

THE IMPACT OF LANGUAGE ATTRITION ON LANGUAGE TEACHING: THE DYNAMICS OF LINGUISTIC KNOWLEDGE RETENTION AND MAINTENANCE IN MULTILINGUALISM

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Abstract

Language attrition has become a vibrant theme as it has implications for theoretical linguistics, including, for example, the organization of linguistic information in the brain and language processing. Insights from this area also have an impact on the study of second language (L2) development and can feed the area of language teaching. Once language attrition may be valuable for the study of language retention and maintenance, it can contribute to language teaching with long lasting results, more effective planning and syllabus design. In this perspective, as studies exploring L2 attrition are still limited, this article¹ provides a synthesis of research on the area. By drawing from the Dynamic Model of Multilingualism and from the Threshold Hypothesis, it also explores the implications L2 attrition research has for language teaching with a view to establishing more informed language practices and policies.

Keywords: Language Attrition; Language Teaching; Dynamic Model of Multilingualism; Threshold Hypothesis.

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Introduction

Languages are intuitively associated with acquisition, learning or production. In other words, they are usually affiliated to gain, as one might be able to perceive in this issue of *Ilha do Desterro* edited by professors Mailce Borges Mota and Augusto Buchweitz. As a consequence, it seems less natural to think of languages in terms of breakdown, loss or attrition (Szupica-Pyrzanowska, 2016, p. 109). In this vein, to Kupske (2016, 2017a), although language development has been a subject of scientific inquiry for a long time, the decline of a language in healthy speakers, phenomenon here taken as language attrition, has been studied systematically only for about three decades or so. Thus, compared to research on language development, research on retention, maintenance and attrition of language skills is a relatively recent development.

Even though there is sociolinguistic tradition of study on language shift, work on language attrition really started in the 1980s. Since the publication of *The Loss of Language Skills* by Lambert and Freed in 1982, research on language attrition has undergone an increase, and, as a new area of inquiry, it is still very effervescent, sometimes yielding contradictory results. On the one hand, for example, there are studies indicating that languages could be completely erased from the human brain, as in the one conducted by Pallier et al. (2003), in which event-related brain imaging technology was used to reveal apparent complete disappearance of L1 systems after a long period of total lack of use. On the other hand, Footnick (2007), in a controversial study, revealed evidence sustaining long-standing knowledge of a forgotten childhood language by means of age-regression hypnosis.

In this way, as pointed out by Ecke (2004, p. 321), “language attrition has become a vibrant subfield of applied linguistics”, and psychologists and speech scientists are more interested in bilingualism/multilingualism and language attrition (Ecke, 2004), as it has implications for theoretical linguistics as a whole, including, for example, the organization of linguistic information in the brain, language processing and memory (Schmid & Mehotcheva, 2012). It is also known that language attrition may have an impact on the study of language development (Kupske, 2016). Since results of second language² (L2) development research can be applied to language teaching (Cook, 1992), it is strongly believed that the knowledge constructed by the research on L2 attrition can also feed language teaching, the focus of this work.

According to Schmid and Mehotcheva (2012), it is usually presupposed an L2 will be forgotten when it is not used or studied, despite where and how it was developed. The question of how much of the acquired language is retained later in life “can therefore still be considered wide open” (Schmid & Mehotcheva, 2012, p. 4). Studies exploring L2 attrition are still very limited, especially in Brazil, and, in a society which is now multilingual and in which people are trying to master languages, to understand the principles governing L2 attrition is even more relevant (Schmid & Mehotcheva, 2012). Also to Schmid and Mehotcheva

(2012), for example, research on L2 attrition may contribute to more effective planning, syllabus design and teaching with long lasting results. Following Szupica-Pyrzanowska (2016), it is paramount for language teachers to be familiar with language attrition and with its manifestations in order to be able to propose preventive measures.

