* is of special interest in this context because it
19 captures the need to acknowledge that bilinguals' performance varies depending on the
20 communicative situation they are in. Language mode was first proposed and defined by
21 Grosjean (2001) as "the state of activation of the bilingual's language and language
22 processing mechanism", and it can be affected by a number of different factors. It is important
23 to note again that proficiency plays a role when it comes to the level of control that can be
24 exercised over language mode. Bilinguals who are highly dominant in one language may
25 simply not be able to control language mode in the same way as balanced bilinguals.
26 Although they may deactivate their stronger (L1) language in a monolingual environment that
27 requires them to use only their weaker (L2) language, their L2 language may simply not be
28 active or developed enough to allow them to stay in a monolingual mode (Grosjean, 2001, p.
29 21).
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32 There has been some criticism addressed at the notion of language mode and how to
33 determine it, and more importantly, a question has been raised of whether it is the fluctuating
34 language mode that is in charge of variation in bilingual linguistic behavior or something else,
35 for example a kind of *conscious output monitor* that regulates the output rather than language
36 mode per se (see de Groot 2011, p. 288, and also page 290 on the circularity of language
37 mode argumentation).⁸ As Dewaele (2001) has shown, students in a bilingual language mode
38 can show very different language behavior (including code-switching types and instances)
39 depending on the current communicative context (e.g. formal vs. informal). Green and Wei
40 (2014) have thrown light on the role of cognitive control processes (CPs) in different types of
41 bilingual code-switching. It remains to be seen whether the adaptability concerns fluctuations
42 in the degree of activation of the bilingual's two language subsets or fluctuation in the
43 attentiveness of a mental monitor that watches over the output of the language system. In
44 either event, our CASP for Bilingualism Model is compatible with both options. In fact, the
45 two theoretical positions (mode fluctuation vs. mental monitor fluctuations) need not
46 necessarily be viewed as diametrically opposed. Whichever mechanism is responsible for the
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52 ⁸ The monitor need not be purely linguistic, but rather the one that is in charge of cognitive control in general.
53 Namely, bilingualism has been demonstrated to afford advantages in executive control across the board (e.g. in
54 working memory and inhibition; see further discussion in the section on cognitive consequences of bilingualism,
55 further down in this chapter). Even if the languages are typologically close, such as two different dialects, the
56 advantages across the executive control system is evident (see Antoniu et al., 2016).
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3 control over bilingual output, the fact remains that bilingual outputs will depend on the
4 specifics of the communicative situation (e.g. formal vs. informal) and interlocutor profile
5 (e.g. monolingual vs. bilingual).
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7 It is important to point out that what we are talking about here goes beyond saying that
8 speakers are in different language modes (Grosjean, 2001) when they communicate in
9 different situations. Our bilingual speaker can be in a bilingual mode when he is interpreting
10 in a formal context, speaking to two monolinguals in each language in an informal context,
11 when speaking to a relatively incompetent L2 speaker, when speaking a weaker language if
12 proficiency is uneven, and when speaking to bilinguals in the same languages. All these
13 situations may result in different outputs even though the mode is always characterized as
14 bilingual. We need to capture more fine-grained distinctions here that stem from our key
15 factor: adjustability. Who are our bilinguals interacting with and adjusting their outputs to?
16

