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FROM BILINGUALISM TO MULTI-LINGUISTICS: THE INTERFACES BETWEENPSYCHOLINGUISTICS WITH NEUROLINGUISTICS

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Abstract

Bilingualism and multilingualism are a framework for understanding the subject from the point of view of diverse cognitive experience, beginning with the ability to use various languages in various context and for different purposes. The present study presents a summary of the key aspects of bilingualism and multilingualism studies and is based on three main goals: (i) identifying and problem-setting principles of bilingualism and multilingualism; (ii) addressing the main methods and results influencing research on bilingualism and multilingualism, psychologically and neural-language;(iii) to present the researches that have been developed in different countries including Iraq from these approaches.

Keywords

bilingualism; multilingualism; psycholinguistics; neurolinguistics.

1. Introduction

The topics of psycholinguistics are the interaction of language processing and learning and cognitive processes and the relationship between psychology and linguistics (Wong et al. 2016). Although it is considered as an interdisciplinary branch of Psychology and Linguistics, Psycholinguistics should not be confused with the Psychology of Language. The spectrum of psycholinguistics is broad as this interface research examines and human communication process, through the use of language, focussing on reciprocal influences between psychocognitive processing mechanisms and differences in the comprehension and development of language-oral, written and gestural (Auer, 2007). Neurolinguistics, in turn, is the science that

studies the brain mechanisms underlying the understanding, production and abstract knowledge of language-spoken, signed or written. In other words, it investigates the relationships between the structure of the human brain and linguistic ability, with a special focus on language acquisition and language disorders, especially those originating from brain injuries (Wong et al. 2016). It is an interdisciplinary field, which articulates knowledge from Linguistics, Cognitive Sciences, Neurobiology and Computer Sciences, among others. Among a myriad of potentially possible psycho and neurolinguistic investigations - sentence, text processing, speech production, mother tongue acquisition, among others - studies on language in bilingual and multilingual have been highlighted (Walters, 2005).

In the current studies on second language acquisition (L2), it is not difficult to find studies on the relationships between the mother tongue (L1) and the second language, or on how both languages interact in bilingual individuals. However, when we start to question how languages previously learned (not only L1, but also L2) can influence the acquisition of the next one (L3), few answers are found, mainly in Psycholinguistics and Neurolinguistics studies in the world (Bhatia, 2013). With the growth of global policies interested in promoting the teaching and learning of several languages, as currently occurs in the European scenario, for example, the need to develop studies that investigate the processes that multilingual speakers go through when establishing contact is highlighted with various linguistic systems. The main strands of studies on bilingualism and multilingualism are the theme of this work, organized from three main objectives: 1) to define and problematize the notions of bilingualism and multilingualism; 2) discuss the main approaches that have guided psycholinguistic and neurolinguistic research on bilingualism and multilingualism; 3) present the research that has been developed in Various countries and Iraq based on these approaches (Li, 2009; Rodrigo & Wilkinson, 2020).

1.1. Revisiting the notions of bilingualism and multilingualism

Bilingualism has many forms and configurations and the different classifications of bilingualism vary depending on the linguistic, cognitive, social and developmental dimensions that are considered as the focus of attention. One of the first linguists to coin different types of classification for bilinguals was Roberts (1939), who made a distinction between subordinate and coordinated bilingualism (Marian and Spivey, 2003). Two decades later, Weinrich (1953) appropriated these classifications (with due credit to Roberts) and added yet another distinction to the original dichotomy, establishing three categories of bilingualism in the bilingual relationship based on the relationship between lexicon and conceptual systems in two languages: 1) organized bilingualism in which two words (one of a bilingual spoken language) represent different concepts; 2) hybrid two-lingualism in which a single unified concept is expressed by two words (one of a language spoken by a bilingual one), 3) subordinate bilingualism, in which a word from L2 would be accessed through its translation into L1 (Schwieter, 2013; Rompoti, Madas, & Kitsios, 2020; Rostiyanti, Hansen, & Harison, 2020).