In this perspective, the present article provides a comprehensive synthesis of research on L2 attrition to date. By drawing from the Dynamic Model of Multilingualism (DMM - Herdina and Jessner, 2002) and from the Threshold Hypothesis³ (TH), it also explores the impact L2 attrition research might (should) have on language teaching with a view to establishing more informed practices and policies as insight into language attrition may be of value for language retention and maintenance, and, therefore, for language teaching itself. It is noteworthy that it might be problematic to generalize the data displayed in this article to the current Brazilian context, where this issue was originally published, or to any other setting, as L2 teaching, learning and use change considerably over time and place. In addition, this article does not control the typological proximity between the languages involved in the processes of the data presented, which has a role in language development and attrition.⁴ This article solely aims at popularizing L2 attrition in a more generalist fashion so that language professionals (e.g., teachers, teacher trainers, material designers and policy makers) notice that L2 development is also a “losing game”, and, in a dynamic perspective, language retention and maintenance instead of pure gain must be considered. To that end, this work begins by outlining language attrition, when a dynamic angle to the phenomenon is advocated. Attention then turns to studies specifically focusing on L2 attrition and on the variables that militate upon such process, in which a general discussion on language contact (frequency), age, attained proficiency and motivation is made. Finally, the conclusions are presented.

1. The Nature and the Dynamics of Language Attrition

In a few words, language attrition may be defined as the partial or complete decline of any language (L1, L2, etc.) or language ability in a healthy speaker (Kupske, 2016). It makes reference to prolonged losses instead of momentary ones usually triggered by disuse or lack or reduction of input (e.g., Flege & Eefting, 1987; Sancier & Fowler, 1997; Kupske, 2016, 2017a). Language loss due to brain injuries (aphasia etc.), healthy aging or severe pathological changes due to ageing (dementia etc.) are currently not discussed under the domain of language attrition (Kupske, 2017a). According to Goral (2004), these types of language losses were once described as attrition, but its current focus is the context of bilingualism/multilingualism.

Language attrition is basically threefold as it concerns: (1) L1 loss in L2 settings, when the contact with the L1 is limited or interrupted or when there is a great competition with other linguistic systems, as in the case of first generation immigrants immersed in an L2-dominant setting (e.g., Sancier & Fowler, 1997;

Chang, 2010; Kupske, 2016); (2) L1 loss in L1-dominant environment, when highly proficient bilinguals are frequently in contact with an L2 such as language teachers (e.g., Cohen, 2004; Lord, 2008; Schereschewsky, Alves & Kupske, 2017); and (3) L2 loss in L1 settings, when learners of an additional language or L1-migrant returnees discontinue contact with the L2 (e.g., Mehotcheva, 2010; Xu, 2010).

In general terms, to Ecke (2004), language attrition is connected to forgetting, which usually follows failure in one of the basic elements of remembering: (i) encoding, the learning of new information; (ii) storage, the integration and representation of information; and (iii) retrieval, the access to the information stored. As language attrition is concerned with the loss of a language that is not led by ageing in healthy speakers and as only acquired information can be lost, it is assumed that the encoding and storage components of remembering are intact during the process. Therefore, it implies that language attrition would be connected with the retrieval of linguistic information that was somehow forgotten/attrited. To Ecke (2004), there are basically seven psychological explanations of forgetting that could be used to interpret language attrition: repression/suppression, distortion, interference, decay, retrieval failure, cue dependency, and Dynamic Systems Theory (DST), here advocated. As the author also points out (2004, p. 324), the latter is not “a true theory of forgetting. However, it is included because it attempts to address forgetting in relation to acquisition and other variables.” Kupske (2016) also provides a strong argument in favor of a dynamic perspective to attrition, in which languages are highly sensitive to environmental changes and time. In his study, first generation Brazilian immigrants in London (age of arrival >18), England, after four years of immigration, produced L1 items with acoustic features expected for the L2. In other words, they presented a foreign accent in their Brazilian Portuguese (BP)-L1 production. A pilot experiment (Kupske, 2019) indicated that some of these attrited Brazilian immigrants were not even considered to be BP native speakers when their speech productions, on the word level, were assessed in an accentedness judgment task by monolingual compatriots. As a conclusion, languages are dynamic to the point in which bilinguals/multilinguals in an L2-dominant context may sound like foreigners in their very own L1.

To Schereschewsky et al. (2017) and Kupske, Perozzo and Alves (2019), a dynamic approach to language most importantly describes holistic, organic, and emerging systems that are composed of two or more interrelated systems, which may *per se* represent other dynamic systems (Mercer, 2013). Therefore, as variables/agents mutually interact and influence one another, dynamic systems/languages may change over time. Kupske (2016) states that every dynamic system is an open system, and energy can either enter or exit. In addition, as variables/agents are interconnected, if one of them changes, it will affect all others, and the complexity of these systems originates precisely from this relation of interdependence between its constituent elements. Removing or adding elements might compromise the behavior of the system in an unpredictable way, and changes in those systems should not be equated with the direct causes as small variations or small inputs may bring about considerable changes (Kupske et al., 2019). Based on these tenets and

considering language as a dynamic system, Herdina and Jessner (2002) developed the Dynamic Model of Multilingualism (DMM), which holds great potential to accommodate language development and attrition.

