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Proper Names and Common Nouns Dissociation: Exploring Differences in Linguistic Processing and Memory Retrieval

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ABSTRACT

Philosophy and linguistics suggest that proper names and common nouns are dissociate lexico-semantic categories. Evidence from psychology and neuropsychology honours this distinction as it provides indications that they may activate different neuro-functional systems. Nevertheless, there are still some lacks in the literature that must be filled. There are mixed findings about the temporal pole involvement in proper names retrieval. Furthermore, to our knowledge, no study has yet investigated the dissociation of proper names vs. common nouns in light of the well-documented oscillatory dissociation of episodic theta and semantic alpha as reflecting the distinct declarative memory requirements. Besides, no study has explored the brain-based dissociation between the two categories using images as a stimulus. Our naming task showed that there is a dissociation in the retrieval of proper names being more demanding and source-consuming compared to common nouns. Also, oscillations patterns revealed a more pronounced evoked theta power in the proper names retrieval condition in comparison to the common nouns condition. For the alpha wave, we did not obtain differences between the categories. These results sustain the claim of the existence of functionally and anatomically distinct retrieval pathways for the categories of proper and common names, and thus, a dissociation between proper names and common nouns.

Key words: proper names, common nouns, dissociable categories, dissociable retrieval pathways.

RESUMO ALARGADO

O nosso mundo mental é construído por múltiplas categorias léxico-semânticas que nos ajudam a processar e organizar o nosso conhecimento (Mandler, 2004; Murphey, 2002). Entre essas categorias podemos mencionar as categorias linguísticas que representam os nomes próprios e os nomes comuns. A dissociação dessas categorias é amplamente relatada na filosofia, na linguística, e em teorias e modelos neuropsicológicos.

Em geral, argumenta-se que os nomes próprios e nomes comuns têm diferentes representações mentais pelos seus potenciais de referência. Os nomes próprios são designadores rígidos que se referem exclusivamente a uma entidade específica, eles relacionam-se com a sua referência num 'token' (individual) e carregam pouco sentido ou conotação em oposição aos nomes comuns que descrevem um 'tipo' (categórico) (Maddalena, 2006; Segal, 2001; Kripke, 1980; Schlücker & Ackermann, 2017).

Os nomes próprios podem às vezes, diacronicamente, ser derivados de nomes comuns, no entanto, podem ser formalmente distinguidos destes. Eles têm diferenças cruciais que tornam nomes próprios e nomes comuns classes distintas de nomes. Nomeadamente, os nomes próprios e comuns têm propriedades semânticas, fonológicas, morfossintáticas e pragmáticas crucialmente diferentes (Schlücker & Ackermann, 2017; Longobardi, 1994; 1999; Nübling et al., 2015)

Além disso, estudos da psicologia do desenvolvimento ou aquisição de linguagem fornecem evidências que as crianças possuem um conhecimento semântico implícito prévio que as ajuda a perceber, sem esforço, que certas palavras direcionadas a objetos são nomes próprios e outras nomes comuns (Hall, 1998). Esse conhecimento consiste principalmente na expectativa de que os nomes próprios se refiram apenas a um objeto único e tenham de vir de uma entidade que representa uma importância social para a criança (Bloom, 2000).

Estudos neurocognitivos também demonstraram que a recuperação do nome próprio é tipicamente mais difícil e muito mais vulnerável ao esquecimento do que a recuperação de nomes comuns. Esta dificuldade pode depender das diferentes vias de processamento de ambas as categorias no cérebro (Cohen & Faulkner, 1986; Burke & al,1991; Burton & Bruce, 1992;).

De facto, há indicações de que os nomes próprios e nomes comuns ativam diferentes vias neurais. Ambas as categorias podem recrutar o sistema de memória semântico (factos abstratos), mas os nomes próprios também podem envolver o sistema de memória episódico (dependente do contexto). Assim, a dificuldade do nome próprio pode ser devido a um correlato neural de recuperação mais largo e consumidor de processos cognitivos que recruta, além da memória semântica, o sistema episódico-hipocampal, e as suas interações com outras regiões. Os nomes comuns são mais fáceis de processar porque são categorias essencialmente semânticas.

Outras indicações de que estas categorias semânticas podem ativar diferentes sistemas neuro-funcionais provêm do facto de que a capacidade de nomear itens de nomes próprios é uma das primeiras competências afetadas ao longo do envelhecimento saudável e a dissociação semântica entre a recuperação de itens de nomes próprios vs. de nomes comuns é um marcador neuropsicológico distinto para inspecionar o desenvolvimento de demências (i.e., Demência Semântica e Doença de Alzheimer (eg., Pavão Martins & Farrajota, 2007; Semenza et al., 2003). Por exemplo, um déficit semântico no processamento de itens de nomes próprios em comparação com nomes comuns foi encontrado em estágios iniciais da doença de Alzheimer (Semenza et al., 2003), sugerindo que esse tipo de representação semântica não é completamente preservado em pacientes com o hipocampo comprometido.

No entanto, ainda existem algumas lacunas na literatura que devem ser preenchidas. Por exemplo, a literatura existente indica o envolvimento do polo temporal nos nomes próprios (Damasio et al., 1996; Martins & Farrajota, 2007; Yasuda et al., 2000; Gorno Tempini et al., 1998; Rotshtein et al., 2005). Essas evidências não são consistentes se considerarmos os estudos de caso único de anomia conduzidos por Martins e Farrajota (2007). Este estudo fornece evidências de que há também uma dupla dissociação entre as duas categorias de nomes ao nível de acesso lexical. Mas ao contrário do que é documentado na literatura, a lesão temporal não foi associada à anomia dos nomes próprios. Além disso, o hipocampo parece ser uma possível área envolvida na recuperação do nome próprio (Martins & Farrajota, 2007).

Até onde sabemos, nenhum estudo explorou a dissociação de nomes próprios vs. nomes comuns à luz da dissociação oscilatória bem documentada do teta episódico e o upper-alfa semântico como refletindo distintos requisitos de memória declarativa (Hanslmayr, Staudigl & Fellner 2012; Klimesch, Schimke & Schwaiger, 1994; Liu, 2018; Klimesch et al., 1994). Além disso, não temos informação sobre nenhum outro estudo que buscou explorar a dissociação neural dessas categorias usando imagens como estímulo.

Considerando tais lacunas, este estudo teve como objetivo investigar as diferenças ao nível comportamental, contrastando o desempenho de recuperação de nomeação a partir de imagens em ambas as categorias. Mas, mais importante, inspecionámos os diferentes padrões de oscilações cerebrais associadas a cada categoria de nomeação. Ou seja, analisámos as frequências teta e alfa relacionadas ao processamento mnésico durante a nomeação. O estudo incluiu 23 estudantes universitários saudáveis e nativos de Portugal (20 mulheres e 3 homens). As suas idades variaram entre os 18 e os 30 anos. (M = 19 anos; DP = 5,10). Para cumprir os nossos objetivos, usámos uma tarefa simples de nomeação oral, na qual três blocos de imagens foram apresentados aleatoriamente entre os participantes. A tarefa de nomeação apresentou dois blocos (pessoas e objetos). Os sinais de EEG foram registados durante toda a tarefa.

Os nossos resultados mostraram que a nomeação foi mais imprecisa para nomes próprios, e que os participantes foram também mais propensos a esquecer nomes próprios do que nomes comuns. Além disso, verificámos que a onda de teta sincronizava na recuperação de nomes próprios, em comparação com nomes comuns. Isso indica um maior recrutamento da memória episódica nessa categoria. Para a onda alfa, não obtivemos diferenças entre categorias, o que revela que ambos os nomes recrutam a memoria semântica.

Em suma, o que se observou ao nível comportamental sugere a dissociação na recuperação de nomes próprios, sendo mais exigente e consumista em comparação com os nomes comuns. Além disso, o efeito encontrado da categoria de nomes de pessoas em teta indica a existência de correlatos de recuperação funcionalmente e anatomicamente distintos para as categorias de nomes próprios e comuns.

Destaca-se que os nossos resultados mostraram que a região temporal parece ser consistentemente ativada na recuperação de nomes próprios e, portanto, sugere-se que o polo temporal desempenhe um papel relevante no processamento dos nomes próprios, o que faz sentido pela sua proximidade com as estruturas do hipocampo. Os nossos resultados estão de acordo com estudos prévios de imagem funcional em que o lobo temporal foi observado a desempenhar um papel na nomeação de pessoas famosas (Brédart, 2017; Tsukiura et al., 2002; Damasio et al., 1996, 2004; Grabowski, 2001; Tsukiura et al., 2002, Gesierich et al., 2012).

No entanto, os nossos resultados são inconsistentes com os resultados de estudos de caso único de ACB em que a lesão temporal não estava associada à anomia do nome próprio (Lyons, Hanley & Kay, 2002; Martins & Farrajota, 2007). De facto, devemos sempre ter cuidado com os estudos que consideram danos cerebrais, pois essas diferenças podem estar associadas com a extensão das lesões. Além disso, o cérebro pode realizar algumas alterações neurais e cognitivas

ou redirecionar a função cognitiva para lidar com a patologia cerebral (Stern, 2009). Formalmente, uma vez que a patologia ocorre, o cérebro, ou usa correlações cerebrais existentes de forma mais eficiente para manter uma tarefa cognitiva (reserva neural) ou usa correlatos alternativos para manter um estado cognitivo normal (reserva neural) compensação) (Stern, 2006). Especificamente, foram encontradas evidências para este processo compensatório em pacientes com doença de Alzheimer (Querbes et al., 2009). Assim, os resultados dos estudos do caso único podem estar a refletir diferenças no desempenho dos pacientes, em vez de correlatos cerebrais originais. De acordo com os nossos resultados, entende-se tanto o polo temporal quanto o hipocampo podem desempenhar um papel crucial na recuperação de nomes próprios.

Além disso, estes resultados estão de acordo com a teoria dos múltiplos traços e a hipótese de transformação que postula que a consolidação da memória não marca o fim do processamento hipocampal após as memórias se apresentarem permanentemente no córtex (Winocur, Moscovitch & Bontempi, 2010; Sekeres, Moscovitch & Winocur, 2017; Nadel & Moscovitch, 1997; Harand et al., 2012).

A nossa descoberta da dissociação de nomes próprios e nomes comuns ao nível da recuperação, mostra que o cérebro reflete a distinção linguística das duas categorias, processando-as em diferentes vias cerebrais. Além disso, os nomes próprios são rótulos arbitrários rígidos que designam permanentemente um único item relacionado a um contexto espácio-temporal específico, que requer o sistema de memória episódica. Ao contrário dos nomes comuns que designam, em vez disso, categorias de itens que são abstratas (Segal, 2001; Pierce, 1931; Kripke, 1980).

Palavras-chave: nomes próprios, nomes comuns, categorias dissociáveis, vias de recuperação dissociáveis

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Introduction

In humans, categorization is a manifold cognitive process that was demonstrated to evolve earlier than the use of natural language (Mandler, 2004). Based on shared properties, this capacity allows us to group different items in the same unitary representation (Tiberghien & Abdi, 2002). In this way, we build up our mental storehouse and keep holding it together in order to respond properly to every new object that happens to fall within same category that we have built up previously (e.g., although I have never seen this breed of cats before, it should have the same behavior as the other cats and so can scratch me or hide if it is in fear) (Murphey, 2002).

Remarkably, by the age of 3 y.o, toddlers have already built up a considerable mental storehouse, based on basic features of things (e.g., categories like cats, dogs, furniture, mammals) (Quinn & Eimas, 1996; Behl-Chadha, 1996). Nevertheless, depending on their age, reasonably, children rely on their own fragmentary and subjective experiences (e.g., doggie typically refers to all four-legs animals that have a tail like cat, sheep, caw., etc.). Eventually and gradually, children add more items with different features and build more and more categories to cover up all adult word specifications (Rescorla, 1980, pp.331-2).

But what really makes a category? According to Murphey (2002), categories are built up according to natural principles of categorization. This is why, there is a whole slew of conceptual categories that are present in every natural language; among other things, categories that arrange words (e.g., nouns, verbs, adjectives) (Murphey, 2002). We could also scale up to what matters for this present thesis, among the lexical categories that are universal may be mentioned those which represent categories of names, that is, proper names and common nouns (Bright, 2002; Müller, 2004; Pierce, 1931).

Initially, and from a linguistic perspective, the different meanings and properties of proper names and common nouns take place at the semantic level. According to Pierce (1931) names are linguistic categories because they have a reference potential. Strictly speaking, in concrete communicative situations, a name could designate a reference that composes different degrees of abstraction and conceptual complexity (Mateus et al., 2003). Scaling up again, this *x* reference potential of a name is the one that builds apart the categories of proper names and common nouns. Consider the following examples:

(a)-*Franz Kafka* was the one who wrote the Metamorphosis.

(b)-*Cats* are adorable.

The italicized noun in (a) designates an individual entity-the Czech bohemian novelist and short-story writer. In this case, the referent is fixed and unique. While in the italicized example in (b) the word designates a category of entities -every small and cute domesticated carnivorous animal, with a tail, and retractable claws (Cunha & Cintra, 1985).

Overall, as obvious as it could seem from the given examples, it has been claimed by philosophy, linguistics, cognitive and neuropsychological theories, that proper names are a special kind of noun in the language (Kljajevic & Erramuzpe, 2018). Notwithstanding, the distinction between proper names and common nouns still generates controversies.

In a philosophical perspective, two theories are presented by Tyler Burge (1973) and Gabriel Segal (2001). According to Burge (1973), a proper name is a type of common noun. That is, consider a cat called ‘’Tom”, Tom encodes the property of being a cat (that he shares with the other cats) and the property of being Tom (that he shares with other Toms). Segal (2001), with the opposite view, states that a proper name is different from a common noun, with a different mental representation. Therefore, the name Tom is paired with the individual concept Tom in the speaker’s mind, and the individual concept ‘’Tom’’ is encoding knowledge about Tom (e.g., that he is blue, and always chases Jerry) (Burge, 1973; Segal, 2001).

As we have mentioned before, toddlers at a very young age already acquire a small range of categories relying on basic shared properties. In so far as we think, evidence from language acquisition stands for Segal's argument about the distinction between proper names and common nouns. Very young children (17-24 mo) acquiring English as a first language already have the capacity to discriminate individuals and then learn their names, whereas, for common nouns, they do not discriminate individuals and only learn the name for the class of the individuals (Katz, 1974). This fact suggests that children could have a prior capacity for the classification of objects (Katz, 1974; Caramazza & Shelton, 1998; Tyler & Moss, 2001; Bright, 2003).

Throughout the present thesis, we will start by discussing the philosophical controversy upon proper names and common nouns dissociation in the shadow of pieces of evidence from language acquisition and linguistic studies.

In fact, common nouns and proper names have different phonological and morpho-syntactic behavior within the same language and cross-linguistically. The major defining linguistic property of how proper names and common nouns are treated linguistically is the use of definite and indefinite articles. Nevertheless, some languages did not develop these articles at all. But one could think about other characteristics like the language-specific morphological features and the article binding theory to claim that proper names and common nouns are dissociated categories. We will take a special case example of the Amazigh language that did not develop articles to argue the universal proper names and common nouns dissociation. The reason behind this choice is the fact that the absence of such defining features (articles) of the distinction between the two names has received important attention in the philosophy of language. Furthermore, little is known about the syntactic contrasts between proper names and common nouns in such less-studied languages.

Psychology studies have also demonstrated a dissociation between proper names and common nouns showing that the retrieval of proper names (i.e., personal names of famous people) is typically more difficult and much more vulnerable to being forgotten than the retrieval of common nouns by young, middle-aged, and elderly people (Cohen & Faulkner, 1986; Burke et al., 1991). Response times are also slower for proper names, rather than common nouns in the memory retrieval tasks upon writing definitions, which suggests that they engage a more demanding processing (Burtin & Bruce, 1992; Proverbio et al., 2000).

From Neuropsychological literature, there are some indications that proper names and common nouns are processed by different neural mechanisms. Both categories may recruit the semantic memory system (abstract facts) (Martins & Farrajota, 2007; Levelt et al.,1998). But proper names might engage additionally the episodic memory system (contextually dependent) (e.g., ventromedial Prefrontal cortex, Anterior Temporal Cortex, Hippocampus), specialized perceptive areas according to stimuli type (e.g., Fusiform Face Area; Parahippocampal Place Area) and, socio-emotional related structures (Hadjikhani et al., 2004; Douville et al., 2005; Levelt et al., 1998). This suggests that there is a dissociation between the two categories of names at the lexical encoding or retrieval levels.

Brain oscillations play a key role in memory formation and retrieval via shaping synaptic plasticity and coordinating the reactivation of memories (Staudigletal et al., 2010). Declarative memory processes are consistently associated with theta and alpha frequencies, distinctly. In episodic tasks, theta (evoked) power increases (about 4-7 Hz); whilst in the semantic tasks, upper alpha (evoked) power decreases (about 9,5-12 Hz) (Klimesch et al., 1994; 1997). However, the neural correlates related to the specific processing of the proper vs common names are barely explored; particularly, the oscillations patterns have not yet been reported.

Notwithstanding with the existing behavioral literature that suggests that memory retrieval is more demanding and source consuming for proper names, no study has explored the

dissociation between proper names and common nouns using images as a stimulus. Finally, at the neuronal level, we will further investigate how these representations and computational processes of names are implemented in the hardware of the brain. The existing literature critically indicates the involvement of the temporal pole in proper names (Damasio et al., 1996; Yasuda et al., 2000; Gorno Tempini et al., 1998; Rotshtein et al., 2005). This evidence is not consistent in regard of the single-case studies of anomia conducted by Martins and Farrajota (2007). This study also provides evidence that there is also a double dissociation between the two categories of names at the lexical access level. However, in contrast to what is recurrently reported in the literature, the temporal lesion was not associated with the proper names' anomia. Besides, the hippocampus-dependent system and its interaction with the semantic memory system seems to be a possibly involved area in the proper name's retrieval (Martins & Farrajota, 2007).

In sum, we will further inspect the well-reported differences at the behavioural level, by contrasting the retrieval performance from images in both semantic categories of proper vs. common names. But most importantly, we will inspect the different patterns of brain oscillations associated with each naming category, namely looking at the dissociative activity between theta and alpha frequencies related to proper and common names.

Considering the abovementioned literature and aims, in this thesis, we intend to investigate and clarify the dissociation between proper names and common nouns and fill research gaps at a three-level cognitive investigation program that we are borrowing from Marr (1982): task or computational, representational or algorithmic, and physical or implementational levels. Thus, forming multidisciplinary research that relies on various areas of cognitive science.

Given the fact that complex information-processing systems are considered to have multiple levels of organization, it has become conventional and commonplace to separate the three latter levels in analysis (McClamrock, 1991).

Marr (1982) summarizes this three-levels analysis in the following:

- ✓ *Computational level: What is the goal of the computation, why is it appropriate, and what is the logic of the strategy by which it can be carried out?*
- ✓ *Representational and algorithmic: How can this computational theory be implemented? In particular, what is the representation for the input and output, and what is the algorithm for the transformation?*
- ✓ *Implementational level: How can the representation and algorithm be realized physically?* (Marr, 1982, p. 25)

Our general commitment is to draw a parallel with our thesis and firmly be consistent with all these sources of evidence.

According to the unfolding of our reasoning about the present thesis, we switch the order of the three-level analysis to algorithmic first, task and physical level. At the first algorithmic level, we will rely on developmental psychology or language acquisition to inspect how children acquire proper names and common nouns and on cognitive psychology to see how adults retrieve proper names and common nouns under controlled conditions (Chapter 2). At the second task level, we will describe how proper names and common nouns are structured in languages and cross-languages (Chapter 3). At the third level physical or implementational level, we will review the processing of proper names and common nouns in the light of neuropsychological and localization studies in the theoretical part (Chapter 4).

Finally, most central for this thesis, we will investigate the specific processing of the categories of proper names and common nouns, particularly, the neural correlates of oscillations using electroencephalography (Part 2). In the empirical part, however, the physical focus in Marr's terms needs to be a bit toned down, because although our measures come from the brain, with electroencephalography (EEG) it is hard to determine where any particular brain pattern

exactly originates in the brain. Thus, we are not talking about moving down directly to the hardware of the brain (as it is the focus of the neuroscience and neuroanatomy fields). In other words, it'll be hard to say that our results make a scientific contribution to the actual physical (implementational) level or neural substrates. Instead, brain oscillations will provide us with indirect understanding clues about the systems involved in the processing of each lexical category.

