Joint PhD between Lille & Ghent Universities

Cross-linguistic influence of L1 morphological knowledge in L2. The case of French-English late bilinguals.

A thesis submitted
By
Amélie Menut

for the degree of
Philosophiæ Doctor in Psychology

Composition of the Jury

Pr. Marc Brysbaert	University of Ghent, Belgium	Co-Director
Pr. Séverine Casalis	University of Lille, France	Director
Dr. Laura Anna Ciaccio	Freie Universität Berlin, Germany	Examiner
Pr. Davide Crepaldi	Scuola Internazionale Superiore di Studi Avanzati, Italy	Reviewer
Pr. Kathy Rastle	Royal Holloway, University of London, UK	President of the Jury
Pr. Leah Roberts	University of York, United Kingdom	Reviewer
Pr. Durk Talsma	University of Ghent, Belgium	Examiner

Public defense on December 12th, 2022

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C’est parce qu’il n’y a pas une minute à perdre,
qu’il faut prendre son temps

— Stéphanie Bodet

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Abstract

The mother tongue (L1) has shown to influence the second language (L2) at the level of phonology, the writing system, and semantics. One other parameter that may be considered in language transfer is morphology which refers to the smallest units bearing meaning in a language, morphemes. The evidence supporting the idea of cross-language transfer in inflectional studies (or morphosyntactic) is numerous and led to this elaboration of the morphological congruency effect (Jiang et al. 2011). Considering these results and the models presented on cross-language effect, we explored how derivational morphology could be transferred from the L1 to L2 in French-English late bilinguals.

The principal aim was to examine how L1 morphology could transfer to L2. We used different methodologies to explore the phenomenon: Morphological awareness, self-paced reading, and word learning tasks. Each study was designed to look at how the status of the suffix would influence the different processes of L2 morphology. The distinction was dichotomic: complex words studied were either composed with common suffixes of L1 and L2 (e.g., -able) or a L2-unique suffixes (e.g., -less). In the first study, the cross-language effect was evaluated in three morphological awareness stages: lexical semantic knowledge, syntactic knowledge, and distributive knowledge. In the second study, the effect of L1 suffixes were examined in sentence reading using a self-paced reading paradigm. Finally, the third study established a learning paradigm to see how L1 morphology would affect L2 learning.

The second aim of the research was to look how L2 morphology would evolve with the increase of English proficiency and especially of the status of the suffix (common vs. L2-unique) would interplay with proficiency.

The expectation was that common L1 and L2 suffixes would facilitate L2 learning, processing and morphological awareness, but the results did not confirm this hypothesis. In the first study, late French-English bilinguals showed that as their proficiency increased, their performances in morphological awareness tasks increased as well. The same patterns were evidence in reading and learning with faster reading times in self-paced reading task and more words recalled in the learning task as proficiency increased. However the fact that suffixes were common between L1 and L2 did not make a strong difference as opposed to L2-unique suffixes. In all tasks, results were similar for both conditions. Further analysis even showed that the inconsistency in the mappings in common suffixes hindered the learning of new words. This however, was not the case in reading and morphological awareness.

In conclusion the results of this dissertation brought further insight on the transfer of common morphological features between L1 and L2 in French-English late bilinguals. More specifically it suggested that common suffixes would be as facilitative as L2-unique suffixes. Also, the results of the learning paradigm seemed to suggest that inconsitent mappings between L1 and L2 (e.g. glissement/slippage as opposed to amazement/étonnement) would even hinder the learning of new words. This latest distinctions of the suffixes bring further perspectives and invite future studies to take into account more than a dichotomic distinction of the suffixes in L2.

Résumé

Il a été démontré que la langue maternelle (L1) influence la deuxième langue (L2) au niveau de la phonologie, du système d'écriture et de la sémantique. Un autre paramètre qui peut être pris en compte dans le transfert linguistique est la morphologie, qui fait référence aux plus petites unités porteuses de sens dans une langue, les morphèmes. Les preuves soutenant l'idée d'un transfert interlinguistique dans les études flexionnelles (ou morphosyntaxiques) sont nombreuses et ont conduit à l'élaboration de l'effet de congruence morphologique (Jiang et al. 2011). Compte tenu de ces résultats et des modèles présentés sur l'effet inter-langue, nous avons exploré comment la morphologie dérivationnelle pouvait être transférée de la L1 à la L2 chez des bilingues tardifs français-anglais.

L'objectif principal était d'examiner comment la morphologie de la L1 pouvait être transférée vers la L2. Nous avons utilisé différentes méthodologies pour explorer ce phénomène : La conscience morphologique, la lecture à un rythme autonome et les tâches d'apprentissage de mots. Chaque étude a été conçue pour examiner comment le statut du suffixe influencerait les différents processus de la morphologie en L2. La distinction était dichotomique : les mots complexes étudiés étaient soit composés avec des suffixes communs en L1 et L2 (e.g., -able), soit avec un suffixe unique en L2 (e.g., -less). Dans la première étude, l'effet inter-langue a été évalué dans trois étapes de la conscience morphologique : la connaissance sémantique lexicale, la connaissance syntaxique et la connaissance distributive. Dans la deuxième étude, l'effet des suffixes a été examiné dans la lecture de phrases en utilisant un paradigme de lecture autonome. Enfin, la troisième étude a établi un paradigme d'apprentissage pour voir comment les suffixes en L1 affecteraient l'apprentissage en L2.

Le deuxième objectif de la recherche était d'examiner comment la morphologie en L2 évoluerait avec l'augmentation de la compétence en anglais, et en particulier comment le statut du suffixe (commun ou unique à la L2) interagirait avec la compétence.

On s'attendait à ce que les suffixes communs L1 et L2 facilitent l'apprentissage, le traitement et la conscience morphologique en L2. Les résultats n'ont cependnat pas confirmé cette hypothèse. Dans la première étude, des bilingues français-anglais tardifs ont montré qu'à mesure que leur compétence augmentait, leurs performances dans les tâches de conscience morphologique augmentaient également. Les mêmes schémas ont été observés en lecture et en apprentissage. L'augmentation de la compétence en langue était associée avec des temps de lecture plus rapides dans la tâche de lecture à rythme libre et davantage de mots rappelés dans la tâche d'apprentissage. Cependant, le fait que les suffixes soient communs en L1 et en L2 ne facilitait pas plus les performances que lorsque les suffixes étaient uniques en L2. Dans toutes les tâches, les résultats étaient similaires pour les deux conditions. Une analyse plus poussée a même montré que l'incohérence des liens entre les suffixes communs entravait l'apprentissage de nouveaux mots. Ce n'était cependant pas le cas en lecture et en conscience morphologique.

En conclusion, les résultats de cette thèse ont apporté un éclairage supplémentaire sur le transfert des caractéristiques morphologiques communes entre L1 et L2 chez les bilingues tardifs français-anglais. Plus précisément, ils ont suggéré que les suffixes communs seraient aussi facilitants que les suffixes uniques à la L2. En outre, les résultats du paradigme d'apprentissage semblaient suggérer que des correspondances incohérentes entre L1 et L2 (par

exemple, glissement/slippage par opposition à amazement/étonnement) entraveraient l'apprentissage de nouveaux mots. Ces dernières distinctions des suffixes apportent de nouvelles perspectives et invitent les études futures à prendre en compte plus qu'une distinction dichotomique des suffixes en L2.