17 We must also refer in this context to Communication Accommodation Theory,
18 developed by Howard Giles in the 1970s. The basic idea behind this theory is that people
19 change their behavior in order to attune their communication to their partner. This theory is
20 grounded in social psychology and social identity theory (see Giles & Smith, 1979 for
21 details). While this approach to the study of communication addresses a wider set of issues
22 that concern communication in general and not bilingualism specifically, we must draw a
23 parallel between some of the notions from this framework that bear relevance to our model.
24 Namely, speakers can employ “strategies of convergence” whereby individuals adapt to each
25 other’s communicative behaviors to reduce social differences. In contrast, “strategies of
26 divergence” are employed when individuals accentuate speech and non-verbal differences
27 between themselves and their interlocutors (Giles, Coupland & Coupland, 1991). Too much
28 convergence can lead to over-accommodating that can be interpreted as condescending. This
29 theory has been applied to the study of communication between native and non-native
30 language speakers in second language acquisition (Zuengler, 1991). Interestingly, native
31 speakers have been found to engage in so-called “foreigner talk” when interacting with second
32 language learners, adjusting their language by adopting features such as slower speech rates,
33 shorter and simpler sentences, greater pronunciation articulation etc. (Zuengler, 1991).
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36 There is a parallel here with what bilinguals do when engaging with different
37 interlocutors. For instance, they may code-switch more when talking to another bilingual of
38 the same two languages than when speaking to a monolingual. By the same token, their code-
39 switching may be more controlled when talking to other bilinguals on a formal occasion
40 compared to informal communicative situations. The conscious output monitor (de Groot
41 2011) mentioned earlier may guide this accommodation to the specifics of the communicative
42 situation. Our model captures this adjustability of bilinguals and explains how it may depend
43 on factors of variability in individual speakers (such as proficiency in each language), which
44 together determine which of the possible outputs predicted by our model will materialize.
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47 We also need to account for some monolingual-like performances by bilinguals. These
48 can occur *when a bilingual is talking to a monolingual in one of the two languages*.
49 Monolingual-like performance is also documented in some psycholinguistic studies. This
50 outcome can be due to the fact that bilinguals are kept in monolingual mode (e.g. Kousta et
51 al., 2008) or when access to one of the two languages is disabled in the experiment (e.g.
52 Athanasopolous et al., 2015) or when the proficiency is higher in one of the two languages.
53 Monolingual-like performances are one extreme of our cline, modulated by both internal
54 factors such as proficiency and external factors such as whether or not there is a need to keep
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3 both languages constantly active and accessible throughout the communicative situation. The
4 other extreme of the cline is making common ground excessively even when this is not
5 grammatically licensed in one of the two languages, which is more characteristic of SLA
6 outputs. The outputs at either end of the cline are also in line with our principles, modulated
7 again by the same individual factors and depending on who the bilingual is talking to. The
8 most proficient bilinguals will also be the most efficient: they know when and how best to
9 make common ground with the least required learning and processing effort while achieving
10 maximum expressive power fit for the specific communicative goals. They will have
11 overcome any falsely perceived language distance (see Kellerman's (1986) psychotypology
12 discussion) and they will also not make ungrammatical attempts at making common ground,
13 although some lexical or pragmatic usage conventions may not be adhered to (e.g. through the
14 overuse of more marked and less frequent patterns in one of the two languages due to habitual
15 bilingual use). CASP can help us make concrete predictions here. For example, Maximize
16 Efficiency and Minimize Processing Effort would go against Maximize Common Ground and
17 Maximize Expressive Power when a proficient bilingual is involved in a monolingual
18 communicative situation and we can therefore expect fewer instances of common ground than
19 in a situation when both languages are active to a similar degree.
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23 Whether and how bilingualism affects other cognitive functions still awaits a holistic
24 scientific account though some evidence is emerging about how bilingualism affects memory
25 for events (e.g. Filipović, 2011, 2013a, 2018) and categorization (e.g. Lai et al., 2014) as well
26 as overall benefits for executive function (see Kroll & Bialystok, 2013, for a focused
27 overview). What kinds of benefits are possible and realized may vary in different cognitive
28 domains, language combinations and individual bilingual characteristics. These questions can
29 all be investigated in the context of the CASP for Bilingualism model.
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31 Finally, we must address a critical question that arises for all multi-factor models,
32 including the one we are proposing here, and involving their overall power and the
33 falsifiability of their predictions. When numerous factors and principles are proposed, there is
34 a danger that at least one of them can be found to account for any set of bilingual data, making
35 the overall predictions vacuous. We are mindful of this danger. However, we believe that any
36 successful model of bilingualism must be a multi-factor one, and we can show further that our
37 model is readily falsifiable.
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39 The problem with most theoretical work in the field hitherto is that it has not been
40 general enough, and has focused on either social or psychological aspects of bilingualism, on
41 poor versus good proficiency, on some linguistic levels rather than others, e.g. lexical vs.
42 syntactic, often ignoring crucial typological differences between languages, whose potential
43 for common ground is vastly different for different pairs of languages, and which interact in
44 different ways with the social and proficiency factors of the overall model. We believe that
45 the field is full of invaluable data and case studies and insights, but they need to be brought
46 together into a more general and more complete context, and this is what CASP is trying to
47 do. The model has to be general and multi-factor, therefore, and we think it is right to err on
48 the side of power, if need be, in order to capture the multifaceted phenomena at hand.
49