In DMM, language development is characterized by (i) change in quality, (ii) reversibility, (iii) stability, (iv) complexity, (v) non-linearity, and (vi) interdependence. The first characteristic alludes to the fact that language proficiency may oscillate. To Herdina and Jessner (2002), both knowledge and use of languages are in continuous flow; as languages are dynamic and adaptive, their development and attrition are possibilities to the model. According to Herdina and Jessner (2002), such a change in quality would be reversible. One example of this reversibility may be found in a study conducted by Sancier and Fowler (1997). In one of their three experiments, the authors attempted to elucidate the hypothesis that a Brazilian immigrant residing in the USA would have her Voice Onset Time⁵ (VOT) values for English-L2 and BP-L1 items increased when in the host country and, on the other hand, decreased when in Brazil. This hypothesis was significant for [p] in both languages. This research thus indicates that the immigrant modified her VOT values depending on the linguistic context in which she was immersed. However, a dynamic system may be stable once there is constant time and effort for maintaining its elements, and this article will focus on this feature later on.

With regard to complexity, a multilingual system is a complex adaptive system in which all languages of a bilingual/multilingual – subsystems – interact among themselves and with the environment. Again, on a phonetic-phonological level, the research conducted by Kupske (2016) reveals L1 production that follows the acoustic patterns expected for the L2 of the environment participants were immersed in. Cohen (2004), Lord (2008) and Schereschewsky et al. (2017) point out that even in an L1-dominant context proficient bilinguals will integrate to their production features of the L2. Thus, once a language is developed, it does not necessarily stay at the same level of proficiency, which is due to changing linguistic needs, the interaction between languages (Włosowicz, 2014), and the context. Language development is not only non-linear, but also characterized by periods of accelerated growth and retardation (Herdina & Jessner, 2002). In such perspective, according to Herdina and Jessner (2002), to develop an additional language is only achieved at the expense of the cognitive resources that are already in use to keep the other languages previously developed. To Jessner (2003), the learning of new information/language affects the other languages leading to less language development and to the forgetting of previously learned information/languages. As Ecke (2004) points out, bilingualism/multilingualism comes with a cost.

Languages are systems that develop over time by means of the interaction between environment and cognitive processes. As there is an interrelatedness of variables (language maintenance effort, language aptitude, etc.), Herdina and Jessner (2002) point out that language attrition represents a change in a bilingual/multilingual's language proficiency, which is still an open question mainly to linguistic models that take language as a set of invariant grammar. To the

authors, the languages of a multilingual are interdependent and in a continuous adjustment process to the environment and internal conditions, so that balance is maintained. Languages are not autonomous, but interdependent, and their interaction influences the stability of the whole system (Herdina & Jessner, 2002). That is why, due to cross-linguistic interaction, in multilinguals, the competence in each language, including L1, differs from that of a corresponding monolingual.

The model predicts both positive and negative growth, development and attrition, as already highlighted. The former occurs when energy (time and effort) is provided into the system. On the other hand, when less or no energy is endowed, the system faces a negative growth that may lead to gradual language attrition. To Włosowicz (2014), maintaining each language at a particular level requires effort, and the DMM includes a language maintenance effort (LME) component that relates to a constant commitment required to preserve one's language, to preserve the stability of the system. As stated by Schmid and Mehotcheva (2012, p. 8), "rather than focusing on the process of attrition itself, DMM considers the language maintenance effort that bilinguals and multilinguals have to exercise in order to keep their languages 'alive'". To these authors, using a language for communication and verifying hypotheses about the multilingual system will lead to stimulation of parts of the speaker's linguistic subsystems. If no such effort is made, owing to a lack of exposure to a language, for example, this may lead to decline of linguistic skills. Without LME due to lack of language use or input, DMM predicts deterioration in aspects of that particular system, which is, for example, also predicted by the Neurolinguistic Theory of Bilingualism (NTB).