Abstract

De moedertaal (L1) blijkt de tweede taal (L2) te beïnvloeden op het niveau van de fonologie, de orthografie en de semantiek. Een andere parameter die bij taaloverdracht in aanmerking kan worden genomen is de morfologie, die verwijst naar de kleinste betekenisdragende eenheden in een taal, morfemen. Er is talrijk bewijs dat het idee van taaloverschrijdende overdracht in inflectiestudies, en dit heeft geleid tot de uitwerking van het morfologische congruentie-effect (Jiang et al. 2011). Gezien deze resultaten en de gepresenteerde modellen over cross-language transfer, onderzochten wij hoe morfologie bij afleidingen van L1 naar L2 kan worden overgedragen bij Frans-Engelse late tweetaligen.

Het hoofddoel was te onderzoeken hoe L1-morfologie kan worden overgedragen naar L2. We gebruikten verschillende methoden om het fenomeen te onderzoeken: Morfologisch bewustzijn, zelfgestuurd lezen en woordleertaken. Elke studie was ontworpen om na te gaan hoe de status van het achtervoegsel de verschillende processen van L2-morfologie zou beïnvloeden. Complexe woorden waren ofwel samengesteld met gemeenschappelijke achtervoegsels in L1 en L2 (bv. –able; bestaat in het Frans en het Engels) of een L2-uniek achtervoegsel (bv. –less; bestaat enkel in het Engels).

In de eerste studie werd het cross-language effect geëvalueerd in drie stadia van morfologisch bewustzijn: lexicaal-semantische kennis, syntactische kennis en distributieve kennis. In de tweede studie werd het effect van L1-suffixen onderzocht bij het lezen van zinnen met behulp van een paradigma voor zelfgestuurd lezen (self-paced reading). Ten slotte werd in de derde studie een leerparadigma opgesteld om na te gaan hoe L1-morfologie het leren van L2 vertalingen zou beïnvloeden.

Het tweede doel van het onderzoek was te kijken hoe de L2-morfologie evolueert met de toename van de Engelse taalvaardigheid en vooral hoe de status van het achtervoegsel (gemeenschappelijk vs. L2-uniek) zou interageren met de taalvaardigheid.

De verwachting was dat gemeenschappelijke L1- en L2-suffixen het leren, verwerken en morfologisch bewustzijn van L2-woorden zouden vergemakkelijken, maar de resultaten bevestigden deze hypothese niet. In de eerste studie lieten late Frans-Engelse tweetaligen zien dat naarmate hun taalvaardigheid toenam, ook hun prestaties in morfologische bewustzijnstaken toenamen. Dezelfde patronen kwamen naar voren bij het lezen en leren, met snellere leestijden in de self-paced leestaak en meer onthouden woorden in de leertaak naarmate de vaardigheid toenam. Het feit dat achtervoegsels gemeenschappelijk waren tussen L1 en L2 maakte echter geen sterk verschil met L2-unieke achtervoegsels. In alle taken waren de resultaten vergelijkbaar voor beide condities. Uit verdere analyse bleek zelfs dat de inconsistentie in de mappings bij gemeenschappelijke suffixen het leren van nieuwe woorden belemmerde. Dit was echter niet het geval bij lezen en morfologisch bewustzijn.

Concluderend hebben de resultaten van dit proefschrift meer inzicht gegeven in de overdracht van gemeenschappelijke morfologische kenmerken tussen L1 en L2 bij late tweetaligen Frans-Engels. Meer bepaald wordt gesuggereerd dat gemeenschappelijke achtervoegsels niet gemakkelijker te leren en verwerken zijn dan L2-unieke achtervoegsels. Ook lijken de resultaten van het leerparadigma te suggereren dat inconsistente mappings tussen L1 en L2 (bv. glissement/slippage in tegenstelling tot amazement/étonnement) het leren van

nieuwe woorden zelfs kan belemmeren. De laatste bevinding opent nieuwe perspectieven en nodigt toekomstige studies uit om rekening te houden met meer dan het dichotome onderscheid tussen gemeenschappelijke en specifieke achtervoegsels in L2.

CHAPTER 1

THEORETICAL INTRODUCTION

1. Introduction and literature review

1.1 Introduction

Mixing two languages while talking in a casual conversation is common nowadays. So common that even new terms such as Frenglish have made their apparition in the informal language. This phenomenon refers to language mixing between French and English. The speaker will fill lexical gaps with the non-target language when talking in one or the other language (e.g., Je suis so excited d'aller au concert / I am so excited to go to the concert). Although this kind of cross-linguistic influence is now seen as common, it was not always considered positively (Epstein, 1915; Smith, 1923).

Epstein (1915) upheld that bilingualism would slow down thought processing because of the alternative linguistic options it triggered in the mind. Recommendations following his work were to wait until after childhood has passed before learning a second language (L2) and, the use of L2 should be reduced to reading and basic everyday expressions. His work also depicted that behavioral evidence of language transfer (such as Frenglish) was due to learners' laziness. The historical context (pre-World War I) surrounding Epstein's research in Switzerland, a multilingual country, emphasized the need to take a strong stand and promote monolingual-speaking countries. The German language was the main language in Switzerland. The uprising of Germanization and its sympathy threatened to take over other minority languages of the country, such as French speakers who advocated for the allies. Later, Nazi Germany followed this ideology and further claimed that bilingualism was associated with intellectual deterioration and mental inferiority (see Pavlenko, 2014 for further details).

The stand against bilinguals was also found in other socio-political contexts. Smith (1923) advocated that Welsh-English bilinguals performed worse than monolingual children in a variety of tasks compared to monolingual children. Such results supported the negative effects of bilingualism, namely: intellectual impediment and linguistic emotional conflict. Paradoxically, the results were used both for the defense of the official language of instruction as well as for the minority language of education.

The view which advocated the minimization of bilingual education lasted long after the 20th century's research. Non-target languages were prohibited in the classrooms to limit language interference with the learning process until recently (Cenoz & Gorter, 2014). Still, Epstein (1915) represents one of the pioneer research projects of what we now call code-switching and cross-linguistic transfer. This dissertation is a focus on the latest.

Cross-linguistic transfer or cross-linguistic influence are terms that we use here to refer to an influence from the mother tongue (L1) to the second language (or vice versa). Just as Jarvis and Pavlenko (2008) suggested, these terms aimed to be theoretically neutral and refer to how, in many ways, the knowledge in L1 can modulate the knowledge and use in L2.

Lado (1957) legitimized language transfer as inevitable when learning another language and this, at the linguistic, psycholinguistic, and sociolinguistic levels. Odlin (1989) defined the notion of linguistic transfer as follows:

> "Transfer is the influence resulting from the similarities and differences between the target language and any other language that has been previously acquired" p.27

Characteristics between L1 and L2 can be defined as "similar", "dissimilar", and "unique" (Tokowicz & MacWhinney, 2005; Tolentino & Tokowicz, 2014). Similar characteristics are the ones that occur in the same way in both L1 and L2. For example, Spanish and English use tense-marking verbal auxiliaries the same way. A sentence like "His grandmother is cooking very well" in English would thus be structured as "Su abuela está cocinando muy bien" in Spanish. Unique characteristics would be ones that only exist in one of the languages. In Spanish, determiners and adjectives always agree with the gender of the noun but English does not use any grammatical marker for nominal gender. In the Spanish sentence "Ellos fueron a una fiesta" (They went to a party), "una" agrees with the noun while English uses a neutral gender determiner. Finally, dissimilar characteristics are the ones that mismatch between the L1 and the L2. For example, determiners of number agreement are used differently in both Spanish and English. In Spanish, the article agrees with singular and plural nouns, but it is not the case in English: "el niño" (the boy) vs "los niños" (the boys). In terms of behavioral (or electrophysiological) responses, similar features are expected to trigger the same in both L1 and L2, unique features should trigger moderate sensitivity and dissimilar features the least sensitivity.

