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What is special about L3 processing?*

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While research on third language (L3) and multilingualism has recently shown remarkable growth, the fundamental question of what makes trilingualism special compared to bilingualism, and indeed monolingualism, continues to be evaded. In this contribution we consider whether there is such a thing as a true monolingual, and if there is a difference between dialects, styles, registers and languages. While linguistic and psycholinguistic studies suggest differences in the processing of a third, compared to the first or second language, neurolinguistic research has shown that generally the same areas of the brain are activated during language use in proficient multilinguals. It is concluded that while from traditional linguistic and psycholinguistic perspectives there are grounds to differentiate monolingual, bilingual and multilingual processing, a more dynamic perspective on language processing in which development over time is the core issue, leads to a questioning of the notion of languages as separate entities in the brain.

Keywords: third language (L3), language processing, bilingualism, multilingualism

Introduction

While knowledge of multiple languages has for quite some time been subsumed under the header of bilingualism, the interest in multilingualism and third language (L3) acquisition has, in the last decade, developed into a subfield of its own, with dedicated journals, book series and conferences devoted to it. The assumption underlying this trend is that there is something special about having more than two languages, and this has been voiced by one of the forerunners in this area, Charlotte Hoffmann, with respect to psycholinguistic processes:

> A comparison of bilingual and trilingual processing suggests that these similarities and differences are both of quantitative and qualitative kind, and therefore trilingual competence is distinct from bilingual competence. (Hoffmann, 2001, p. 1)

A similar argument has been put forth by Ulrike Jessner, who argues that:

> Apart from all the individual and social factors affecting second language acquisition, the process of learning and the product of having learnt a second language can potentially exert influence on the acquisition of an L3 and this involves a quality change in language learning and processing. (Jessner, 2006, p. 14)

In both statements the main point seems to be that the impact of the first language (L1) in learning or using a second language (L2) is fundamentally (qualitatively) different from the impact of the L1 and L2 on learning an L3.

The aim of the present contribution is to find out in what respects there are such qualitative and quantitative differences when comparing bilingualism and multilingualism, which is defined here for the moment as the mastery of more than two languages, but which will be made more specific later on.

In our view there are two issues here:

(i) Is processing multiple languages fundamentally different from processing two languages?

(ii) Is the acquisition and use of an L3 fundamentally different from that of an L2?

Our aim is to clarify these two issues further and evaluate the relevant research carried out so far. Answering these questions may have substantial consequences for the field of L2 development. If it is concluded that existing models and paradigms suffice to deal with processing multiple languages, then there are no grounds to consider trilingualism as a separate subfield. If, however, the conclusion is that we need new theories and models to deal with processing multiple languages, then there are grounds for a split at the paradigmatic level, leading the study of multilingualism away from mainstream L2 development and which warrants the existence of specialist journals, books and conferences on L3.

Defining bilingualism and multilingualism

The definition of what constitutes bilingualism is problematic. There are contradictory views on this, and

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the main dimensions that seem to come back are level of proficiency and use (see Aronin & Singleton, 2012, pp. 1–7, for an overview of definitions). Here we will only present some specific views and not try to solve the terminological problems. In *Bilingual: Life and Reality*, François Grosjean gives the following definition: "Bilinguals are those who use two or more languages (or dialects) in their everyday life" (Grosjean, 2010, p. 4). It is clear from his definition that he sees no reason to distinguish between bilingualism and multilingualism, which was also the position one of the pioneers of bilingualism research, Einar Haugen, defended as early as 1956 (Haugen, 1956, p. 9). As Grosjean indicates in his discussion of this matter, most definitions center around use and mastery, frequent use does not necessarily imply a high level of proficiency, but a high level of proficiency without extensive use is fairly unlikely, as the research on language attrition shows.

Whether we define languages as sets of context-specific utterances, as usage-based linguists would do, or as sets of rules and elements, as more structurally-oriented linguists would do, in both traditions there is no real distinction between languages and dialects, and by implication between languages, styles and registers. This also becomes clear if we look at definitions of what a language is and what a register is:

> Language: the system of communication in speech and writing that is used by people of a particular country or area.
>
> (*Oxford Advanced Learner's Dictionary*, OUP, 2011)

> Register: the level and style of a piece of writing or speech, that is usually appropriate to the situation that it is used in.
>
> (*Oxford Advanced Learner's Dictionary*, OUP, 2011)

While the scope of style or register may be more limited than that of a language, the psycholinguistic processes involved are the same, and specific registers of a language, such as that used in flight control, can well be seen as languages themselves. From this perspective it can be argued that there is no monolingualism, since every healthy language user uses more than one style or register. From a neurolinguistic perspective, Paradis (2000, p. 55) argues that "sociolinguistic registers in unilinguals have come to be viewed as neurofunctionally fractionable, like two languages in the brains of bilinguals". There is no research on the cognitive advantages of having many styles or registers, so at the moment the assumption of the equivalence of languages/dialects/styles/registers is based more on logical argumentation than on empirical evidence.

For a definition of bilingualism and multilingualism we have to look at when a language user is or becomes a bilingual or multilingual. The transition of a monolingual system to a bilingual or multilingual one is gradual. There is no defined level of use or proficiency at which the language user is no longer monolingual, but bilingual. The language system expands due to interaction with the environment and self-organization. In an instructed learning setting, elements from an L2 or an L3 may be defined as belonging to language A or B, but that is not the case in an informal setting of acquisition, where it is more person- and situation-bound, and labeling elements as belonging to a language at a metalinguistic level does not mean that such elements are stored and used in the brain on the basis of such labels. Following Paradis' (2004) ideas, it is likely that through use, subsystems develop. The fact that at a metalinguistic level, these subsystems can be labeled as language (or dialects/styles/registers) does not mean that the word "window" is labeled in the brain as "+English". There is a large literature on whether or not words are labeled for language. Dijkstra and Snoeren's (2004) review of the literature on this issue shows that overall, language recognition is slightly slower than word recognition, which suggests that language membership only becomes available after word retrieval. In some experiments language membership seems to play a role in language perception and production, but research using recurrent networks (Elman, 1990) suggests that language membership follows from use and that the bilingual memory self-organizes into language-specific subsets for which no language label is needed.