In sum, our aim is to present a cognitive science thesis, primarily based on neuropsychology in which we have conducted experimental research, together with sustaining our claims relying on linguistical background and sprinkles of the philosophy of language.

If you like, you can consider this thesis as trying to draw an image of its problem that is changing in response to further empirical information. This is to say that the account we are trying to give cannot be accurate enough if we consider an isolated source of evidence. Instead, as cognitivists, we would rather present this thesis as an interdisciplinary investigation in which, linguistics, biology, and psychology are all contributing from different angles.

1 Philosophical beginnings and semantics of proper names and common nouns

One of the most puzzling problems of the philosophy of language is the dissociation between proper names and common nouns. In the current section, we will be discussing two rival theories of these categories. The one that considers that a proper name is a kind of common noun is defended by Burge (1973) and the second theory claims that the proper name is a different type of name. The authors that we will be considering for this claim are mainly Segal (2001), Pierce (1931), and Kripke (1980).

It is by no means necessary to endorse this heavy philosophical framework in order to participate in the discussion of proper names and common nouns. Yet some sort of philosophical background is required to generate a firm ground for the unfolding chapters.

Burge (1973) claims that proper names are a kind of common nouns. According to him, a cat called Tom encodes the property of being a cat (a feature that he shares with other cats) and the property of being a Tom (a feature that he shares with other Toms). The syntactic justification of this claim is that proper names could be also, and not only in English, combined with determiners (e.g., the Matthew I met yesterday was a real jerk) and pluralized (e.g., there are many Toms in the world). In modern English and German, these kinds of plurals oftentimes happen. Essentially, one says "the Childs" (Julia Child and her husband), not "the Children". Or, in German, (Thomas Mann and his wife) are not the Männer, but the Manns (Pinker, 1999, p. 156). Even when unmodified and on their own (e.g., Tom chases Jerry) proper names are a kind of common nouns (Burge, 1973). Nevertheless, if we substitute the name Tom and Jerry by their common forms cat, mouse, the sentence *cat chases mouse is ungrammatical (Scott, 2010). But the latter example is quite sketchy and open to interpretation to Burge. He solves this problem by claiming that bare, unmodified nouns have implicit or hidden determiners attached to them, a demonstrative such as 'that', [[that cat] chases [that mouse]] (Burge, 1973).

Burge (1973) suggests that proper names are constantly binding in the determiner head in the syntactic tree even if it goes unpronounced in the sentence. In other words, you can drop the determiner, but it is still there implicitly. Segal (2001), in contrast, questions why is it that determiners can go unpronounced when attached to names, but not when attached to common nouns. And why is it that particular conditions are required to place the determiner in front of a name? – '' where do you live?'' the response '' I live in Saint Louis'' seems natural, whereas ''*I live in that saint Louis'' sounds unnatural. If saint Louis is short for a phrase such as that Saint Louis, then why can we not say ''I live in that Saint Louis''. That is, if there are hidden determiners that stick to the names, we should have some special rules that govern when they should pop out on the sentence and when they cannot (Segal. 2001; Scott, 2011).

According to Segal: '' *DP*[1] *stands in serious need of a well-motivated account of these rules. Given the prima facie syntactic evidence against DP and the absence of any good evidence for its hidden determiner, it seems reasonable to conclude that the theory is in trouble.''* (Segal, 2001, p.561)

The account put forward by Burge misses something important that is necessary to understand why names can be sometimes combined with articles in English. It is true that in some cases it is possible to use an article before a proper name if one wants to emphasize it. The

[1]Determiner phrase. It is a type of phrase defended by modern theories of syntax. As opposed to NP (noun phrase), the head of the syntactic three of the DP is the determiner, instead of the noun (e.g., in the phrase 'the cat', the is a determiner and car is the noun, on the DP-analysis, the determiner 'the' is head over the noun 'cat' (Müller, 2016).

speakers simply judge it as a utile tool for this purpose. But it is pretty much like an expansion of determination -because the proper name is determined by itself. In fact, Burge did not provide any reasonable explanation for the proper-name-determiner-constant-binding. Definite determiners are in principle redundant with proper names (Gressels, 1991) (see more in section 3-3 and subsection 3-4), therefore it is ungrammatical and unnatural in English. Besides, whatever the condition that makes the use or the no use of the article in English util, it does not quite follow from there that a proper name is a subclass or a kind of a common noun.

Charles Pierce proposes an intuitive argument for the proper name uniqueness. That is, most languages have two classes of names -proper and common names (Peirce, 1931, p.337). Other opponents to the Burgian view like Segal (2001) and Kripke (1980) argue that proper names are a completely different kind of word, and most importantly, with a different mental representation/processing. This mental representation is believed to be closely related and due to the kind of relation the proper name has with its reference (Cohen & Burke, 1993; Semenza, 1997; Valentine et al., 1996; Yasuda et al., 2000). Otherwise stated, each name category, proper names and common nouns, have different mental representations in virtue of their references. Proper names are rigid designators that refer uniquely to one specific entity, they relate to their reference in a 'token' (individual) and carry little of any sense or connotation as opposed to common nouns that describe a 'type' (categorical) (Maddalena, 2006; Segal, 2001; Kripke, 1980; Schlücker & Ackermann, 2017). In other words, proper names hold an arbitrary relation with their reference, whilst common nouns refer to categories of items.'' (Kripke, 1980)

Moreover, proper names are constant and unchangeable designators over a changing time. In this regard, a cat named Tom retains this label whatever sense they assume during their history 'chain of causal transmissions', and it is paired with an individual concept Tom in the speaker's mind. And this individual concept is encoding specific knowledge about Tom **(**e.g., that is a furry cat cartoon, blue, and always chases Jerry). In short, a proper name sticks faithfully to the same individual across all situations (Maddalena, 2006; Segal, 2001; Kripke, 1980; Donnellan, 1977; Putman, 1975).

Besides, in-depth, if we say that proper names convey no more than a particular entity, unlike common nouns it means literally that for example, if Tom was chasing Jerry and another cat starts chasing Jerry, and it happened to be called Tom and looked similar as well. Regardless of all these similarities, Tom the first is still referring to the same Tom. A more illustrating example is cited by Bloom (2000): consider the two words bug. It is not the case that bug depicts both the listening tool (1) and the insect (2). On second thought, there are two bugs; one depicts the (1) and the second depicts the (2). They merely happen to sound the same (Bloom, 2000).

But when we say that a proper name is paired with an individual concept in the mind, and has a different mental representation, what do we actually mean? Valentine et al (1996) hypothesize the information to be stored in a connectionist network[2] that in the case of proper names would be connected by a single bidirectional excitatory link. Whilst the common nouns would be connected not only by such link but also by excitatory links to the animal node, the pet node, and so forth.

[2]Connectionist networks or neural networks are a composition of neurons described by an architecture. Cognitive processing is analyzed from its evolution along its activation landscape from one node to another-how the information flows. Therefore, activation or connections weighs occur in simple processing unities that connect and form complex networks. Activation changes over time and can range from excitatory to inhibitory (Thomas & McClellandm, 2008).

2 Acquisition of proper names and common nouns

Acquiring proper names and common nouns could seem effortless, but if you take another look, you acknowledge that it is a complex and heavy task. In order to learn the names, toddlers are required to assign both meaning and grammatical category for the *x* name (e.g., assign the kind CAT for the word 'cat' and recognize that is a common noun). Hearing the word 'cat' accompanied by pointing towards the kind CAT provides children with limited information about whether it refers to the dog kind in the first place and whether the word is a common noun, or quite not, whether it is one of the properties of that kind and that the word 'cat' is an adjective or whether it is actually a proper name of the specific animal, for example (Hall, 1998). Regardless of the complexity of this task, children's capacity to acquire names is unmistakably remarkable.

It is a striking fact that kids (17-24 mo) learning English as a native language can already predict that certain names refer to only one thing. When you tell them that an abject[3] is zav ''this is zav'' (with no determiner), children are hesitant to apply this new word to other objects, even if they are highly like the original object. However, when they are told that an object is a zav ''this is a zav'' with the determiner, infants are not hesitant to generalize the name to other objects that share the same properties as the original one (Katz, Baker & Macnmara, 1974; Scott, 2011; Bloom, 2000; Hall, 1998; Gelman & Taylor, 1984).

Nonetheless, it doesn't quite follow from infants distinguishing proper names and common nouns using syntactic clues like determiners that children are prewired to distinguish names from common nouns. This study only suggests that caregivers use proper names under the same conditions that children expect them to be used, and that syntactic clues can help children make correct mappings between their guesses and the appropriate words. But the syntax rules of names as in English are not universal as they vary from language to language. There are languages for example in which both proper names and common nouns are neutral to definiteness or do not have binding definite or indefinite determiners (see more in section 3-4). children must learn the grammatical properties of the names in their particular language (e.g., that in Portuguese, 'X' can appear in the sentence, 'this is an 'X'). In other words, kids need to be able to identify some words as proper names and common nouns without the support of syntax (Hall, 1998). Moreover, even with the children's knowledge of proper names as expressions that designate specific entities in contrast to common nouns, they still must discover where these names appear in caregivers' utterances in their particular language. In short, what are the alternatives to syntax?

Children could have a prior implicit capacity, a kind of universal semantic competence[4] that is independent from grammar. This unconscious cognizance of linguistic rules and principles gives kids the capacity to classify objects within their particular language as well as the potential names in caregiver's utterances, mastering this way the nominal expressions and the specific predictions kids entertain about their meanings and grammatical category (Segal, 2001; Hall, 1998; Bloom, 1994; Markman, 1994; Pinker, 1984). Some suggested alternatives to syntax or semantic knowledge that could lead children to favor interpreting a directed nominal expression as a proper name are the following.

First, kids might have the semantic intuition that objects should pick up only one proper name, and thus may tend to interpret a novel object name as a proper name if it is associated with one object rather than if it is used in conjunction with more than one (Hall, 1996). Hall and

[3]The word was applied either to a doll or to a block.

[4]This claim relies on and extends Chomsky's approach to linguistics making part of cognitive psychology. Chomsky assumes that linguistic human competence is a kind of unconscious cognizance or representational state of linguistic rules and principles (Chomsky, 1986).

Graham (1997) showed that 4 y.o children expect proper names to pick out only one individual, and they struggle to attribute the same name to other individuals. In other words, if the word *x* was applied to one object, children restricted it to the named object, treating it as if it was a proper name referring to that specific object. If the same word was directed to two different objects, children generalized its extension to both named objects as well as to other objects that shared a common salient property with the named objects. When 4 y.o children were told that a dog is named Zavy, and another dog was brought to them, and they were asked which dog was named Daxy, they chose the second one. But another half of kids that were told the dog was very zavy (as an adjective) had no such preference (Hall & Graham,1997). Furthermore, children, one of 6 months and another of 20 months cannot attribute the name of their siblings to other individuals[5] (Macnamara, 1982; Hall, 1999). In other words, children possess an avoidance of two proper names for one object.

Second, familiarity also seems to be partially playing a role in proper names acquisition since kids get to learn their first proper names for people long before any common nouns associated with these individuals (Macnamara, 1982; Bloom, 2000). Also, several researchers documented that children will interpret a word as a proper name if it was referring to a familiar kind (e.g., cat) rather than an unfamiliar kind (e.g., monster, truck or a shoe); and enjoy particularly learning proper names of kinds that have some social importance (church, people that are important in their own right) than if it does not. 4 y.o children are also unwilling to give a proper name to animals like bees, snakes but if said that the animal is owned by the experimenter -my bee, such hesitance disappear (Bloom, 2000).

Furthermore, they typically extended the name of then unfamiliar object to another object of the same kind suggesting that they had interpreted it as a naming a kind of object. Also, children who learned the word for the unfamiliar object often misconstructed the intended proper names pluralizing it it looks two zavs or using it as a common noun (another Zav) they did not do this with the word of it was applied to a familiar object (Hall, 1998; Soja, 1994; Gelman & Taylor, 1984; Hall, 1994; Katz et al., 1974).

In sum, more than mastering the grammar of their own language, preschool kids appear to have additional semantic knowledge that children could target certain object-directed words as likely being proper names. This knowledge consists of the expectation that proper names pick out only a unique object and have to come from a privileged kind.

To conclude, the claim that proper names are a separate semantic class paired with a different mental representation in comparison to common nouns seems to be well-founded regarding the developmental psychology of the two categories of names. Evidence from language acquisition studies gave us a key level that anchor this thesis, an algorithmic understanding of proper names and common nouns, and provided us with insights to go forward and suppose that both classes might have different processing pathways in the brain.

Nevertheless, all the claims that were made so far in the previous chapters are based on the English language, and so it is less clear whether the rules discussed can be extended to other proprial classes and/or other languages. Indeed, languages vary in how the two names are treated linguistically. If we do not describe other languages' noun categories on clear-cut dissociation, then from an overall point of view this thesis will seem to be fragmentary. For this reason, it seems more promising to examine concretely the linguistics of proper names in some other languages and inspect whether their specific linguistic properties deviate from common nouns

[5]Children also finds it sufficiently clear when you explain that, for example, both dogs have the same name Zavy. Under these conditions, they treat Zavy as two proper names, one for each dog. (Hall, 1996; Bloom, 2000)

and if so, whether these differences are enough to justify establishing the fact that proper names are dissociated noun classes.

3 Descriptive linguistics of proper names and common nouns

This chapter deals with the linguistic properties of proper names in comparison to common nouns in natural languages[6]. The central question is whether proper constitute a specific linguistic class on their own rather than being considered as a subclass of common nouns. Effectively, proper names come with specific properties that differ to some fair extent from those of common nouns, even in languages that are not equipped with syntactic tools that understandably show the dissociation of the categories of names (e.g., determiners).

We will go on and describe some phonological, and morphological behaviors of proper names and common nouns in different languages. We will also resort a bit to pragmatics to build up our argumentation.

Before, it is worth defining the branches of linguistics we will be using in our argumentation. Phonology is the study of how speech sounds are organized in the mind and used to convey meaning. Whilst morphology studies the internal construction of words, and syntax the study of how these words and morphemes combine to form phrases and sentences. Pragmatics is rather concerned with the use of languages in social contexts and the way we produce and comprehend meanings through language. In complementarity to the abovementioned points, we will explain what linguistic mechanisms could replace the defining and differentiating use of articles in names, and investigate whether these tools are different from articles, or they end up functioning similarly

We will not be, however, discussing all the linguistic properties of names, since that would go far beyond the scope of this present thesis. We will discuss only some key linguistic differences within the same language and cross-linguistically that indicate the dissociation between proper names and common nouns.

3-1 Phonological features of proper names vs. common nouns

In most of the cases, proper names are diachronically derived from common nouns (see more in section 3-2). Yet, proper names can be formally distinguished from common nouns. And some aspects of this distinction, in this case, are linked to phonology.

In German, a phoneme sequence is consistently repeated in some proper names -ts (e.g., Fritz, Heinz), although many names do not take it, this same phoneme rarely appears in common nouns (Fleischer, 1992; Leys, 1066; Wimmer, 1973; Mangold, 1995).

Stress also is an important property of spoken in English, and it goes beyond arbitrary convention when it comes to personal names (Schlücker & Ackermann, 2017). Stress patterns differ in proper names between female and male names. If we compare female names to male names in English, we will more often find that the first ones have more stress on the second syllable (e.g., Michael ‘M’ vs. Michelle ‘F’), and to have more syllables (e.g., Stephen ‘M’ vs Stephanie ‘F’). There is a third equally important way in which female names differ from male names. Specifically, male names are more likely to contain an open vowel (e.g., /æ/ and /ɔ/) and female names a close vowel (e.g., /ɪ/ and /ʊ/) (e. g., Cutler et al. 1990; Slater and Feinman 1985;

[6]Natural function, specific to human beings, which allows communication based on semantic representations, and which serves as a support for thought. (Tiberghien & Abdi, 2002)

Pitcher et al. 2013; Wright et al. 2005). A second representative case concerns nicknames, De Klerk and Bosch (1997) also showed that this sound symbolism applies to female nicknames than male nicknames. Namely, female nicknames tend to contain a close vowel /i:/ than male nicknames (Klerk & Bosh, 1997).

Interestingly, a study explored the use of sound-symbolic cues to infer the gender of personal names, and it showed that people are capable to do so even in languages they do not speak (See more details in Cai & Zhao, 2019).

In conclusion, specific phonological properties of proper names offer useful insights about the proper name and common noun dissociation, as they possess different recognizable features. Proper names take over phonemes and stress patterns that give in cues to infer the gender of a personal name and thus distinguish it from common nouns in which those features rarely exist.

3-2 Morphological features of proper names vs. common nouns

Proper names come in a variety of shapes, both language-specifically and cross-linguistically. They may be morphosyntactically simple (e.g., Joana, Portugal) or complex (e.g., The United Kingdom, Templo da Diana) (Schlücker & Ackermann, 2017).

Morphologically, it is true that from a typological approach the processes solely reserved for the proper name's formation are few. In fact, proper names may have typically derived from common nouns (Helmbrecht & Handschuch, 2016). The two categories share processes of word formation due to the former word-class being the common noun. Nevertheless, being a former class does not amount too much, because proper names still have special morphological characteristics that make them separate from their former word category. These special characteristics specify the name category, or via special affixes or via the previous structures that lead to dissociation from the original class (Harnisch & Nübling, 2004. p.1902).

Diachronically, the structure of proper names becomes less transparent or opaque. For instance, Alfred in English is derived from the old English common noun *Ælfræd* with the Noun + Noun structure itself 'elf' + -ræd 'counsel, advice', or Shepherd and Green (Colman, 2004. p.184). Although these names maintain a shared formation structure and sound like roots (because originally, they were based on one's residence, distinguishing feature, job., etc.), it is hard to memorize them. These names have long since lost their 'sound-alike-root' meaning. No one would think that Mrs. Green is actually green or Doctor Shepherd to be a shepherd (Pinker, 1999, p.155).

Not to forget, Frequently, also, proper names derive from proper names themselves, or through compounding (e.g., Frederickpersonal name→ Fredericksburgplace name) or through derivation (e.g., Frankfurtplace name→ Frankfurterpersonal name) (Schlücker & Ackerman, 2017).

Another key argument for the proper and common names dissociation in terms of morphological forming processes is the fact that the invention of a new word with no meaningful existing linguistic material seems to be used more for coining names (e.g., brands) than for common nouns (e.g., Wi, Kodak) (Ronneberger-Sibold, 2015).

Affixes are also, usually, a marker for proper names. For example, -ga in the Hoocak language[7] is an enclitic marker that is placed at the right of the proper name phrase for third-person reference (see Stolz et al., 2017. p.130). In Catalan, these markers are particles -en, na.

[7]North American Indian Language of the Siouan language family.

Moreover, affixes may also express gender, the most marked information in proper names. Alike German family names -in, -sche, -s, is a marker for female sex or affiliation and -in for husband or father (Steffens, 2014; Werth, 2015, Schmuck, 2017). Diachronically, this previous gender flexion in German was lost and has been replaced by one single marker -s. Thenceforth, these proper names have developed an inflectional class of their own (Ackermann, 2016). Polish suffixes -ska for female and -ski for male, this kind of affixation solely merges with family names (Szczepaniak, 2005). On top of that, some suffixes are specific for proper names formations like -cester in English (Leicester, Gloucester), -ay in French (Orsay, Fontenay), and -ow in German (Teltow, Gatow) (Schlücker & Ackermann, 2017). A crucial difference is that in some languages like Basque, proper names in contrast to common nouns, do not need numeral affixes, because they are determined by themselves (Lafitte, 1962, pp. 55-57).

Furthermore, when common nouns function as modifiers, they are more variable than proper names. The reason behind this is suggested to be keeping the word form (e.g., umlaut, inflectional endings, linking elements, stress shift) stable- proper names are less frequent, and preserving their form will facilitate their recognition (Zimmer 2016, pp. 119-15) This maintenance of proper names unchangeable is called the onymic or morphological schema constancy (Nübling 2005, Nübling 2012; Ackermann & Zimmer, 2017). Nevertheless, in many languages defective declensions concern proper names - there are also highly deflected languages that exhibit inflectional marking (solely) on proper names, as has been shown in Hoekstra (2010) for personal names in Mainland North Frisian, Yiddish, and some Dutch dialects. At first sight, this conflicts with the constancy of proper names forms. Yet, native/traditional names have inflectional marking in these languages while modern names tend to deflect (Hoekstra, 2010, p.760). As Zimmer (2016) and Ackermann (2016) show, schema constancy is more relevant regarding non-native names or names with non-native structures.