According to the Threshold Hypothesis (TH), long-term disuse of a language leads to a raising of its level of activation, as language items and systems have activation threshold levels which depend on the impulses that are necessary for their activation. The activation of linguistic structures is therefore active only when an adequate quantity of positive neural impulses has reached its neural substrate (Paradis, 2004). Low activation threshold levels require fewer impulses to activate the items, while higher levels demand more. To Bardovi-Harlig and Stringer (2010, p. 4), "the higher the activation threshold, the greater the number of activating impulses needed to reactivate the representation". Each time an item is used, its activation threshold level is lowered and it then gradually starts rising again until the next activation occurs: the more often an item is used, the lower its activation threshold level is maintained (Mehotcheva, 2010).

To Schmid and Mehotcheva (2012, p. 10), "in order for an item to be selected, activation of the item in question is accompanied by inhibition of its possible competitors, i.e. their activation threshold levels are raised (but not beyond the point where they would no more be recognized". In that manner, the level of activation of language items and (sub)systems will change constantly during the lifespan of an individual and is dependent on language use frequency and recency. Dynamic models of grammar emphasize that frequency of occurrence is an important determinant of linguistic structure and language use, and there is already a robust body of research suggesting that frequency has an impact on

the comprehension, production and emergence of linguistic categories (de Bot, Lowie & Verspoor, 2007; Bybee & Hopper, 2001). Therefore, frequency has an impact on language attrition. To Paradis (2007, p. 125), in sum, language attrition would be the result of long-term shortage of linguistic stimulation. Conversely, to Bardovi-Harlig and Stringer (2010), if a specific threshold of language use is attained, its representation may be less prone to or even immune from attrition.

As discussed so far, language improvement can decline due to negligence, lack of LME or lack of linguistic contact/use. The process can also stabilize when the balance between improvement and decline is maintained (Szupica-Pyrzanowska, 2016, p. 112). As Kupske (2016) points out, language use/contact is only one of the many variables considered in language attrition, but it plays a very important role, and when there is enough time, effort and attention given to a linguistic system, it flourishes. If however there is a decrease in the amount of input and contact, a language (L1 or L2) may attrite and eventually be forgotten. Thus, at least in a dynamic viewpoint, L2 language professionals must not consider linguistic development only as a gain-oriented process or as a linear and closed system, but as a dynamic system that is also open to losses. Language teaching would then be balancing losses and gains, and by being aware of L2 attrition, teachers may be able to create retention and maintenance strategies, the focus of the next section.

2. L2 Attrition and Language Teaching

Bardovi-Harlig and Stringer (2010) highlight that the research on L2 attrition is weak and requires further investigation. Despite the fact that studies about the loss of L2 skills are found since the late 1920s with a focus on language teaching (Cole, 1929), it was only in the 1970s and early 1980s that linguistically oriented studies started to appear in the area (Cohen, 1974; Gardner, Lalonde & MacPherson, 1987), being Bahrlick (1984) the scholar introducing L2 attrition to psycholinguistics by investigating general issues of memory. As now there is a reasonable body of research on the area, (tentative) comprehensive descriptions of L2 attrition and its agents can be made. In this perspective, in the following subsections, a summary of the main findings that may help English specialists to take more informed sets of actions will be presented.

2.1. An outline of L2 attrition and the effects of language contact and frequency

It is currently known that L2 attrition shares many characteristics of L1 attrition; however, it is far more complex because of additional variables, including, for example, the L1 knowledge itself. To Bardovi-Harlig and Stringer (2010), the most significant difference between L2 and L1 development is the variation in degree of success, as typical L1 development is consistently successful. To Schmid and Mehotcheva (2012, p. 7), “traditionally language acquisition, whether of L1

or L2, has been regarded as a linear process characterized by a steady upward movement”. Healthy speakers would then be expected to move linearly forward analogous stages during language development. Even though this may hold true for typical development by monolingual children, research on L2 development has shown learning not to be linear as there are several linguistic and extralinguistic⁶ variables militating upon the process (Bates & MacWhinney, 1989; de Bot et al., 2007; Kupske, 2016). As a consequence, L2 attrition is not a linear phenomenon as it is predicted largely by the degree to which the language had been mastered prior to its onset (Mehotcheva, 2010). In a similar angle, de Bot et al. (2007) point out that it is difficult to predict the outcome of a multilingual speaker with a simple linear function either in terms of gain or loss.