Defining L3

In the last decade many attempts have been made to define what an L3 is. Order of acquisition, level of proficiency, and frequency of use have been used to define L1, L2, L3, Ln, but no classification seems to cover all cases of multilingualism. A good example of why it is difficult to classify languages is the quadrilingual aphasia patient reported on by Filiputti, Tavano, Vorano, De Luca and Fabbro (2002). He was born in the Friuli region in Northern Italy, his mother tongue was Slovenian; he started learning Italian in school and acquired Friulian as a language of interaction with friends and peers. Then he migrated to Canada, where he learned English and spoke Italian at home and in his community. Fifteen years later, he returned to Italy where he continued to use Italian at home and at work, and he used Friulian with his friends, while he maintained his English through watching movies and talking to his son. He never spoke Slovenian after his return to Italy, till he had an ischaemic stroke at age 55. In terms of order of acquisition Slovenian was his L1, Italian his L2, Friulian his L3 and English his fourth language (L4). However, when frequency of use and maybe level of proficiency is concerned, at the moment of his stroke Italian was his L1, Friulian his L2, English his L3 and Slovenian his L4 (no premorbid language assessments are available to get an indication

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of level of proficiency). What this case shows is that there is no set order for languages, but a dynamic pattern in which use probably plays the most important role. Following Grosjean's bilingual/multilingual mode model, language will have different levels of activation at different moments in time, depending on need and recency of use. This may be why general effects of L3/L4 acquisition can be hard to establish, as the levels of language activation will change over time. Only in well-defined settings in which formal instruction is the main component can we see a clear effect of newly acquired languages, but the activation level of each language may still alter through use after the instructional period.

An additional point to consider is when we can determine that an additional language has become a system of its own as part of the larger multilingual system. There is no universally accepted definition of bilingualism, just as there is no universally accepted definition of trilingualism or multilingualism. We may consider language ability to be on a continuum with two extremes. At one end of the continuum is a native-like command of the language, whilst the other end is some minimal repertoire with a few words and patterns. However, this description does not provide a neat definition, nor does it allow us to determine at what stage the language has its own system within the larger multilingual system. Perhaps, everyday use, as in Grosjean's definition, mentioned earlier, is a more appropriate way to define the present state of a multilingual's language system.

What does "special" mean?

It is not easy to define what "special" means. L2 development (excluding that of simultaneous bilinguals) is clearly different from L1 development, because in the latter case the language is acquired along with all other aspects of life, in particular cognitive development, while in the case of L2 development there is already a language system in place and the L2 develops largely on the basis of the L1. It is less easy to define what makes L3 different from L2, or L4 different from L2 and L3. Here we will consider a number of dimensions on which there may be differences, but it is not clear when quantitative differences become qualitative differences. A quantitative difference may be that trilinguals show interferences in one of their languages from two other languages, while bilinguals show interferences from only one. If the type of interference is similar, the difference is quantitative rather than qualitative. An example of a qualitative difference would be when the processing of the L3 in the brain is found to take place in different areas of the brain than the L2.

We will be looking at the following aspects that potentially make L3 special:

- Does trilingualism specifically contribute to linguistic theories?
- Is the L3 more easily acquired than the L2?
- Is L3 processing different from L2 processing in terms of speed, types and number of errors or interference?
- Is the L3 more easily lost or maintained than the L2?
- Is the L3 stored in different parts of the brain than the L2 or is the L3 processed differently in the same parts of the brain than the L2?

Does trilingualism specifically contribute to linguistic theories?

For this first aspect, the answer seems to be positive. Flynn, Foley and Vinnitskaya (2004, p. 4) claim that we need an L3 in order to study language acquisition:

> We argue that a comparison of L1 and L2 acquisition alone, however is not sufficient in terms of our understanding of the human capacity for language. We need to to investigate the acquisition of a third language (L3) in order to unconfound certain factors left confounded in L1/L2 acquisition.

Is the L3 more easily acquired than the L2?

For linguists and educationalists alike an important question pertaining to the significance of L3s has been whether they are acquired more "easily" than L2s. There are, however, many factors which affect the answer to this question.

One of these factors is the type of L3 learner involved. A pilot study by Cabrelli Amaro and Rothman (2010) illustrates this particular issue well. Two L3 learners of Brazilian Portuguese (BP), who differed only in the status of their first two languages, were compared. One was a simultaneous bilingual (English/Spanish), whilst the other was a successive bilingual (L1 English, L2 Spanish). Both learners exhibited Spanish influence in the phonology of their L3 of BP, but the successive learner was faster to modify towards BP phonology. (The flip side of this facilitative effect is that this same learner also showed evidence of BP phonology in the L2 Spanish phonology, which was not evident in the simultaneous bilingual's Spanish phonology.) A similar effect (of learner type) was also demonstrated in a phonological discrimination study involving typologically unrelated languages. Gallardo del Puerto (2007) examined Spanish/Basque speakers acquiring L3 English, and found the learners to perform worse in the discrimination of L3 English vowels the higher their Basque proficiency. However, the same language combination produced different results for Cenoz and Valencia (1994), who examined speaking, listening, reading, writing, vocabulary and grammar in the English L3 of Spanish/Basque bilinguals in an

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immersion setting.[1] Multiple regression analyses showed that "the inclusion of bilingualism significantly improved the prediction of English language achievement" (p. 204). The proficiency of the learner's L3 has also been shown to affect the source (and degree) of phonological influence, as illustrated in Hammarberg and Hammarberg (1993), which examined polyglot Sarah Williams' acquisition of Swedish. Initially, Williams showed influence of German (her strongest and most recently used L2), but with increasing proficiency in Swedish, the L1 (English) became the stronger source of influence. This was further supported by Wrembel (2010), who observed that advanced L3 speakers were generally correctly identified as speakers of their L1 (rather than their L2), and that the L2 is a stronger influence in the earlier stages of acquisition, but that this influence decreases as the L3 proficiency increases.

A recent study from Llama, Cardoso and Collins (2010) compared the L3 production of voiceless stops in Spanish (aspirated in English, and un-aspirated in Spanish and French), by L1 English/L2 French and L1 French/L2 English learners. Both groups were found to show less influence from the (psycho)typology of the languages involved and stronger influence from the L2s (appropriately for the L1 English group, but inappropriately for the L1 French group).