In sum, although in many cases, proper names are derived from common nouns diachronically, through compounding and derivation, they still have crucial differences that make proper names a separate class on their own. Proper names, in contrast to common nouns, maintain a morphological schema constancy to facilitate their recognition. Furthermore, in opposition to common nouns, proper names do not necessarily have meaningful linguistic material 'coining names', and even though they could possess sometimes some diachronic shared formation structure, over time they become opaque and less transparent. And last but not least, some suffixes are specific for proper name formations, and in many cases, they do not need numeral affixes, because they are determined by themselves.

3-3 Syntax features of proper names vs. common nouns

To date, in most studies on proper names, the syntax is more contemplated (see, e.g., Longobardi 1994; Anderson 2004; Longobardi 2005; Anderson 2007). If we restore the diachronic perspective, syntactic features are indeed more persistent than morphological features (Plank, 2011, pp. 284–288). As we have seen earlier, morphology is prone to changes over time due to sociolinguistic conditions as was the case of the gender marker in German that turned to be neutral with time for the sake of equality of genders (Schlücker & Ackerman, 2017). As opposed to syntax, among which the use of determiners, our main interest in this chapter and the following, is preserved over time.

Let's consider in the beginning the general morphosyntactic properties of proper names: Proper names, contrary to common nouns, can be used in close opposition structures (e.g., the writer Kafka, Queen Elizabeth) (Langendonck, 2007, pp. 91, 125-143). Among Bantu family of languages spoken in the southern half of Africa, some languages are diverging in their argument

patterns (Orungu's noun class is activated by the noun on all agreement objects (e.g., verbs, pronouns, and adjectives) in such a way that noun classes are defined by the groups of nouns that activate the same agreement pattern (Velde & Ambouroue, 2011, p. 116). This is another example in which people's names are usually derived from common nouns, however, they preserve a special syntactical marker -strict agreement pattern. Common nouns, on the flip side, activate a different kind of the target, given their nouns class as determined by their affix (Schlücker & Ackermann, 2017).

The foremost property of names is the classificatory function of determiners. But what is determination in the beginning? According to Mateus et al (2003) determination allows names to designate a specific referent in concrete situations of communication by using semantic-pragmatic tools-determiners. In short, determiners composite the referential value of a name (Mateus et al., 2003). Thenceforth, the same expressions made up of the same singular noun and phrase could be the expression of different determination processes and referential values. Consider the following examples:

(1) *The boy* was robbed today on his way to school.

(2) *A boy* was robbed today on his way to school.

(3) In India, *a woman* is always innocent until proven guilty

In the first, the italicized expression designates a unique, identified individual that is known. In the second italicized expression, the referent is not specifically known by the person we are communicating with. In the third example, the italicized expression designates all objects that have the property of being a woman. Another pertinent example in which determiners define the referential value of the expression they happen to be in is the case of homonyms, different marking helps the listener recognize what kind of object it is being spoken about (e.g., I am looking for Miller vs. I am looking for the Miller) (Schlücker & Ackermann, 2017). Above all, definite determiners give one the presupposition that referred object exists and is unique, while the indefinite ones give on the presupposition that the referred object is unknown and there are several objects of the same (Mateus et al., 2003; Shneider & Janczyk, 2020).

Again, different languages differ in their use of determiners. Generally, proper and common are different regarding the use of definite and indefinite articles, which is consistent with the idea of distinct categories.

Semenza et al (2020) describes that in Italian, for example, singular common nouns cannot be in the argument slot without an overt determiner, whilst plural and mass nouns can occur without a determiner being subject to an indefinite interpretation (e.g., ''I eat bananas''). Proper names, in the case of the Italian language, always occur without the determiner (Semenza et al., 2002). In English and German, proper names also do not pick up a definite nor an indefinite article *the Lisbon, *the Jack (Muller, 1997).

In some cases, as we have discussed in (section 1), it is possible to use an article before a name to emphasize it, or simply, because some proper names require its use (e.g., The United Kingdom). However, the use of an article does not make a proper name a subclass of common nouns, because proper names are inherently definite. Simply put, the semantic content is naturally definite, and the use of definite determiners is in principle redundant (Longobardi, 1994, 2005). In other words, one does not need a determiner's differentiating functions to distinct proper names. Conrad (1985) goes far beyond that and claims that proper names are not a word category/class, they are grammatical structures or nominal phrases and they do not pick up determiners.

Nevertheless, Definite determiners are obligatory in some languages like Portuguese and Greek personal names (e.g., der Peter (G), o Joao (P), ο Πέτροϛ(G)) (Mateus et al., 2003; Werth, 2015)[8].

Let's explore Portuguese as it will be the language investigated in our empirical study (Part.2). In Portuguese, proper names have a fixed referent, and thus they do not admit number variation:

-*Galileus morreram na miséria.

-*O Açor é uma região autónoma. (Mateus et al., 2003, p.214)

In other words, plural proper names cannot be in any case converted to a singular proper name, and singular proper names when pluralized no longer function as proper names since they start designating one plural part of the entities named or the whole entities designated by the name in question (e.g., os Joões or even todos os Joões, os dois Joões) are either meaning (e.g., people who are named João in general, those two people named João).

Besides, since proper names in Portuguese are completely determined, they do not admit complements or modifiers of restrictive value like we can see in the following examples:

-*Galileu que era físico nasceu em Pisa.

-*O João inteligente vive em Coimbra.

- A madalena, contente, esperava pela sua recompensa.

- A Madalena, que escreve muito bem, recebeu um prémio. (Mateus et al., p.213)

Common nouns, in contrast, admit variation of number, in the singular designate in general, a singular set defined by the intention expressed by the marked form of the common noun, in the plural designate a set of simple or collective entities, the construction of its referential value requires the application of operations of determination and, sometimes, complements and modifications of restrictive value:

-A irmã da maria vive em Londres.

-O miúdo que o Marcus conhece foi ao cinema. (Mateus et al., 2003, p.217)

Despite these defining features of names in Portuguese, definite determiners *a, o, as, os*, are obligatory with Portuguese proper as well as common nouns. According to Mateus et al (2003) exception cases are the proper names that designate individuals belonging to the collective cultural-historical memory (e.g., ''Galileu morreu na miséria''= Galileu died in poverty). Another exception case is when the proper name of a country/city has a meaning in the language, the definite article is added.

Thenceforth, according to the literature and as in the other previous languages cited above, proper names in Portuguese seem to be inherently fixed and unique referent designators, and the binding of definite articles is merely an extension of the determination they formerly possessed. To put it another way, we think that the function of the article that accompanies proper names is very limited– they do not have the function of determinatives at all (See more in Section 3-4).

The fact that some languages develop articles for both categories of names makes us run to another big and hellishly critical puzzle for our pretended dissociation of proper names vs. common nouns. That is languages that did not develop articles at all like Turkic, Amazigh, and

[8]We still do not understand the reason behind why articles develop. However, we can have some clues through every language. For example, definite determiners may be useful to indicate the category to which the referent belongs, like in German -, e.g, German is a language with three genders (male, female, and neuter), as such, without a determiner Königin Mary 'queen Mary' (without determiner) refers to the queen, dieFEM Königin Mary to a ship, and dasNEU Königin Mary to a hotel (see Nübling 2015, Nübling this issue (Schlücker & Ackermann, 2017).

Tupi. Do names function differently in these languages? What could characterize the dissociation between proper names and common nouns in these languages? Does it mean that definiteness fades away in languages that do not have articles? Most difficult still, how could one disambiguate if the common nouns are not taking any determiners, considering that they are not rigid designators as in the case of proper names? The second component of this section consists of describing/explaining the ability of particularly of common nouns in the Amazigh language to appear without determiners.

Before, we should mention that this choice of Amazigh rather than Turkic or Tupi was simply made because it is my native language. Thereby it allows me, beyond examining the existing literature, to introspect my own use of the language and contemplate my own thoughts. A further added value that does not exactly contribute to the main aim of the thesis, is the willingness to contribute to the knowledge about the Amazigh linguistic research. Considering that this issue of proper names and common nouns is scarcely addressed, being mainly a spoken language but also a dying language with very little corpora and linguistic research.

3-4 Linguistic analysis of definiteness in Amazigh

The Amazigh language is from the Hamito-Semetic linguistic family, and it is considered the aboriginal language of North Africa (Boukous, 1995). Amazigh, among other agglutinating languages like the Turkish language (Cresseils, 1991), did not develop determinative articles for both proper names and common nouns (e.g., The man/ ⴰⵔⴳⴰⵣ [argaz]; hnu/ⵀⵏⵓ [hnu])[9]. Not to skip, even though Amazigh speakers treat nouns as indefinite when they are modified by the numeral quantifier [jj]‘‘one’’. In many contexts, nouns are treated as being indefinite although they are not modified by the numeral quantifier in question.

This article absence, one will suppose, could be critical, because Amazigh, every so often, presents general uncertainties in terms of grammatical classes. for example, ⵜⵍⵍⵜ can be considered as a verb with negative completeness "it exists”, or like a family name "my daughter” (Boulknadel & Talha).

In this section, we will try to solve this problem by showing that, although definiteness is not marked in Amazigh for both proper names and common nouns, they are all the same dissociated categories because they have ‘more rigid’ morphological features and behave syntactically non-identical to languages with articles. That is to say, we will see how Amazigh speakers rely on other characteristics rather than articles to disambiguate and interpret the directed nominal expression in speech. However, we will not attempt to give a complete detailed account of the different alternatives that exist in this language regarding this issue, since the details are not a major issue of the current thesis.

The types of names that exist in Amazigh are proper and common nouns, noun adjectives, Arabic loans[10], and kinship terms[11](Sadiqi & Ennaji, 2004). Of these types of nouns in Amazigh, it is common nouns that are most recurrent and the trickiest for not taking articles. Hence, we will focus on the morphology of this type of noun.

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[9]Definiteness is not marked in Amazigh; however, we should mention that many loanwords derived from the Arabic language possess the definite article ‘‘al’’ (Abdel-Massih, 1971).

[10]Arabic loans preserved a phonological variant of the Arabic article ‘‘al’’, which is a marker of definiteness. Arabic loans keep their plurals as a part of the noun; however, gender is usually unmarked (Sadiqi & Ennaji, 2004).

[11] Kinship terms have the property of heading possessive constructions and taking possessive pronouns (e.g., ultmas n haddu ‘‘Haddu’s sister’’; Khals n Hassan ‘‘Hassan’s uncle’’) (Sadiqi & Ennaji, 2004).

It is important to mention first that since Amazigh is an agglutinating[12] language, it is morphologically rich and highly inflected, and does not have a *case system* (Sadiqi & Ennaji, 2004).

According to Sadiqi & Ennaji (2004) the common form of proper names in Amazigh are beginning with a consonant, they do not take the plural form, nor can be marked for the state. Whilst common nouns carry gender and number. Nouns starting with a consonant the prefix *ta* and finishing with the suffix *t* are generally feminine (e.g., **ta**-funas-**t** ‘’female cow?’’), while masculine nouns start with a vowel, generally the prefix *a* (e.g., **a**-funas ‘’bull’?’), and then this noun can be pluralized using the prefix *ti* and the suffix *in*(e.g., **ti**-funas-**in** ‘’ cows’’) for feminine names and the prefix *i* and the suffix *a* for masculine names (e.g., **i**-funas-**a**-**n** ‘’bulls’’).

The number gender inflection in Amazigh does not differ much from the French determiners for instancd (e.g., *le, la, une, un, des)*, the only apparent difference in this regard is that Amazigh determiners are realized inside the word as affixes-suffixes, prefixes, and infixes. Thus, and so, just for being affixal, determiners in Amazigh attach at some stage in the derivation to the noun, while in French, not being affixal, they do not attach to the noun. That is why an adjective can never be placed between the affixal determiner in Amazigh, while in French it is possible (e.g., la Meilleur galette ‘’the best galette’’ vs. **ta**-ahamosh tamggrant ‘’the big girl’’) (Ouhalla, 1988, p. 148; Abde-Massih, 1971).

Nevertheless, plurals are not formed only by these affixations. Plural morphology is complex, and can also involve an internal vowel, a combination of regular change and internal vowel change (e.g., ta-fust ‘hand’ to tifusin ‘hands’) or an irregular change (e.g., azru ‘’stone’’ is izra ‘’stones’’ in plural). The plurality usually modifies the suffixal part, especially the vowel[13].

In this stage, we will refrain from venturing into the details because of the complexity of the facts involved and explain more about the function of these intern Amazigh ‘’articles’’.

As we have said explained in previous sections (Section 1, Section 3-3), articles in proper names are very limited and redundant, because names are themselves rigid designators. Let us now consider the proper name João, although there are many individuals with the name João, if the phrase João lives in Coimbra is communicatively appropriate, João designates one and the same individual for the speaker and interlocutors. That is, a proper name is always a designator of a single identified object belonging to the class of objects of the universe of reference relative to a given discourse. At this point, we consider the proper names articles omission is solved. But what about common noun’s articles?

According to Creissels (1991) articles for common nouns are omissible if we could spot the nominal ‘nucleus’ in common nouns -the part we cannot in any way delete. This way, the determination is merely a non-compulsory expansion of the nominal ‘nucleus’: ‘’*The determiner is a suppressible term in the construction, in contrast to the determined… which is only one able to occupy the same syntactic position as the globally considered syntagm.*’’ (Creissels, 1991. p:63)

Therefore, the contrast between the determiner and determined term coincides with the contrast between the suppressible element of construction and the non-suppressible element.

In names, the determination is raised by the enunciation (e.g., French sportsman) French is the determiner and sportsman is the determined term in this case. The determiner is the lexical choice by which the enunciator begins the construction of a noun phrase according to the

[12] In morphologic typology, an agglutinative language is a language in which words are made up of a linear sequence of distinct morphemes and each component of meaning is represented by its own morpheme (Malherbe, 1995).
[13] This description could suffer some alterations according to the dialect of Amazigh, the tribe ayt seghrouchen drop the prefix a in many singular masculine nouns for example (Abde-Massih, 1971).

referential value that he is aiming for (Greissels, 1991). The determiner intervenes to add any precision considered useful (e.g., in a shop of clothing of different kinds and colors, one speaking of the same object could say for example to the salesman: give me the shirt or give me the red one. In both cases, the seller can respond which? to say that an additional determination is necessary for him to understand the reference concerned, for example, size 40, with short sleeves., etc. But the most important is which that comes after the red one cannot, in any case, mean that the missing precision is for example shirt or tie -the determined term, implicitly understood. Otherwise, the seller should ask what are you talking about? (Greissels, 1991) Therefore, it means that there is a violation of the rules of the game. The omission of a thematic element, when the language system authorizes it, must only be effective if the interlocutor is supposed to be able to restore this element[14] (Wittgenstein, 2009; Grice, 1975).

The behaviour of nouns and their determiners are tightly dependent on the context. Thus, for example, within the limit of a village, the mayor or the chief has a semantic affinity with proper names, because they have only one possible reference, while a villager has several. Thus, in the Kita Maninka language[15], there is an article in the form of a floating tone-cannot be pronounced by itself but affects the tones of neighbouring morphemes (Gressels, 1991). But some nouns are lacking the article, including in contexts where the article will be rather necessary for other nouns. Indeed, references are established inside the utterance, through the anaphors, as long as between the utterance and the enunciation (e.g., deictics for example do not refer to fixed elements of the natural world, they only have meant about the circumstances of the enunciation). This means that the definition of reference should also encompass the imaginary/mental and discursive world[16] (Greimas & Courtés, 1980).

Determiners can also be replaced (e.g., in French the determiners **un** homme ‘a/one man’/**des** hommes ‘the men’ can be empty as soon as the terms appear to be belonging to another paradigm **l’**homme ‘the man’, **mon** homme ‘my man’, **cet** homme ‘this man’) (Gressels, 1991). In Amazigh, the possibilities are more restricted for the number-gender information being an affixe, but also possible for other determiners (**itj a-**argaz ‘a/one man’, **i-**rgaz**-**an ‘the men’ /**a-**rgaz ‘the man’, **a-**rgaz **inou** ‘my man’, **a-**rgaz**-n** ‘this man’). Constructions like (deux petites charmantes fillettes’’two charming little girls’’) are determined by ‘petites, deux, **-ettes**, can be reduced to the nominal nucleus ‘’fille’’, but never respectively to the determiners * deux**-ettes** ou une charmant**-ette**. However, as referred earlier, the construction can be reduced to determiners if the interlocutor can restore the implicit reference by anaphorisation for example (e.g., il a une grande fille et deux petites ‘*he has one old daughter and two younger[17]’) (Gressels, 1991).

So, the definite and indefinite distinction seems to be contextually inferable in Amazigh, both linguistically and pragmatically. Chakir and Mettouchi (2006) describe: ‘*’Definiteness is contextually inferable in Tamazight, word order playing a role in the matter. Anaphoric and deictic particles appear where necessary to disambiguate.*’’ (Chakir & Mettouchi, 2006)

It follows that the non-development of definite and indefinite articles allows the development of other features and restrictions (Ouhalla, 1988).

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[14] Meaning, according to Grice (1975) should be calculated or inferred in terms of what speakers are intending in specific contexts. Consequently, it’s indispensable to understand to what extent the context of the speech influences the meaning of the linguistic code, and how it is correct to modify the literal sense to be able to infer the actual meaning depending on the occasion.

[15] A Manding language spoken in Mali.

[16]We endorse the semiotic perspective according to which reference is not a direct link between the significant and the referent but rather a network (of references) not only within the discourse but also between this latter and the instance of the enunciation

[17]The English translation is supposed to be rather ‘he has one old daughter and two younger ones, except that in French ones is omitted.

Syntactically, Longobardi (1994, 1999) claims that proper names take the determiner position themselves, being rigid designators of a unique referent. Therefore, Proper names move themselves from the nominal head (N-) to determiner position (D-). Hence, in the Italian language in for example in which proper names occur without the determiner and common nouns with it, N-to-D movement doesn't occur for common nouns and occur more or less frequently for PNs and pronouns[18] (Longobardi, 1994; 1999).

This head-to-head movement from N to a higher functional head that may, at least in some cases be identified with D has been tentatively argued to apply in Semitic languages (Ouahalla, 1988, Fehri, 1989). In fact, N-movement to D movement in syntax is likely to take place in Amazigh for both names, because articles are fused with common nouns. Proper names preserve their rigidness and common nouns are, in the same way, very strict in their designation for being morphosyntactically inferable. Because if it's really the D position that turns a nominal expression into an argument as claims Longobardi (1994) as generalizations of the X-bar theory[19] two versions (npDP(nN)) and (dp(d'D NP), there is no way that these names that occur freely in Amazigh function without any movement to (-D).

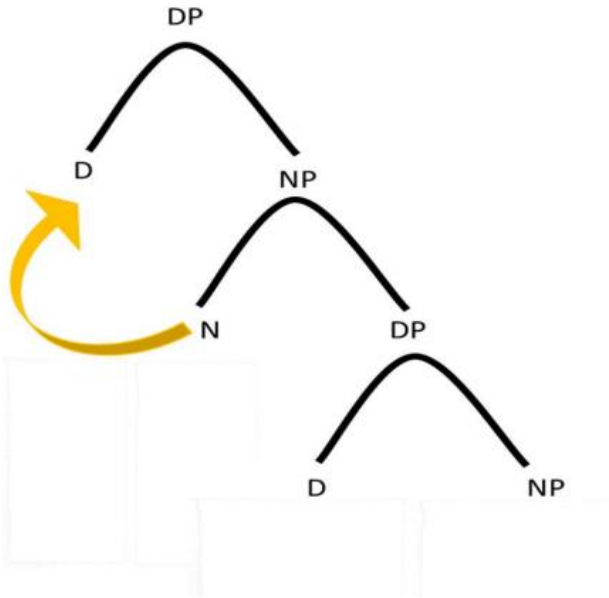

Figure 3-1 A syntactic DP three showing the N-to-D movement.