The various classifications and, often, conflicting characterizations about bilingualism presented in the literature make it clear that there is no consensual definition of bilingualism among researchers, precisely because there is no consensus between the answers given to the questions "What does it mean to know two or more languages? " "How much does an individual need to know more than one language to be classified as a bilingual individual?" One of the answers to this question originated the Monolingual Double Hypothesis (Sear, 1922) according to which a bilingual is seen as the meeting of two monolingual subjects in a single person; therefore, it should have performances equivalent, in both languages, to the monolingual speakers of each one. Grosjean (1999) criticizes this hypothesis harshly, stating that it brings a monolingual (or fractional) view of bilingualism. According to him, a bilingual individual is not the sum of two monolinguals, as bilinguals use each of their languages for different purposes, in different contexts and when communicating with different interlocutors. This means that it is practically impossible to achieve full proficiency in two or more languages, considering the four language skills (speaking, writing, listening and reading) and each of the linguistic subcomponents of each language (morphology, syntax, semantics, pragmatics, speech and phonology). Cook (2003) reinforces this position, stating that bilinguals used languages for different purposes than those of monolingual; in addition, those have a much more complex linguistic system. Therefore, the parameters used to assess the knowledge that a monolingual speaker has of their mother tongue should not be used as a parameter to assess the knowledge that bilinguals have of each of their languages (Cenoz, 2013)

The Monolingual Double hypothesis, reflects a long controversy regarding the definition of what characterizes a bilingual individual. In fact, in the literature, there is a wide range of definitions, such as, for example, that of Bloomfield (1933), according to which bilinguals are individuals who have "native control of two languages" (p.56), up to that proposed by Edwards (2006), who states:

It's all bilingual. That is, no one (no adult) in the world knows at any rate a few words in other languages than the language of the mother. If, as an English speaker-or if only you understand these words-you obviously have a command of an foreign language, you know how to say "gracious or good day or towering." .. the matter is, of course, graduate; and it's a problem which is still creative and a main research module. (Cenoz 2013,7)

The above statement highlights two important factors in relation to bilingualism. The first concerns the issue of code-switching as a psycho-sociolinguistic facet since it is linked to the context of the use of languages by the bilingual. Butler and Hakuta (2006) draw attention to the fact that the use of language by a bilingual individual is strongly subordinated to a specific context. The second factor highlights the question of the level of proficiency in the second - or another, such as the third, the fourth - language. Combining these two factors, it is clear that the topic of discussion, the relationship of intimacy between interlocutors, the level of formality in the environment, the psychological and

physical conditions of individuals, for example, are factors that affect not only the degree of proficiency they individuals will acquire in each of the skill domains (speaking, writing, etc.) in two or more languages, as well as determining the extent to which individuals will switch between one system and the other and whether they will be able to use them separately.

Recently, (Estrela et al.2002) described "bilinguals" as people who know and use two languages, not necessarily in the same sense or mastered with the same ability levels. We should assume that more than half the world's population is bilingual, based on this definition. Therefore, we will see bilingualism as the ability to use two languages and multilingualism as the ability to use two other languages if we adopt this conceptualisation. Furthermore, if we follow this conceptualization, we can understand bilingualism as the ability to use two languages, and multilingualism as the ability to use more than two languages. This definition, based on usage, implies a vision of bi / multilingual as people with different degrees of competence in the languages they use. Thus, bilingual and multilingual people may be more or less fluent in one language than in another; they may have different performances in languages depending on the context of use and the communicative purpose, among other reasons.

The different skills developed in the different contexts of use in the two or more languages spoken by the individuals highlight the mode of activation and processing of the languages, which, according to Grosjean (1999), constitutes a continuum, which goes from the monolingual to the bilingual mode, passing through several intermediate states of processing and activating the languages used. In addition, there are individual differences in the ability with which bi / multilinguals change the mode over the continuum. Both bilingualism and multilingualism are dynamic, not static, as the profile of bi / multilingual changes over time, as he progresses on the continuum or stops using one of the languages.

From the above statements, we would like to emphasize our stance on bi / multilingualism from a dynamic and holistic view of cognition. Thus, we do not accept only ambilingualism as an object of neuro and psycholinguistic research in the area, but we take the most expanded version of the terms bilingualism and multilingualism, as explained above.