In the domain of the lexicon, the question of the L3 being easier to master has produced widely differing answers. Gibson, Hufeisen and Libben (2001) found no advantages for multilinguals acquiring German prepositional verbs, even for speakers of languages typologically similar to German. However, a study by Ringbom (2001) examining lexical transfer in the L3 English of two groups of L1 Swedish, L2 Finnish and L1 Finnish, L2 Swedish, found both groups to rely more on their Swedish knowledge. This encouraged Ringbom to propose that in "no other area . . . , is the importance of psychotypological[2] factors, perceived similarities, more in the foreground than lexis" (p. 60). De Angelis and Selinker (2001) also found psychotypology, together with proficiency, to affect the source of lexical influence in their study of two Italian learners. The two factors of proficiency and the (psycho)typology of previously learned languages were again examined in relation to the cause of lexical influence in the advanced French learners of Lindqvist (2010). She concluded that no use was "made of closely related languages" (Spanish and Italian), and further that "the proficiency factor is decisive for inter- and intralingual influences to occur in advanced learners" (p. 131). In relation to lexical access in L3 and multilingual learners, code-switching is an issue of some interest. The previously mentioned study of Sarah Williams (Williams & Hammarberg, 1998) showed that four factors should be considered when discussing language influence in code-switching: proficiency, typology, recency (of use) and L2 status. A more recent study (Pittman, 2008) found code-switching in two trilinguals to be linked to recency and the structure of the languages involved. However, this study involves sisters, who may have developed their own manner of communicating using all the languages known to them.

In relation to the domain of morphosyntax,[3] Flynn et al. (2004) examined Kazakh learners of L3 English, with L2 Russian, and showed that previous experience of an L2 with the same head direction as the L3 aids the learner in their performance on restrictive relative clauses. They conclude that "[p]atterns of acquisition in a new language will depend upon the nature of the linguistics knowledge already represented in the mind/brain of the learner" (pp. 12–13). Bardel and Falk (2007) extended this research to show that L1 knowledge of a certain feature can be blocked, if the same feature is not present in the L2. Their study compared two groups of learners of a (verb-second) V2 language on negation placement in the L3, one with a V2 language as an L1 and a non-V2 language as an L2, and another group with these distinctions reversed (L1 non-V2 and L2 as V2). The group with a V2 language as an L2 outperformed the group for which this feature was present in the L1. The researchers were encouraged to argue that "there is a qualitative difference between the acquisition of a true second language (L2) and the subsequent acquisition of an L3" (p. 459).

Leung's (2005) study showed a clear effect of L2 knowledge affecting the L3 acquisition (L3A) of articles in a positive manner, in her comparison of L2 and L3 learners, where both groups were native speakers of article-less languages. A group of L1 Chinese learners of L3 French, with L2 knowledge of English, were compared with a group of monolingual Vietnamese learners of (L2) French on article suppliance in obligatory contexts and the appropriate suppliance of definiteness. The Chinese learners outperformed the Vietnamese learners in both aspects, demonstrating that "L3A is not simply another

[1] Neither Gallardo del Puerto (2007) nor Cenoz and Valencia (1994) distinguishes between the chronological order of acquisition for the Spanish and Basque speakers in their respective studies; however the former bases the division of participants upon the current proficiency in those languages.

[2] Originally conceived by Kellerman (1978) to account for transfer between languages, psychotypology refers to the learners' perception of the distance between their languages. Typology, on the other hand, may refer to the broad family description (e.g. Germanic, Romance) but may also refer to some specific property of a language, such as null subjects or head direction, etc.

[3] The result of syntactic operations often results in the spell-out of different forms, for this reason research in the domains of morphology and syntax is conflated in this paper under the one heading of morphosyntax.

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case of L2A because transfer in L3A does not necessarily always come from L1" (p. 39).

Rothman and Cabrelli Amaro (2010) also illustrated how the language combination of the learner can have a very strong influence on the (initial) success of the morphosyntax of L3 learners. They took two groups of learners (both with L1 English and L2 advanced Spanish), who were beginner learners of either L3 French or L3 Italian, and compared them, on null/overt subjects and the Overt Pronoun Constraint, with two groups of monolingual English speakers, who were also beginner learners of French or Italian. The L3 learners performed differently to their L2 counterparts, appropriately for the Italian learners and inappropriately for the French learners. Later work from Rothman (2010, 2011) on word order, relative clause attachment preferences and adjectival interpretation further supports the proposal that the acquisition of an L3 is influenced by the (psycho)typology of the previously learned languages.

So far then, we have seen that learner type, learner proficiency, linguistic domain, grammatical feature and language (psycho)typology may all, to some extent, affect the ease or difficulty with which a learner acquires an L3. A further crucial issue to consider is the linguistic background of the learner in relation to their literacy in the L2, and specifically their metalinguistic knowledge. Metalinguistic knowledge, is defined by Jessner (2008, p. 277), "as the ability to focus on linguistic form and to switch focus between form and meaning", and further that this knowledge is "made up of a set of skills or abilities that the multilingual user develops owing to her/his prior linguistic and metacognitive knowledge" (p. 275).

The benefit of metalinguistic knowledge was demonstrated by Thomas (1988) in a study examining a variety of grammatical properties and comparing two groups of (L1 English) L3 learners of French, one group with a minimum of two years formal instruction in the L2 of Spanish, the other group L2 Spanish without any formal instruction. The biliterate group was found to outperform the non-biliterate group in the majority of properties examined, encouraging Thomas to propose that the results "highlight the importance of formal instruction in the bilinguals' related language to develop metalinguistic awareness" (p. 240). Similar findings were obtained by Sanz (2000) in research comparing the acquisition of English by Spanish monolinguals and Spanish/Catalan bilinguals, encouraging the conclusion that:

> [H]eightened metalinguistic awareness, which results from exposure to literacy in two languages, gives bilinguals the capacity to focus on form and pay attention to the relevant features in the input. (Sanz, 2000, p. 36)

In a study on trilinguals in Sweden, Mägiste (1986) found that the pattern of L1 use in migrants has an impact on learning an L2 or L3. She concludes: "Passive bilingualism seems to facilitate learning a third language, while active bilingualism may delay it" (p. 116). Papagno and Vallar (1995) compared Italian polyglots (defined as people reporting speaking three or more languages fluently) and non-polyglots (in fact bilinguals who learned a foreign language at school) on a number of phonological and non-verbal memory tasks, general intelligence tasks and paired-associate word learning tasks. In the learning tasks they compared the learning of pairs in Italian and the learning of pairs in which one of the words was Russian. The polyglots outperformed the bilinguals in verbal short term memory tasks and the learning of new words, while no differences were found for intelligence, non-verbal memory and learning of Italian word pairs. Without further argumentation, they consider "unlikely" (p. 105) the possibility that the learning of multiple languages may have impacted memory capacity. The conclusion is that enhanced verbal memory capacity supports the acquisition of foreign languages and in particular the learning of words in an additional language.