[18]Semenza et al (2020) provide evidence that the movement N-to-D reflects some psychological computation, requiring processing cognitive resources (Semenza et al., 2020).

[19] X-bar theory is a generative theory of language conceived by Noam Chomsky. It proposes that the organization in every phrase is similar across all languages because it depends on how our mind does organize sentences. Generative grammar form words into phrases and phrases into sentences. Every phrase has a head, which is always the first (X) level it could be a noun, verb, determiner, or preposition. Then, the XP level is argued to be the phrase level, X-bar is the intermediate level (Chomsky, 1970). In our Amazigh case, determiner phrases (DPs)are headed by a null determiner (D). Having a null D also helps to explain why such nouns are definite in meaning (Ghomeshi & Massam, 2009, p.76).

Taken all the above-mentioned facts together, we can conclude that definiteness never fades away from proper names or common nouns in the light of all the linguistic and contextual different and possible conditions in case there is no violation of the game's discursive rules. Morpho-syntactically Amazigh is a highly inflected language and behaves differently from languages with determiners. Proper names are inherently definite, while common nouns carry internal structures that indicate gender and singular and plural forms. Common nouns are somewhat more rigid so that speakers can effortlessly disambiguate directed nominal expressions. In other words, these internal structure tools used by the Amazigh language end up functioning similarly to definite and indefinite articles.

In conclusion, the dissociation between proper names and common nouns is clear given the descriptive linguistics. Effectively, there are considerable differences regarding phonological, morphological, and syntactic properties among the various name classes linguistically and cross-linguistically, thus distinguishing the special status of proper names. In sum, (1) names can be phonologically different in the different sound patterns used (2) Proper names differ as well morpho-syntactically from common nouns, these morphological and syntactic differences are so ***striking*** that Nübling and colleagues (2015) speak of a specific onymic grammar. (3) cross-linguistically, proper names and common nouns behave in a different manner, however, they still have crucial differences that make proper names and common nouns distinct classes of names.

Thenceforth, it seems that the evidence from the task level supports our theory that proper names and common nouns are distinct semantic classes. However, we will still be doomed to operate with definitions devoid of general conclusions and that depend on the linguistic characteristics of such and such groups of languages. Since language is conceived as a diversity of idioms all having at their peculiarities, but the same natural rules which constitute a kind of constant *n*, the human nature, or better the human brain (Tiberghien & Abdi, 2002, pp.171-172). In the following chapters, we will seek evidence of proper names and common nouns dissociation from the physical level.

4 Psychology and neuropsychology of proper names and common nouns

In earlier chapters, we have seen that proper names and common nouns differ in the way they are acquired, as well as in how they are treated linguistically. This leads us to think that the same natural rules may govern their processing in the mind. Thenceforth, we expect that we can find cognitive and neuropsychological differences between the two categories.

In the following chapters, we will seek evidence of the dissociation of the two names from the algorithmic and physical levels, in other words, cognitive psychology and neuropsychology. This review will provide possible approaches to explain proper name vs. common nouns processing and investigate whether proper names retrieval is more difficult than that of common nouns and, whether the two categories are retrieved via different processing and distinct neural pathways.

We will begin by contemplating the neurocognitive theories of semantic and episodic memories, then the oscillations associated with these declarative memories. Next, we will show that proper names are more difficult to retrieve than common nouns in naming behavioral tasks, pointing out the dissociation according to declarative memory demands. At, the end, we will explore imaging studies that indicate dissociated neurofunctional patterns of proper names and common nouns.

4-1 Semantic and episodic memories

As we have detailed in previous chapters, a proper name is an arbitrary name that designates a unique specific entity related to a spatio-temporal context, whilst a common noun is a generic designation label that is contextually independent. This distinction resembles closely that made between semantic and episodic memory. In the following paragraphs, we will be showing the differences between semantic and episodic memories and how these may support proper names and common nouns dissociation. In other words, we are drawing a parallel between the functionality and structures of both declarative memories and naming proper names and common nouns. We will also inspect how both memories interact with each other by virtue of their semantic components through a distributed semantic processing stream.

First, what is the semantic and episodic memory? episodic memory is responsible for encoding, storage, and retrieval of our very specific personal experiences (Tulving, 2002). It is related to a precise spatial and temporal context as if one was time traveling to reexperience these individual events. Tulving describes this state of recalling contextual-based informations from the episodic memory as an ‘’autonoetic awareness’’ (Tulving, 2002; Wheeler et al., 1997). Whilst semantic memory is the hypothetical declarative system for storing and retrieving the general language about the world (Tulving, 1972). This includes facts, ideas, concepts, meanings, referents, and their rules of manipulation (abstract knowledge). In contrast to episodic memory, it is not structured by subjective time, but by reference to the world (Tiberghien & Abdi, 2002; Tulving, 1972).

The Traditional Standard Consolidation Theory (SCT) postulates that semantic and episodic memories initially in their formations both depend on the hippocampus, with the unfolding of time they become consolidated in extra-hippocampal structures (Moscovitch & Winocur, 2011). Specifically, in the beginning, the medial temporal lobe including the hippocampus strengthen the cortico-cortical connections of the context-specific memories to gradually transfer out into the cortex and transform into semantic memories. Here, the contribution of the hippocampus progressively decreases with neocortical areas becoming able to support independently the retrieval of remote memories (Squirel & Alvarez, 1995). Studies

conducted with rodents and humans indicate reorganizationon of hippocampal-dependent memory traces into the cortex over time (Sekeres, Moscovitch & Winocur, 2017). Indeed, amnesic patients with hippocampal damage show traces of memories suggesting that they are retained apart from the hippocampal system (Nadel & Moscovitch, 1997).

However, it is unconvincing that the physical correlates of memories are transferred from one brain location to another like one piece of mail is delivered from one site to the next (Sekeres, Moscovitch & Winocur, 2017). Nadel and Moscovitch (1997) explain that these retained memories in amnesic patients with hippocampal damage have become depersonalized events that have been semantized or schematic over time. This observation eventually led to the proposal of the Multiple Trace Memory (MTT) and the transformation hypothesis. According to this theory, in the reorganization process of the declarative memories into the cortex, episodic memory will continue to require the hippocampus, Thenceforth, episodic memory have general knowledge of an event while also maintaining details of the original personal experience of the memory, with each form being represented in its respective neural correlates. But the hippocampus is not needed for the retrieval of semantic memories (Winocur, Moscovitch & Bontempi, 2010; Sekeres, Moscovitch & Winocur, 2017; Nadel & Moscovitch, 1997).

Harand et al (2012) using fuctional magnetic resonance (FMRI) investigated the role of the hippocampus in memory consolidation and tracked the evolution of memories that were initially episodic and became semantic (retrieved without any additional contextual details) and memories that were consistently episodic. The results showed a gradual disengagement of hippocampal activation for later semantic memories and a stable hippocampal activation for consistently episodic memories (at least in their posterior part). For both types of memories neocortical activations were observed at both delays, notably in the medial prefrontal and anterior cingulate cortices (Harand et al., 2012) these findings are consistent with MTT and the transformation hypothesis. The fact that memories significantly lose the richness of the details of the memory present during the initial encoding preserving the more semantic aspects of the event is also integrated in the latter views (Harand et al., 2012).

In fact, there is evidence that these two systems are interdependent and do not operate in isolation (Graham et al., 2000; Lee et al., 2002; Schacter & Tulving, 1994; Takashima et al., 2014). They are inextricably linked so that if one undergoes changes in its function it will necessarily suggest changes in the other (Moscovitch & Winocur, 2011).

Neuropsychological and neuroimaging studies showed that the relationship between episodic and semantic memory is detected in a common core network of brain regions- medial temporal lobe, hippocampus and ventro-medial prefrontal cortex (Denkova et al., 2006; Gilboa et al., 2009; Hirshhorn et al., 2012a; Renoult et al., 2016; Trinkler et al., 2009). These results suggest that, according to the memory transformation models and the multiple trace memory, there is an involvement of the episodic system in the formation and maintenance and update of semantic memories (Irish et al.,2012). Additionally, semantic knowledge provides a necessary framework that structures episodic memory and supports semantic formation.

In fact, many studies have examined how semantic knowledge facilitates learning and memory of new information (Atienza et al., 2011; Bein et al., 2015; Craik & Lockhart, 1990; Greve et al., 2007; Prior & Bentin, 2008; Staresina, Gray, & Davachi, 2009). For example, individuals who are considered experts have better memory for information specific to their field when compared to novices (Bein et al., 2015). On the flip side, Semantic dementia (SD) [20]

[20]Semantic dementia (SD) is a progressive aphasia syndrome related to a focal cortical atrophy of the anterior and inferolateral temporal lobes (Henry et al., 2008; Mummery et al., 1999; Grossman et al., 2004; Gorno-tempini et al., 2004; Galton et al., 2001; Snowding, Goulding & Neary, 1989). Generally, Semantic dementia patients have fluent

presents the opposite effect of other frontotemporal dementias and Alzheimer disease, this temporal variant is consistently documented to have the semantic memory impaired, and the episodic memory spared (Kertesz et al., 2010; Henry et al., 2008; Hodges et al., 1992). Indeed, the examination of SD patients showed that the atrophy may involve both temporal lobes, with earlier and greater tissue loss in the left hemisphere (Hodges et al., 1992, Lambon Ralph et al., 2001; Grossman et al., 2004) Atrophy to the Left (and in some cases right) anterior and inferolateral temporal lobes is associated with an impaired semantic memory performances (e.g., anomia) (Mummmery et al., Galton et al., 2001; Williams et al., 2005; Rosen et al., 2004). Regarding the episodic memory, examination of patterns cortical atrophy showed that the medial temporal cortex is spared (e.g., the hippocampus and related structures) (Mummery et al., 1999; Mummery et al., 2000; Hodges et al., 1992). Thus, there are suggestions that episodic memory structures might support the new learnings in SD patients.

Indeed, in the rehabilitation of two SD patients presenting severe anomia and comprehension deficits, Snowden and colleagues (1996) showed that new learnings and improvements in naming performance were possible and more effective when combined with meaningful personalized contextual clues or experiential links (episodic memory traces). The items associated with the more personally meaningful uses (autobiographical context information) showed more durable treatment over time. And the naming accuracy particularly suffered when the item was presented in an unfamiliar context. In other words, the episodic memory system is suggested to provide critical support for new vocabulary acquisition, slowing down the progression of anomia and providing protective benefits to residual semantic knowledge. (Snowden et al., 1996; Henry et al., 2008) Nevertheless, these findings are valid only in earlier stages of the development of the dementia, because hippocampus atrophy is reached at some point of the disease progression (Galton et al., 2001; Chan et al., 2001; Henry et al., 2008).

A study of event-related potentials (ERPs) also suggests that episodic and semantic memory share neural structures (Kutas & Federmeier, 2011). In fact, the study showed that episodic memory is associated with a distributed semantic memory processing stream. Twenty-seven healthy subjects verified the veracity of 4 types of questions, semantic facts, episodical facts (e.g., autobiographical), repeated events, and unique events (e.g., episodic). The results showed that autobiographical facts and repeated events were associated with modulations of the N400 ERP response, which is associated with a distributed semantic processing stream (Kutas & Federmeier, 2011).

Furthermore, in a review of over 100 neuroimaging studies, Binder et al. (2009) observed that the semantic memory processing network is substantially overlapping with the autobiographical episodic memory network. They grouped the overlap into three general brain regions: posterior multimodal and heteromodal association cortex, heteromodal prefrontal cortex, and medial limbic regions, all regions more lateralized to the left hemisphere. They also noted how the semantic network engages a neural network like the default network, a brain system involved in numerous internally focused tasks (Raichle et al., 2001; Spreng et al., 2009), including autobiographical and episodic memory (Buckner et al., 2008). Kim (2016) probed the extent of this posited overlap of semantic and episodic memory and the default network through a meta-analysis of 99 fMRI and 6 PET studies. He drew the conclusion that the overlap between the two

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speech, syntax, and phonology, but an impaired comprehension questioning the meaning of words (e.g., what is steak?) (Kertesz et al., 2010), they also present a severe and progressive impairment in word finding and picture naming memory tasks (Hodges et al., 1992; Hodges, Petterson & Tyler, 1994; Rogers et al., 2006). During a conversation, SD patients show an 'empty' language, semantic paraphasias, and regular pauses (Hodges et al., 1992; Neary et al., 1998).

memory systems and the default network was largely overlapping, diverging mainly in a necessary and distinct role for hippocampal and parahippocampal areas in episodic memory retrieval (Kim, 2016).

Therefore, semantic and episodic memories are shown to be interdependently dynamic in that they share a common core network associated with a distributed semantic processing stream. Largely overlapping, both memories recruit the temporal lobe, but the region in which the two memories seem to diverge is thought to be the hippocampus and the parahippocampal area that the episodic memory recruits in addition, independent of how long they were formed. And that we think makes the core difference between proper names and common nouns processing.

Much the same, common nouns are shown to be cortically allocated (Martins & Farrajota, 2007). For instance: a region in the left posterior temporal lobe, agreeing with the location of Wernicke's area, as well as a consistent activation was found in the right parietal cortex, thus preceding and partly overlapping with the left temporal response, resembling semantic memory system (Levelt et al.,1998). Proper names are more complex and in the case of names of people, neuropsychology studies suggest that there is a specific module for retrieving proper names and appears to be fragile and source-consuming, it requires a large neural network putting at work semantic and episodic interactive systems (e.g., ventromedial Prefrontal cortex, Anterior Temporal Cortex, Hippocampus), specialized perceptive areas accordingly stimuli type (e.g., Fusiform Face Area (faces); Parahippocampal Place Area) and socioemotional related structures (Duchaine & Yovel, 2016., Freiwald, Duchaine & Yovel, 2015; Liu, 2018; Semenza et al., 2003., Semenza, 2011; Simmons et al., 2010; Hadjikhani et al., 2004). Moreover, these differences between proper names and common nouns processing spread differences between semantic and episodic memory systems. (Semenza et al., 2003) And so, proper names and common nouns both are semantic representations (abstract facts), but proper names might also engage the episodic memory system (contextually dependent) (Douville et al., 2005; Hadjikhani et al., 2004; Levelt et al., 1998).

It may be concluded that semantic memory emerges from primarily episodic information over time, and consolidation of memories does not mark the end of hippocampal processing after memories become represented permanently into the cortex, as the hippocampus will continue to stably activate for the retrieval of episodic memories. Furthermore, the multiple trace memory (MTT) and the transformation hypothesis are in accordance with much of the studies cited above, directing us to think that consolidation of memory is a continuing and interactive process within the hippocampus and the medial prefrontal cortex (mPFC) and over broader memory networks in the brain (Sekeres, Moscovitch & Winocur, 2017). This distinction is suggested to resemble closely the formation and processing of proper names and common nouns that are suggested to be both semantic classes, except that proper names might still recruit or activate stably episodic memory traces due to its contextually dependent nature.

In the following section, we will explore oscillations patterns associated with the semantic and episodic memories.

4-1-1 What can theta and upper-alpha waves tell us about the specific memory processes regarding the episodic and the semantic system?

Electroencephalography or EEG is a non-invasive brain scan technique that measures the electrical patterns generated in the brain. Electrodes placed on the skull record electric waves and the differences in the signals detected between these electrodes provide information about precisely when any brain event occurs and what brain areas are active during a specific task, as memory retrieval or paying attention for example. It is a fast technique that could measure

changes that occur in just milliseconds; However, the technique cannot tell exactly where any brain pattern originates. Using more electrodes and sophisticated data analysis could help (Cohen & Mike, 2014).

Brain oscillations pick up electrical waves generated constantly in the brain, in other words, graded excitatory or inhibitor postsynaptic potentials (Staudigletal et al., 2010). These oscillations play a key role in selective information processing in the brain (Pfurtscheller & da Silva, 1999). There are two different kinds of neural oscillations that differ in their phase relationships to the stimulus (David, Kilner & Friston, 2006). Evoked neural oscillations, in which phases are locked to the stimulus onset, and induced neural oscillations are not, they are not strictly locked to the stimulus onset but are related to the stimulus (Onitsuka, Oribe & Kanba, 2013).

Increasing power of theta (μV^2) (around 5Hz) is repeatedly demonstrated through studies to play a key role in memory formation and retrieval via shaping synaptic plasticity and coordinating the reactivation of memories in selective memory retrieval tasks (Staudigletal.,2010). In Animal studies, theta rhythm is consistently documented to dominate the local potential field of the hippocampus in episodic memory tasks, which suggests that it plays a major role in the retrieval and encoding of episodic memories. When rodents shift from one point to the other in space, their hippocampal place cells fire at different phases depending on the animal's location (theta phase precession) (Vanderwolf, 1969; O'Keefe & Recce, 1993; Skaggs et al., 1996). Nyhus and Curran (2010) point out that this firing is a form of phase coding to plan trajectories to particular goals probably due to encoding and retrieval episodic processes necessary to guide ongoing behavior.

Furthermore, analysis of the hippocampal local field potential in epileptic rats, that exhibited a highly specific impairment of episodic memory traces (for what-when-where tests)[21], showed that both the theta rhythm and its coordination CA1 and DG-measured as theta coherence and phase locking were selectively disrupted (Bellistri al, 2013). In other words, this dysfunction of the episodic like memory was associated with a decrease of the hippocampus theta oscillatory power and its coordination (Bellistri et al., 2013). Moreover, the disruption of the hippocampal theta in rodents abolishes spatial learning in the Morris Water maze experiment[22]that can be re-established by stimulating theta frequency (McNaughton, Ruan & nWoodnorth, 2006).

In sum, the abovementioned rodent studies hypothesize that hippocampal theta may be induced into the cortex via hippocampo-cortical feedback loops and, therefore, may even be detected by scalp electrodes in human electroencephalography (Klimesch, Doppelmayr & Schimke, 1997).

Indeed, in humans, theta power (μV^2), particularly in the fronto-lateral regions, has been consistently related to the hippocampal activity. An increase of theta (evoked) power (4-7Hz) at frontal, fronto-temporoparietal, and occipital regions, reflects the recruitment of episodic-like memory traces (Hanslmayr, Staudigl & Fellner 2012; Liu, 2018; Klimesch et al., 1994; Clouter et al., 2017).

While alpha power (μV^2) most likely is generated in thalamo-cortical feedback loops as well as in the cortex (Klimesch, 1999; Klimesch, Doppelmayr & Schimke, 1997). Consistently, Semantic processes are primarily associated with the (evoked) upper alpha power decreasing

[21]The characteristics of an episode are divided into ''what'' happens ''where'', with contextual information (temporal '' when'' or circumstantial ''which'') are considered implicitly (Eacott & Norman, 2004).

[22] the Morris water mase in behavioural task used in the neuroscience filed for investigating the psychological processes and neural mechanisms of spatial learning and memory. The rodent is placed in a circular pool of water and required to escape onto a platform without any help of local cues . The location of the platform Is detected using spatial memory. Conceptually, the experiment requires place cells in the hippocampus for spatial representations (O'Keefe, 1976).

(about 9,5-12 Hz) (Klimesh et al., 1994; Klimesch, 1999). Like theta power, it is crucial to note that upper alpha is related to many cognitive processes. The attentional aspect of it is inherent to its relationship with episodic memory and sensory-perceptive memory. In this context, the relevancy of upper alpha is associated with the task type and the brain areas recruited. In more non-demanding tasks, like basic semantic processing, upper alpha reflects the semantic processing in the retrieval (Klimesch, 2006).

To put it in more detailed terms, we will illustrate some of these experiments[23] that essentially document the association of the upper alpha wave with semantic memory processing and theta wave with episodic memory. It is crucial to note, however, that none of the following oscillations studies led by Klimesch addresses proper names exactly since there are no studies that use EEG naming tasks that explore oscillations

In a first study, Klimesch and colleagues (1994) assessed 12 young adults in a semantic congruency task and episodic recognition task. The stimuli consisted of common concept words of living and non-living things. The subjects had to respond with yes or no to the congruency of words like (e.g., eagle-claws, pea-huge, etc.), then, episodically, the same word pairs had to be judged combined with new concept features pairs. There, the episodic task was to recall whether a particular concept feature was already mentioned in the semantic task. The results showed that Event-related response to a stimulus has different effects in the alpha and theta bands (μV^2). In the episodic recognition task, theta (evoked) power increases maximally (about 4-7 Hz) over the frontal area; whilst in the semantic recognition task, (evoked) upper alpha power decreases maximally (upper-alpha cortical inactivity) (about 9,5-12 Hz).