1.2. Main Approaches to Neuropsycholinguistic Researches on Bilingualism and Multilingualism

This section deals with the approaches and studies made on the theme of bi / multilingualism in the fields of psycholinguistics and neurolinguistics and is divided into three subsections. In the first, psycholinguistic approaches to bilingualism are presented. Next, the psycholinguistic research that investigates multilingualism is approached. Finally, neurolinguistic approaches to buy / multilingualism are discussed.

1.2.1 Psycholinguistic approaches to Bilingualism

Research that investigates the effects of bilingualism from a psycholinguistic perspective focuses primarily on issues related to the impact of bilingualism on non-verbal aspects of cognitive development, although taking into account the results obtained from studies that investigate other aspects, such as, for example, the development of metalinguistic and literacy skills of bilinguals. (Alshahrani, 2017)

Although currently, it seems obvious that the linguistic experience lived by bilinguals can have some effect in terms of cognition and development, research focused on this type of investigation is quite recent. Until the early 1960s, studies that looked at the behavior of children living in bilingual contexts tended to claim that bilingual individuals seemed to have linguistic and cognitive disadvantages compared to monolingual ones. Herdina and Jessner (2002) state that even today findings are reported that, although they do not point out general cognitive deficits for bilinguals, at least they suggest a linguistic disadvantage of bilingual subjects in one of the languages at some level:

Through the quest for learning of the second language, numerous studies seem to show the linguistic deficiency of the bilingual and the monolingual. Bilinguals' Linguistic Resources are evidently lower than their monolingual counterparts and the contact between the two linguistic systems appears to be sufficient evidence. It should also be noted that, while bilingual people are evaluated according to monolingual standards, both linguistically and cognitively, they tend to have considerable disadvantage.” (p. 12)

The turn towards a more positive approach to the effects of bilingualism started in the 60's when Peal and Lambert (1962) carried out a study that caused a great impact and that today is seen as a “watershed” in research in the area. Based on the findings in force at the time, the authors started from the initial hypothesis that both monolinguals and bilinguals tested would obtain the same scores on non-verbal cognitive measures, although bilinguals could perform better on verbal measures. In analysing the performance of a select group of French and English-speaking children, the researchers confirmed the linguistic advantage of bilinguals, but also found an unexpected advantage of bilinguals in some non-verbal cognitive measures involving symbolic reorganization (intellectual reasoning), among others. Based on the results obtained, Peal and Lambert (1962) argued that the experience of having two languages to describe the world provides bilinguals with conditions to understand that many things can be seen in two ways, and contributes to them perceiving and interpreting the world more flexibly. The main conclusion evidenced in this study - that bilingualism provides the flexibility of thought - is an idea that persists today, each time with more consistent evidence. (Reynolds, 1991).

The history of research that investigates the effects of bilingualism on child development has shown that bilingualism seems to accelerate children's linguistic and metalinguistic development. (Ricciardelli, 1992) Concerning investigation of the effects of bilingualism on children's cognitive development, the work carried

out by Bialystok and his research group stands out. Bialystok and Shapero (2005) presents a review of research involving the effects of bilingualism on children's cognitive development and demonstrates that, although some studies report conflicting results, most research shows a more accelerated mastery of certain cognitive processes in the case of bilingual children.

For example, report two studies involving six-year-old monolingual and bilingual children in tasks of identifying alternative images in a reversible figure in which they demonstrate that bilingual children were more successful in seeing the other meaning in ambiguous images. Such results reinforce the advantages of bilinguals in cognitive processes that require "executive control of the ability to select attention to aspects of a stimulus and resolve conflicts based on conflicting responses" (Bialystok and Shapero 2005, 603). The results confirm previous studies on selective attention and inhibitory control in the formation of concepts, who tested the ability to reverse rules in young children. The authors showed that bilingual children, when asked to follow a simple rule of organizing a set of cards or blocks (for example, according to their color) and then reverse this rule in order to organize the same cards or blocks in a way different (for example, according to their format), they show greater capacity to adapt to the new instruction, solving problems faster than monolingual children. According to Bialystok (2005), tasks of this type impose a great demand on the child in terms of the ability to control selective attention: "children need to inhibit attention to a previously valid visual perception and refocus on a different aspect of the same stimulus" (p .423).