Van Hell and Mahn (1997) compared different methods for learning novel words in a foreign language in experienced (Dutch) learners and inexperienced (American) learners. The experienced learners had learned their foreign languages in secondary education, but no information on level of proficiency of the three languages was provided. The data show that rote learning was more effective in the experienced learners, while no differences between rote learning and learning through the key word method were found for the inexperienced learners. Overall learning performance was better for the experienced learners than for the inexperienced ones and reaction times (RTs) (translation latencies) were shorter for the former as compared to the latter group. The outcomes show that there is an advantage of having learned one or more foreign languages when learning a new one.

Marian, Blumenfeld, Mizrahi, Kania and Cordes (published online August 1, 2012) used a multilingual variant of the classical color-word Stroop test. Participants were tested in their three most proficient languages. The Stroop effect was found in all three languages, and error and disfluency rates were dependent on level of proficiency. They conclude:

> Multilinguals were faster and more accurate in the within-language-competition condition than in the between-language-competition condition, indicating that additional processing costs are required when stimulus and response languages differ. (Marian et al., p. 2)

This suggests, then, that multilingual processing does change the demands on cognitive functions, but there are no indications that the L3 leads to specific and qualitatively different demands. Na Ranong (2009) obtained similar results using a Stroop test in L3 beginner

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learners of Chinese (L1 Thai, L2 advanced English). She also measured the degree of interference, and found the strongest interference to be from L2 to L3 (with strong interference in the opposite direction, from L3 to L2, also noted). This suggests that differences may be quantitative, if not qualitative.

Is L3 processing different from L2 processing in terms of speed, types and number of errors or interference?

One of the early studies on trilinguals is Mägiste (1979). She looked at latencies in decoding and encoding tasks in monolinguals, bilinguals and trilinguals. For most of the participants German was the L1 and Swedish the L2. There was a range of L3s. A comparison between the three groups showed that in the decoding tasks the trilinguals were significantly slower than the bilinguals. The difference between the monolinguals and bilinguals was not significant. For the encoding tasks the monolinguals outperformed the bilinguals, who in turn were faster than the trilinguals.

Kavé, Eyal, Shorek and Cohen-Mansfield (2008) looked at the impact of knowledge of two, three or more languages on cognitive functioning in the oldest Israeli Jewish population (mean age: 83.00). Different tasks tapping into various cognitive functions were applied and for all the tasks a significant effect of number of languages was found, with higher scores being associated with knowledge of more languages. The differences between bilingualism, trilingualism and multilingualism were not tested in a post-hoc contrast analysis, so although there was a general effect, it is not clear whether the additional effect of trilingualism over bilingualism or multilingualism over trilingualism is significant. Moreover, the effect of bilingualism was not tested since there was no monolingual control group. There was a main effect of number of languages but no interaction with the various tasks and this suggests that there is a quantitative effect, but no qualitative difference in the sense that more languages have specific effects for different types of tasks. As in many studies of this kind, it could not be determined what caused what.

> It is most likely impossible to determine with certainty whether multilingualism is the result or the cause of better cognitive performance, as multiple factors may contribute to the differences among individuals who speak two, three or more languages over the lifespan. (Kavé et al., 2008, p. 76)

Szubko-Sitarek (2011), following earlier research by Lemhöfer, Dijkstra and Michel (2004), looked at the impact of cognateness in a German lexical decision task. She compared RTs of trilingual and bilingual cognates in L3 German. Polish was the L1 and English the L2. Triple cognates (words that were similar in all three languages) were reacted to faster than double cognates (Polish/German), which in turn were reacted to faster than monolingual controls (words that only existed in German). In a second experiment, she looked at the impact of cognate status on word recognition in L1 Polish. Here, an effect of the L2 was found, but not of the L3. The data taken together show that lexical access is non-selective, and that there was an impact of L1/L2/L3 on each other even in a setting in which the L1 was the only language the participants had to react to. Interestingly, part of the stimuli was used in both experiments (the first with L3 German as the testing language and the second with Polish as the target language). It turns out that the pattern of reaction times in the two experiments was different for the same words, which shows that access to words is not absolute, but setting- or task-dependent.

Lemhöfer et al. (2004) carried out a similar experiment with Dutch trilinguals (Dutch L1, English L2 and German L3). The lexical decision task was done in German. RTs were slower for triple cognates than for double cognates and slower for double cognates than for non-cognates. Though the task was similar in the two studies (Lemhöfer et al. and Szubko-Sitarek), reaction times were substantially shorter in the Lemhöfer et al. study. This may be explained by the difference and similarity of the three languages on the two studies: Dutch/English/German are clearly more cognate overall than Polish/English/German. There may also have been differences in proficiency in the L3 to explain these differences. So while the cognate studies suggest an advantage of trilingualism over bilingualism and monolingualism in terms of speed of processing, other studies, like Mägiste (1986) and Kavé et al. (2008) show that adding a language to the system leads to a slowing down of specific cognitive processes.

Is the L3 more easily lost or maintained than the L2?

There is very little research that focuses on the attrition or maintenance of an L3. Schmid (2002) presents a meta-analysis of 37 studies on L1 attrition. While many of the individuals tested are likely to be multilinguals because attrition typically takes place in settings in which one or more languages are acquired in a new social setting, such as migration, no information on the impact of the L2 vs. the L3 is available. Many of the studies on L2 attrition are actually about L3 attrition. Weltens (1989) and Grendel (1993) looked at the attrition of French as a foreign language in the Netherlands, and their subjects, mostly university students had at least English as their L2 and German as their L3/4. In addition, many of the participants were speakers of a dialect. The same holds for the study on German as a foreign language in the Netherlands by Jordens, de Bot and Trapman (1989). In all these studies the data show that these languages are well maintained,

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but no specific effects of L3 have been found. Similarly, Schmid (2011) found no indications that having multiple languages protects any language against attrition. Paradis (2004) reflects on the impact of the difference between declarative knowledge and procedural knowledge, and argues that declarative knowledge is more vulnerable than procedural knowledge and that L2s that have been learned explicitly and largely consist of declarative knowledge are more vulnerable than languages that have been acquired implicitly and largely consist of procedural knowledge. So in his view the way a language is learned has more of an impact on attrition or maintenance than order of acquisition. A complicating factor is that the command of earlier-learned languages (often English) is generally higher than that of languages acquired later. Bardovi-Harlig and Stringer's (2010) review of language attrition research shows that level of proficiency is a significant factor in language attrition and maintenance.