To assess the onset of L2 attrition is also not clear-cut. For example, although vocabulary loss is one of the first manifestations of L2 attrition and can be measured, attrition events not always lead to vocabulary loss (Meara, 2004, p. 145). Meara (2004) also argues that the process of attrition may not lead to direct changes, but would weaken linguistic structures. Attrition events can therefore build up and create a greater loss, or in his terms “an avalanche loss” (Meara, 2004, p. 147). Moreover, to Bardovi-Harlig and Stringer (2010, p. 24), “there is no common starting point for attrition, whereas, in acquisition, the assumed starting point for all learners with the same L1 is zero (no L2 knowledge).”

In this regard, Chang (2010), working with L1 attrition, revealed, for example, that after only a two-week intensive course on Korean-L2, North-American participants would produce attrited L1 items. To Kupske (2016), also investigating L1 attrition, immigrants in L2-dominant settings would face language attrition after four years of immigration. However, the onset of L2 attrition is considerably more difficult to precise, and, according to Yoshitomi (1999), L2 attrition would start as soon as learners come home. The population of language attriters is as heterogeneous as the population of language learners, and some may attrite sooner than others. What contributes to the lack of homogeneity is a myriad of extralinguistic and language-related factors (age, language aptitude, attitudes towards languages and motivation, etc.), and the hall of factors influencing attrition is by no means exhaustive (Köpke & Schmid, 2004). It is still an open question.

Bardovi-Harlig and Stringer (2010) draw attention to the fact that L2 attrition may have a silent buildup period, during which language loss is just “laying a foundation” (p. 24), corroborating Meara’s “avalanche loss”. To Schmid and Mehotcheva (2012), L2 attrition appears to set in rapidly and then it would level off, as more intense attrition levels were found in initial periods – up to three years – of non use than in ensuing ones, supporting Bahrck (1984), who has revealed L2 attrition to be more intense during the early years of language non use (0-3) than in subsequent years (5-25).

After its onset, in general terms, to Holmes (2008, p. 59), L2 attrition is more commonly described to be connected to shrinking phonetic inventories, simpler phonetic rules, shortage of grammatical flexibility, smaller lexical repertoires,

and a decrease in fluency. On this point, to Bardovi-Harlig and Stringer (2010), the lexicon has been generally taken as more likely to be attrited than grammar, and this hypothesis has been previously demonstrated by Kuhberg (1992). This decrease in lexicon may relate to size (e.g., Russell, 1999) and access (e.g., Cohen, 1989; Olshtain, 1989). A possible explanation is that morphosyntactic and phonological items are realized by procedural memory while vocabulary is sustained by declarative memory. It is then expected that the latter will be affected first or would be more vulnerable to frequency effects. To Schmid and Mehotcheva (2012), in the light of TH, for example, long-term disuse of a language would also first affect access to declarative items (lexical words), and later procedural ones (grammar rules). To the authors (2012, p. 11), “if attrition is to be detected in early stages of the attrition process, it is going to be on the lexicon”.

In addition, Andersen (1982) points out that linguistic structures that are more important in maintaining L2 distinctions are less prone to loss. In other words, for example, allophones are more likely to attrite than phonemes, which are distinctive. Hansen and Chen (2001) reveal that more frequent morphological elements are more robust against attrition, and to Tomiyama (1999), phonology tends to be more resistant to L2 attrition than syntax and morphology, contrary to L1 attrition research that highlights the vulnerability of the phonetic-phonological component to loss (e.g., Flege & Eefting, 1987; Sancier & Fowler, 1997; Kupske, 2016). It is also interesting to note that, to Yoshitomu (1992), for beginners, grammar would more likely to be attrited than the lexicon.

Even though lexical and grammatical retention have been the most scrutinized topics in the psycholinguistics of L2 attrition (e.g., Russell, 1999; Tomiyama, 2009), several studies have also investigated language skills maintenance and the relationship among these in language attrition/retention. More contemporary studies have also addressed the attrition of communicative competence ranging from fluency and speech rate to register and turn-taking (Yoshitomi, 1999). The most commonly referred finding (Bahrick, 1984; Hedgcock, 1991; Bardovi-Harlig and Stringer, 2010; Szupica-Pyrzanowska, 2016) is that L2 attrition is selective, as language production skills (speaking and writing) are more vulnerable to attrition than the receptive ones (listening and reading), or, in other words, receptive skills are more resistant to attrition than productive ones (Hakuta & D’Andrea, 1992; Weltens & Grendel, 1993).