In this dissertation, the cross-linguistic transfer that we wish to focus on is the one that involves second language processing and learning in adulthood. Adults (or young adults) would build their L2 based on what they have already acquired and consolidated in L1. This previous knowledge would serve as a base for L2 learning and processing (Koda, 2008; MacWhinney, 2018). Also, the transfer we wish to focus on is from L1 to L2. Although evidence from L2 to L1 has also been advanced (Pavlenko & Jarvis, 2002), this will not be the subject of the present dissertation.

This chapter will outline what we know about cross-language knowledge transfer from L1 to L2. Introducing the fundamentals of language transfer is essential to understand the scientific grounds on which this dissertation is built. This includes an overview of what implies a transfer from L1 to L2 and the literature's evidence of transfer in the different linguistic parameters (phonology, orthography, vocabulary) and especially, in morphology, the topic of this thesis.

1.2 Models on cross-linguistic transfer

1.2.1 The interdependence hypothesis

The interdependence hypothesis (Cummins, 1981, 2000) upholds that language is a part of cognitive development. When two languages are involved, both languages rely on one central processing system.

The hypothesis distinguishes social and academic language. The first one is considered the "tip of the iceberg" and represents the Basic Interpersonal Communicative Skills (BICS) which refer to the basic abilities to communicate in social interaction (e.g., accent, oral fluency, and socio-linguistic competencies). BICS would be independent of the languages spoken. They

are supposed to develop within 6 months to 2 years when learning a language. This discrepancy may be modulated by the similarities between the two languages or the exposure to the second language.

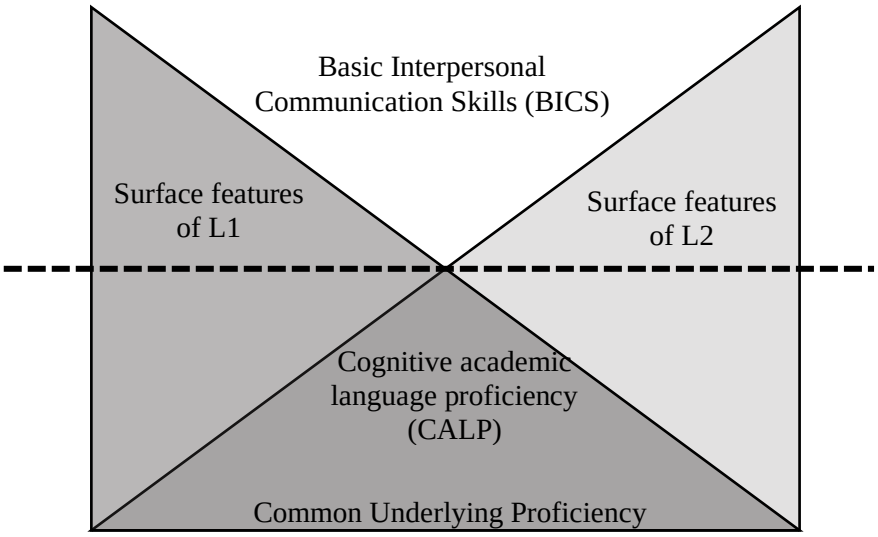
The academic language Cognitive Academic and Language Proficiency (CALP) is a common ground on which language learners rely. It refers to formal academic language that is used in higher-level thinking (e.g., literacy, content learning, abstract thinking and problem-solving) and takes about 5 to 7 years to develop. Academic competencies developed while learning the L1 would not only be helpful for the development of the language itself but also the acquisition of deeper conceptual and linguistic proficiency. Once consolidated, CALP would be accessible in a common underlying proficiency resulting in the possible transfer of academic or literacy achievement to another language. This would be true for L1 to L2 transfer but also for L2 to L1 transfer. The hypothesis also supposes that to achieve such transfer, learners need to have high-quality instruction in the L1 as well as sufficient proficiency in the L2:

> "To the extent that instruction in a Lx is effective in promoting proficiency Lx, transfer of this proficiency to Ly will occur, provided there is adequate exposure to Ly (either in the school or environment) and adequate motivation to learn Ly. (1981, p.29)".

To summarize, once a competency is acquired, all related knowledge is available for learning a new language. This entails that, older L2 learners will have an advantage in language learning as they will possess a stronger academic language background to lean on (see also figure 1 for an illustration of the model)

Figure 1

The Linguistic Interdependence hypothesis (Cummins, 1981). The theory is also referred to as the "Iceberg Theory".



The interdependence hypothesis, however, raised some issues (Genesee et al., 2006). First, the definition of interdependence is yet to be properly defined and second, the hypothesis does not identify what is transferred between languages. Another limitation of this model was that it may be more appropriate for children rather than adults (August, 2006).

1.2.2 UCM – unified competition model

The Unified Competition Model (UCM, MacWhinney, 2005, 2018) was described to overcome the earlier concept of the Critical period (Lenneberg, 1967) which supposed that language learning was very difficult past a certain age.

The UCM proposes that language learning relies on the same cognitive and social processes for both children and adults. Language learners, past early childhood, would have at their disposal four risk factors to language learning (entrenchment, transfer, overanalysis and, isolation) and four support factors to compensate for the latest (resonance, decoupling, chunking and participation). But these processes would interplay differently in children and adults with risk factors increase as a function of age.

The first risk factor, entrenchment, is a fundamental property of neural network functioning. At birth, the auditory cortex is not specific to one language (Streetler, 1976). Between six months of age and one year of age, the infant passes from being sensitive to all phonetic contrasts to being able to discriminate between native phonemes and foreign-language phonemes (Cheour et al., 1998). With the increase of input, the auditory cortex specifies to respond to one language only (the native language, L1). The entrenchment of L1 then competes with L2 patterns when learning starts in older children or adulthood (Flege, 1995; Iverson et al., 2003). The support factor, resonance, can counterbalance this effect by reorganizing the neuronal territory. To promote resonance, learners need multiple repetitions and practice to make sure the lexemes are properly encoded and retrievable.

The second risk factor, transfer, relies on the idea that L1 supports L2 learning. This idea was first mentioned by the Revised Hierarchical Model (Kroll & Stewart, 1994) which described an interconnected relation between L1 and L2 in new learners of an L2. Here the transfer factor can both be of help and hindrance. On one hand, the factor leads to quick assimilation of similar mapping between L1 and L2 forms, resulting in a positive transfer. On the other hand, dissimilar mappings between L1 and L2 will lead to negative transfer. The UCM assumes that L2 learners tend to transfer as much as they can from L1 to L2 and described decoupling as a support factor for transfer. The idea behind decoupling would be that L2 learners would learn to access words, meanings, syntactic structures, and phonological forms without relying on L1 structures. This, in turn, would minimize transfer and maybe diminish the interference effect.

The third risk factor is overanalysis. During new words acquisition, adult learners tend to apply a surface analysis on what they perceive or produce. They will isolate content words and disregard inflections and function words. But chunking (the support factor) should help overcome this. Here, the UCM describes chunking as the “unitization of simultaneous perceptions of single words”.