Another aspect that has been studied refers to possible cognitive advantages of bilingual children in terms of arithmetic ability and internalization of mathematical concepts. In general, the results indicate that the level of language proficiency interferes with the ability to solve mathematical problems and that bilingual individuals do not seem to demonstrate a clear advantage in comparison to monolinguals in terms of mathematical precocity[16]. However, research has also shown that there are no advantages for monolinguals, as some older studies have come to defend. According to Bialystok (2005), "monolingual and bilingual children who are similar in terms of linguistic ability have solved mathematical problems with the same level of competence" (p. 425).

Nevertheless, the author suggests that bilingual people have strong advantages in the resolution of issues involving contradictory information and in an attempt to ignore this information and that these advantages contribute to improved results in various forms of cognitive care. According to Bialystok (2005), it is a significant processing advantage and persists in linguistic and non-linguistic areas involving problem-solving to inhibit the attention to conflict-generating knowledge.

In the past two decades, studies on bilingual processing have also involved investigations on cognitive aspects of adult bilingual individuals, who have shown superior performance than monolinguals in cognitive processes that deteriorate with the effects of age. The findings indicate that speaking two languages instead

of one is associated with a delay in the development of senility for up to five years and that such a difference exists even when taking into account the educational level, sex and social environment or country of origin of the women people studied. It is interesting to note that the pharmacological treatments to which these individuals were submitted did not have as significant an effect as the practice of two languages.

Finally, in the most recent literature (DeLuca et al. 2019), it is possible to see a growing concern with the expansion of the research focus in the area, with the aim of going beyond the description of the advantages cognitive aspects of bilinguals, seeking more consistent theoretical explanations for this type of attested cognitive advantages. This is the case, for example, of research on bilingual speech processing, in which theories about working memory and models of bilingual speech production, later extended to account for the multilingual speech processing, have appeared to try to systematize and explain, theoretically, the experimental findings. (De Cat et al. 2018).

This section highlighted the psycholinguistic approaches to bilingualism, focusing mainly on studies with children. In the next section, some approaches and investigations involving multilingualism will be described and commented on, which were developed mainly with adult participants.

1.2.2 Psycholinguistic approaches to Multilingualism

With the recent development of research aimed at clarifying the nature of the organization and activation of languages in multilingual, some factors have been highlighted, such as the role played by the second language over the third consecutive multilingual language. The typological distance observed between languages acquired by an apprentice is one of these factors and has already been investigated by several researchers in the field (Robinson 2019). According to the notion of typological distance, the influence of L2 will be more noticeable on L3 if it is typologically closer to L3 than L1. Sima ModirkhameneaLaleh and Toupa Esfandiari (2014) had already highlighted this factor, and their approaches had a more cognitive character since the authors attributed to the apprentice a great responsibility for the identification of this distance between languages. What Toupa Esfandiari called "psychotypological" distance refers to the fact that, often, the learner credits a similarity between two languages that is not supported by the formal language system? Thus, there would be a psychotypological perception that would result from the development of the learner's metacognitive competence and metalinguistic awareness. Modirkhamene (2006), complemented this view, explaining that both the style and the learning environment shared between L2 and L3 can trigger this similarity effect.

Willians and Hammarberg (1998) launched the concept of 'linguistic status' to explain the interaction, in sequential trilingual, of the mother tongue with foreign languages. These authors emphasize that interlingual transfers can occur with more emphasis from the second language, and not from the mother tongue

(Pokrivcakova, 2013), to the third language. According to the authors, the apprentice may try to block access to L1, based on the knowledge he has in his L2, because he has a foreign language status as opposed to L1. The degree of proficiency in L2 also emerges as an important factor in establishing the transfer in the L2-L3 direction. Hammarberg (2001) points out that the higher the level of proficiency of the apprentice in L2, the more it will have its influence noticed in the production in L3, especially if the apprentice's L2 has been learned and used in a natural context.

Another important factor to explain transfers in the L2-L3 sense was defined by Hammarberg (2001) as a regency effect. According to this notion, L2, as it received a great demand for activation as it was acquired by the apprentice, may be more accessible than L1 when L3 is produced.