So basically, the question of whether an L3 is lost or maintained more easily cannot be answered due to lack of research aiming specifically at this issue. A fully acquired L1 seems to be less vulnerable to attrition than later, and typically less completely learned, languages (de Bot & Clyne, 1994; Ecke & Hall, published online August 9, 2012; Schmid, 2011), but no distinction can be made between L2s and L3s.

Is the L3 stored in different parts of the brain than the L2, or is it processed differently in the same parts of the brain than the L2?

There are three neurolinguistic sources of information that may inform us about the status and storage of multiple languages in the brain: bilingual aphasia data, neuroimaging data and Electronic Brain Stimulation (EBS) data. Ideally these sources of information converge, but as will be pointed out, this is not really the case. The question to be answered is: How are languages represented in the brain? There are basically three options: Firstly, all languages are served each by their own dedicated neural substrate; secondly, languages are spread over shared and dedicated sites; and, thirdly, all languages share the same site. Paradis has pointed out a fourth option:

> Two languages acquired concurrently are stored in separate micro-anatomical circuits in the same gross anatomical area (the subsystems hypothesis); the same goes for a late-learned L2 only to the extent that it has eventually been automatized, but to the extent that it has not, entirely different anatomical structures will support the use of metalinguistic knowledge. (p.c., August 9, 2012)

In light of the present article, the question can be refined further: To what extent is the processing of an L3 in the brain different from that of the L1 or L2? This may also imply the localization of languages. The L3 would be special if the L1 and L2 were served by the same neural substrate, while the L3 was served by a separate one. Here we will first present the findings from the three sources mentioned and then see to what extent they converge or diverge.

Multilingual aphasia

The main issues here are the following:

- Are there differences in aphasic symptoms between bilinguals and multilinguals?
- Are patterns of decline and recovery different in L3, as compared to L1 and L2?
- Does having more languages make one more or less likely to suffer greater damage in cases of aphasia?
- Are there different aphasia types for different languages?
- Does therapy in L3 support recovery of L1/L2?

The main sources of information are two meta-analyses of bilingual and multilingual aphasia, Albert and Obler's (1978) analysis of 108 reported cases from mid-19th century till 1977 and Paradis's (1977, 1983) analyses of historical cases. Although the cases reported are fascinating and provide rich information, caution is needed when interpreting these data. As Albert and Obler mention, "[t]he individual case studies on polyglot aphasics are published because they are interesting" (p. 100). By present-day standards the reports and assessment procedures are severely lacking and are often based on the impressions of medical experts, which may be insightful, but are often hard to interpret. With respect to patterns of decline and recovery in different languages, five patterns have been mentioned in the literature (Paradis, 1977, p. 65):

- Synergistic: Impairment and recovery in parallel
- Differential: Languages are differently impaired and recover in different rates. Also cases of different types of aphasia in different languages have been labeled differential
- Antagonistic: Decline of earlier recovered language with recovery of other language
- Successive: Recovery of one language after previous one
- Selective: Impairment and recovery of only one language

In the literature on bilingual aphasia a number of factors have been found to play a role in recovery; these include order of learning the languages, degree of proficiency in languages, affective attitudes to languages, site and size of lesion and recent use of languages. No single factor appears to explain the different patterns of decline and recovery, and thus it is difficult to assess pure L3 effects, since that may also be the language with the

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lowest proficiency and use patterns. Paradis (2001, p. 90) summarizes the findings of the meta-analyses as follows:

> Neither primacy, automaticity, habit strength, stimulation pre- and post-onset, appropriateness, need, affectivity, severity of aphasia, type of bilingualism, type of aphasia or structural distance between the languages could account for all the non-parallel recovery patterns observed.

A meta-analysis of the Max Planck Institute's aphasia project data (Huibregste, de Bot & Fabbro, 2002) showed that out of the 17 cases of aphasia, seven were multilinguals, all of them have been tested in all of their languages with the Bilingual Aphasia Test. The data show that synergistic recovery is the general pattern. Differential recovery appeared to reflect pre-morbid differences in proficiency as far as that can be assessed reliably. There were no indications that the L3 showed a different pattern in the cases studied.

With respect to the question of whether having more languages makes one more or less likely to suffer greater damage in cases of aphasia, there are hardly any data available. Two sides of the same coin are that having more languages means that there is more to lose, but at the same time with the same degree of decline, there is more left. The meta-analyses suggest that only with non-parallel recovery, an additional (L3) language may take over, but given the myriad of factors playing a role, as mentioned earlier, singling out one factor is problematic.

In the literature, several cases have been reported in which patients show different aphasia types for different languages (Fabbro & Paradis, 1995; Silverberg & Gordon, 1979). Paradis (2004, pp. 65–68) discusses a number of cases that have been labeled as differential, and concludes that it is more likely degree of decline in different languages, related to premorbid proficiency than real differences in aphasia type in the patients tested.

Differences between bilingual and multilingual aphasia

The definitional problems related to bilingualism and multilingualism mentioned earlier are also prevalent when one tries to compare these two with regard to aphasia. As indicated earlier, the literature on this topic is handicapped by the selective character of the reports of special/interesting cases which makes generalizations particularly difficult. Also the incomplete information by present-day standards is a problem, so firm conclusions cannot be drawn from the available studies. In Albert and Obler's (1978) meta-analysis no significant differences were found between bilinguals and multilinguals, but some tendencies emerged:

- Multilinguals seem to recover the first learned language more, while bilinguals tended to have better recovery of the recently, most frequently used language.
- Multilinguals tended to have more non-parallel recovery.
- When the L2 recovers, there is more regression of the L1 in multilinguals than there is in bilinguals.

The main problem is, however that there is hardly any information about premorbid proficiency and language use to substantiate these tendencies. Non-parallel recovery is likely to be a reflection of differences in proficiency before the brain damage occurred. In addition, little is known about language development over the life-span. There is differential age-related language decline (see de Bot, 2009, for a review) and that should be taken into account when interpreting signs of aphasia in elderly patients.

It can be concluded from the literature that there are no clear indications for special characteristics of multilinguals over bilinguals when it comes to aphasia and that the processing or decline of the L3 is not different from that of an L2. But no hard conclusions can be drawn since numbers are small and assessment of skills in multiple languages is still rare.