A second series of studies have revealed that upper alpha (μV^2) (10,3-12,3 Hz) is different from lower alpha (μV^2) (lower-alpha (8,3-10,3 Hz); lower-alpha (6,3-8,3 Hz) because the first is primarily associated with semantic processes and the second with attentional processes. Indeed, only the upper alpha band desynchronization that is shown to respond selectively to the encoding and processing of semantic memory. Lower alpha decrease, however, most likely reflects unspecific processing demands such as the increase in attention with increasing task demands. Thus, the gradual increase in lower alpha desynchronization may reflect the gradual increase in attentional or general task demands from the beginning to the end of a trial (Klimesch, Doppelmayr & Schimke, 1997; Klimesch, Doppelmayr, Pachinger et al., 1997).

Together these results point to the association of the upper alpha wave with semantic memory processing and theta wave with episodic memory. With respect to our thesis aim, we are assuming that this well-documented oscillatory dissociation of theta and upper alpha is reflecting a dissociation between proper names that in their turn reflect the recruitment of episodic memory inducing theta power and common nouns associated with semantic tasks and upper-alpha power.

In the next chapter, from an algorithmic perspective, we will approach this distinction between common nouns and proper names by naming memory retrieval tasks.

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[23]Starting with oscillations studies, it is important to understand the type of analysis used in these following studies. Klimesch (1994, 1997a, 1997b) uses the event-related power desynchronization or ERD measures. ERD consists of contrasting the frequency between two distinct periods: test and reference intervals. The power amplitude (μV^2) analysis is based on the measurement of shifts in band-power. It is an evoked-based measure influenced by amplitude peaks (Pfurtshiller & Aranibar, 1977). The amount of decrease or increase in band power that occurs during a test interval (in the following studies: the retrieval period) in response to some experimentally controlled events in a particular trial/as compared to their reference interval (as a baseline), being a by-trial analysis. The behaviour of a specific band will decrease (desynchronize) or increase (synchronize) relative to the baseline (in percent or other standardized transformation). Overall, the averaged group-based estimate of ERD for each band of interest would be higher or lower (de)synchronized from one condition to another.

4-2 The psychology of proper names vs. common nouns

In the present section, we will primarily focus on the difficulty of proper names in comparison to common nouns in memory retrieval tasks, which is closely linked to the fact that proper names follow a separate pathway that additionally recruits episodic-like memory traces. Thus, the retrieval of proper names may simply be more difficult and demanding than the retrieval of common nouns, consuming more cognitive processes.

4-2-1 The accuracy of proper names vs. common nouns

Perhaps the best way to begin this section is by citing Cohen and Burke (1993): *''proper names have a frustrating propensity to be forgotten"* (Cohen & Burke, 1993, p.249). In fact, psychology studies repeatedly revealed that the retrieval of proper names is typically harder and much more vulnerable to being forgotten than the retrieval of common nouns (Cohen & Faulkner, 1986; Burke & al,1991). This is a valid finding for young, middle-aged, and elderly people.

In general, previous research has shown that proper names are the linguistic category most likely to cause retrieval difficulties in normal adults in comparison to common nouns (Maylor & Valentine, 1992; Burke et al., 1991; Cohen & Burke, 1993; Huijbers et al., 2017; Salthouse & Mandell, 2013; Shafto et al., 2009). The main methodologies used in the research of names retrieval are diary studies which are introspection report studies of failures to name familiar people; or laboratory experiments where subjects, under controlled conditions, are asked to retrieve names that had been selected by the experimenters.

First, in diary studies, adults of different ages record their memory failures over several days or weeks. This extended framework typically taught us that subjects experience more difficulty in retrieving proper names of familiar people in comparison to common nouns (Cohen & Faulkner, 1986; Burke et al., 1991; Reason & Lucas, 1984; Young, Hay & Ellis, 1985).

Second, in a laboratory context, pioneers, Yarmey (1973) and Young and Ellis (1991) assessed subjects proper names retrieval using photographs of famous faces. Subjects had no pronounced difficulty accessing the person's occupation or other related pieces of information, although not being able to recall the person's name. Curiously, subjects do not have a problem retrieving semantic information or general abstract facts about the person they have difficulty naming, and they claimed they knew the person of the photograph. Hanley and Cowell (1988) also emphasize this finding by showing that in one experience 33% of famous people were named correctly, and 49% of occupation was attributed correctly to the total of trials.

Moreover, in other controlled experiences, students have the tendency to forget faster cognitive psychologists (proper names) rather than concepts from cognitive psychology (common nouns) (Cohen & Faulkner, 1986; Conway, Cohen, & Stanhope, 1991). Teachers were also requested to name former students. Six months after teachers were able to retrieve 28% of the names of the photographs of their students, 5% after one year and deteriorating sharply to 0% after 8 years. However, in eight years, they were still able to recognize 50% of the students by their photographs (Bahrick, 1984). In many ways, the group to be covered up by this discrepancy between name recognition and name retrieval is all evidence that the access to the proper names more vulnerable and lost rapidly, while knowledge of the names remains rather stable (Seamon & Travis, 1993).

4-2-1-1 Errors and the tip-of-the-tongue phenomenon (TOT)

Errors happen also, further evidence of the dissociated retrieving networks of proper names and common nouns comes from the tip of the tongue phenomena (TOT) [24]. This is an issue that people tend to experience more for proper names than common nouns in daily life, as well as in experimental studies. And often, enable access to the target word's first letter and are often accompanied with related words (Brown & McNeill, 1966). The TOT state is exquisitely hard to recover from, although the semantic information related to the person is often available in the subject's memory storehouse (e.g., the person's occupation). It is no guarantee for recovery in TOT naming state (Read & Bruce, 1982; Yarmey. 1973; Brennen et al., 1990; Hanley & Cowell, 1988).

In aging studies, the frequency of the reported proper naming failures was found to increase substantially with increasing age (Burke, et al., 1991; Cohen & Faulkner, 1986; Schweich, Van der Linden, Brédart, Bruyer, Nelles, Schils, 1992). In fact, forgetting names was by far the largest age-related problem reported by older adults (Maylor, 1997). This difficulty often occurs at social gatherings when the older person forgets the names of people he or she has just been introduced to; but it also occurs as a failure to recollect well-known names-personal friends as well as names of celebrities and public figures. The first example may simply reflect the well-established inefficiency of new learning associated with aging, but the second example appears to be a clear example case of age-related problem of retrieval (Rose et al., 2015).

In one study Cohen and Faulkner (1986) found that a group of older adults (mean age 71 years) reported more memory blocks for names than did either a young or a middle-aged group (mean ages 31 and 47 years, respectively). Most name blocks occurred for the names of friends or relatives whose names were rated as well known and usually easy to retrieve, suggesting that retrieval failure results from some fluctuation in the efficiency of the retrieval process. Burke et al (1991) also documented that in one self-evaluation study, older subjects (in comparison to mid-age and young subjects) reported more difficulty reporting names of people they know, rather than common nouns or abstract words. Furthermore, healthy middle-aged people retrieve more incorrectly proper names than common nouns, believing that they have retrieved the correct ones (Kljajevic & Erramuzpe, 2018).

Another controlled study was conducted by Burke and colleagues (1991) in which participants were asked to retrieve names from various categories (e.g., places, people, common nouns, verbs, adjectives) upon verbal descriptions. The results showed that the older subjects experienced more TOTs than the younger participants for people's name. The proportion of TOTs was also significantly higher than the other categories of names. Same, Maylor (1997) showed that whereas older adults were less able to retrieve proper names than were their younger counterparts, this age-related difficulty was no more severe for the final stage of recalling the name than it was for such prior stages as face recognition and retrieval of relevant semantic information.

In fact, the semantic memory representations are overall well-maintained and may even improve throughoutaging (Haitas et al., 2021; Kavé, Samuel-Enoch & Adiv, 2009; Wingfield & Grossman, 2006). Wingfield and Grossman (2006) justify this relative preservation of semantic

[24]The tip of the tongue state is the inability to retrieve a certain word, while one has enough related knowledge about it (Brown & McNeill, 1966). To illustrate, I know that Tom is a furry blue cat and always chases a mouse called Jerry, but I cannot retrieve at a specific moment the word Tom. Brown and McNeill (1966) define the tip of the tongue phenomena as the following '*'involves a failure to recall a word of which one knows, and the recall must be felt to be ''imminen*t" (p.325)

memory along aging by the need that people must preserve successful communication increasing this way neuronal plasticity. This necessity result in compensatory, flexible, or atypical recruitment of neural resources. In other words, older adults have a preserved accuracy in semantic tasks due to their more extensive experience with word use and a larger vocabulary than younger adults (Kavé, Samuel-Enoch & Adiv, 2009; Verhaegen & Poncelet, 2013 , Wingfield & Grossman M., 2006, Balota et al., 2004; Methqal et al., 2018).

Considering the accuracy, errors, and Tip-of-the-tongue phenomenon studies, we conclude that naming proper names is much more difficult that vulnerable to forgetting in comparison to naming common nouns in young, middle-aged, and elderly people. These reported difficulties in retrieving proper names highlight the fact that proper names seem to engage a more demanding processing recruiting additionally the episodic memory system (hippocampally dependent). Furthermore, it can be mentioned that when we a parallel between proper names and common nouns dissociation with declarative mnesic dissociation, this dissociation of categories may potentially be relevant to better understand memory systems and their relationships.

4-2-2 Response times of proper names vs. common nouns

The preceding section demonstrates how the processing of the names could affect the accuracy of their retrieving, with proper names consuming more cognitive processes, they are hard to retrieve. One other best-known feature of their difficulty is how they take a longer time to retrieve as well. An increase in time of retrieval is classically associated with more complex cognitive processing. In this section, we will be collecting a few studies that measure the latency of retrieving names, namely proper and common nouns.

In reaction times studies, subjects are presented with images or writing definitions of specific categories, and then the participants are asked to retrieve the names or classify them according to familiarity, occupation, or nationality of the person as examples. In the retrieval task, the time between stimulus onset and the onset of the correct response is measured with dedicated tools. In classification tasks subjects must decide whether the item presented belongs to a particular category or not. Response latencies are then measured with a voice key when the subjects respond with “yes” or “no” or push the appropriate button (Milders, 1997).

In fact, the consensus is that reaction times are consistently slower for proper names, rather than common nouns in the memory retrieval tasks (Burton & Bruce, 1992; Proverbio et al., 2001). The phenomenon of dissociation between semantic information and proper names is quite well documented here as well. Several reaction times studies have shown that the reaction time of retrieving people’s faces is slower in comparison to retrieving semantic information (e.g., categorizing the same face concerning the profession) (Johnston & Bruce, 1990; Young et al., 1986; Ellis & Hay, 1986; Young, Ellis & Flude, 1988). In previous studies, most reaction times for retrieving people’s names lay between 1200ms and 1500ms (Brédart et al., 1995; Valentine & Moore, 1995; Young et al., 1986), whilst for objects names retrieval the mean vocal response lay around or below 1000ms (Jolicoeur, Gluck & Kosslyn, 1984; Humphreys, Riddoch & Quinlan, 1988).

4-2-3 What other possible explanation for the proper name difficulty retrieval?

Proper names are less accurate and take way longer reaction times in memory retrieval tasks Thanks to the preceding sections of this chapter, we have now sorted out that this may be critically due to their large and source-consuming processing that involves the episodic system. While common nouns are easier because they are allocated to more cortical regions (Martins &

Farrajota, 2007). We have now one last piece to fill in, what other possible explanations of why it is the case.

Proverbio (2009) claims that the difficulty lies in the level of processing at the retrieval (not in the storage), considering that proper names offer little semantic information to help or facilitate the retrieval of the target name; they are purely referential expressions (chapter 1 and 2), in other words, they are arbitrary (Cohen & Faulkner, 1986; Proverbio, 2009; Cohen, 1990). Common nouns, in contrast to proper names, carry rich associated energy. Common nouns are organized semantically (e.g., common roots: polarity, polarization, polaroid., etc.) (Proverbio, 2009). besides this semantic complex structuration could have a facilitating effect on semantic memory retrieval.

The non-descriptive nature of proper names could play a role as well. One research that is consistent with the arbitrary names being harder to retrieve was led by Brédart and Valentine (1998). They showed that People are shown to remember better names of cartoons and comic-strip[25] that compose descriptiveness (e.g., Lucky Luke is indeed lucky) rather than arbitrary names that elicited significantly more retrieval blocks and less correct naming.

Nevertheless, the far more sophisticated question is whether common nouns are not arbitrary themselves. Saussure (1916) put forward a solid claim that the relationship between the phonological form of a word and its meaning is arbitrary. There is no direct link between the word ‘’bowel’’ and the bowel itself, the link is merely conventional. This tells us something distinction between descriptiveness and common nouns. Descriptiveness in this case is the mere fact that some names convey little information about their bearers, some property (e.g., Lucky Luck) (Lucchelli & de Renzi, 1992; Valentine, 2010).

In looking at the so-called “bakerBaker” paradox, we figure out the difference between being descriptive and being a common noun: it is actually easier to learn that a face belongs to a baker than it is to learn that the same face belongs to a Mr.Baker (McWeeny et al., 1987). People’s names that could be also common nouns (e.g., names of occupations ‘baker’,’ Potter’., etc.) are shown to be as difficult and challenging to learn as people’s names with a meaningless string of phonemes (McWeeny et al., 1987). It turns out that this effect is not particularly due to the phonological form or frequency of the occurrence of occupations vs. proper names, but rather, it is quite clear that the difficulty is due to the retrieving of a proper name being more difficult for its semantic properties and retrieval pathway.

Eventually, the descriptiveness, in contrast to common nouns, of a proper name could be facilitated by the descriptive properties consolidating the semantic access pathway, in the way it conveys the properties of the proper name bearer. However, many of the details remain to be sorted out in laboratory experiments to prove this right. Nevertheless, this does not mean that arbitrariness is a factor that explains why proper names are particularly difficult. In our point of view, this vulnerability is mainly determined by the vulnerable retrieval pathway of proper names which is more demanding and consuming of cognitive processes. The best available evidence provided by behavioral studies is the increasing difficulty to retrieve proper names in the normal healthy aging decline of episodic memory or unhealthy aging under diseases like Alzheimer that accelerate the deterioration of episodic memory.

In conclusion, this chapter reviewed data from behavioral studies that suggest that proper names and common nouns have distinct retrieving processes and two distinct classes in the mental lexicon possibly mirroring their specificity of reference (Craik, 2002). Proper names are indeed

[25]Cartoon characters are shown to be processed in an analogous manner to that of faces (Johnston, 1994; Johnston & Bruce, 1994).

inherently more difficult and slower to retrieve than common nouns. They follow a different and more demanding and source-consuming pathway.

So, what we have learned? The chapter provided an algorithmic comprehension of the phenomenon of proper names and common noun dissociation. In the next chapter, we will seek evidence from the physical level of localization and neuropsychology studies that further support this claim. This issue will highly support our hypothesis that proper names and common nouns may be following separate pathways.

4-3 Neural correlates of proper names vs. common nouns

Once established that proper names, in contrast to common nouns, are more demanding and vulnerable to being forgotten in memory retrieval tasks, and that this is mainly due to their large and source-consuming network. Another important and debated issue concerns the neural correlates of the retrieval of proper names in comparison to common nouns. Reported investigations so far employed lateralization techniques, event-related potentials (ERPs), neuroimaging as well as the classic study of brain damages (e.g., single case studies of anomia) and aging under normal conditions or in a detrimental manner (Semenza, 2006).

Caramazza and Shelton (1998) put succinctly that semantic knowledge must be categorically organized within the brain and depending on what type of semantic information, it is represented in a neurally distinct location that can be selectively impaired by brain injury. These brain injuries happened on several occasions and provided evidence that knowledge of people vs. knowledge of objects appears to be separate processing systems (Harris & Kays, 1995; Martins & Farrajota, 2997; Miceli et al., 2000; McKenna, 1997).

It is important to note that brain damages provide even more direct information about the neural correlates of proper names and common nouns retrieval, since, in many cases, it is possible to see where the brain has been damaged (Sedivy, 2014, pp. 67-69). Several single cases of anomia have attracted the attention of scientists because it appears that certain kinds of brain damage can cause people to lose their ability to use proper names while leaving their ability to use common nouns intact, and vice versa. Studying the difference between proper and common nouns through the cases of neuropsychological dissociations has been extremely useful to explore the organization of the lexical-semantic system, and to distinguish general semantics (common nouns) from semantics that refers to specific individuals (proper names) (Semenza, 2006). Indeed, several patterns of dissociation have been described in a variety of neuropsychological cases. When it is a simple dissociation, it could indicate a difference in terms of the difficulty of the task. When it is a double dissociation, this phenomenon that affects one process and leaves the other intact can provide clues about different underlying neuroanatomical structures (Sedivy, 2014). We will focus on clearest cases for these two varieties with reference to the neuroanatomical region that is documented to be damaged in each case. The careful revision these single case anomia studies will help us construct our theoretical model of proper name and common noun processing within the domain of neuropsychological research.

Let's initially consider the patient BG that suffered from a stroke at her 68 y.o. The computerized tomography (CT) scan revealed that the damage was involving the left temporal lobe. One of the massive difficulties she suffered from is the retrieval of names of famous people but preserved the ability to access semantic information related to them (e.g., a television personality) (Harris and Kays, 1995). Lyons and colleagues (2002) suggested that her semantic memory was completely preserved, and the impairment was due to a problem at the level of the lexical representations in the production of proper names or in the lexical access level to these latter representations.

Another patient called APA who, following massive punctate head trauma, was unable to retrieve proper names, and often, had difficulties in accessing detailed biographical information about those people she was no longer able to name. She would recall 40% of a set of 90 famous faces (control range = 76-90%) and had mild impairment in the retrieval of common nouns. The people's names she was able to recall were basically the names of members of her immediate family (husband, parents, and in-laws), she was also able to name all animate beings (e.g., animals), and inanimate objects (e.g., vacuum cleaner) (Miceli et al., 2000). The blocks of proper names were thought to be due to damage to some domain-specific semantic memory storage of proper names. According to a more detailed MRI scan performed dorso-laterally, the areas affected by her head trauma with a temporal bone fracture were the middle and inferior temporal gyri (Brodmann areas: BA 20 and 21), Ventro-medially, it involved the inferior temporal gyrus up to the anterior portion of the fusiform gyrus (BA 20, with partial involvement of BA 36 and substantial sparing of BA 37). And the spared areas were temporal pole, the lingual gyrus, parahippocampal gyrus and of the hippocampus (Miceli et al., 2000).

To keep it simple, we should summarize the previous findings and point out that, in accordance with previously mentioned functional imaging, these single-case studies defend that the temporal pole has a critical role in naming people. Nevertheless, the following anomia cases we will be discussing are quite controversial and differ from the previously reported patients in that the temporal pole lesion is not associated with proper name anomia.

Patient FH had a history of hypertension with slurred speech (dysarthria) and right-sided facial weakness, his condition eventually led to, according to a CT scan, a low attenuation in the left-frontal lobe consistent with an infraction. The lesion is shown to be in all respects subcortical and damaged the white matter of the left temporal lobe. FH's ability to retrieve the names of objects was impaired and his ability to name familiar people from famous faces and from verbal accounts of their occupations is spared and was as accurate as of that of control subjects (e.g., like control subjects, FH was able to recall the occupation of every famous face he named) (Lyons, Hanley & Kay, 2002). McKenna (1997) assessed patient FH in both word picture matching and comprehension tests of object names, he made a relatively large number of errors in naming and supplying detailed semantic information about the object he was not able to name when asked. He mirrored the exact contrary results when he was required to access biographical and conceptual knowledge about people, familiar faces, and names. So, his mental storehouse of familiar people was intact, contrary to objects. FH, therefore, represents a dissociation with the proper name anomia in which semantic knowledge of people can be preserved even when semantic knowledge of objects is impaired (Lyons, Hanley & Kay, 2002).