Finally, it is worth highlighting a model regarding multilingualism developed by De Bot (1992). The Multilingual Processing Model seeks to explain the issue of lexical access in multilingual languages based on a notion of competition between languages. According to this model, the languages learned by the trilingual will always be activated simultaneously, generating constant competition between them at the time of production, as well as at the time of linguistic perception. The language that is most frequently activated by the learner will be more likely to stand out among the others, transferring more lexical items towards the less used language.

Another research, developed by Dewaele (1998), investigated the creation of words (lexical invention) in a group of 39 Dutch speakers as L1, 32 of whom spoke French as L2 and English as L3, and the remaining 7 spoke English as L2 and French as L3. The results found attest to a visible interlinguistic influence in the invention of lexical items in both groups; French speakers like L2 seem to make more use of the information linked to the Dutch motto (L1), while French speakers like L3 seem to use more resources related to the English motto (L2). For Dewaele, there would be a blockade preventing the use of L1 in the production of lexical items in L3.

Tremblay (2006), examined the impact on the interlinguistic English (L1) and French (L2) transfers to German (L3) of L2 knowledge and exposure. The author examined the lexical innovation rate as well as language changes between three language groups with different skills and exposure rates to L2. According to the findings, L2 has a greater effect on L3 when apprentices are more exposed to L2. Similarly, the findings also indicate that while L2 skills seem to impact L2 in output at L3, it appears that the degree of exposure to L2 causes students to use L2 in order to try and prevent lexical problems.

1.2.3 Neurolinguistic Approaches to Bi / Multilingualism

A great increase was made possible in the Neurolinguistics study agenda thanks to a growing improvement in the various neuroimaging techniques, which allow an in vivo investigation of the brain dynamics during the execution of

cognitive tasks, including language. Specifically in this field, that of linguistic processing, studies have investigated a wide range of aspects, including: 1) how the production and understanding of words, phrases and texts occurs; 2) what is the brain architecture recruited to process the visual input and what is required for the auditory input; 3) how language is processed under special conditions, that is, in illiteracy, multilingualism and the presence of sensory deficits, such as deafness (reading signs) and blindness (reading Braille).

Several relevant findings about linguistic processing in the brain have emerged from studies with neuroimaging in adults. For example, it was evident that the language centres are not limited to homogeneous areas, much less to the classic regions of Baghdad and Kurdistan, but also occur in small non-adjacent points, specialized in specific components of language. It was also found that it is much more relevant to study the functioning of the areas related to the language (s) in terms of its components (morphology, syntax, phonology, semantics) than in terms of activities such as repetition, reading and listening and listening. Finally, the hemispheric predominance of language was investigated. These studies indicated that the left hemisphere seems to be more accustomed to syntactic, semantic and phonological processing, while the right would be more specifically in charge of discursive and pragmatic aspects, such as the interpretation of connotations, irony, of the theory of mind. In addition, the left hemisphere, in lexical terms, would select the most specific word for a given context, while the right hemisphere would provide all possible meanings for a particular word, read or heard.

Specifically, in the case of bilingualism (or multilingualism), studies have focused on the analysis: 1) the effects of age and the form of acquisition of L2, the use of L2, as well as the interaction between the levels of proficiency in L2 and the formal representation of different languages; 2) the processes of brain reorganization after an injury; 3) the effects of different therapeutic strategies on brain reorganization; 4) the precise identification of the location and extent of brain damage in bilinguals with aphasia.

A relevant issue in researching language production in bilinguals says regarding how bilinguals control the use of their two language systems. There are inconsistencies in the literature on psycholinguistics regarding the control of the use of one language or another. According to Abutelabi and Green (2008), it is not certain whether: (1) control issues are central to understanding language processing in bilinguals; (2) if they are, which is the region (s) that exercise control; and (3) whether language control in bilinguals is supported by inhibitory mechanisms. Implications from research data using neuroimaging techniques can deepen our understanding of language control. In their article, Abutelabi and Green (2008) demonstrate that bilinguals adopt cognitive control networks to perform tasks such as language switching during the current speech. Evidence of neuroimaging points to the existence of multiple neuronal control regions that seem to depend on inhibitory mechanisms. These data, inferred from the activation of

different parts of the brain, should, in turn, increase the development of a neurocognitive contribution for linguistic processing in bilinguals.