Finally, the fourth factor is isolation. Adult L2 language learners face social factors that may not support L2 learning as much as young learners would. It may be harder for adults to communicate with an L1 community for several reasons. Adult L2 learners may evolve in an environment promoting L1 over any other foreign language. Also, adults are more critical of language failure than children and, conversely, adults are less open to corrective feedback, teasing, or verbal challenges. The social factors are nonexistent in children learning but become impediments to L2 learning in adulthood. One way to tackle this is through the participation support factor. Adults will benefit from participating in a variety of activities implicating the L2, such as reading, watching L2 programs and socializing with L2 groups (Firth & Wagner, 2007).

1.2.3 Koda (2008): transfer facilitation model

Just like the UCM, the Transfer Facilitation Model (TFM, Koda, 2008) accounts for the development of an L2 in adults who have a well-established L1. More specifically it focuses on how well-established metalinguistic skills in L1 can contribute to L2's reading skills.
The model outlines multiple patterns in the transfer process. First, L1 skills must be automatized before any transfer may happen. It also supposes that both languages are activated at the same time (Dijkstra & van Heuven, 2002; van Heuven et al., 1998) resulting in the automatic activation of both languages and an influence from L1 to L2 that is unintentional with a low probability to be controlled (non-selective). Second, transfer is a continuous process which will remain throughout all L2 development, independently from L2 level. Finally, transfer is a dynamic process: L1 competencies would constantly interact with the evolving exposure to the L2 print.

Aside from the patterns, Koda's (2008) model also considers multiple factors that modulate the transfer of metalinguistic skills between L1 and L2: the L1-L2 distance, the cross-linguistic variations, and the L1-L2 proficiency. The distance between the L1 and the L2, or linguistic complexity, will modulate the likelihood of the transfer. Specific features that are similar among languages will be more likely to transfer than features that do not. In the present dissertation we study the example of French and English languages. Those two languages share the same alphabetic systems. The model supposes that the orthographic similarities in two languages will facilitate the acquisition of either of them as L2. As a counterexample, Greeks learning English (and vice versa) will have to learn a new alphabetic writing system and will not be helped as much by L1 writing knowledge. Due to this distance, acquiring the L2 might take more time.

> "The model predicts that linguistic/orthographic distance (degrees of similarity) between the languages involved should play a significant role in explaining individual differences in the rate in which second-language metalinguistic awareness and related reading sub-skills develop." (p.80)

In the same vein, cross-linguistic variations should modulate the transfer. Linguistic structures that are critical for language learning and the development of metalinguistic

awareness in both languages will be transferred. Structures specific to one or the other languages will ask more time to be acquired. If speakers are used to composing a sentence with morphosyntactic rules in their L1, there is a high chance that these are the ones they will base themselves on when producing in L2. For example, Chinese verbs are not conjugated to express a change of tense. A sentence as "Yesterday, I ate an apple" will be translated into "昨天，我吃了一个苹果" (in pinyin: zuó tiān wǒ chī le yí gè píngguǒ). Here, the auxiliary word "了" is used on its own in Chinese to express grammatical features of past tense without change of the verb "吃". A common mistake would then be for Chinese-English bilinguals to say "Yesterday, I eat an apple". Another example, relevant to the group of bilinguals studied here, would be the difference in adjectives' use for both French and English language. English places an adjective before the noun while French does the opposite. Thus, French people would tend to prioritize "a bike green" (in French being "un vélo vert") although it should be "a green bike".

L1 and L2 proficiency will also affect L2 development. On one hand, L1 literacy experience will continuously impact L2 reading development. As such, higher reading achievement in L1 will induce facilitation in L2 achievement as well. On the other hand, L2 properties themselves will influence the reading subskills in L2 to the point where L2 variables will outweigh the main variance that is accounted for in the L1 (Koda, 2007).

Both the UCM and the TFM are of interest because they are complementary for bilinguals that acquire their second language late in development. The UCM provides an overview of cross-language transfer at the general level. It focuses on how late adults' bilinguals of L2 can overcome the risk factors in language learning. One of them, transfer, is described both as a help and a hindrance. The TFM's focus is more specific on positive transfer. It allows going deeper into how the L1 can be helpful for L2 acquisition. Noteworthily, there is not much consideration about the hindrance of L1 over L2.

The next section provides a review of the results which support the idea of transfer from L1 phonology, writing system, and vocabulary to the L2. Notably, some of the results presented aimed to support the idea that both L1 and L2 are activated during L2 processing (Dijkstra & van Heuven, 2002; van Heuven et al., 1998). However, these studies could also be interpreted in favor of transfer evidence from L1 to L2 because the effect observed may depend on the L1. Also, as Koda (2008) suggested, transfer could occur automatically and under the reserve of mutual L1-L2 activation.

1.3 Evidence of transfer considering Phonology, Orthography, Semantic

Transfer seems to occur in various linguistic skills that a learner acquires in L2. In this section, we will review evidence of transfer from L1 to L2 in phonology, writing system, and semantics. Note that the aim was to reference evidence of a general cross-language transfer. Hence, we try to get a global overview considering several methodologies for each linguistic parameter referenced.

After reviewing these linguistic parameters, the next section will go over what we know about L1 transfer to L2 morphology and how it can affect L2 processing both syntactically and derivationally.

1.3.1 Phonology

The most evident transfer from L1 to L2 may reside in phonology (with the infamous examples of foreign accents). Researchers have easily evidenced that the L1 conditions the way L2 learners speak and perceive sound in L2 (Aoyama, 2003; Aoyama et al., 2004; Escudero et al., 2013; Flege, 1995; Flege & Bohn, 2021; Nguyen-Hoan & Taft, 2010; Schepens et al., 2020). However, this effect decreases with more exposure to L2 and an increase in proficiency (Aoyama et al., 2004; Neufeld, 1979).

1.3.1.1 L1 hindrance in perception but help in production?

The effect of L1 on L2 perception and production was well documented in Japanese-English bilinguals (Aoyama et al., 2004; Escudero, 2005; Iverson et al., 2003). Escudero (2005) showed that Japanese speakers identified the English /r/ better than the English /l/ (92% vs. 77% of correct responses). For Japanese-English bilinguals, the /r/ in Japanese is perceptually closer to /l/ than /r/ in English. Hence, the closeness in-between phonemic categories interfere with the recognition of /l/ compared to the dissimilar L1-L2 sound, /r/. Also evaluating Japanese-English bilinguals on their pronunciation of the same pair of consonants, Aoyama (2004) showed that native speakers of Japanese struggle to pronounce differently the English /r/ and /l/. They usually pronounce them both like the /r/ in Japanese. Here, results could be interpreted as facilitation of L1 for the similar phoneme but also as a hindrance for the dissimilar sound.

Kartushina & Frauenfelder (2013, 2014) evidenced that the L1 phonemic register of vowels affected both the perception and the production of similar L2 sounds. However, their study differed from the ones presented above. They used a continuum to evaluate the phonological contrast rather than 2 choice-tasks. In Kartushina & Frauenfelder (2014), Spanish learners of French were evaluated on their perception of L2 French mid-close/mid-open vowel contrasts in a large L2 phonological response set. The authors showed that the production accuracy was higher for the French vowel /e/ that had a closer L1 category. This suggested that Spanish speakers were facilitated by the similar sounds between L1 and L2 and had more difficulties with new contrasts, i.e., more specific to L2. These studies highlighted that, examining two opposite sides of the contrast may lead to evidence of a hindrance of L1. But this hindrance might be misleading as it may only concern the furthest sounds on the L2 continuum.

