that have proved useful in more established disciplines (where the volume of research output is larger by several orders of magnitude).

Aside from its use in assessing productivity and influence/impact, citation analysis can serve other purposes, such as analyzing INTERDISCIPLINARITY by categorizing citations depending on the disciplines to which cited authors and works belong (Gile 2006). It is also possible to identify the relative weight of different types of research in a discipline by categorizing publications as referring to concepts, ideas and opinions versus research methodology and findings from empirical research (Gile 2005a).

DANIEL GILE

## BILINGUALISM

→ BILINGUALISM, SOCIETAL

Bilingualism refers to the co-existence of two languages within an individual (implying that a person speaks two languages) or within a society. Studies on individual bilingualism and societal bilingualism tend, on the whole, to fall within two distinct domains: psycholinguistics and sociolinguistics, respectively. However, the two phenomena are closely interrelated, and both are of obvious relevance to INTERPRETING, albeit in different ways. Whereas bilingualism in the individual (as discussed below) is the sine qua non for the act of interpreting, the co-existence of two (or more) language groups in a society both generates interpreting needs and variously shapes the acquisition and use of one or more additional languages.



The study of individual bilingualism, viewed as a subfield of psycholinguistics, focuses on the cognitive and neural mechanisms, processes and knowledge structures that enable the acquisition and use of two (or more) languages. As there are many factors influencing second-language (L2) acquisition, and different parameters of proficiency, bilinguals are not a homogeneous group. Rather, they can be classified according to multiple dimensions, such as their relative FLUENCY in the two languages, their functional ability in the two languages, and the age at which L2 was acquired (see Butler 2013). These dimensions lead, respectively, to a differentiation between 'balanced' and 'dominant' (or 'unbalanced') bilinguals (with equal proficiency in L1 and L2 vs. lower proficiency in L2 than in L1); between receptive and productive bilinguals (with the ability to understand L2 but not to produce it vs. the ability to both understand and produce L2); and between 'simultaneous', 'early sequential', and 'late' bilinguals (exposed to both languages from birth vs. not from birth but still at an early age, after some L1 acquisition has already taken place vs. first exposed to L2 later in life, after having completed L1 acquisition). To meet the requirements of interpreting, interpreters must be productive and (close to) balanced bilinguals, but they may be simultaneous, early sequential, or late bilinguals, because all ages of first exposure to two languages may ultimately lead to balanced bilingualism with a high level of proficiency in both languages. Though there is widespread consensus in INTERPRETING STUDIES that bilingualism is a necessary, but not a sufficient condition for performing as an interpreter, the notion of NATURAL TRANSLATION/INTERPRETING points to the fact that all bilinguals, without any special training, have some ability to translate (Harris 1976).

A persistent finding in bilingualism research is that both languages are always activated to at least some extent, not only when bilinguals perform some translational task but also when they are communicating in a monolingual setting and intend to use only one language. A substantial part of the relevant evidence comes from studies in which word recognition and word production in bilinguals is examined. These have shown that during word recognition

the presented word activates in MEMORY not only the corresponding lexical representation, but also the representations of words with similar forms in both the selected and the non-selected language (e.g. Grainger & Dijkstra 1992). Similarly, during word production an activated lexical concept triggers the associated lexical representations in both languages (e.g. Hermans et al. 1998). This phenomenon raises the question of how bilinguals manage language control – that is, how they make sure that, when one language has been selected for use in production, the other language does not constantly interfere in the form of unintentional code-switches. This issue constitutes a focus of bilingualism research that is especially relevant to SIMULTANEOUS INTERPRETING (SI), where both languages must continuously be available at the same time. Several theoretical proposals have been advanced (see de Groot 2011, Ch. 6), three of which have considered the special case of language control in SI.

### *Theories of language control*

The language-mode theory proposed by Grosjean (1997, 2001) includes the assumption that activation of the two language subsystems (briefly called 'languages' by Grosjean) in bilingual memory can be adapted to the specific characteristics of the communicative context, so that the two languages become activated to different degrees. Grosjean assumes that the selected language (the 'base language') is always as highly activated as possible, but that the level of activation of the other language (the 'guest language') varies with the contextual circumstances. For instance, when conversing with monolingual speakers, bilinguals will be in a 'monolingual mode', wherein the guest language is deactivated as far as possible. In contrast, when their interlocutors are bilingual speakers of the same two languages, bilinguals may be in a 'bilingual mode', wherein the guest language too is highly activated (though less so than the base language). Intermediate language-mode states (i.e. in-between states of activation of the guest language) may also arise, depending upon various factors such as the conversational topic and the interlocutors' knowledge about one another's level of fluency in the two languages and language use preferences. According to these ideas, language maintenance in monolingual settings is secured by the monolingual mode in which the bilingual participants are operating in these situations.