Research has pointed to the positive correlation between proficiency in L2 and its use versus the organization of L2 in the brain. More specifically, in relation to proficiency in L2, studies have demonstrated greater participation of regions in the right hemisphere during the performance of linguistic tasks by non-proficient speakers. However, a meta-analysis of six studies using neuroimaging techniques indicates that participants with a high level of proficiency in the second language activate similar areas of the brain, which suggests that L2 becomes automated, becoming part of procedural knowledge (Del Maschio et al. 2019).

These findings seem to corroboratefor whom the effective use of L2 in daily life, an aspect that until recently was ignored in the questionnaires that traced the profile of the bilingual research participant, is a factor intrinsically linked to the level of proficiency and fluency, since L2 linguistic structures are more easily accessed when its use is frequent.

Another issue that has deserved a lot of attention on the part of researchers is the relationship between the age of acquisition of the second (or other) languages and their structuring in the brain. The data obtained through these surveys are quite controversial. Evidence provided by some studies tends to state that the acquisition of syntactic aspects would be more conditioned to the age of acquisition, that is, late bilinguals (those who acquire L2 after childhood) would recruit areas not overlapping the areas of syntactic processing in L1. In relation to semantic processing, the age factor would not be so determinant, since the overlap of areas of brain activation was registered in studies with late bilinguals. Finally, in relation to the age of acquisition factor, it should be noted that many of the results brought by research can be considered questionable, since their interaction with the proficiency factor was not always properly investigated, the same occurring in concerning to the issue of effective use , daily, from L2 by the investigated bilinguals (Herrmann et al. 2009).

We realized, then, that these two issues - the proficiency achieved by the bilingual or multilingual and the effective use of L2 or L3 - are, evidently, determinants for the distribution of linguistic processing in the brain. These findings were the result of studies carried out abroad through neurolinguistic approaches.

The investigations discussed in this section bring together some of the studies that have been conducted abroad on bilingual and multilingual processing - mainly trilingual - from the psycholinguistic and neurolinguistic approaches. It is relevant, then, to verify what types of studies are being done by few researchers in these two areas.

2. Full bilingualism vs. incomplete bilingualism

The linguistic level of each language is a criterion that also allows bilingualism to be classified. In this sense, Marian et al., (2012) speaks of

subordinate bilingualism that denotes an imbalance in the linguistic development of the two languages and implies the fact that the mother tongue has been consolidated, while the second language is developing. Bilingualism is then incomplete. Insubordinate bilingualism, the individual "perceives life" from her mother tongue, and thus proceeds as a monolingual. In this type of bilingualism, one-way transfers are observed —from L1 to L2—, and this is promoted by the pedagogy of translation that does not allow a clear differentiation of the two systems.

2.1 Equal and additive bilingualism vs. unequal and subtractive bilingualism

Sanayi et al. (2013) distinguish between egalitarian bilingualism and unequal bilingualism, according to the social status that each of the two languages occupies in the symbolic representations of a given society. In this way, the relationship between the two languages can be one of equality or subordination, depending on the social and geopolitical circumstances that exist at a certain time between the two cultures of those languages.

The relationship between the two languages, and / or cultures, influence the feeling of the community, and the social group then transmits attitudes to the child towards the acquisition of a second language (Kovelman et al. 2008). Kovelman (2008) thus distinguishes between additive bilingualism and subtractive bilingualism. The first occurs when the child's social environment thinks that bilingualism is a cultural enrichment, the second appears in the opposite case when the social context perceives that this bilingualism may be a risk of loss of identity. Kovelman (2008) considers that for bilingualism to be suitable it is relevant that there is no conflict situation in the child's mind; there needs to be egalitarian and additive bilingualism. In order for the child to make the arduous and gradual cognitive effort that is necessary to acquire both languages, it is important to present the two linguistic systems as the capital of interesting and valuable concepts and referents.