Can the L3 play a role in treatment for aphasia in multilinguals?

The L3 could be special in the sense that it could be used as a vehicle in the treatment of aphasia. Patients may have lost access to their L1 and L2, and therapy using the L3 might lead to generalization to the other languages. It could be argued that multilinguals in this sense have more resources than monolinguals or bilinguals. Kohnert (2009) reviewed the literature on this, focusing on the potential transfer or generalization of the effect of treated languages on untreated ones. Out of the 12 studies available, six failed to take into account the effects of spontaneous recovery. Four of the remaining studies did find generalization effects and two found no effect on the untreated languages. As in most studies on bilingual or multilingual aphasia, premorbid language assessments are typically missing, which makes the assessment of the impact of therapy particularly difficult. One of the studies showing generalization over languages is the one by Filiputti et al. (2002). The language history of this patient was mentioned earlier. The treatment was carried out in Italian and, apart from Slovenian, all languages were assessed after the brain insult and at the end of the rehabilitation phase. In addition, the patient was retested four years later. The findings show that all languages improved, but not in parallel, and that the levels reached after the intervention by and large remained the same, apart from Slovenian, which showed some decline after four years. As mentioned by Kohnert (2009), to what

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extent different patterns might have emerged without therapeutic intervention remains unclear. In this case it was the L2, when order of acquisition is taken as a criterion, that was used for the therapy and the L1 seemed to have profited the least. Goral, Levy and Kastl (2010) report on the impact of treatment of aphasia in a Hebrew/English/French trilingual. Treatment was provided in English, the L2. There was improvement of morphosyntax in the treated language and French, the L3, but not in Hebrew, the L1. As the authors indicate, the structural differences between the three languages may have played a role in this.

As Kohnert's (2009) review shows, there are few studies on the generalizability of therapy in multilingual aphasia, and so far there are no indications that therapy in an L3 has additional value. In their overview of cross-language therapy, Faroqi-Shah, Frymark, Mullen and Wang (2010) come to similar conclusions and they point out that there are no indications that providing therapy in one language will harm the other languages.

Neuroimaging data on multilinguals

The number of neurolinguistic studies using neuroimaging with multilinguals is fairly small. One of the most extensive studies is the one by Vingerhoets, Borsel, Tesink, van den Noort, Deblaere, Seurinck, Vandemaele and Achten (2003), who compared three language processing tasks, verbal fluency, picture naming, and comprehension reading in Dutch/French/English trilinguals. All subjects had Dutch as their L1, timewise French as their L2, and English as their L3, but questionnaire data show that their use and exposure to English was more extensive than to French. Whole-head functional magnetic resonance imaging (fMRI) was applied while the participants did the language tasks. The authors conclude that:

> [T]he performance of language tasks in different languages engages largely the same cerebral areas but that the brain, to perform at a comparable proficiency level, engages more neural substrates for later acquired languages. (Vingerhoets et al., 2003, p. 2181)

It should be added that the level of proficiency in the L2 and L3 was also lower, so the engagement of more neural substrates may reflect lower levels of proficiency as well. Similar findings have been reported by Yetkin, Yetkin, Haughton and Cox (1996) in their study of five multilinguals, and by Wattendorf, Festman, Westermann, Keil, Zappatore, Franceschini, Luedi, Radue, Münte, Rager and Nitsch (published online August 28, 2012). In none of these studies was a task by language interaction found or reported, which suggests that the different languages showed no specific task effect. Briellmann, Saling, Connell, Waites, Abbott and Jackson (2004) conducted a neuroimaging study with quadrilinguals and conclude that "all four languages activated overlapping brain areas, corresponding to the major language regions. The number of activated voxels correlated with proficiency (lower proficiency, fewer voxels)" (p. 531). No effect of age of acquisition was found. The same findings have been reported by Bloch, Kaiser, Kuenzli, Zappatore, Haller, Franceschini, Luedi, Radue and Nitsch (2009), who conclude: "All languages of an individual use a unitary language committed neural system, at any rate at the level of the BOLD response" (p. 625).[4] Videsott, Herrnberger, Hoenig, Schilly, Grothe, Wiater, Spitzer and Kiefer (2010) looked at word production in multilinguals. Their conclusion is that "[m]ultilingual word production activated a common set of brain areas dedicated to known subcomponents of picture naming" (p. 103).

So while the early studies on the localization of languages in the multilingual brain suggested both shared and language-specific neural substrates for different languages (e.g. Dehaene, Dupoux, Mehler, Cohen, Paulesu, Perani, van de Moortele, Lehéricy & Le Bihan,1997), the more recent studies using different types of neuroimaging techniques seem to converge on the view that the same brain areas subserve the different languages of multilinguals and that more brain tissue is involved in processing for languages that are less developed and automatized. Indefrey (2006, 2007) argues that through use the brain may be optimized for the native language and that therefore using another language is more costly in terms of resources. There are no indications on the basis of these studies that the L3 is processed differently from the L2, taking into account differences in command of the languages.

Electrical Brain Stimulation (EBS)

The findings of overlapping brain areas for different languages is not supported by some of the studies using electrical cortical brain stimulation (EBS), a technique used to gauge functional areas in the brain before brain surgery with epileptic patients. The procedure for EBS is roughly as follows: First language areas are detected using neuroimaging techniques. Then after the skull has been removed electrodes are placed on parts of the cortex and small microvolt charges are used to stimulate the brain. The patient is awake during this phase and has to carry out various tasks, including various language processing tasks. If the language processing is disrupted when a particular brain area is stimulated, the assumption is that

[4] When an area of the brain works on a specific task, oxygen (via blood) is sent to this area; this is known as the Blood Oxygen Level-Dependent (or BOLD) response. Neurolinguistic research, such as fMRI uses this information to identify where the activity in the brain is located.

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that part of the brain is crucial for language processing and can therefore not be removed without damage.

Lucas, McKhann and Ojemann (2004) found no difference in the overall cortical extent for L1 and L2, and they indicate that an L2 does not require greater cortical representation. They also find both language-specific sites and shared sites in the brain. The differences in findings from cortical brain stimulation and neuroimaging are problematic and there do not seem to be grounds for favoring one technique over the other, though Lucas et al. (2004, p. 455) claim that:

> [Our] results underscore the fact that fMR imaging can be used to visualize areas in the cortex involved in language processing but not necessarily those areas essential for it.