A study by Iverson et al. (2003) brought further elements on how the L1 may affect the L2 English sounds of /r/ and /l/. They conducted a cross-linguistic study with Japanese and German native speakers of L2 English. They showed that Japanese native speakers had difficulty contrasting the lateral-rhotic contrast in L2 English, but that German native speakers did not. These results support the idea that L1's phonemic contrasts can uphold the distinction

of L2's sounds. They also showed that one L1 can be an advantage for certain learning, while another one will hinder the same learning.

The difference observed between German and Japanese languages is also true for other pairs of languages (Escudero et al., 2008; Hallé et al., 2004; Iverson & Evans, 2009). Iverson & Evans (2009) showed that German had a larger vowel category inventory than Spanish which facilitated to a greater extent the learning of new English vowels. Hallé et al. (2004) identified that Taiwanese and French learners differed in their sensitivity to tone contour differences in Mandarin. Both groups of French and Taiwanese were sensitive to tone contour differences but the group of Taiwanese showed more sensitivity than French speakers.

Transfer effects can also differ inside a language itself. Netherlands and Belgium countries both speak Dutch, with significant regional differences. On this basis, Escudero et al. (2008) evidenced that although speaking the same language, both differed in their perception of /ɛ/ and /æ/ in English. Inter-individual differences were also evidenced by Kartushina and Frauenfelder (2013) in native speakers of Spanish that showed variabilities in producing the /e/ vowel. This would in turn have implications to produce L2 sounds. Native speakers with a compact L1 space would be more likely to distinguish phonetic differences between L1 and L2 sounds and thus establish more precise L2 categories compared to native speakers with dispersed L1 productions.

Meunier et al. (2003) evidenced how the L1 can benefit the second language sound perception. They compared two groups of French and American speakers on their accuracy to perceive foreign sounds. Both L1s had a range of 10 oral vowels in their respective inventories which allowed them to be comparable in their naïve perception of Spanish. The results showed better categorization of the Spanish vowel sounds for French speakers compared to American speakers. The authors attributed the results to the difference between the two L1s acoustic spaces. Compared to English, French vocalic space is more compact, and its vowel categories are less overlapping.

Schepens et al. (2020) recently investigated how the similarity between 62 different L1s affected Dutch-speaking proficiency. They found that the closer the L1 and Dutch phonological systems are, the better the product will be. Facilitation or hindrance of the L1 might therefore depend on the pairs of languages studied.

1.3.1.2 Evidence in visual word recognition

The similarity in phonology for words may facilitate lexical decision tasks (Ando et al., 2014; Zhou et al., 2010). Zhou et al. (2010) investigated Chinese-English bilinguals in a word naming task (i.e., see target door and name it aloud) and a lexical decision task. They evaluated the effect of the prime of Chinese single characters (e.g., /dao/ meaning road) on phonologically related English targets (e.g., door). They highlighted that both word naming and lexical decision evidenced cross-language phonological priming, in both directions (L1-L2 and L2-L1). They interpreted the results that both languages are integrated into the same phonological register. In line with what was previously discussed, this study may also be evidence for L1 transfer to L2. As this facilitation is conditioned by the L1 phonemic inventory, this may also be an effect of transfer. Similar phonemic registers in L1 and L2 facilitate the processing of L2 sounds. This

would also be true for L2 to L1.

1.3.2 The L1 writing system

The L1 writing system (or transfer of orthography) will impact how L2 learners will process written words. Although this is especially true during the early stages of L2 literacy development (Wade-Woolley, 1999), the L1 writing system keeps on influencing L2 speakers in their word form analysis even after years of practice or high proficiency (Koda, 2008; X. Li & Koda, 2022; Martin, 2017; McBride et al., 2022; Sparks et al., 2008; Yamashita, 2018). Sparks et al. (2008) evidence a strong correlation between L1-L2 spelling skills in older L2 learners suggesting a long-term cross-linguistic transfer.

Native languages provide different grounds for second language learning. Presumably, L2 learners that have the same writing system in L1 and in L2 (e.g., French learning English) will be advantaged compared to L2 learners who try to learn an L2 with a different writing system from their L1 (e.g., Japanese learning French or vice versa; Koda, 1990). Evidence of this assumption has been widely documented.

1.3.2.1 Effect on spelling

It has been proposed that L1 positively influences L2 spelling when similarities between the languages exist (e.g., Schwartz et al., 2016), and negatively when there are large differences between the languages and when the learner has not acquired sufficient knowledge of the L2 (Figueredo, 2006).

Wang and Geva (2003) found that Chinese-English children bilinguals performed similarly to English native speakers in spelling English words but did worse than them in spelling non-words. Coming from a logographic orthography (Chinese-Mandarin) that does not rely on phoneme-to-grapheme correspondences, Chinese-English bilinguals would be able to acquire whole lexical units or visual-orthographic forms (McBride et al., 2004) but their L1 writing system would be detrimental to acquire phoneme-level decoding and mapping skills. Similar findings were found in adults (Holm & Dodd, 1996). However, their results were more nuanced. Native speakers of Chinese-Mandarin who previously learned pinyin (the alphabetic form of Mandarin) learned better how to spell nonwords. This strengthened the idea that previous knowledge of a writing system can benefit the learning of a new language.

Martin (2017) investigated how the knowledge of different L1 writing systems, namely, French (an alphabet), Hebrew (an abjad), and Mandarin Chinese (a morphosyllabary), would influence whole-word spelling in L2-English. Speakers were examined on their accuracy to identify misspellings of consonants versus vowels in pseudo-homophones of their L2-English. The results outlined that L1 Chinese speakers displayed the best performances in spelling accuracy overall (consistent with previous findings, e.g., McBride-Chang et al., 2004) then followed by Hebrew speakers and finally, French speakers who showed the least accuracy in spelling. When looking at the difference between misspellings, all L1 groups had better accuracy for misspelled consonants compared to misspelled vowels. But the performance on misspelled consonants differed across L1 groups. L1 Hebrew were more affected by misspelled

consonants than misspelled vowels (4.2% difference) as compared to the L1 Chinese group (2.4% difference). The difference for French speakers was not significant. The effect in Hebrew was consistent with previous findings (Martin & Juffs, 2011) in L1 Arabic speakers. Both languages rely on a non-linear morphology that does not include as many written vowels in diacritics as English does. In all, the results were supportive of the hypothesis that the L1 writing system may influence the way L2 speakers process L2 word forms.

1.3.2.2 Effects on visual word processing

L1 orthographic word forms influence the processing skills in L2. Some eye movement studies evidenced different visual searches in L2 depending on the L1 (e.g., Green et al., 1996; Ktori & Pitchford, 2008). Also, the sensitivity to sub-lexical characteristics in L2 (e.g., letter frequency, sequence legality), whole-word spelling and orthographic shapes seem to be influenced by the L1 (Akamatsu, 1999, 2003; Fender, 2003; Wang & Koda, 2007).

Wang and Koda (2007) compared two groups of bilinguals: Chinese-English and Korean-English on accuracy naming and auditory category judgment tasks. Chinese possesses, as previously mentioned, a logographic system (one character represents one meaning) while Korean is categorized as an alphabetic system with written letters representing phonemes (just like English). Results highlighted a clear difference between the two bilingual groups with Korean-English showing an overall advantage. Korean-English were more accurate than Chinese-English in naming all types of words. They were also more performant in regularizing their naming errors for low-frequency words. Finally, they displayed more accuracy and were faster in auditory meaning retrieval. These results were in line with an earlier study (Wang et al., 2003) with the same language comparison.