To Bardovi-Harlig and Stringer (2010, p. 32), “oral competence is generally agreed to be highly susceptible to attrition”, and to Szupica-Pyrzanowska (2016), students whose language curricula concentrated predominantly on productive (oral) skills showed rapid and extensive decline in comparison to those whose instruction targeted receptive (comprehension) and writing skills. In this light, the importance of the written language and the use of authentic texts in language teaching has to be emphasized. As Brown (2007) indicates, balance is paramount in language teaching, and, taking L2 attrition data as a parameter, those students immersed in syllabuses that overvalue oral production in detriment of the written one might be more susceptible to L2 attrition. To Szupica-Pyrzanowska

(2016), extensive exposure to the L2 written language can even compensate for the absence of spoken input. Reading in L2 not only promotes development, but also prevents attrition.

Apart from balancing language skills, the contact with the L2 is an important factor in language retention, as, following a TH perspective, the more often a language is used, the better it will be retained (Paradis, 2007). Frequency of L2 use is imperative in maintaining a low threshold level of activation and preserving language accessibility. Different levels of activation are demanded to remember and to recognize language items; a higher level is demanded to recall words while a lower activation is needed only to recognize them for example. To Schmid and Mehotcheva (2012), once the threshold has fallen below the recognition level, a linguistic structure would usually be considered lost/inaccessible/forgotten. More frequent words and structures are then more easily learned, more readily accessed and more likely to be retained. Applying this discussion to language teaching, high frequency items and more simple grammar should be taught and mastered and then followed by less frequent items and more complex structures. Even though this argument sounds primary, to Macalister (2016), for example, language specialists seem to ignore it.

According to Macalister (2016), coursebooks writers usually do not apply the frequency principle which says “A language course should provide the best possible coverage of language in use through the inclusion of items that occur frequently in the language, so that learners get the best return for their learning effort” (Nation & Macalister, 2010, p. 40). That reality can be applied to course materials in general. As language contact and frequency are important to language development, at least in a perspective that draws from the DMM and the TH, it should be common sense that the greater the frequency of occurrence in a language, the higher the likelihood that learners will face it again and, therefore, learn it.

Macalister (2016, p. 47) indicates that coursebooks do not provide sufficient exposure to high frequency items, and that “as a result of the topic-based approach to coursebook organisation, learners are presented with a mix of low frequency as well as high frequency items simultaneously”. That also applies to grammar as, for example, the modal “will” is usually introduced after “going to”, despite the far higher frequency of the former in English use (Mindt, 1996). Teachers, material developers and policy makers must ensure continued contact with high frequency items and structures, not only to provide students with the opportunity to learn useful language, which they are actually likely to use for real communication, but also to guarantee the maintenance of an L2 language core by reinforcing frequent items. By doing so, even though less frequent patterns may be attrited, the essentials for communication in the L2 are likely to be retained.

It is interesting highlighting that, as multilinguals’ languages are interconnected and using one of them may activate the others by crosslinguistic influence, the TH predicts that lack of purposeful commitment to language maintenance, the aforementioned LME, does not have to be completely equated with language losses, because certain linguistic aspects can be subject to cross-

linguistic activation in a bilingual/multilingual context (Szupica-Pyrzanowska, 2016, p. 112). Flege (1995, 2007) and Best and Tyler (2007), for example, support this assumption. To these authors, the L1 and L2 sound systems of multilinguals would reside in the same phonetic-phonological space and would therefore bidirectionally influence each other by means of categorical assimilation and dissimilation. Although this interaction between languages is not enough to fully maintain the system that is not receiving LME, it would explain why absolute language attrition is generally not seen after certain ages or specific proficiency levels (Schmid & Mehotcheva, 2012).

To close the discussion about language contact and frequency, even though sudden and total L2 disuse is not very often documented, the length of reduced input and use must be also considered in language attrition and retention. To Clark and Jordan (1984), for example, beginners presented severe L2 attrition after a relatively short period of time without instruction, and, as already mentioned, L2 attrition would start as soon as learners come home (Yoshitomi, 1999). Therefore, the importance of the homework, usually trivialized, must be highlighted. Using L2 attrition data as arguments, homework is a means of reinforcing language retention, an instrument for language contact and maintenance. Homework in the light of L2 attrition should not be connected to repetitive, mechanical and time-consuming exercises out of the classroom, but to the creation of opportunities to keep the L2 in authentic frequent use. Contact with the L2 is a factor warranting language retention. LME is therefore in great part a responsibility of the learners/multilinguals, as active agents in their L2 development.