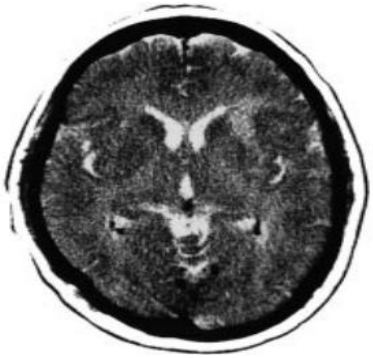

Figure 4-1 A CT scan showing damage to FH's left frontal lobe. Note that the image has been right-left reversed so that the left hemisphere appears on the right side. Source: Semenza (2006).

The different naming impairments between FH and APA reflect damage to different components of the semantic system that are neurally and functionally different (e.g., FH's anomia appears to be semantically based) (Semenza, 2006).

The following two patients JFJ and ACB will present damage to distinct lexical output systems in that both, oppositely, present a purely expressive disorder that preserves one ability and leaves the other intact, and thus provide evidence that there is a double dissociation between the two categories of names at the lexical access level.

In these cases of anomia, on the one hand, patient JFJ had the temporal pole spared and medial inferior temporo-occipital region impaired (e.g., related to face and naming); the lesion was extensible to the hippocampus. JFJ had proper name anomia of people's names, while his ability to retrieve common nouns was preserved. On the other hand, patient ACB had the temporal pole impaired (temporoparietal infarction), and it was not extensible to the hippocampal regions (hippocampus spared).

ACB had a preserved ability to produce people's names, but he had difficulties with common nouns retrieval (Martins & Farrajota, 2007). It's crucial to note that there are differences in performance for these categories, including retrieval from images: ACB presents good performance for any representation of proper names, and JFC presents particularly the memory quite compromised to remember names from faces. This study indicates different neural correlates for processing proper names and common nouns and raises doubts about the importance of the temporal pole for the recovery of proper names and suggests that other episodic areas such as the hippocampus could be involved.

The double dissociation between JFJ and ACB represents strong evidence that the selective naming impairment that such patients experience does not occur simply because peoples' names are more difficult to retrieve than common nouns, but there exist two different kinds of memory processes. These findings favour the idea that processing proper and common nouns follows at least partially independent pathways in the cognitive system and in the brain.

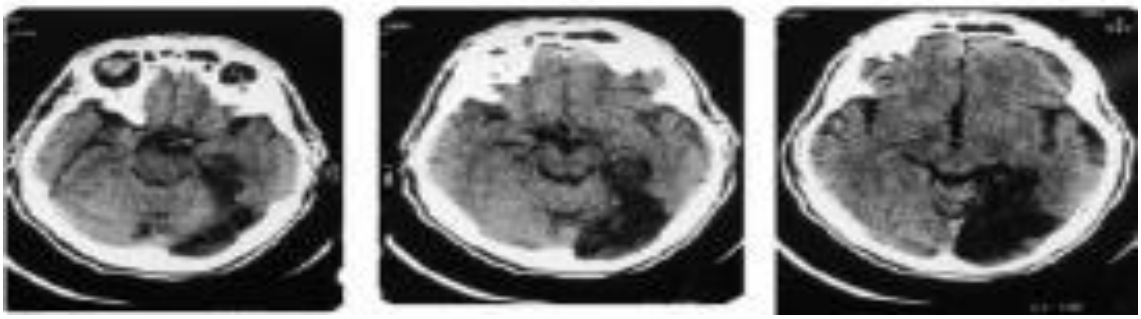

Figure 4-2 JFJ-CT Scan (3 months post-onset) showing a left hemisphere infarct, involving the occipital and the medial inferior temporal lobes, sparing the temporal pole. Source: Farrajota and Martins (2007).

In sum, well documented single-case studies of anomia support the existence of functionally and neurally distinct retrieval pathways for the categories of proper and common names. Although these aforementioned damages to the brain offer a piece of direct information about the location of brain structures responsible for the retrieval of names, they are quite questionable. Since neuroplasticity reroutes the cognitive functions to healthy brain areas. The area that performs a function *x* in a normal brain, may not be the same in a damaged brain. The brain has the capacity to reroute its function (even within a few weeks of a damage). The function of damaged area is taken by a healthy part of the brain (Sidvy, 2014, pp.75-76; Kempler 2005, p.12). Furthermore, there are few individuals that will suffer from brain damages, and they will

differ a lot in the location and extension of the damages. This will obviously limit the generalization to the general population (Sedivy, 2014, pp. 75-76). So, ultimately, we need to study the healthy human brain in order to confirm and extend and better understand the findings.

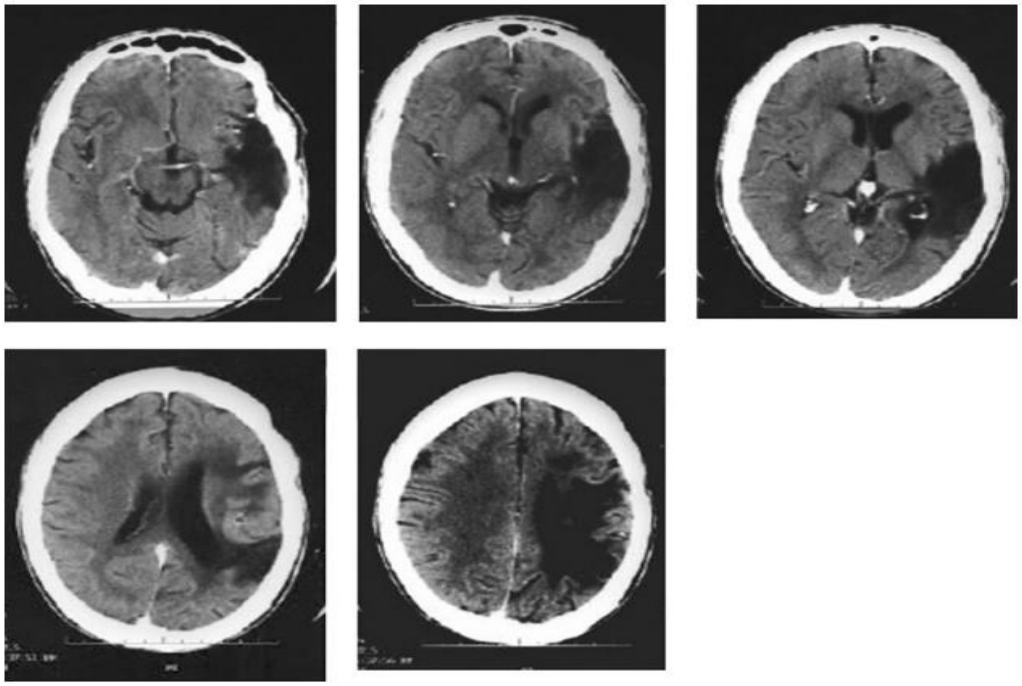

Figure 4-3 ACB-CT scan (7 years post-onset) showing a left temporo-parietal infarct including the anterior temporal lobe. Source: Farrajota and Martins (2007).

In healthy participants, functional imaging studies consistently documented that the left-temporal pole is dedicated to the retrieval of proper names (Brédart , 2017). A functional magnetic resonance study with healthy participants showed that components of the retrieval of faces, names and peron related semantics may be jointly mediated by the bilateral anterior temporal lobe, whose dynamics may be depending on the level of face-name associations (Tsukiura et al., 2002). The involvement of the temporal lobe has been observed also in positron emission tomography studies (PET) (Damasio et al., 1996, 2004; Grabowski, et al., 2001 as cited in Brédart, 2017). The activation of the left temporal pole was reported mutually in naming famous people (Damasio et al., 1996, 2004; Grabowski, 2001; Tsukiura et al., 2002, Gesierich et al., 2012) or naming recently learned proper names (Ross & Olson, 2012; Tsukiura et al., 2002).

Therefore, neuroimaging studies with healthy subjects seem to indicate the critical role of the temporal pole in retrieving people's names and other unique entities and its damage is accompanied by an impaired retrieval of this lexical category, leaving intact the access to common nouns like in the case of documented single-cases studies of BG and APA. Nevertheless, there are still some lacks in the literature that must be filled. These pieces of evidence are not consistent[26] in regard to the single-case studies of anomia conducted by Lyons and colleagues (2002) and Martins and Farrajota (2007). FH's and ACB's temporal lesion was not associated with the proper names' anomia. And, In the case of ACB, the hippocampus seems to be a possible involved area in proper names.

[26]The left temporal playing a crucial role in proper name retrieval has been questionable also by the systematic review of Semenza and colleagues (1995).

In fact, there are other indicators that proper names may recruit additionally the episodic system (hippocamply-dependent), unlike common nouns that are purely supported by semantic memory. Indeed, it has been shown that proper names anomia in comparison to common nouns is an omnipresent feature in earlier stages of Alzheimer disease (AD)[27] (Semenza et al., 2003), owing to the fact that the hippocampal atrophy is one of the first AD impairments (Savonenko et al., 2015). In this previous study, Semenza and colleagues (2003) assessed 70 Alzheimer disease (AD) patients and 47 control subjects. The stimulus consisted of faces (15) as well as definitions of people (15) and definitions of objects (16). The proper name retrieval was based on faces (pictures) and definition-based, while the common nouns retrieval/naming was only definition-based. The results showed that there is a deficit in AD patients for the retrieval of proper names in comparison to common nouns. Effectively, the dissociation between common vs. Proper names items retrieval is a distinctive neuropsychological marker to inspect the development of dementias (Semenza et al., 2003).

In general, the difficulty with proper names is a very common complaint in healthy aging as well. Proper names are the first category to suffer some memory decline, which is in line with the decline also expected for episodic memories (Semenza et al., 2003). Consequently, proper names seem in all likelihood to be more dependent on the hippocampal structure and its interactions with other regions.

Most important for our aim is the event related potentials (ERPs)[28] study associated with spatial/localization mapping that contrasts proper names and common nouns (Proverbio et al., 2001). The study assessed 9 young people (mean=26) in 332 words including common nouns of living and non-living objects, and proper names of people and other categories like places, medicine, body parts, concepts., etc. The naming of the entities was triggered by concept definitions. A tacit retrieval of a proper led to a strong activation of the anterior left temporal area and centro-frontal areas, whilst the same task shows a greater involvement of occipito-temporal areas with common nouns. It is worth noting that this kind of activation of the temporal pole was also found in tasks that involve the episodic memory (Schloerscheidt & Rugg, 1997). Proverbio (2001) suggests that this finding may be due to the lexical nature of proper names in that they require high contextual complexity as precise spatio-temporal coordinate, as the episodic memory (Tulving, 1983). The study revealed that proper names and common nouns activate diverging overlapping cortical regions according to different lexical properties. This allows us to draw a parallel between proper names and episodic memory vs. common nouns and semantic memory that are independent of any contextual information.

Summing up, in keeping up with the philosophical, linguistic, and behavioral studies about the particularities and vulnerability of proper names, all the work so far conducted in neuropsychology corroborates the proper name and common noun neurofunctional dissociation.

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[27]Alzheimer disease (AD) is a degenerative disease that causes a progressive loss of memory, and cognitive and behavioral impairments that ultimately may lead to dementia. Neurochemical assessment of brain samples from cases of Alzheimer's has shown that people with AD lose cortical cholinergic innervations. Neuropsychological studies demonstrated degeneration of basal forebrain magnocellular neurons and cholinergic deficits in the cortex and hippocampus. Memory loss is usually the first symptom of Alzheimer's disease, because cell death starts in the hippocampus -which is responsible for forming memories (Savonenko et al., 2015).

[28]According to Leary and Knott (1955): '*'Refer to long latency responses (>70 ms) associated with an event, such as a deviant stimulus (as in mismatch negativity, P3 or P300), anticipation of a response, or anticipation of a stimulus demanding a response (as in contingent negative variation). Applied mainly to slow (on account of their lower frequency content) "endogenous" evoked potentials elicited by controlled manipulation of the psychological context. Thought to reflect some aspect of higher sensory processing, and therefore sometimes referred to as "cognitive potentials," such as attention, expectancy, novelty detection, stimulus salience, target recognition, task relevance, information delivery, decision-making, stimulus evaluation time, template matching, memory, and closure of cognitive epoch.*'' (Leary & Knott, 1955, p.808)

We now know that, at the physical level, proper names and common nouns are processed by dissociable neural correlates in the brain. They require different computations, and their activation follows different paths, as proper names seem activate additionally the episodic memory system.

Notwithstanding the existing literature, there are mixed findings about the involvement of the temporal pole in the proper names retrieval. Furthermore, no aforementioned study has explored the dissociation between the two categories using images as a stimulus. And the specific processing of the categories is scarcely explored, particularly, the neural correlates of oscillations have not yet been reported. It follows from here that we can allow ourselves to draw a parallel with the well-documented literature of oscillations studies of episodic and semantic memories' distinct associations with theta and upper-alpha powers. In other words, we assume that the dissociation between proper names and common nouns seems to reflect the engagement of different memory systems, congruent with the different oscillatory patterns for the association of the upper alpha wave with semantic memory processing and theta wave with episodic memory traces. If this is the case, it can be verified through the oscillatory patterns associated with each system.

5 The Empirical proposal

Considering the above-mentioned findings and inconsistencies, in the empirical part we will further inspect the well-reported categorical differences at the behavioral level by contrasting the retrieval performance from images in both proper names and common nouns. Moreover, we will inspect the different event-related oscillatory patterns associated with the naming retrieval of each category, namely looking at theta and alpha frequency power´ dynamics.

Regarding the behavioral results, we expect that proper names will be more difficult and slower to name and lead to more errors, given of their large and source-consuming processing, which might be related to the interaction between different memory systems, namely with the episodic system. Common nouns may be easier and faster to retrieve because they are allocated to more cortical regions (Martins & Farrajota, 2007), depending on the semantic system only. Furthermore, we also expect a maximal increase of theta power (4-7Hz) for proper names in frontal and temporoparietal regions, reflecting recruitment of episodic-like memory traces and a maximal decrease of upper alpha power (10-13 Hz) reflecting semantic knowledge that is predicted to be larger for common nouns (Hanslmayr, Staudigl & Fellner 2012; Klimesch et al., 1994; Liu, 2018). Thus, corroborating the hypothesis of proper and common names being distinct semantic categories at the neurofunctional level and to provide pieces of evidence of episodic system involvement as reflected by selective theta activity for proper names comparatively to common nouns.

1 - Methods

1.1 Participants:

Twenty-three healthy young Portuguese University students (20 females and 3 males) participated in this experiment. Their ages ranged from 18 to 30 y.o. (*M* =19 years-old; *SD* =3.23; 20 right-handed). Participants had the European Portuguese as native language, a normal or corrected-to-normal vision, and reported no history of neurological illness. The experimental protocol was approved by the ethical committee of the ISCTE-Instituto Universitário de Lisboa, which follows the deontological principles applied in Europe for studies with human beings

1.2 Stimulus, Task, and procedure:

Two images' blocks comprising the semantic classes of proper names (i.e., 40 famous people images) and of common nouns (i.e., 40 common object images). Objects were equally distributed into living and non-living domains and presented randomly at each block. The images used in this experiment were obtained from pre-existing normalized images for the Portuguese-speaking adult population, and hence were controlled for arousal and familiarity (Souza, Garrido et al., 2021; Souza, Carmo & Garrido, 2022).

In each block, the participant was given the experimental instructions to read including examples in which images were presented and followed by a brief training session with three different examples of audibly naming. In each test trial, participants saw an image and were requested to name it aloud, as accurately and faster as possible after given a warning for responding. The images were presented at the center of a computer monitor, in an isolated room with light lightening, Participants were told also to report the cases when they did not recognize the item or recognized the item but were unable to name it correctly, even though they remember other associated information.

The order in which the blocks were presented across participants was randomized among participants.

The task started with a fixation cross that lasted for 500ms. After, an image appeared for 3000ms and was followed by inter-stimulus blank screen (500ms) including an acoustic warning signal (50ms) to initiate the response-naming max.4000ms (response duration). The intertrial interval (ITI) was (3000-5000ms). This was applied for all the blocks and trainings.

The experimental design included Category 2 (Common X Proper) as independent variable within participants and Naming accuracy and response times of correct trials as behavioral dependent variables. Naming accuracy was measured in percentiles and response times in milliseconds.

The oscillatory dependent variables consisted of the respective Theta (4-7Hz) and Alpha (10-13Hz) waves changes in each category; event-related changes will be obtained through the event-related oscillatory changes in each band.

1.3 Apparatus, acquisition, and processing of EEG data:

We used the EEG cap from BrainVision with a set of 64 built-in silver electrodes attached with a cap to the scalp (figure 1-1) (ADD/EEG cap, standard 64Ch-actiCAP-Slim with Built-In Electrodes, BrainVision). Additionally, 5 ocular electrodes were placed to record horizontal and

vertical eye movements. The electrodes were placed according to the 10-20 international EEG system of electrodes positioning (Kropotov & Mueller, 2009). The electrodes were continuously recorded at a sample rate of 2048 Hz. FCz served as the online reference lead, and the impedance of the electrodes was kept below +/- 10 k Ω. Overall, the equipment used to record EEG signals was the Brain Vision recorder 2 (BrainVision Recorder, Vers. 1.23.0001, Brain Products GmbH, Gilching, Germany), and amplifier (actiChamp Plus, Brain Products GmbH, Gilching, Germany). The data was afterwards analyzed using BrainVision Analyzer 2 (BrainVision Analyzer, Version 2.2.0, Brain Products Gmbh, Gilching, Germany).

The sampling rate was down-sampling to 500 Hz. Raw data was inspected manually and carefully by visual inspection and marked for artifacts (i.e., eye blinks, horizontal and vertical eye movements, speech muscle artifacts, etc.). Highly noisy channels were interpolated (*M=3, SD*=1,182663). Our max criterion of interpolation was 10 channels, and due to this criterion one of our participants was excluded.

Thirdly we used an infinite impulse response (IIR) filter. Filters were applied in a low cutoff frequency of 0,5 Hz order 4, and a high cutoff of 40Hz order 4 (12dB/octave). The notch filter was at 50Hz.

After the filters, we used an Ocular Correction ICA, allowing the correction of the artefacts due to eye movements like blinks and saccades. We used this algorithm in an automatic mode over the regression-based algorithm for the ocular correction using blink intervals. The ICA algorithm we used is infomax restricted to obtain VEOG and HEOG components, percentage of variance to delete 30%, number of ICA steps 512, convergence bound 1E-07, and bound number of considered blinks at 60. This procedure successfully attenuated ocular artifacts.

The first segmentation was done to separate the two categories of proper names and common nouns according to stimulus type. The configuration was at start: -500ms, end: 2000ms, length: 2500ms. A second segmentation was done to select only correct responses having as a basis the image trigger and response criterion. We have used the advanced Boolean expression function to locate the correct marker positions, start -500 ms, end: 6500.00ms, length: 7000.00. EEG epochs associated with an incorrect behavioral response were then excluded. The average of correct trials across participants for people: (*M*=9, *SD*=2,835406), for objects: (*M*=30, *SD*=3,236404).

Artifact rejection was performed before averaging to discard epochs in which eye movements, blinks, excessive muscle potentials, or amplifier blocking occurred. The artifact rejection criterion was peak-to-peak amplitude exceeding 50 μV/ms; 200ms, before and after event. The Maximal allowed difference of values in intervals was at 200uV, interval length 200ms, before event 200ms, after event 200ms. Finally, the lowest allowed activity in intervals was at 0,5 uV, interval length 100ms, before and after event 200ms.

In order to inspect theta power/alpha power in each category for the relevant fronto-lateral regions (Hanslmayr, Staudigl & Fellner 2012), we have selected the following electrodes over the central area (Cz, C3, C4) the frontal (F3, F4, Fz) the parietal (P3, P4) (that were used for the alpha wave), and the temporal area (t7, t8)(t7►t3 and t8►t4)[29] (that were used for the theta wave) (figure 1-2) (see Klimesch et al., 1997a; 1997b; 1994). The motivation behind our selection for the upper-alpha wave is that frontal, central, parietal and temporal regions are demonstrated to respond to semantic processing demands (Klimesch et al., 1997b). However, we selected only the parietal region for the upper-alpha wave considering the activation of this region that precedes

[29]The taxonomy of our electrodes is different from the ones used in the articles.

and partly overlaps with the left temporal response, resembling semantic memory system (Levelt et al.,1998). For the theta wave, we have considered the demonstrated strong activation of left anterior temporal and left centro-frontal areas in the retrieval of a proper name in the ERPs study conducted by Proverbio and colleagues (2001).