What seems to be is that the closer the L1 orthography is to the L2 target language, the faster and more accurate L2 word recognition will be (e.g., Akamatsu, 1999; Muljani et al., 1998). This will be even more true for languages sharing the same orthographic system. In a sentence context, Bultena et al. (2014) found evidence that nouns with similar orthography between the L2 target word (English) and its L1 translation (Dutch) would be read faster. The effect was however restricted to go past times (a later measure). However, Van Assche et al. (2011) found the cognate facilitation effects for both early and late eye movement measures. And this effect seems to last even when reading an entire novel (Cop et al., 2017).

Using the neighborhood priming paradigm, evidence for cross-language hindrance was also obtained (Bijeljac-Babic et al., 1997; van Heuven et al., 1998). Bijeljac-Babic et al. (1997) reported that French-English bilinguals took longer to recognize a target word if this word was primed by a high-frequency, orthographically related word in L1 (e.g., French-English bilinguals took longer to recognize *gage*, the French word for *forfeit*, when it was preceded by *game* than when it was preceded by an unrelated prime: bird-GAGE). Similar results were obtained by van Heuven et al. (1998) in Dutch-English bilinguals. Identification speeds were slower for words that had a great number of orthographic neighbors with L1 in both a progressive demasking task and a lexical decision task. These studies brought support to the hypothesis that the two languages of a bilingual are organized together (Dijkstra & van Heuven, 2002; van Heuven et al., 1998). However, some recent studies suggest that these effects might

be due to orthographic markedness (Commissaire et al., 2019). Commissaire et al. (2019) evidenced that a word that shares the same orthographic pattern (unmarked words) in L1 and L2 will display an effect of orthographic neighborhood (e.g., proud), but marked words will not (e.g., straw).

1.3.3 Semantics

Evidence for L1 influence on L2 vocabulary is broad and usually highlighted with cognate words (e.g., Davis et al., 2010; Dijkstra et al., 2010; Lemhöfer & Dijkstra, 2004; Voga & Grainger, 2007). Cognates are words that are strongly related to one another in form and meaning. Taking the example of French and English words, we can find words which have very much the same form and meaning (e.g., government and gouvernement). These words will be acquired more easily because the knowledge in L1 will facilitate learning. However, the reverse is also true. False cognates can be a counter advantage as the L1 will provide false information about the word's meaning (e.g., *eventually* in English means "at the end" while in French *éventuellement* means "maybe").

The effect of cognateness was evidenced in several linguistic tasks. Bilinguals showed greater accuracy in cognate words compared to non-cognate in categorization (Dufour & Kroll, 1995), translation (De Groot & Poot, 1997), word association (Van Hell & De Groot, 1998), and word learning (De Groot & Keijzer, 2000). The cognate facilitation effect remains even when a change of script is observed (Hoshino & Kroll, 2008).

Peeters et al. (2013) found that reaction times to identical cognates (e.g., table) were shorter than for non-cognate controls. The effect also depended on word frequency in both English and French. Libben and Titone (2009) conducted a very interesting study which allowed to be put in evidence the facilitation effect as well as the hindrance of semantics in French-English bilinguals. They evaluated the difference in processing in bilinguals of English cognates (e.g., piano), and English homographs (e.g., coin, meaning "corner" in French) and matched control words in sentence processing. The results showed overall facilitation of cognates in low-constraint sentences on both the early-stages and late-stages comprehension measures. However, homographs showed the opposite pattern. They interfered with comprehension.

Sunderman and Schwartz (2008) also showed in Spanish-English a facilitation effect for cognates. They looked at whether partial cognates provided the same facilitation effect as full cognates. Partial cognates were words for which the meaning overlap was not perfect. For example, Spanish and English use the same word "grave" (which means serious) but in English alone, this word also means "burial place". The results showed that the partial cognates were retrieved more quickly and accurately than noncognate control words but less than full cognate words. The authors interpreted those results as evidence that partial cognates should be included in the cognate effect. But also, that partial cognate should be taken with caution as an imperfect meaning overlap reduces the facilitative effect of the word.

The cognate facilitation effect remains even in different scripts (N. Jiang et al., 2020). Jiang et al. (2020) highlighted that the speed of processing English words in the L2 learner groups was influenced by the frequency of the Chinese translations: Reaction times were faster

for English words with high frequency Chinese translations, but slower for English words with low frequency Chinese translations. No meaningful differences were found between the L2 groups, potentially indicating that "immersion experience" was not a key factor in explaining word recognition. The authors concluded that "this finding suggested that L1 translations were activated, and their activation was more than a by-product of L2 word recognition". Noteworthily, the facilitation of cognate seems to only be evidenced in the writing modality but it is way less true in the oral modality (Cornut et al., 2021).

1.4 Cross-language transfer from L1 to L2 in morphology

We previously reviewed the evidence of cross-linguistic transfer between L1 and L2 at the level of phonology, the writing system, and semantics. One other parameter that may be considered in language transfer is morphology which refers to the smallest meaning units to be found in language, morphemes. We will now review what morphemes implicate and then review what we know of language transfer in morphology. We will present that most of the evidence has been gathered in inflectional morphology and how this led us to wonder whether transfer could also be identified in derivational morphology.

The focus will essentially be on the influence of cross-language similarity on written language processing. As it will be described in the next chapter, our groups of bilinguals mainly acquired English in academical context which supposes stronger exposition to written materials. And as far as morphology is concerned, it seems that its effect is stronger during reading than listening (Beyersmann et al., 2020).

1.4.1 Morphology, definition

Morphemes are defined as the smallest meaning-bearing units of a language (O'Grady et al., 1997). They are the internal structure of words and can be distinguished between free morphemes and bound morphemes. Free morphemes are morphemes that compose a word itself (e.g., "house", "high") while bound morphemes are morphemes that must be attached to another to carry meanings (e.g., "un-", "-ness") and can be defined as affixes. Therefore, a word will necessarily be composed of one morpheme (e.g., "dance", "work") in the sense that it cannot be further decomposed into smaller units that would carry meaning or function. Then, complex words are words that are characterized by at least two or more morphemes (e.g., "worker" which would be decomposed into its stem "work" and its affix "-er").

Two different kinds of morphology can be differentiated: derivational and inflectional morphology. Derivational morphology allows the creation of new words composed on a stem basis. The addition of an affix will modify the meaning of the stem (e.g., "unhealthy" composed with the affixes "un-" and "-y", and the stem "health"). Inflectional morphology, however, concerns words that are created in order to fit a particular role in a sentence but that do not change the meaning or the part-of-speech of the word ("worked", composed with the stem "work" and the affix "-ed"). Inflectional affixes aim to underline numbers, tenses and persons, modes, and genres.

The integration and comprehension of morphemic structures are associated with an increase in the ability to spell, so people more sensitive to the morphemic structure of words are better at using morphological spelling rules (Figueredo & Varnhagen, 2004; Marinova-Todd et al., 2013).

In the following section, we will review the evidence of cross-language transfer in inflectional morphology. We will then provide an overview of the train of thought that lead us to the present dissertation and the hypothesis we have on cross-language transfer in derivational.