50 So how then do we ensure falsifiability? It is indeed possible for a multifactor model
51 to make constrained and falsifiable predictions. The crucial requirement is that we clearly
52 *delimit the relevant factors and principles that apply in any given empirical domain*. So, if a
53 pair of languages is such that common ground in their word orders can be created without
54 offending a grammatical constraint in one or the other language (recall the adjective ordering
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3 data among French-English bilinguals discussed above and taken from Nicoladis, 2006), then
4 we predict that common ground will be maximized, whereas overriding a grammatical
5 constraint (leading to language change) requires other relevant factors of a social or
6 proficiency nature to be considered as well. More generally, if our bilinguals are interacting
7 with other bilinguals, or with monolinguals, or in one language mode vs. another, then the
8 relevant social factors (and their independently established general consequences for
9 bilingualism) are invoked, in conjunction with the grammatical contrasts in question, to make
10 one set of predictions rather than another.

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12 Similarly, if proficiency in one language is low rather than high, then Maximize
13 Common Ground and the other CASP principles predict different outcomes. In short, it is
14 crucial to identify that subset of factors from the multi-factor model that makes predictions for
15 the case at hand, and to assess how they work together. Sometimes one factor will not
16 interfere with the predictions of another. Sometimes it will. Sometimes they will co-operate
17 and pull in the same direction, sometimes they will compete. Having multiple factors to
18 consider does not make the overall predictions easy, therefore, but it does not make them
19 impossible, as long as we delimit the empirical domain of applicability for each factor and its
20 expected consequences. In any case, we have no choice. Any adequate model of bilingualism
21 must be a multi-factor one.

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23 The reader is referred to Hawkins (2014, ch.9) for general discussion of co-operation
24 and competition among multiple factors in a grammatical and language processing context, to
25 Filipovic & Hawkins (2013) for detailed illustration of the interaction among multiple factors
26 in an SLA context, and to the many papers on grammar, processing and learning in the
27 competing motivations volume edited by MacWhinney, Malchukov and Moravcsik (2014).
28 The same issue of the relevance of different factors in any given domain, their relative
29 strength and their co-operation or competition, arises in all of these studies.

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31 For example, if we look at typological predictions for the ordering of relative clauses
32 and head nouns across languages, two of Hawkins' (2014) principles (Minimize Domains and
33 Maximize Online Processing) work together to predict that head-initial languages (like
34 English) will have only post-nominal relatives. This prediction is straightforwardly falsifiable.
35 For head-final languages these principles compete, on the other hand, and are compatible with
36 both pre-nominal and post-nominal relative clauses. But a prediction is still made, despite the
37 competition. Specifically, pre-nominal relatives are predicted in proportion to how strictly and
38 rigidly head-final the language is (like Japanese with its obligatory verb-final rule in clauses),
39 i.e. this is a gradient prediction. Thus, if we discover more pre-nominal relatives in non-rigid
40 head-final languages than in rigid head-final ones, this is a clear counter-example and
41 the prediction has been falsified. This illustrates how multi-factor models make falsifiable
42 predictions, as long as we delimit the relevant domain of their applicability (to e.g. head-initial
43 vs head-final languages, rigid vs non-rigid head-final ones, etc.), and clarify the nature and
44 strength of the prediction (e.g. we have an absolute prediction for head-initial languages vs. a
45 gradient one for head-final ones).