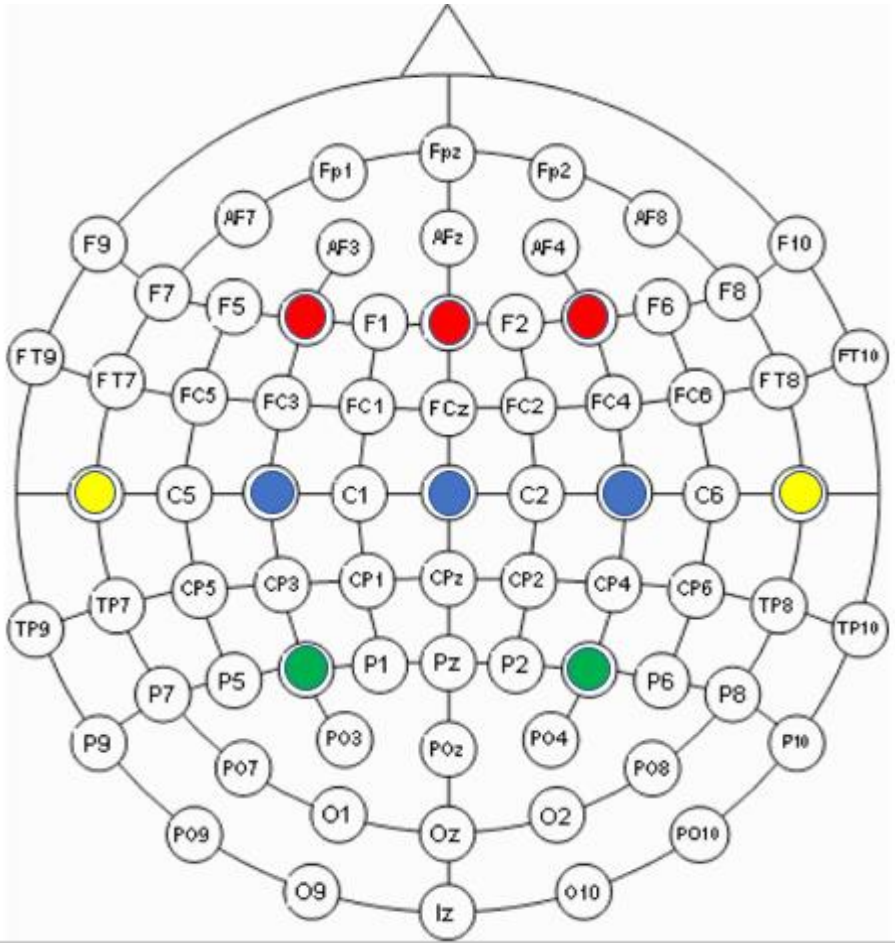

Figure 1-1 Head map with channels placed over the head and the selected channels marked for each ROI. The image illustrates the selected ROI channels for every band over the scalp. **Central** in the BLUE channels, **frontal** in the RED channels, **parietal** in the GREEN channels, and **temporal** in the yellow channels. Source: actiCHamp Plus, Brain Products GmbH, Gilching, Germany.

The method we have used for the extraction of power is the Morlet wavelets transform to obtain the power for each condition relative to a baseline normalization. This method of power extraction here is worth some explanation.

The Morlet wavelet looks like a sine wave in the middle but then tapers off to zero at both ends, and is useful for localizing changes in the frequency characteristics over time (Cohen & Mike, 2014). This method analyzes the time-frequency of non-stationary data, and the result of convolution is a real-valued signal from which instantaneous power and phase can be extracted at each time point. According to Mike & Cohen (2018), the key parameter of Morlet wavelets is the width of the Gaussian that tapers the sine wave.

This latter width function controls the trade-off between temporal precision and frequency precision, and the result of the convolution is a time series of "similarities" between the signal and the wavelet. In other words, it ensures an equal number of cycles in the mother wavelet for each frequency. Thenceforth, by using the Morlet wavelets, we are obtaining the dynamics of power change over time in the different bands of interest. This way, we are not limited to a specific

bandwidth, and we have the same spectrum of graphics. Since the Morlet wavelets minimizes the ripple effects that can be confounded with oscillations and retains the temporal resolution of the original data signals, it is a good method for our analysis.

There are a few limits, however, of the Morlet Wavelets we find important to mention. According to Mike and Cohen (2014) the first limit is that, in the building of wavelets, one cannot be using frequencies that are slower than the epochs (say a data of 1s, one cannot analyze activities lower than 1Hz). The proposed solution for this limit is using various cycles of activity (say 1s of data, one must use wavelets that are 4Hz and faster)

The second limit is that the frequencies of the Morlet Wavelets connot be higher than the Nyquist frequency which is one half of the sampling rate.

Third, very similar frequencies will likely provide identical or similar results, this why more frequency beans (ideally between 15 and 30 frequencies comprising for example 3Hz to 60Hz) will increase the computation without increasing the information in the results (Cohen & Mike, 2014, p.145).

Additionally, Morlet Wavelet behaves as a bandpass filter, thus power and phase information are not readily available in the filtered signal. This information, however, is crucial for time-frequency analysis. Furthermore, the result of convolution will depend on phase offsets between the wavelet and the data, and it seems to indicate that there are points of time where the two vectors are orthogonal (dot product of zero) and other points in time where the two vectors have a negative dot product. In order to solve both these problems of real-valued Morlet Wavelets, the Complex Morlet Wavelets are proposed. These latter have both a real component and an imaginary one. In other words, the mapping between the two vectors will be represented in a 2D space and no longer will depend on phase laggs. This 2D space will allow the extract the bandpass filtered signal, time-frequency powe,r and phase information (Cohen & Mike, 2014, p.149).

Mathematically, on the one hand, a Morlet Wavelet is constructed by multiplying a sine wave by a Gaussian (Cohen & Mike, 2014, p.157):

$$cmw = Ae^{-t^2/2s^2}e^{i2\pi ft}$$

On the other hand, the Complex Morlet Wavelet is built the same manner, but the sine wave is a complex one (Cohen & Mike, 2014, p.157):

$$A = \frac{1}{\left(s\sqrt{\pi}\right)^{1/2}}$$

Our Morlet complex function for wavelets included the transformation to real squared values and the normalization to consider the baseline correction (min frequency: 0,5 and the max frequency 30Hz, Frequency steps: 30, Frequency layer steps: Logarithmic). We have used the instantaneous amplitude (Gabor normalization) for the wavelet normalization with a 7-wavelet parameter. According to Mike and Cohen (2014), this 7-cycle wavelet is shown to be more sensitive to long-lasting activations at specific frequencies and more pinpoint at identifying the frequency of the dynamic. This will facilitate distinguishing activity at frequencies within a narrow range (e.g., separating lower alpha from upper alpha). Generally, A larger number of cycles (7 to 10 cycles) will smooth identifying temporally sustained activity (however the temporal precision will be decreased) (Cohen & Mike, 2014, p.169-170). Additionally, the data should be ideally stationary in the wavelet nonzero periods, thus, increasing cycles will increase the wavelet's nonzero components and consequently the longer period of time for which data should be stationary (Cohen & Mike, 2014, p.170).

For the average squared of power, we obtained it through 125ms intervals for each condition, area, and participant. Then, obtained the power difference between the test and baseline for each frequency band, The interval size started from -400ms to -100ms, with a length of 300ms. We used fixed band interval of 3Hz for each band, theta (4-7 Hz) and upper alpha (10-13 Hz).

Again, the aim was to obtain the event-related changes in power (synchronization/desynchronization) and calculate the sum of accumulated power relative to baseline. We obtained a measure that involves phasic components although both influenced by amplitude power (tonic).

Other materials include the E-Prime 2 for the display of the naming task and the CheckVocal windows application for the measurement of response times. This tool measures the RTs in milliseconds between the start of the stimulus and the start of the response. It presents each recorded response audiovisually as a waveform, spectrogram, and sound played out (see Figure 5) together with the corresponding printed correct response and registered response time. (Protopapas, 2007) The offset of the response time was corrected manually to skip the beep warning signal. Therefore, for each trial the CheckVocal marker was placed at the beginning of participants´ responses.

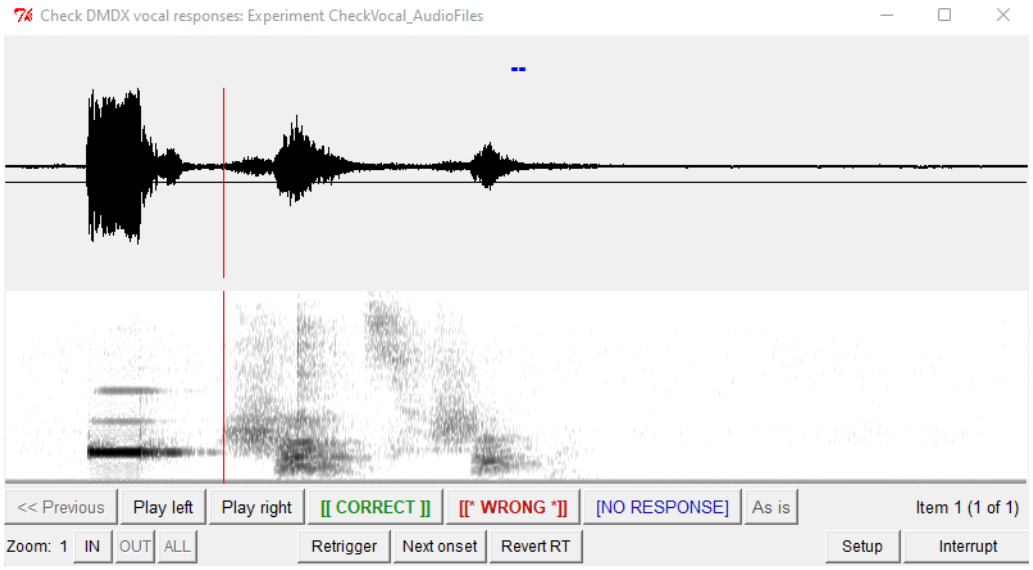

Figure 1-2 Example of auditory stimulus processed by CheckVocal. Source: Protopapas (2007)

1.4 Statistical analysis:

In the pre-analysis of the behavioural naming task we followed some guidelines given by Brodeur and colleagues (2014). This procedure comprises a first inspection for naming variants and naming mistakes/errors. Basic level concepts and regional variants were considered as correct. Subsequently, after extracting the response times (RTs) from the CheckVocal software for correct responses, response times exceeding mean ±2,5 standard deviations were excluded as well.

The statistical analysis was run on the statistical program IBM SPSS Statistics (Version 26). The data was subjected to paired sample t-tests to determine whether any change in naming accuracy and response time is the result of the semantic class. The paired samples T-tests analysis were obtained for every separated dependent variable.

The independent factor was the lexical class 2 levels: Proper vs. Common nouns, and the dependent variables were correct Response (ACC), incorrect Response (ERROR), don't remember responses (DR), don't know responses (DK). It is worth mentioning that, according to Souza and colleagues (2022), don't remember responses (DR) were obtained for responses in which participants knew the item but were momentarily unable to name it, including both "tip of the tongue" (TOT) responses in which participants provided associated semantic information (e.g., ''Portuguese writer'' or ''he received the Nobel prize'' ; for José Saramago's image), and when participants only said they knew the item but ''*don't remember*'' the name of it.

The frequency (in %) was obtained for accuracy, errors, don't remember, and don't know responses. Finally, the response times were obtained for accurate responses only.

The EEG data was obtained for correct responses as well. Alpha and theta bands were analyzed separately. We have used the ANOVA repeated measures with two independent factors, the first was the brain regions or ROI with 3 levels. For Theta: frontal, central, and temporal regions. For alpha: frontal, central, and parietal regions. The second factor is the lexical class with two levels (Proper vs. common nouns).

When the data failed for the homogeneity test, we used the Greenhouse-Geisser correction. The contrast and factors are polynomial, an overall estimated marginal means, and we compared the principal effects with the confidence interval adjustment Bonferroni. The level of significance *p* was set at 0,05 for both behavioral and EEG analysis. Then, subsequent Post-hoc t-tests were performed in order to understand the ROI * Category interaction effects.

2 Results:

Behavioral results:

The accuracy results showed that the naming retrieval was more accurate for common nouns (*M*=74.35, *SD*=8.09) rather than proper names (*M*=24.24, *SD*=7.09, *t*(22) =-27.91, *p*< .001). The pattern of inaccurate data showed that participants were more likely to not remember (DR responses) proper names (*M*=18.37, *SD*=9.43) rather the common nouns (*M*=12.93, *SD*= 6.42, *t*(22) =-2.65, *p*<.05). Furthermore, the percentile of unknown items (DK responses) was very high for proper names (*M*=54.35, *SD=11.63*) rather than common nouns (*M* =5.98, *SD=4.81*, *t*(22) = 22.96, *p*<.001).

Participants also committed more errors retrieving common nouns (*M*= 5.76, *SD*=4.36) rather than proper names (*M*= 1.96, *SD*=2.25, *t*(22)=-3.74, *p*<.001)

Moreover, the statistical analysis revealed that response times (RTs) were not significantly affected by the semantic class modulation ($p > .05$).

Electroencephalography results:

Theta wave:

A repeated measures ANOVA for the theta wave showed a significant main effect of category, *F*(1, 22)=8. 01, *p*=0.01, η^2=.27. The directions of the effects showed a greater theta in the category of people (*M*=4136,13, *SD*=1461,20, $p < .05$) in comparison to the category of objects (*M*=-4136,13, *SD*=1461, 20, $p < .05$).

However, no significant main effect of ROI was found, which means that the brain areas represent a similar theta wave *F*(2, 25.69)=2.75, *p*=.10, η^2=.11.

Regarding the interaction ROI*CAT Effect, we found a marginal significance, *F*(1.08, 23.96)= 3.17, *p*=.08, η^2 =.13. First, in an analysis by category, it showed that in People's condition,

there is a marginal difference between central and frontal area $t(22)= -1.89$, $p=.07$, the frontal area having a larger theta wave (the difference between central-frontal (i-j): $M=-5438.58$).

Figure 2-1 Percentage of responses. DK►don't know responses, DR►don't remember responses, Error►erroneous responses, ACC►accurate responses.

But no differences between the central and temporal area were found $t(22)=1.17$, $p=.24$.

At last, a marginal difference was also found between the frontal and temporal area, $t(22)=1.98$, $p =.06$. In this case, as well, the theta wave is more pronounced in the frontal area (frontal-temporal (i-j): $M=6539.15$).

In the object's condition, the results revealed that there is no difference/tendency across brain regions in the theta wave: central-frontal: $t(22)=-.04$, $p=.97$; central-temporal : $t(22)=.27$, $p=.79$; frontal-temporal: $t(22) =.14$, $p =.89$. In sum, this analysis showed that the representation of the theta wave in the People's condition varies across areas.

Second, in an analysis by ROI, we compared the differences of categories in each brain regions and it showed that the theta effect is always greater in People's condition regardless of the area, but in each area, the theta is distributed differently, with a more pronounced theta effect in the central area as shown by the following t-test significance $t(22)=2.55$, $p=.018$, followed by the frontal area $t(22)=2.32$, $p=.03$, and also in the temporal area as well $t(22)=2.14$, $p=.04$. This leads us to understand that within each category, the representation of theta is totally different, there is always a tendency for theta to be higher in People's condition (as compared to Object's condition) across regions.

Alpha wave:

In the repeated measures ANOVA for alpha, no main effect at the category level was found, $F(1, 22)=.01$, $p=.94$, $\eta^2=.00$. Moreover, a marginal effect of the alpha power at the ROI level was obtained, $F(2, 44)=2.82$, $p=.07$, $\eta^2=.11$. Post-hoc analysis indicated differences between the frontal and parietal areas, $t(22)= 2.48$, $p=.02$, with a greater pronunciation of the alpha power in the frontal region (Frontal: $M=999.96$, $SD=732.25$; Parietal: $M=-454.86$, $SD=682.94$). However, no significant difference emerged across the central and frontal regions, $t(22)=-.39$, $p=.70$, and neither between central and parietal areas, $t(22)=1.31$, $p=.20$.

Finally, the results revealed no interaction ROI*CAT, $F(1.39, 30.54)=.93$, $p=.37$, $\eta^2=.04$.

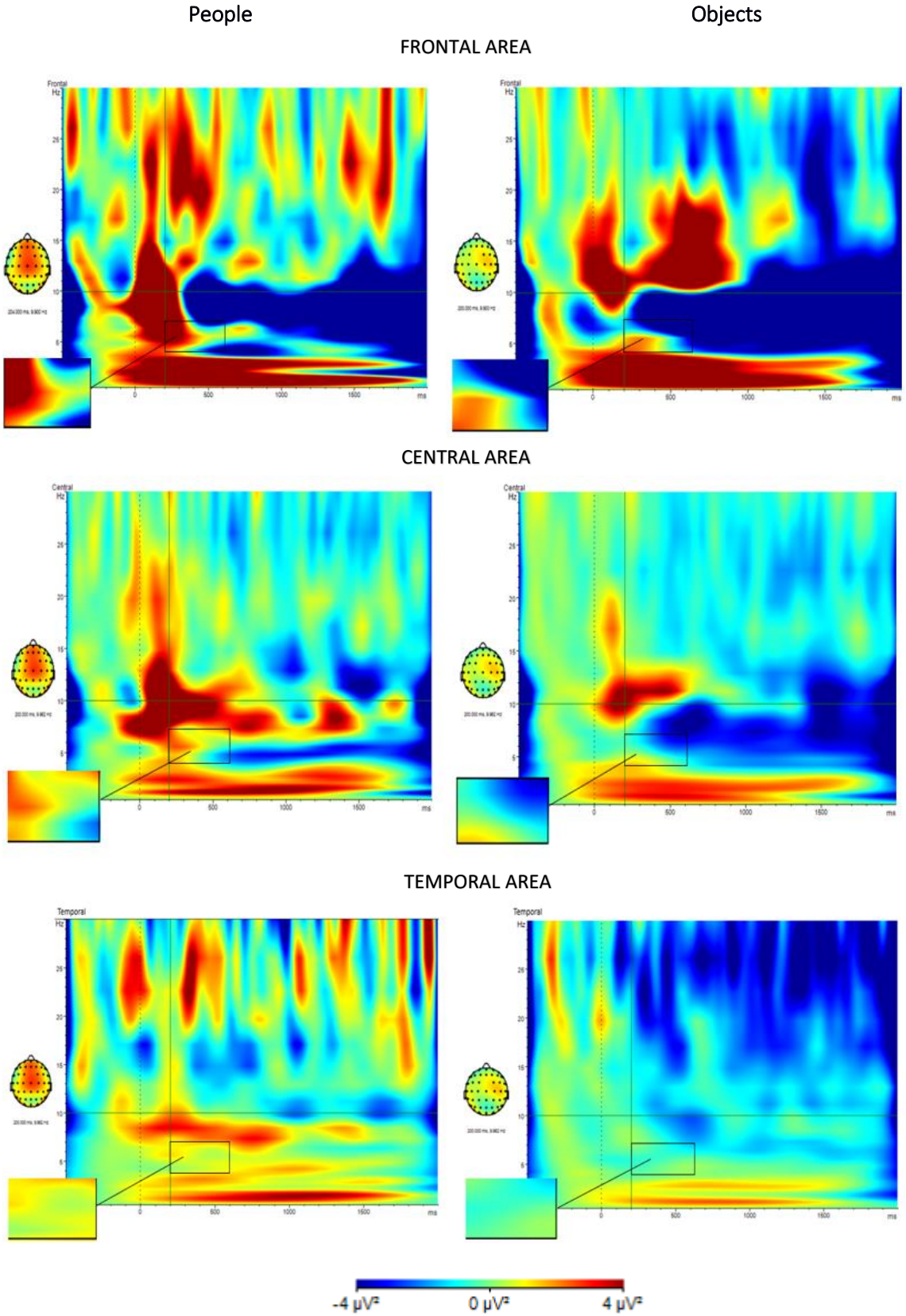

Figure 2-2 Spectral changes in the theta power in the frontal, central and temporal areas during naming retrieval of people vs. objects (μV^2). The image illustrates the grand averaged data of the clustering ROIs frontal, central and temporal in which theta event-related mean power changes (relatively to baseline -400 to -100) are presented per condition people vs. condition objects along time. **THETA** in the rectangle.