Grosjean (2001) extended his language-mode theory to account for language control in SI. To the two language subsystems in the original model (which can be viewed as stores of linguistic units) he added two processing mechanisms per language, one dealing with input and the other with output. He assumed that during SI the two language subsystems are both highly, and equally, activated (in other words, they are in a bilingual mode), whereas activation across the four processing mechanisms varies. He supposed the two mechanisms for output processing to be in a monolingual mode, with maximal activation of the one for output in the target language and the highest possible degree of deactivation of the mechanism for processing source-language output. This set-up enables target-language production while preventing source-language production. In addition, Grosjean hypothesized that during SI the two mechanisms for input processing are in a bilingual mode. This enables processing of input not only in the source language (for purposes of COMPREHENSION) but also, at the same time, in the target language (for self-monitoring by the interpreter).

Grosjean's original idea of two language subsystems that can be activated and deactivated independently of one another and to varying degrees, depending on the language user's current needs and goals, is also central to the neurolinguistic theory of bilingualism developed by Paradis (1994, 2004). Paradis focuses on the individual linguistic items in the language subsystems and on what happens to them during language use, using neural terminology to describe the processes involved. In this account, a word is recognized or produced the

moment the amount of activation in its neural substrate surpasses a critical threshold. During language use the representation of a targeted item (e.g. a specific word) is activated by positive neural impulses, while at the same time the activation thresholds of competing items are raised so that these items become less available. Paradis furthermore assumes that neural impulses are less easily generated from an internal (mental) source than from an external stimulus. To enable not only comprehension (which results from external stimulation and is thus relatively easy) but also production (which comes from internally generated neural impulses and is thus more difficult), he additionally assumes that production requires lower threshold settings than comprehension. In other words, at a certain, relatively high, threshold setting, comprehension is still possible whereas production is not. Finally, Paradis assumes that a bilingual's intention to use one language but not the other has the effect that positive neural impulses are sent to all elements of the targeted language, while the activation thresholds of the elements of the other language are automatically raised to a high level.

To account for SI, where both the source and the target language must be readily available (to enable comprehension and production, respectively), Paradis (1994) assumes that the activation thresholds for both languages are set at a relatively low, though not equal, level. To prevent source-language elements from being output, the activation threshold of the source language is set higher than that of the target language. This relatively high threshold for the source language is thought to nevertheless allow comprehension, because external stimulation generates neural impulses relatively easily so that the critical threshold level will still be reached.

A third idea for explaining language control in SI divides each of a bilingual's two sub-lexicons (one for each language), into an input lexicon and an output lexicon. Christoffels and de Groot (2005) propose that during SI the resulting four subcomponents of the bilingual mental lexicon are activated to different degrees. Thus, the output lexicon of the source language is deactivated as far as possible (to prevent output in this language), while the source-language input lexicon and the target-language output lexicon are both highly activated, to enable comprehension and production, respectively. Finally, to enable output monitoring, the input lexicon of the target language is also activated, though presumably at less than the maximum level, given the assumption of greater excitability of elements in the input lexicons (see Paradis 2004).



### *Language control as executive control*

Several sources of evidence suggest that (a subset of) the mental devices regulating language control are not specific to language processing, but are domain-general mechanisms involved in the regulation of behavior of all sorts (often called 'executive control' or 'cognitive control'). One indication of this derives from bilingual studies that address a form of language control that is involved in all forms of translation: language switching. These studies have shown that when unbalanced bilinguals are forced to switch between their languages at unpredictable moments in word production tasks (e.g. picture naming), the switch cost (the difference in naming time between switch and no-switch trials) is larger for switching from the weaker to the dominant language than vice versa (e.g. Meuter & Allport 1999). This asymmetrical switch cost has been attributed to the workings of a control system that suppresses the elements of the language subsystem not requested on the current trial and does so proportionally to the strength of the two languages: a stronger language is suppressed to a greater extent than a weaker one. When a language switch is requested on the next trial, the previously suppressed language must be reactivated. The more strongly it was suppressed, the greater the effort required for its reactivation. That the control system in question is not specific to language

processing, but domain-general, is suggested by the finding that similar asymmetrical switch costs arise for switching between tasks (rather than languages) of unequal difficulty (e.g. between word reading and color naming).

Other evidence to suggest that language control is effected by a domain-general mental control system is the finding that bilinguals who speak both their languages daily outperform monolinguals on various nonverbal tasks that are known to involve the executive-control system – that is, the system regulating the planning and execution of behavior by means of various processes such as attending to relevant information, suppressing irrelevant information, monitoring and adjusting behavior (e.g. Bialystok 2009). If bilinguals exert control over their languages by involving their executive-control system, the implication is that they appeal to this system more often than monolinguals do, and consequently become particularly skilled in executive control.