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47 Similar reasoning applies to the CASP Model for Bilingualism. Since there is a lot of
48 possible variation we need to *first restrict the relevant universe of applicability*, as we
49 suggested above, namely we need to state what the languages are, who is talking to whom
50 (and why), and with what level of proficiency. It is then that we can start to make falsifiable
51 predictions and these predictions will be relative to the grammatical, social and
52 psycholinguistic universe to which they apply and within which they work together, possibly
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constraining each other or not, as the case may be. For instance, English-Turkish bilinguals equally competent in both languages who use both languages in their daily life and work are more likely to express evidentiality in both English (lexically) and Turkish (grammatically), as we discussed in the previous section. This is the most efficient way to be communication-ready in both languages, by making common ground and being able to express all meanings in both languages. If they use one language more than the other habitually, or when they are speaking to a monolingual, this impacts the extent to which common ground is made (e.g. when speaking English only to an English monolingual there will be no consistent lexical expression of evidentiality).

Conclusions and further research

In this paper we have introduced a new multi-factor model, CASP for Bilingualism. As indicated by the name of the model, it assumes that the principles underlying bilingual language behavior reflect a complex adaptive system whereby a number of factors interact in competition or in collaboration. The general principles of CASP for Bilingualism define the mechanisms that characterize language learning, usage and grammar by bilinguals, which can then be modulated by the specific circumstances of the bilingual individual (their respective levels of proficiency, acquisition histories and frequencies of using one or the other language) as well as by the specific features of a communicative situation (e.g. bilingual speaking to other bilinguals, one monolingual or two monolinguals, one in each language). Crucially, as we point out, all bilingual behavior can be described and explained as the consequence of an interaction among general processing and learning principles that are adaptable depending on the internal and external factors that we outline in the **Discussion** section. These general principles are the underlying driving force of the model, operating at all times, sometimes collaborating, sometimes competing. They apply to all instances of bilingual linguistic behavior, though the degree to which they are manifested varies based on the internal and external factors.

This model creates a common platform for the study of bilingualism that does not describe the same or similar outcomes by different names just because different bilingual participants are involved. In fact, it makes it possible to study bilingualism as the cline that it actually is. For instance, we expect to see the same tendencies in the linguistic outputs of both more and less proficient bilinguals, namely those driven by the general principle of Maximize Common Ground. The degree of success may vary (less proficient bilinguals may produce more ungrammatical outputs than more proficient ones in their attempts to stretch the common ground beyond the limits of grammaticality), but the underlying processing mechanism remains the same for both populations.

Finally, we can explain different outcomes in a wide variety of bilingualism research strands, both psycholinguistic and sociolinguistic, and make the desired connections between the various processes within and across bilingual minds that affect language production. We can also explain other aspects of bilinguals' linguistic behavior, such as the relationship between language and memory and historical language change on a wider scale. We make predictions about future developments and the linguistic, psychological and social conditions that underlie different outcomes. For instance, we can calculate which of the possible bilingual outputs is more likely to occur based on its relative efficiency in comparison with

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3 other options, and then assess how individual or social circumstances may encourage or
4 discourage the preferred option in the output. The research realm of code-switching and also
5 historical language change can both further inform, and benefit from, applications of the
6 CASP Model. Outputs in bilingual interactions are conditioned by the dynamic, complex and
7 adaptive relationships among *general language processing principles and the specific*
8 *characteristics of communicative situations based on who speaks in which language to whom*
9 *and why*. From a long-term perspective, these relationships are also the determinants of the
10 directions in which languages in contact evolve. CASP for Bilingualism can help us test,
11 predict and explain more vs. less likely outcomes.
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13 It is our hope that other investigators, regardless of theoretical persuasion, will find
14 CASP for Bilingualism useful as a framework for developing and testing their ideas and for
15 contributing to our knowledge about bilingualism.
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20
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