Similar findings have been reported by Ojemann and Whitaker (1978) and Cervenka, Boatman-Reich, Ward, Franaszczu and Crone (2011). It should be mentioned that all of these studies looked at two languages only, and from the reports it is not clear whether the patients tested actually knew more languages. Bello, Acerbi, Giussani, Baratta, Taccone, Songa, Fava, Stocchetti, Papagno and Gaini (2006) present data on multilingual patients and they squarely conclude: "Sites for each language were distinct and separate" (p. 125), which is in complete contradiction to the neuroimaging data presented earlier.

Roux and Trémoulet (2002) used electrostimulation to map cortical language sites and found considerable individual variation between patients with respect to the sites for different languages. Out of 12 patients, five showed complete overlap for different languages for all language tasks administered. Seven patients had at least one language-specific site. The authors conclude that while cortical stimulation studies contribute to our understanding of the localization of languages in the brain, the technique does not lead to a clear-cut answer with respect to how the multilingual brain is structured. Lubrano, Prod'homme, Démonet and Köpke (2011) present data on a trilingual patient that had German as her L1, English as her L2 and French as her L3, who moved to France and spoke French most of the time. She was operated under awake craniotomy as a preparation for the removal of a brain tumor. Her L1 and L3 were mapped, and both distinct and overlapping areas were found in the left hemisphere for L1 and L3, as is the case in most studies on multilinguals. In this study, the L2 of English was not tested.

A direct comparison between EBS data and data on aphasia and neuroimaging data is problematic for a number of reasons. One problem with the EBS studies is that they are typically done with patients who have suffered severe epileptic seizures and these may have had an impact on their brain architecture and processing mechanisms (Lebrun, 1988). The other problem is the difference in resolution in the measurement and time dimension of the data.

What seems to be a complete contradiction may be resolved by looking at the specific types of data the different techniques provide.[5] Differences in findings may be explained by differences in resolution of the techniques. As Indefrey argues: "At a coarser level of resolution even the stimulation data show overlap . . . On the other hand the stimulation data show the picture at a finer resolution. Even though indeed (as the hemodynamic data show) the same brain regions are involved for L1 and L2 processing, WITHIN these areas there are language-specific neuronal populations. This seems very plausible when one considers that at every level of processing there must be some language-specific neuronal representations - after all there are language-specific phonological and syntactic rules and also lexical entries that simply cannot be represented by the exact same neurons" (Indefrey p.c., August 21, 2012). This is in line with Paradis's view on the multilingual brain mentioned earlier: "Two languages acquired concurrently are stored in separate micro-anatomical circuits in the same gross anatomical area" (p.c., August 9, 2012). Paradis's suggestion of microanatomical systems dedicated to specific languages within the language processing parts of the brain cannot be evidenced at present, since the techniques available are not yet refined enough to trace this.

Some parts of the brain may be necessary to process specific languages, but that does not mean that that is where the language is stored. It may be a switchboard or a connecting node between subsystems that may be stored somewhere else in the brain. One of the main findings from the neurolinguistic literature is that language processing is not restricted to single sites but rather spread over various parts of the brain (Stowe, Haverkort & Zwarts, 2005). Thus the fact that EBS of specific sites has an impact on the processing of certain languages does not mean that that is a language-specific part of the brain or that parts of the language are actually stored there. This may also be one of the explanations for the differential aphasia pattern, where some languages are recovered and others not. The damage may be in the control mechanisms for the different subsystems that by themselves may be intact but inaccessible or inhibited.

The picture that emerges from the triangulation of multilingual aphasia, neuroimaging and EBS is not completely coherent. There are cases of multilingual aphasia that show different patterns for different languages, but there seems to be no specific L3 effect in the sense that patterns have been found for L3 that diverge significantly from those for L2. Some differences were found between L1 and L2/L3, which

[5] The authors are grateful for the stimulating discussion of these issues with Michel Paradis and Peter Indefrey.

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may have to do with level of proficiency and differences in procedural/declarative knowledge, due to manner of acquisition and age. No L3 effects have been found with respect to recovery patterns or the effects of therapy. It is difficult to draw hard conclusions on the localization of different languages in the multilingual brain on the basis of the aphasia data.

The data from neuroimaging seem to converge on a shared representation of different languages in the brain, though some studies found both shared and specific language sites. There are no indications that the organization of the L3 is different from that of the L2. The studies on EBS largely show a combination of shared and specific areas for different languages in the brain, with some studies even claiming completely separate substrates for each individual language. No specific effects for L3 as compared to L2 have been reported. The discrepancy with the neurolinguistic data is not easy to explain. The two methodologies have different aims: for neurolinguistics the aim is to map the cortical structures that play a role in the processing of different languages, while the EBS studies try to show what areas are crucial for the processing of these languages.

Some studies have looked at other language disorders in multilinguals. Lindgren and Laine (2010) compared reading and writing performance in dyslexic and non-dyslexic multilingual university students. Their first two languages (Swedish and Finnish) were learned and used at home mainly, while their L3, English, was learned at school. Dyslexic impairment was most prevalent in English. The authors point out that the students had a lower level of proficiency in English, which in combination with the orthographical opacity of English, may have caused the differential problems.

A Dynamic Systems Theory (DST) perspective on multilingualism

A new and supplementary view on multilingual processing is provided by a Dynamic Systems perspective. The core of a DST approach is that multilingualism is not a state but a process (de Bot, 2008, 2012b; Herdina & Jessner, 2002; Larsen-Freeman & Cameron, 2008; Verspoor, Lowie & de Bot, 2012). Languages (or dialects, registers or styles), both as communicative tools and as part of the cognitive system, continually change due to interaction with the environment and internal reorganization. Development is dependent on internal and external resources. There is no end-state in language development, and growth and decline of language skills takes place all the time. Languages as systems interact over time, so the learning of elements from a new language has an impact on the rest of the system and the other languages the system consists of. For the study of multilingualism these assumptions imply two things: it is pointless to study just one of the languages in the multilingual system, and research on multilingualism should be concerned with change over time rather than stasis. The fact that languages interact and that changes in a part of the system have repercussions for other parts has been known for a long time. The early work by Mägiste (1986), but also the more recent work by Kavé et al. (2008) mentioned earlier, suggest that adding an L2 or L3 has an effect on the processing of languages acquired earlier. This suggests that the resources for language processing are limited in the sense that the addition of a new language occurs to a certain extent at the expense of existing languages.