Taking up, and combining, the different theoretical perspectives, we could consider that the following types of bilingualism can be developed:

1. Coordinated, complete, egalitarian and additive.
2. Coordinated, incomplete, egalitarian and additive.
3. Coordinated, incomplete, uneven and subtractive.
4. Coordinated, semi-lingual, unequal and subtractive.
5. Compound, complete, egalitarian and additive.
6. Compound, incomplete, egalitarian and additive.
7. Compound, incomplete, uneven and subtractive.
8. Compound, semilingualism, uneven and subtractive.

Their graphic representations are shown in Table 1.

Table 1:Different types of BILINGUISM

1. Coordinated, complete, egalitarian and additive (=, +)	**2. Coordinated, incomplete, egalitarian and additive (=, +)**	**3. Coordinated, incomplete, uneven and sustrative (#, -)**	**4. Coordinated, semiLINGUISM, uneven and sustrative (#, -)**
L1(=,+) L2(=,+)	**L1(=,+) L2(=,+)**	**L1(#,-) L2(#,-)**	**L1(#,-) L2(#,-)**
5. Compound, complete, egalitarian and additive	6. Compound, incomplete, egalitarian and additive	7. Compound, incomplete, uneven and subtractive	8. Compound, semi-linguistic, uneven and subtractive
(=,+) L1+L2	(=,+) L1+L2	(#,-) L1+L2	(#,-) L1+L2

It is a responsibility of the educational field to reflect on how to develop bilingualism in school. It is also a responsibility to ask yourself about the ideal age to start that learning in the classroom. The following table presents a geography of the compulsory presence of bilingualism with international languages in the public educational systems of different countries (Table 2).

Table 2:BILINGUALISM starting age in educational programs in different countries

Country	**Age of onset of bilingualism and international languages at school**
Germany	10 years
Austria	8 years
Belgium	8 years
Bulgaria	11 years
Canada	Depends on each province
Czechoslovakia	9 years
Denmark	10 years
Slovakia	10 years
Spain	8 years
U.S	Depends on each State
Finland	9 years
France	7 years
Greece	8 years
Holland	10 years
Hungary	10 years
Ireland	Non-compulsory education
Iceland	11 years
Italy	7 years
Liechtenstein	11 years
Luxembourg	6 years
Mexico	11-12 years
Norway	9 years
Poland	7 years
Portugal	10 years
UK	10-11 years
Romania	8 years
Sweden	During elementary school
Switzerland	10 years

3. Psycholinguistic and Neurolinguistic Studies on Bi / Multilingualism Carried out in Arabic countries

In order to present the main trends of investigations carried out abroad and in Arabic Countries, this section is subdivided into two subsections, which present: 1) psycholinguistic studies on bi / multilingualism carried out in Arabic countries; and 2) neurolinguistic studies on bilingualism and multilingualism in Arabic countries like Iraq. In this section, studies carried out in Iraq and other Arabic countries with bilingual or multilingual languages that do not focus on the issue of foreign language learning will be addressed, but rather the effects of processing and interaction between the languages used by bi / multilingual in empirical-experimental studies focusing on cognition(Goral et al. 2002). It is interesting to note that most of the psycholinguistic studies on bi and multilingualism carried out in the country, still in small numbers compared to studies focusing on L2 learning, use samples from adult participants(Halsband,2006).

Zughoul (1980), with his line of studies on speech production, has contributed to invaluable studies on the role of working memory in the L2 speech processing model. The researcher proposed that, due to attentional overload, speech production in L2 is more complex than monolingual speech, since it is more controlled and, therefore, slower.

One of the researchers on her team, Hein (2014), has been studying lexical access in the speech production of consecutive bilinguals with different levels of proficiency in L2 (English). The author starts from the general hypothesis that the selection of words in the bilingual mental lexicon is affected by working memory limitations, since a greater attention capacity is required for the execution of less automated processes, as is the case of lexical access in L2 (Dolgunsoz, 2013). In addition, Payne works with the hypothesis that the attentional demands of the lexical access process in L2 may be greater at different levels of proficiency, since less proficient bilinguals may have less procedural knowledge of the language. To test this hypothesis, among others, the author is working with reaction time measures and accuracy scores in lexical access tasks with semantic priming in L2. His study is underway at the Federal University of Santa Catarina.