2.2 Age, attained proficiency and motivation impact on L2 attrition and retention

Even though only the effects of language contact and frequency upon L2 attrition have been discussed so far, as pointed out by Kupske (2016, 2017a), language attrition is a dynamic phenomenon and is dependent on a great variety of other variables, such as age (age at the onset of bilingualism/multilingualism and at the onset of attrition), attained proficiency, and attitudes and motivation towards the L2. In this subsection, they will be discussed.

Age is a crucial factor in language development and attrition. Research on language attrition in children reports a great decrease in proficiency up to level that the language seems to be completely lost (Pallier et al., 2003). Although there is evidence for language attrition in adulthood (Kupske, 2016), research has not reported drastic changes in proficiency. Attrition in children is then more severe. According to Schmid (2006), the development of literacy may be considered the reason for the resistance of language observed after puberty. To Olshtain (1986), older children are less prone to attrition than younger ones because older children have L2 literacy skills. Literacy anchors the L2 during the developmental process and provides another source of input (written language). Hansen and Chantrill (1999) conducted an investigation examining adults who developed L2 literacy

contrasted to those who did not and revealed that literacy offers protection against L2 attrition.

For the development of the L2 sound system earlier is usually better as far as the onset of bilingualism (age) is concerned (Flege, Schirru & MacKay, 2003; McCarthy, Evans & Mahon, 2013). Age then correlates with attained proficiency, which plays a role in L2 attrition. According to Schmid and Mehotcheva (2012), a higher proficiency at the beginning of the attrition process is often believed to lead to better retention of the target language. Mehotcheva (2010), on the attrition/retention of Spanish-L2 by German and Dutch students, corroborates that attained proficiency is a reliable indicator of L2 attrition. As already marked, TH claims that there are levels of achievement above which a language would be less prone or even immune to attrition; “best learned, last out”, as stated by Bardovi-Harlig and Stringer (2010, p. 16), or, according to Hansen (1999, p. 151), “the more you know, the less you lose”.

To Schmid and Mehotcheva (2012), as soon as a L2 is sufficiently developed (entrenched), it becomes unable to be affected by attrition. L2 beginners have a greater tendency to attrite than advanced ones. In a study conducted by de Bot and Clyne (1989), attrited participants were those who had low proficiency in the L2. Moreover, to Bahrck (1984), the knowledge lost in the first years of L2 attrition was the same among participants of different proficiency levels, affecting all levels equally in absolute figures. Therefore, high proficiency participants presented a higher proportion of retained knowledge, since for more proficient speakers linguistic structures are amalgamated at different levels and thus more resistant to attrition. It is expected that mature language systems are more resistant to attrition. It is then also expected a better L1 retention by more mature speakers in L1 attrition, and a better L2 retention by more advanced learners in L2 attrition. Therefore, young learners and beginners would need more LME and more attention from language specialists.

Among other variables that have an effect on L2 attrition and that are related to attained proficiency, according to Lambert and Freed (1982), the strength and quality of learning at the initial stages is one of the most important. “It is argued that the retention of linguistic material is further strengthened by the quality of learning at the initial stages of acquisition” (Szupica-Pyrzanowska, 2016, p. 114). In addition, duration and nature of instruction also play a significant role in language attrition. It is noteworthy that, to Szupica-Pyrzanowska (2016), intensive courses showed to be more effective for language retention. However, duration of instruction is related to its nature, as few months of instruction focusing communicative competence may out-weigh years of traditional teaching in terms, for example, of preventing L2 oral skills attrition (Bardovi-Harlig & Stringer, 2010). To Bahrck (1984), Mehotcheva (2010) and Xu (2010), rehearsal is not enough to prevent attrition. Mechanic repetition, imitation or other memory-related habits impede the learning process. An excessive rote activity is detrimental to the development of communicative competence, as artificial language material does not integrate

cognitive structures. To Szupica-Pyrzanowska (2016), a language developed in a meaningful way is less prone to be forgotten and more likely to be retained. Therefore, approaches for language teaching that emphasize communication and intelligibility instead of form and accuracy are not only paramount in L2 development, but also in L2 retention and maintenance.