From a DST perspective, it is unclear to what extent there are actually languages as entities in the human brain (de Bot, 2012b). It could be argued that all we have is situation-specific utterances and that the choice of elements that at a metalinguistic level can be coded as belonging to a specific language is in fact situational, and interaction in a specific language can be seen as a situation in this respect. This is largely the kind of thinking in usage-based approaches to language development: structure emerges from use and the larger part of how we speak consists of formulaic language (Hopper, 1998; Tomasello, 2001). Usage leads to the formation of templates that can be used and filled with words depending on the setting and the speaker's intentions. Jessner (2008) has argued that having more languages means having a larger metalinguistic inventory and a larger set of templates for utterances.

The need to study multilingualism as a process means that we need other research paradigms. The usual product-oriented techniques (error analysis, lexical tests, and grammaticality judgments) have to be replaced with approaches in which change over time can be measured on different time scales (de Bot, 2012b; Spivey, 2007). As the study by McLaughlin, Osterhout and Kim (2004) shows, the use of Event Related Potentials (ERPs) allows the tracking of lexical activation processes over time. They used an N400 measure to track the change of status of words and pseudo-words in L2 learners and showed that with fairly limited amounts of learning time (14 hours of instruction of French) the status of pseudo-words, as measured by the N400 signal, already changes, while no changes are discernible using behavioral measures. But even with simple behavioral methods like word naming, changes over time can be detected longitudinally, both during the course of experiments and over longer time scales. De Bot, Chan, Lowie, Plat and Verspoor (2012) report on a longitudinal case study, using a word-naming task in L1 (Dutch) and L2 (English), although the participant was in fact multilingual, as are most educated people in the Netherlands of a certain age. In the case study, it was shown that the variation in the data over time, as measured by indices of types of noise, provide

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useful information about the internal restructuring of the system online.

For the study of language development, a refocusing on the process in time rather than the product or state means that paradigms should be used that allow for intra-individual change over time. Also the subtle interaction of subsystems has to be taken into account. This calls for longitudinal dense data collection, rather than large group studies, but group studies are also an option. A good example is the study of bilinguals using both neuroimaging and eyetracking by Marian, Spivey and Hirsch (2003). They showed that over time different cortical subsystems become active in processing words and that the same general brain structures are active for both languages in the early stages of word recognition, but that other subsystems take over in later stages. Pratt, Abbasi, Bleich, Mittelman and Starr (published online June 13, 2012) used ERP to trace the activation over time of different brain areas in a dual word-recognition task with Arabic/Hebrew bilinguals. They found that different areas in the left and right hemisphere were activated. Another example of a longitudinal study is Ecke and Hall's (published online August 9, 2012) study of tip-of-the-tongue phenomena in a multilingual speaker over a 10-year period.

From a DST perspective, the question of what is special about L3 becomes less relevant. In essence, nothing is special in the interaction between a language user and her environment and the language development that takes place. Major restructurings of the language system emerge from interaction with the environment and internal self-reorganization. What "special" factor leads to such restructurings cannot be predicted, but depends on the criticality of the system (de Bot, 2012a).

Conclusions

The aim of the present article is to find out to what extent the processing of an L3 is qualitatively different from processing an L1 or an L2. In order to solve this issue, research from different neurolinguistic and psycholinguistic research areas has been analysed. The main issues are whether trilinguals can provide data on human language processing that cannot be gathered by studying bilinguals, whether an L3 is acquired more easily, or lost more easily, than an L2, whether the processing of an L3 is different from processing an L2 and finally whether an L3 is stored in the brain differently than an L2. The literature presented here suggests that trilingualism provides a specific window on human language processing and provides data that cannot be gathered with bilinguals or monolinguals. There is no evidence showing that learning an L3 is easier than learning an L2, nor that an L3 would be maintained better than an L2. As far as language processing and the involvement of different brain areas is concerned, there seem to be no grounds for assuming mechanisms that are fundamentally different for L3s as compared to L2s: "There is no specific neural mechanism devoted to a third language that differs in nature from what subserves a second" (Paradis, p.c., November 12, 2012). There are clearly quantitative differences: trilinguals have been shown to be somewhat slower in certain tasks and show patterns of cross-linguistic interference that reflect the interaction between three languages, rather than two as in bilinguals, but the patterns of interference from and to L3 are not different from those from and to L2. Using Occam's Razor ("Pluralitas non est ponenda sine necessitate" or "Entities should not be multiplied unnecessarily" (Thorburn, 1915, pp. 345–353)) we have to conclude that there is insufficient evidence to warrant the postulation of specific processing mechanisms for L3, in addition to the ones proposed for L2.

It has been argued that there may not be something like monolingualism, since all speakers of any language have command of different styles and registers in that language, and from a processing perspective, there is no absolute difference between styles, registers, dialects and languages. The same mechanisms are applied when using different styles and registers as when using different languages, so the language system is fundamentally multilingual in nature.

For several of the issues raised here, little or no research is available that has looked specifically at the comparison between monolinguals, bilinguals and trilinguals. In addition, it is quite likely that a major part of the research on bilingual processing has actually been done with multilinguals. A considerable portion of the research on bilingual processing, as carried out by some of the leading researchers, such as Kroll, de Groot, van Heuven and Dijkstra, to name just a few, used Dutch psychology students as participants. Apart from dialects, which are particularly prevalent in the Nijmegen setting, all students have had at least four years of additional language instruction, mostly German and/or French, while they all had six years of English.

As many of the contributions to this special issue show, the main interest in L3 studies seems to lie in the impact of L1 and L2 on L3 and to a lesser extent the impact of L3/L2/L1 on each other. It is obvious that for cross-linguistic influence to take place, a certain level of proficiency in the additional language needs to be reached. As Herdina and Jessner (2002) have argued in their discussion of the Dynamic Model of Multilingualism, languages develop in a dynamic interaction with each other; no language is fixed or has reached an end state ever. Maybe the most important lesson that can be drawn from the literature on multilingualism so far is that studying languages in isolation is not the right way to go. Languages can only be studied in their interaction over time, which has important implications for what research designs we

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should use to study language development, that is, the processes of acquisition and attrition over time.

Overall, the conclusion seems to be that while studying trilinguals and their verbal behaviour is enriching our view of the human language system, on the basis of the research reviewed here, there are insufficient grounds to assume that cognitive mechanisms differ between multilinguals and bilinguals, and as such more research on the mechanisms underlying L2 and L3 processing is needed to fully answer the question in the title.

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