A third body of evidence comes from neuropsychological studies showing that lesions in brain areas known to be involved in executive control result in failures to maintain a selected language. Depending upon the site of the lesion, this specific problem may manifest itself in alternating involuntarily between the languages in successive utterances, or in mixing languages within utterances. It appears that in the former case the afflicted brain areas are a frontal region in the left hemisphere called the dorsolateral prefrontal cortex and a region known as the anterior cingulate cortex, the frontal part of the cingulate cortex that encircles the corpus callosum (Fabbro et al. 2000). The lesion site associated with within-utterance mixing is the left caudate nucleus, a component of the basal ganglia that is located within the forebrain just below the white matter of the cortex (Abutalebi et al. 2000). Neuroimaging studies using hemodynamic signals (e.g. fMRI studies) have shown that these brain areas are core components of the domain-general executive-control network (e.g. Egner & Hirsch 2005). The fact that lesions in these areas are associated with involuntary language switching in bilinguals indicates that language maintenance is controlled by these same structures.



Finally, neuroimaging studies aimed at identifying brain activation patterns in healthy bilinguals performing tasks that require language control have shown that the activated areas are largely the same as those involved in executive-control tasks that do not probe bilingualism (see Hervais-Adelman et al. 2011).

### *Executive control and SI*

Language control in SI, requiring the fine-tuning of activation levels of multiple input and output lexicons or multiple language processing systems, is likely to tax the executive-control system more than language control in more mundane language use. At the same time, other task components of SI also appeal to the limited resources of the executive-control system. Components of SI that take up their share of the control system's limited capacity are (short-term) memory and coordination, responsible for the temporary storage of information and the coordination of all the separate components of SI, respectively. But because comprehension and production are not fully automatized, they will also draw on the executive-control system's limited resources. The consequence of all these competing demands on the interpreter's limited mental resources is that capacity 'saturation' may arise, and this may lead to breakdowns in performance, as hypothesized by Gile (1995a) in the framework of his EFFORT MODELS. To avoid this, sub-processes must be automatized and perhaps modified as compared with these same processes executed by non-interpreters; executive-control operations must run smoothly, and interpreting-specific processing routines that circumvent possible mental bottlenecks may be developed. In PSYCHOLINGUISTIC APPROACHES to studying SI, word recognition, word retrieval and memory processes are compared in simultaneous interpreters, non-interpreter

bilinguals and monolinguals to identify differences between these groups and to see how SI modifies its sub-processes. The awareness that language control may largely be handled by a domain-general executive-control system, and that the pressure on this system is extremely high in SI, has led some researchers to test whether simultaneous interpreters excel, even more than non-interpreter bilinguals by comparison with monolinguals, in nonverbal tasks known to involve executive control. Among the executive-control operations simultaneous interpreters have been found to be particularly good at are activities requiring mental flexibility, task switching, and psychomotor speed (Macnamara et al. 2011; Yudes et al. 2011), the neural foundations of which are being investigated in NEUROSCIENCE APPROACHES to research on SI.

ANNETTE M. B. DE GROOT

## BILINGUALISM, SOCIETAL

Unlike BILINGUALISM in the individual, as studied from cognitive and neurolinguistic vantage points, the co-existence of two languages within a society is approached from a broadly sociolinguistic perspective, with special regard for diverse relationships between different language communities as well as the use of more than one language in various social contexts. The relationship between individual and societal bilingualism (including situations of 'diglossia') is not causal or even necessary; rather, one can exist without the other (see Fishman 1967). Typically, though, the two dimensions of bilingualism are closely interrelated, and in turn there is a multifaceted relationship between bilingualism and interpreting as a social practice.

Societal bilingualism (or multilingualism) may arise in a number of ways when two (or more) distinct language communities come into contact. Throughout history, this would have been the case for different linguistic groups living in neighboring areas, or sharing a border, which facilitated the emergence of bilingual individuals able to serve as interpreters and facilitate interlingual communication. On a broader scale, social bilingualism has resulted from territorial conquest and colonization, with AFRICA as an egregious case in point. Often as a consequence, numerous countries, including AUSTRALIA and many states in the Americas, have linguistic minorities using INDIGENOUS LANGUAGES, with variable needs for interpreting (and translation). Where different language groups have formed a political union, they may co-exist more or less on an equal footing, as in the case of Belgium and CANADA or, on a supranational level, the European Union. It is in this type of constellation, as well as in the case of nations with indigenous language communities, that a national LANGUAGE POLICY is most likely to mandate the provision of interpreting (and translation) services, at least in such public domains as PARLIAMENTARY SETTINGS and legal institutions.

Aside from such historical and geopolitical developments, the most powerful drive toward bi- and multi-lingualism in modern societies has come from migration flows, with immigrants forming sub-communities often defined by language and culture. In this context, as in the case of indigenous and deaf communities, one of the languages involved can be defined as the dominant/societal language and the other as the minority language. A given language can be classified as dominant in one national context and as a minority language in another, minority languages being those that are used by subaltern or non-elite groups within a society (Niño-Murcia & Rothman 2009). Societies consequently assign different values to the various languages co-existing within them, which impacts on what is known as language choice by bilinguals. These values also influence policy decisions, and thus the type and extent of interpreting services offered. Such interpreting to meet intra-social communication needs, commonly referred to as COMMUNITY INTERPRETING or public service interpreting, is crucial to ensuring access to public services for minority-language users who do not speak