1.4.2 Evidence in morphosyntactic studies

The evidence supporting the idea of cross-language transfer in inflectional studies (or morphosyntactic) is numerous. Methodologies using automatic sentence processing (N. Jiang, 2004, 2007; N. Jiang et al., 2011, 2017; S. Y. Kim & Wang, 2014; Park & Kim, 2021; Roberts & Liszka, 2013, 2021; Tokowicz & Warren, 2010), electrophysiological patterns of processing (Kimppa et al., 2019; Molinaro et al., 2011; Tokowicz & MacWhinney, 2005) and word learning (De Zeeuw et al., 2013; Havas et al., 2015; Hawkins & Liszka, 2003; X. Li & Koda, 2022; Z. P. S. Luk & Shirai, 2009; Portin et al., 2008) have displayed clear evidence that L1 morphosyntactic knowledge influence L2 processing. Although it is to be noted that this effect was not systematically found (Bañón et al., 2018; Dudley & Slabakova, 2021; Gerth et al., 2017; Juffs, 2005; Papadopoulou & Clahsen, 2003).

Jiang et al. conducted a series of studies (Jiang 2004, 2007; Jiang et al., 2011) using the self-paced reading (SPR) paradigm to investigate whether reading times in English-L2 bilinguals would be influenced by the L1. In Jiang et al. (2011), they examined how a group of native speakers and three groups of bilinguals with different L1s (Japanese and Russian) were sensitive to syntactic errors in reading. They were all evaluated on plural marking errors and verb subcategorization errors. The results showed that native speakers were sensitive to both syntactic errors. In the bilingual groups, only Russian bilinguals displayed the same patterns as native speakers. The Japanese speakers were only sensitive to verb subcategorization errors. These findings were expected as both Russian and English mark plurality while Japanese does not.

Jiang et al. (2011) interpreted this finding by proposing the morphological congruency effect. This effect hypothesizes that in L2 there are congruent and incongruent morphemes. Congruent morphemes are morphemes that are already acquired in L1. A congruent morpheme will be more easily acquired because of its pre-registered knowledge in L1. For example, French and English both mark plurality which makes it a congruent morpheme. Incongruent morphemes are the ones that only exist in L2. They will be harder to acquire in L2 because there is no ground in L1 to lean on. Still with the example of French and English, French marks gender while English does not. Also, the morphological congruency effect supposes that congruent morphemes may lead to native-like processing while incongruent morphemes may never will. Such a hypothesis converges with the model presented in the previous section, i.e., similarity among languages will facilitate the acquisition of equivalent structures while unique features will take more time to be acquired.

1.5 Evidence in derivational morphology - The case of morphological priming

There is still much discussion about the use of morphology in L2 processing as well as its implication for teaching strategies. One study that led to a great deal of research using the masked priming paradigm was the one by Rastle et al. (2004) with English monolinguals. In this experiment, a brief and masked (invisible) prime preceded a target word. The interest was the facilitation of the prime on the target reflecting the processing of the prime. There were three conditions: Transparent, Opaque and Form condition. The Transparent condition aimed to evaluate the facilitation effect of semantically transparent morphological pairs (e.g., bloody-BLOOD). The Opaque condition had pseudo-morphological relation but no semantic relation (e.g., early-EARL). The Form condition did not manifest any morphological relation between the pairs (command-COMMA). The results of Rastle et al. (2004) showed priming in the Transparent condition (27 ms priming), no priming in the Form condition (4 ms priming) and, most interestingly, a healthy priming effect in the Opaque condition (22 ms). These findings were fully in line with Ullman (2004) prediction that morphological decomposition in L1 occurs automatically when the stimulus has the correct morphological structure. As a result, *early* is decomposed automatically in *earl+y*, whereas no decomposition takes place for command because *–nd* is not a possible suffix. Silva and Clahsen (2008) replicated the masked morphologically priming effect (bloody-BLOOD) in English L1 speakers, but not in bilingual groups of the studies (Chinese English, Japanese-English or German-English bilinguals). These and other findings led Clahsen et al., (2010, p.21) to conclude that: "adult L2 learners are less sensitive to morphological structure than native speakers and rely more on lexical storage than on morphological parsing during processing."

The aforementioned findings were not easily replicated, however. First, Diependaele et al. (2011) reported very similar priming in English L1 speakers and Spanish-English and Dutch-English speakers. More specifically, all groups displayed a 35 ms priming effect in the Transparent condition, a 25 ms priming effect in the Opaque condition, and a 10 ms priming effect in the Form condition. Another pattern with less morphological priming but more orthographic priming in L2 speakers than in L1 speakers was reported by Viviani and Crepaldi (2019). The subsequent conclusion from these studies could be that morphology is less implicated in L2 processing, notably because fewer words are known in English. Another reason that we would like to advance here is that bilinguals possess a larger repertory of suffixes and therefore could identify more suffixes in words' endings (arguably because different suffixes are mastered in the two languages of a bilingual). This latest argument holds on to the possible cross-language transfer effect that we study here.

Masked priming studies studied L2 morphological decomposition but did not look at whether morphological processing could be modulated by the similarity between L1 and L2. The decision not to use the masked priming paradigm came in part from the difficulty to disentangle morphological priming from orthographic priming in L2. As the aim was to explore how L1 morphological knowledge transfers to L2, we decided to tackle the issue from another perspective. More specifically we examined how transfer from L1 to L2 would occur using three different methodologies: morphological awareness tasks, a self-paced reading task and a

word learning paradigm. The next three sections quickly review the literature that led us to the different studies presented here.

1.6 The studies in this dissertation

1.6.1 Morphological awareness

The first area that we wanted to focus on was morphological awareness (Chapter 3). Previous studies on monolingual children have evidenced the role familiar morphemes play in the acquisition and use of new vocabulary (Kieffer & Lesaux, 2012; McBride-Chang et al., 2008), literacy and spelling (Casalis et al., 2011; Desrochers et al., 2018; Rispens et al., 2008) as well as reading fluency and comprehension (Casalis & Louis-Alexandre, 2000; Deacon et al., 2007; Desrochers et al., 2018; Levesque et al., 2019). Evidence also showed that morphological awareness, in adults, contributes to reading comprehension (Kotzer et al., 2021).

In a second language, the contribution of L1 morphological awareness to L2 reading comprehension in children has also been well documented (D'Angelo et al., 2017; Kieffer & Lesaux, 2008, 2012; Lam et al., 2020; Marinova-Todd et al., 2013; Zhang & Koda, 2014). Fewer, yet encouraging results seem to indicate that similar results could be expected in adult bilinguals who learned L2 in adolescence (Wu & Juffs, 2021; D. Zhang & Koda, 2012; H. Zhang, 2021). Interestingly, proficiency seems to be a strong modulator of such effect (Jarvis & Pavlenko, 2008; Kieffer & Lesaux, 2008; T. J. Kim et al., 2015; Koda, 2000, 2008; Koda & Miller, 2018; Ramírez et al., 2013).

Following the results of the current literature we explored two main hypotheses. The first one was to clarify how L2 proficiency will condition the increase of L2 morphological knowledge (Jiang & Kuo, 2019; Kraut, 2015; Sánchez-Gutiérrez & Hernández Muñoz, 2018). The second one was whether this increase would be faster for morphological affixes common in L1 and L2? We expected an interaction between proficiency and whether suffixes are common between L1 and L2. Low proficiency L2 speakers would display a larger advantage of the suffixes common between L1 and L2 as compared to L2 speakers with the highest proficiency (Jiang et al., 2011; Kim et al., 2015; Lam et al., 2020).