Finally, although Schmid and Mehotcheva (2012) point out it is difficult to establish the role of attitudinal/motivational factors in language attrition, as they develop dynamically and are subject to change, research has shown that attitude and motivation are paramount in language development. To Schmid and de Bot (2006), for example, language use and contact depend, to a certain extent, on individual attitudes and motivations. Thus, attitudinal/motivational features are connected to L2 attained proficiency and will relate to L2 attrition/retention (Gardner, 1982). In a dynamic prism, to Kupske (2017b), favorable and unfavorable attitudes towards the L1 and the L2 play a significant role in acculturation and language development, as, for instance, positive attitudes towards the target language would facilitate learning (Yilmaz & Schmid, 2015), as motivated learners tend to seek more opportunities to experience and use the L2, increasing the LME. In a TH perspective, to Paradis (2007), motivation and learner attitudes toward the L2 are able to raise or lower the activation threshold due to its correlation with language contact. Thus, they also play a role in language retention, enhancing L2 development.

Language specialists also have to emphasize the affective side of learning (Jacobs & Renandya, 2016), as motivated students will yield better learning outcomes. That is the reason why the situation in which students are developing the L2 is paramount in language development and maintenance. In the Brazilian public education scenario, for example, usually artificial and stereotypical, the intention to engage in communication often comes from the syllabuses and the teachers instead of from student's themselves, which may reduce the LME. Motivation, attitudes and individual differences play a role in language development and attrition. A curriculum should then be custom-made so as to accommodate the particular populations they are designed to target (Szupica-Pyrzanowska, 2016, p. 115) in terms of students' needs and wants.

To conclude this section, in the postmodern world, the paradigm of teaching has changed. The emphasis faced today is not only on the process of teaching, but also on the process of learning. As Brown (2007) indicates, language teaching reached maturity where professionals are now able to recognize that the diversity of learners and contexts demands an eclectic approach to teaching. However, as discussed so far, by nature, languages are dynamic entities and are susceptible to different processes, whether change or attrition. Language development holistically results from the interplay of environmental, cognitive, social-affective and linguistic variables (Ecke, 2004, p. 341), and language teaching thus also has to take into account knowledge retention and maintenance, as language development is not linear and only gain-oriented.

3. Concluding thoughts

There is a lot to be discovered about the governing principles of L2 attrition and which agents influence this process. Research on L2 attrition still faces a number of methodological issues and constraints (Schmid and Mehotcheva, 2012), mainly in Brazil, where this research theme is almost nonexistent. In this light, the main objective of this article was to provide a comprehensive view of L2 attrition and how its data could feed language teaching in general terms, as by understanding its causes and effects, may allow L2 professional to think of teaching also in terms of retaining, maintaining, recovering and relearning languages, that is, in terms of prevention to L2 attrition. Even though it has drawn from DMM and TH, as linguistic and extralinguistic variables are important for language attrition, this work is sensitive to the fact that it is implausible that its hypothesis or advocated models will lead to full understanding of L2 attrition. Therefore, this paper, hopefully, will encourage additional work in the field.

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2. To Szupica-Pyrczanowska (2016), in the realm of nonnative language development, a further division is made between L2 attrition (immersed learning) and FL attrition (instructed learning), as they differ in regard to input quantity and quality of the native and nonnative languages (Schmid & Mehotcheva, 2012). However, this article does not differentiate L2 from FL, and in both cases mentioned by Szupica-Pyrczanowska (2016) the most common causes leading to attrition are the same. The terms FL and L2 will therefore be used interchangeably in this article.
3. In this article, the general term Threshold Hypothesis is used to cover the proposals of Neisser (1984) and Paradis (2004; 2007).

4. Hansen (2011), for example, found that English native speakers learners of Portuguese-L2 and Spanish-L2 retained significantly more words in the target language than those learning Asian languages.
5. Voice Onset Time (VOT) can be defined as the interval regarding the delay of the vibration of the vocal folds between the soundless stop release and the start of the following vowel sound (Lisker & Abramson, 1964).
6. In a dynamic perspective, Kupske (2016) understands that there are no extralinguistic variables, since social and attitudinal variables militate effectively on language development and attrition. This term, in this way, will be used to make reference to variables or questions that do not directly involve linguistic systems.

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