Eviatar& Ebrahim (2000) developed a case study in which he analyzed both phonetic-phonological transfer and the influence of writing from L2 to L3 in lexical access tasks. The subject participating in the research, a native speaker of Arabic (L1) speaking English as L2 and German as L3, performed word recoding tasks in their three languages, as well as a lexical access test involving his L2 and his L3(Dewaele, 2015) . The lexical items read in the recoding test had their oral vowels analyzed acoustically, and the results found suggest, as in the study by Alansari (2018), the creation of hybrid categories between L1 and L2 for the subject's L3 vowels. In the lexical access test, the subject had to read a block of words in English presented between two blocks of words in Arabic that, in addition to other types, had words whose graphemic bodies were the same that comprised the words

presented in the Arabic language. According to the data collected, it was found not only a strong activation of the knowledge of the graphical-phononic-phonological correspondence of the words of the English (L2) on the later reading of the words of the German language (L3) that had the same tested graphic bodies in Arabic, but also signs of graphical-phonetic-phonological transfer from L3 to L2 in a more lenient way. This result was obtained by measuring the reaction time for reading the words used in this experiment. Taken together, the results found for the two experiments are seen by the author as complementary, providing evidence that is interpreted within a connectionist theoretical framework of memory and learning, highlighting the ability to interact between different languages - through the observation of a continuum between phonetics and phonology - and between knowledge from the neocortical (more consolidated) and hippocampal (less stabilized) systems.

A survey by Mohammed Kamil Murad (2007) involving the performance of Iraqi bilingual children in tests of implicit memory, linguistic awareness and selective attention is also in progress. The differential of this study is the investigation of the effective use of L2 in daily life, since Iraqi children studying in schools called "bilingual" in Iraqi are being tested, in which they are exposed to an average of 10 hours of foreign language class per week, unlike the contexts of total immersion, characteristic of studies developed abroad. The studies described in this section show how different types of psycholinguistic research on bi / multilingualism in Iraq and other Arabic country are, although still quite rare. We perceive a clear gap in this area, which needs to be filled for several reasons, which we will list in the final considerations. For now, let's move on to neurolinguistic investigations on bi / multilingualism in Iraq.

4. Conclusion

Both Psycholinguistics and Neurolinguistics are very recent areas of investigation within the studies of bilingualism and multilingualism. Considering the prevalence of bilingualism and multilingualism in the current world, it is surprising that the cognitive implications of this phenomenon deserved so little attention from language researchers until the early 1990s. Regarding the psycholinguistic and neurolinguistic studies carried out in the Iraq as we saw above, this is an even more recent concern, and many language researchers today still question the validity of investigations in this area of research (Cenoz,2013). It is precisely in this context that the present article is inserted, whose main objective is to draw attention to the need to expand the range of psycho and neurolinguistic studies in order to include bilingual and multilingual populations, which are also increasingly numerous in the country.One of the biggest challenges in this type of research refers to the methodological difficulties imposed by the type of population investigated, since bilinguals sometimes belong to specific ethnic groups, which may make it difficult to generalize conclusions, or on the other hand, they have high levels of individual variation, which also affects research results.

There is also a need to implement studies on bilingualism in children, as there are several bilingual communities, not only in the southern region, in regions of German, Italian, Ukrainian, Russian, Spanish immigration, but also in border regions, where children are often literate in Portuguese as L2. Another gap observed is the development of psycholinguistic research involving trilingual or multilingual participants(Butler, 2012).

Regarding the neurolinguistic approach, without a doubt, the use of neuroimaging techniques in language studies in bilingual and multilingual was a watershed, since it provided a less speculative investigation. However, for the data provided by these studies to be reliable, it is extremely important that a series of criteria be observed in their development, from the recruitment of participants to the analysis of the data considering the characteristics of the investigated groups and the experiment design. In addition, as already stated, there is a great gap in studies with neuroimaging techniques in the country, due to the high cost of implementing these studies. Thus, it becomes relevant to seek partnerships between institutions at the national level, such as teaching hospitals, as well as internationally, with research institutes abroad, in order to implement the studies planned by our researchers.

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