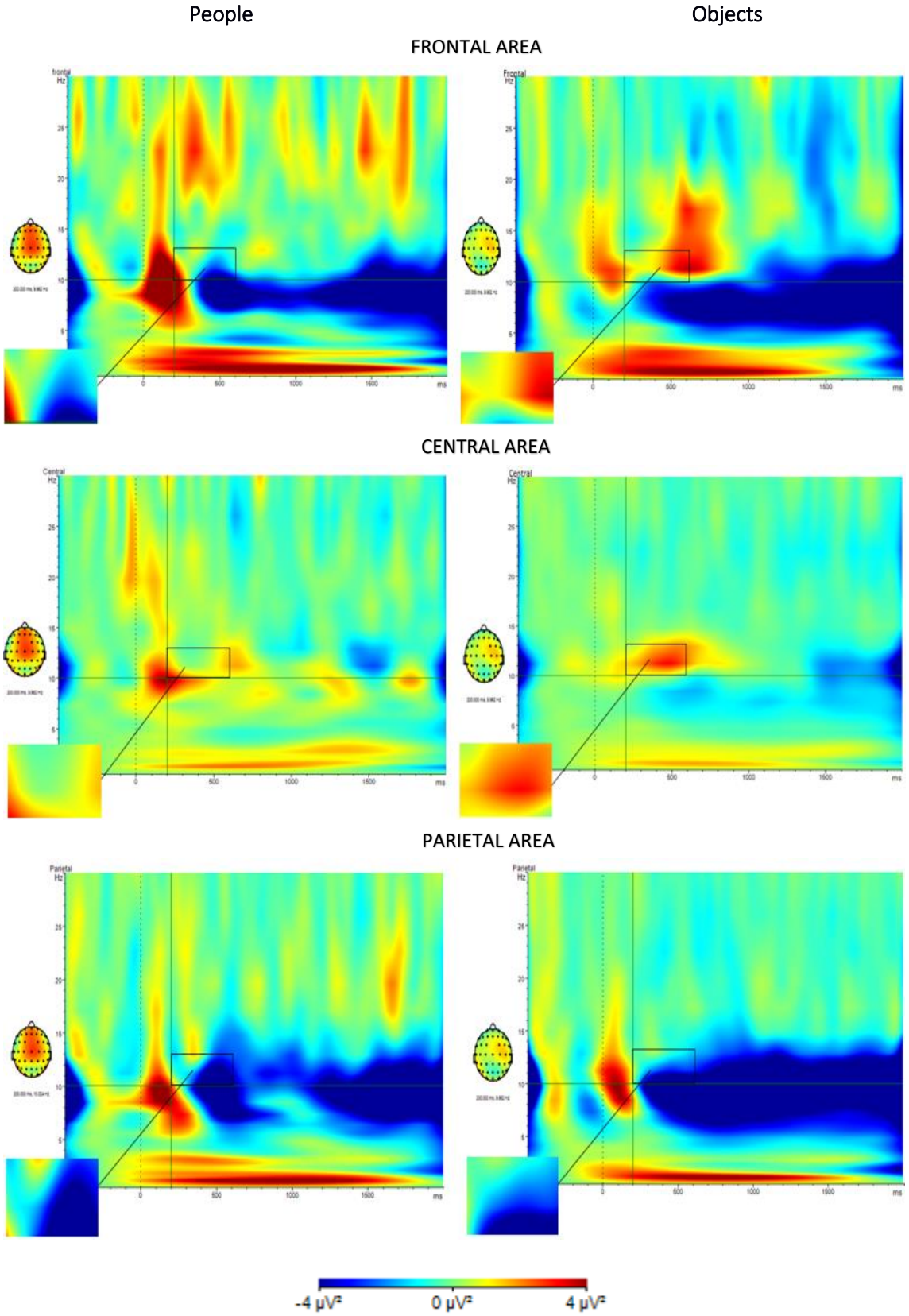

Figure 2-3 Spectral changes in the alpha power in the frontal, central, and parietal areas during naming retrieval of people vs. objects (μV^2). The image illustrates the grand averaged data of the clustering ROIs frontal, central, and parietal in which alpha event-related mean power changes (relatively to baseline -400 to -100) are presented per condition people vs. objects along time. **ALPHA** in the rectangle.

3 Discussion

The aim of the present empirical study was to investigate the dissociation between proper names vs. common nouns considering the well-documented oscillatory dissociation of theta power increasing and semantic upper-alpha suppression in fronto-lateral regions as a reflection of distinct declarative memory requirements (Klimesch et al., 1999). The motivation for this research was based on three lines of evidence. The first refers to the fact that no study has yet explored and contrasted the retrieval performance of the two categories from images. The second reason concerns the different oscillatory patterns associated with the well-documented proper vs. common nouns dissociation, having not yet been reported. The third line of inquiry concerns the mixed findings about the structures and processes involved in such dissociation, as the (arguable) role of the temporal pole, and further dissociable processing. Some studies suggested that the temporal pole may play a crucial role in proper names retrieving, although this has been inconsistent considering the finding of single-case studies of FH's and ACB's where temporal lesion that was not associated with the proper name's anomia (Lyons, Hanley & Kay, 2002; Martins & Farrajota, 2007). In addition, if the proper names dissociation from common nouns is a case of representational nature (i.e., episodic-based vs. semantic-based nature) more than a linguistic property of reference is still the object of analysis. Therefore, the current study addressed, within a cognitive science multidimensional perspective, the main question of the classic semantic dissociation of proper vs. common nouns by experimentally examining their neural oscillatory underpinnings to complement the scope of the philosophical, linguistic, and neuropsychological perspective in the first part of this thesis.

In a behavioural perspective, we expected that proper names were going to be more difficult and slower to retrieve and were going to lead to more errors reflecting a large and source-consuming network that engages, additionally to the semantic memory, the episodic memory system (hippocampally-dependent). Common nouns were assumed to be easier and faster to retrieve as they require only the semantic memory system being cortically allocated (Martins & Farrajota, 2007). Likewise, we expected a maximal increase of theta power (4-7Hz) for proper names mainly represented in posterior regions-of-interest (i.e., central, and temporal regions), as reflecting recruitment of episodic-like memory traces. Moreover, a maximal decrease of upper alpha power (10- 13 Hz) particularly for parietal regions are predicted as reflecting semantic knowledge that is expected to be larger for common nouns (Hanslmayr, Staudigl & Fellner 2012; Klimesch et al., 1994; Liu, 2018).

The behavioural results showed that the naming retrieval was less accurate (i.e., accuracy in naming) for proper names rather than common nouns. Participants were also more likely to forget proper names rather than common nouns (as showed in *don´t remember* responses). Furthermore, participants knew fewer proper names rather than common nouns (i.e., *don´t know* responses). These results corroborate previous literature about proper names complexity while providing evidence for the dissociation hypothesis by showing that the retrieval is more demanding and source-consuming for proper names than common nouns, as they are likely consuming more or diverse cognitive processes (Maylor & Valentine, 1992; Burke et al., 1991; Cohen & Burke, 1993; Huijbers et al., 2017; Salthouse & Mandell, 2013; Shafto et al., 2009).

However, participants were more likely to commit errors retrieving common nouns, rather than famous people names. This result was unexpected, but it does not refute our assumption that proper names are more difficult to retrieve. This might be because these common nouns errors consist of equivocal names that primarily reflect a lack of precision in naming. Thus, and forth, these common nouns errors might be the result of processing at retrieval, not of the storage of

memories. Some common nouns errors resulted from visual similarity, examples include: image, curgete ‘’courgette’’ -» response, pepino‘’cucumber’’; image, lobo ‘’wolf’’-» response, cão‘’dog’’. Moreover, the activation of common nouns, in effect, is suggested to involve a bunch of mental operations (Pavio, 1971) due to their complex structuration of the semantic knowledge with high levels of abstraction. Common nouns are organized semantically (e.g., common roots, polarity, polaroid., etc.) (Proverbio, 2009). This is meant to be facilitating the retrieval of common nouns compared to proper names, and it is because the form of proper names is invariable, less frequent, and preserve their phonological form (Zimmer 2016, pp. 119-15). Nevertheless, in some cases, these common representations could lead to errors in the common nouns retrieval since even in proper names it has been shown that increased similarity (perceptual, linguistic, functional) between items as well as enlarged semantic relations between concepts may enhance possible interference effects (Brédart & Dardenne, 2015; Brédart, 2017). Indeed, errors include semantic swaps of items being of the same category. Consider the following examples: Image, couve-flor ‘’cauliflower’’ -» Response, brócolis ‘’broccoli’’; image, alcachofra ‘’artichoke’’ -» Response, bananas ‘’bananas’’; batata ‘’potato’’ -» Response, kiwi ‘’kiwi’’; image, panela ‘’pot’’ -» Response, frigideira ‘’frying pan’’.

Additionally, previous studies have shown that it is more difficult and slower to retrieve a word from memory that bears a strong phonological resemblance to many other words in the mental storehouse (dense neighborhood) (e.g., the word sling: sting, fling, bling, cling) than if resembles only few words (sparse neighborhood). It is also very important to emphasize that this competition between sound-alike words in a neighborhood density could happen not only when the similar word is available in the immediate context (e., lexical decision priming paradigm, eye tracking paradigm), but it suffices to merely happen to exist in your own mental storehouse (general lexicon) (Sedivy, 2014; Luce & Pisoni, 1998; Hogan et al., 2011; Goldinger et al., 1989). In our task, some examples of errors that probably resulted from the neighborhood density phenomena include: Image, alfarroba ‘’carob’’ -» Response, alcachofra‘’artichoke’’; image, alcachofra‘’artichoke’’-» response, alcaparra‘’caper’’. Quite a bit, it would seem, that similar sound-based words could lead to errors in common nouns retrieval tasks.

Regarding the results of response times (RTs), unexpectedly, they were not significantly affected by the semantic class in the accuracy data. However, this measure (RTs) did not mirror the pattern found for Accuracy. It is worth mentioning that this absence of effects on RTs measures shows that there are no trade-offs with the effects found in accuracy. Moreover, RTs seem to be a less sensitive measure to capture speed processing effects in accuracy-centred trials since the expected disparity of number of correct trials between conditions is likely to bias the RTs measures although reflecting the emergence of the accuracy effect. Therefore, the response times will not be considered for further interpretation for this latter reason.

The neural data on the flip side showed that the dynamic of the theta band was dissociated across proper names and common nouns categories. That is, for proper names that could require more episodic system activity (Semenza et al., 2003), event-related theta power was more pronounced and increased (Klimesch et al., 1994). Thoroughly, we obtained a larger even-related theta in the people’s condition (in comparison to objects condition). Furthermore, there were no category differences in the upper-alpha band. This means that both categories have semantic requirements. With respect to the upper-alpha band, it is well established that is shown to respond selectively to the processing of semantic memory over the frontal, central, parietal and temporal sites (Klimesch et al., 1997b), with greater pronunciation in the frontal area (Klimesch, 1994) as found in the tendency of our results.

It is worth emphasizing that, primarily, naming people is supposedly a semantic task that could be eventually processed by the semantic system only, but apparently it is not the case.

Indeed, proper names seem to have episodic system participation as reflected in the increasing theta power in the people's condition.

Overall, theta increased similarly in the selected regions of interest (i.e., frontal, central, and temporal). Notably, while alpha power did not differ by region of interest, the theta power was modulated by category across recording sites regions. This result is according to our hypothesis in which the increase of theta power (4-7Hz), that is normally found in episodic tasks specifically in the fronto-lateral regions (Klimesch et al., 1994; Klimesch, 1999). Theta synchronization has been consistently related to hippocampal activity and reflects the recruitment of episodic-like memory traces (Bellistri al, 2013; Hanslmayr, Staudigl & Fellner 2012; Klimesch, Schimke & Schwaiger, 1994; Liu, 2018; Klimesch et al., 1994), which seems to occur selectively in the proper names condition. Recall the study led by Martins and Farrajota (2007) in which they reported a patient (ACB) that showed a normal retrieval of proper names and an impaired object naming. This patient's lesion was not so pervasive and extensible to other more profound regions (hippocampal regions), which likely prevent the emergence of anomia in people's naming. The result of our study also draws a parallel with Proverbio ERPs study (2001) that showed that the retrieval of a proper name phonological form is reflected in strong activation of left anterior temporal and left centro-frontal areas.

Noteworthy, in our experiment, the temporal region seems to be consistently activated in the retrieval of proper names, and thus temporal pole is suggested to play a relevant role in name processing, which make sense since their proximity to the hippocampus structures. Hippocampal regions have been argued as the source of theta activity related to episodic memories in animals and human studies (e.g., Winocur et a., 2011; McNaghton et al., 2006; Harand et al. 2012). Theta activity is likely induced to the cortex by its connection with hippocampus structures to support long distances communication (see Klimesch et al., 1997). As showed in the literature, theta activity in frontal-lateral-posterior regions reflect hippocampal engagement in process episodic-like memory traces (Hanslmayr et al., 2012; Liu, 2018, Klimesch et al., 1994). The noteworthy, temporal region in interaction with the hippocampus reflects the engagement of relevant social and emotional information inherent to the faces (face recognition) (Duchaine & Yovel, 2016., Freiwald, Duchaine & Yovel, 2015; Liu, 2018; Semenza et al., 2003., Semenza, 2011; Simmons et al., 2010; Hadjikhani et al., 2004).

Our findings are in accordance with previous functional imaging studies in which the temporal lobe has been observed playing a role in naming famous people (Brédart, 2017; Tsukiura et al., 2002; Damasio et al., 1996, 2004; Grabowski, 2001; Tsukiura et al., 2002, Gesierich et al., 2012). Nonetheless, our findings are inconsistent with the results of single-case studies of FH's and ACB's in which the temporal lesion was not associated with the proper name's anomia (Lyons, Hanley & Kay, 2002; Martins & Farrajota, 2007). In fact, as we have pointed out in the literature, we should be careful regarding studies considering brain damages as these differences may be associated with the extent of the lesions, whether they catch the interaction with the hippocampus and other subcortical regions or not, as in the study of Martins and Farrajota (2007) for example. Besides, the brain may perform some neural and cognitive alterations or rerouting to cope with brain pathology (Stern, 2009). This idea of reserve was proposed due to the consistent documentation of the discrepancies between the degree of brain damage and the clinical manifestation the latter (Stern, 2009; Katzman et al., 1988). It is claimed that this reserve depends on lifetime experiences like education, occupation, and hobbies., etc, thus preventing brain pathologies or compensating them (Wilson et al., 2003). In formal definitions, once the pathology occurs, the brain or uses existing brain correlates more efficiently to maintain a cognitive task (neural reserve) or uses alternative correlates to maintain a normal cognitive status (neural compensation) (Stern, 2006). Evidence for this compensatory specifically has been found in

patients with Alzheimer disease (Querbes et al., 2009). Thus, the findings of the single-cases studies may be reflecting differences of the performances of the patients, rather than original brain correlates. It follows that, according to our results, both the temporal pole and the hippocampus might play a crucial role in proper names retrieval.

The similar Alpha oscillations patterns between the categories means that the semantic system is recruited for both proper names and common nouns conditions. Indeed, proper names and common nouns are both semantic classes and are supposed to activate the semantic memory (Harand et al., 2012). The episodic engagement, although essential, does not mischaracterize the category of names of famous people being a semantic representation with some level of abstraction supported by previous learning. Our findings are according to previously mentioned literature postulating that both proper names and common nouns have similar semantic memory engagement (Martins & Farrajota, 2007).

In conclusion, the finding about the effect of category in theta, but not in the alpha wave supports the existence of functionally and anatomically distinct retrieval pathways for the categories of proper and common nouns as reflected by selective episodic theta activity for proper names comparatively to common nouns, but also that there might be overlapping mechanisms of semantic retrieval as both proper names and common nouns seem to recruit the semantic memory system.

Besides, these results are in accordance with the multiple trace theory and the transformation hypothesis that posit that memory consolidation does not mark the end of hippocampal processing after memories become presented permanently into the cortex (Winocur, Moscovitch & Bontempi, 2010; Sekeres, Moscovitch & Winocur, 2017; Nadel & Moscovitch, 1997). Indeed, proper names that are contextually dependent seem to continue to require the episodic memory system. In accordance with Harand and colleagues (2012) functional magnetic resonance study (fMRI), the semantic memories (that include general knowledge) were shown to be characterized by a gradual disengagement of hippocampal activation, whilst the consistently episodic memories (that also have general knowledge while also maintaining details of the original personal experience of the memory) continued to require the hippocampus. In other words, as the consolidation of memories progresses, the hippocampus engagement decreases. However, there the consistently episodic memories may still involve the hippocampus. In sum, our finding resembles closely the overlap drawn between the two declarative memories in a distributed semantic memory stream between proper and common nouns, diverging mainly in a necessary and distinct role for hippocampal and parahippocampal areas in episodic memory retrieval (Kutas & Federmeier, 2011; Kim, 2016).

Altogether, our findings provide a multidimensional perspective of proper vs. common nouns dissociation. At the level of linguistics, proper names and common nouns come with recognizable different phonological, morphological, and syntactic features. Our finding of the dissociation of proper names and common nouns at the level of retrieval show that the brain honors the linguistic distinction of the two categories by processing them in different brain pathways. Besides, proper names are rigid arbitrary labels that designate and stick faithfully to a unique item that is related to a specific spatio-temporal context that require the episodic memory system. As opposed to common nouns that designate, instead, categories of items that are abstract (Segal, 2001; Pierce, 1931; Kripke, 1980).

Although items were selected considering a diverse period and categories of knowledge to favor increased recognition by the participants, the convenient sampling (restricted to very young academic university students) added some age bias in this search. As conceptual knowledge is also accumulated as increasing age; the younger participants have diminished accuracy. By including mostly very young adults, we obtained reduced scores than expected.

Therefore, these findings are not generalizable to adults overall and further studies should try to contemplate a diverse adult sample in age and educational background. Nevertheless, people category, as referred in the literature, is expected to be highly complex than common objects. In this sense, age and education only were not the reason for which this categorical difference emerged, but certainly enlarged them.

4 Final conclusions

We have argued throughout this thesis that proper names and common nouns are a universal linguistic category built up by natural principles. Their distinction primarily lies in their different reference potentials and in their neurofunctional properties in the brain.

First, from a theoretical point of view, we have explored this dissociation at three levels of analysis:

1- Algorithmic level: (a) studies of language acquisition provided insights that kids could have a prior implicit semantic knowledge that allow them, within their language, to classify objects, master the nominal expressions, and predict their meaning and grammatical category. (b) Neurocognitive studies demonstrated that the retrieval of proper names of people is typically difficult and much more vulnerable to being forgotten and to produce errors than the retrieval of common by young, middle-aged, and elderly people. Furthermore, response times are slower for proper names, rather than common nouns in the memory retrieval tasks.

2- Task level: proper names and common nouns, at the level of linguistics, come with recognizable different phonological, morphological, and syntactic features.

3- Physical level: proper names and common nouns are shown to both recruit different processing systems in the brain. Both recruit the semantic memory, but proper names, due to their contextual representations, recruit additionally the episodic-dependent brain system. Nonetheless, there are mixed regarding the involvement of the temporal pole in proper names processing as damage to this region is not always accompanied by proper names anomia.

Second, the results of our empirical study revealed that, indeed, the retrieval of proper names seems to be more demanding, and source-consuming compared to common nouns. Regarding the EEG results, a higher represented theta wave was found for people's names retrieval task corroborates our hypothesis about the recruitment of episodic memory system for proper names. Noteworthy, the semantic system (and its brain instantiation) seems to be consistently activated in the retrieval of proper names.

In short, the behavioral finding suggests the dissociation in the retrieval of proper names being more demanding and source-consuming compared to common nouns. Also, the oscillatory pattern of Theta band found for the people's names category indicates the existence of functionally and anatomically distinct retrieval pathways for the categories of proper and common nouns. Finally, corresponding to the philosophical hypothesis about the special status of proper names (Segal, 2001; Pierce, 1931; Kripke, 1980) is supported by this work in keeping up with all the evidence from the task, algorithmic and physical levels.

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