1.6.2 Morphological automaticity in reading

As mentioned before, the morphological congruency effect (N. Jiang et al., 2011) supports a series of evidence that the influence of L1 on L2 is persistent in sentence reading (Gerth et al., 2017; N. Jiang, 2004, 2007; N. Jiang et al., 2011, 2017; S. Y. Kim & Wang, 2014; Park & Kim, 2021; Pliatsikas & Marinis, 2013; Roberts & Liszka, 2013, 2021; Tokowicz & Warren, 2010) although others have not been able to highlight the same influence and rather support the absence of influence from L1 to L2 (Bultena et al., 2014; Dudley & Slabakova, 2021; Juffs, 2005; Papadopoulou & Clahsen, 2003).

In Chapter 4 we discuss a study in which we evaluated the expandability of the Jiang et al.'s hypothesis of derivational morphology. Automatic and implicit processing of words may increase the cross-language benefit of morphology. As the TFM (Koda, 2008) suggested, the

transfer is automatic and non-volitional. Considering the difficulty of interpreting findings with the masked priming paradigm, presented above, we hypothesized that L2-readers may benefit more from context (Bosch et al., 2017), which is absent in studies using masked priming paradigms. Sentences frame words in a context which guarantees semantic outlines. They also provide a rich way to investigate how words' characteristics will influence reading fluency.

First, we expected that highly proficient bilinguals would display decreased reading times as compared to less proficient bilinguals. Second, in line with the morphological congruency hypothesis (Jiang et al., 2011), we expected suffixes common between L1 and L2 to show faster reading times than L2-specific suffixes (Bultena et al., 2014; Van Assche et al., 2013). Finally, we could expect an interaction between the main effects. The difference in the facilitation of the suffix types could be larger for low-proficiency participants (with long reading times) than for high-proficiency participants (Kimppa et al., 2019).

1.6.3 Morphological learning

The influence of L1 on L2 in phonology (Aoyama et al., 2004; Kartushina & Frauenfelder, 2014), orthography (Sparks et al., 2008; Yamashita, 2018), semantics (De Groot & Keijzer, 2000) and inflectional morphology (De Zeeuw et al., 2013; N. Jiang et al., 2011; X. Li & Koda, 2022; Portin et al., 2008) tends to suppose that this influence is present all along the acquisition of the L2. But little evidence exists for the acquisition of derivational morphology. This is what we tested in Chapter 5.

Although artificial learning is not directly related to L2 learning, studies found that previous knowledge of morphemes could be helpful for the acquisition of new words (Dawson et al., 2021). In bilinguals studies, however, results were ambiguous (Marks, Sun, et al., 2022; Miguel, 2020). Therefore, we wanted to shed light on whether word acquisition is facilitated by the presence of common suffixes between L1 and L2 during the first moments of word acquisition, and this, for both low-proficiency and high-proficiency bilinguals. Our research questions were, first, whether the presence of common suffixes might help the acquisition of new complex words (e.g., teachable). Second, we wondered whether the effect would be different depending on the time of learning. Would this effect appear during the first moments of learning or rather, later, when the word is consolidated? Finally, we hypothesized that there might be an interaction between the status of suffixes and L2 proficiency. The common suffixes between L1 and L2 might be more beneficial to low proficient bilinguals. We also thought that the opposite pattern could be outlined if morphological knowledge only arose at high proficiency levels.

The next section will be focused on the methodology used for all the experimental studies in this dissertation. We will review what the bilingual notion reflects and how important it is to define bilingual groups in experimental studies. We will then present the material used. Finally, we will briefly expose the choice to conduct the studies online.
After the methodological section, we will present the three experimental studies which aimed to respond to the three main hypotheses presented above.

CHAPTER 2

METHODOLOGY

2. Methodological chapter

2.1 Focus on late bilinguals

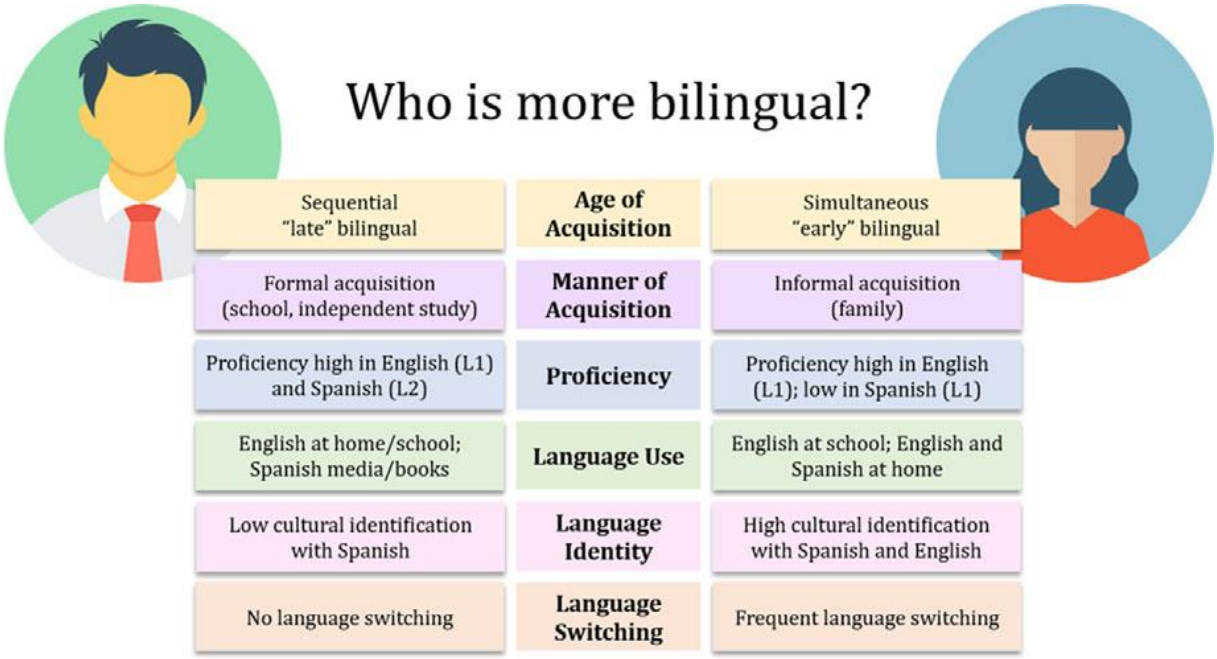
How easy would it be if bilinguals could be defined as "two monolinguals in one brain" (Grosjean, 1989)? But it is not that simple, and bilingualism is a far more complex framework.

The definition of bilingual has brought some challenges to the literature. On the one hand, (Bloomfield, 1933) defined a bilingual person as someone that possesses "native–like control of two languages". Bilinguals would be the ones with perfectly mastered languages and equivalent linguistic knowledge in both languages. On the other hand, (Macnamara, 1967) defined bilinguals as "anyone who possesses a minimal competence in only one of the four language skills, listening comprehension, speaking, reading and writing, in a language other than his mother tongue.". These two definitions, apart from being on radically opposite sides, define bilinguals as a function of one characteristic: language proficiency (Hamers & Blanc, 2000). Other definitions have kept this same tunnel vision (see Ling, 2018 for further details). But later work identified that defining bilinguals cannot only be considered in a dichotomic sense (Luk & Bialystok, 2013). Rather, bilinguals are speakers that evolve across languages, and the skills they develop are not necessarily the same that the ones observed in monolinguals (Grosjean, 2010).

The plain aspect of bilingualism is that someone can speak and listen to two languages. But being bilingual goes deeper. In fact, bilingualism is a multidimensional phenomenon (Luk & Bialystok, 2013). Hence, defining bilinguals necessitates considering multiple aspects of their language experiences. We could consider a person bilingual from the moment this person understands and/or speaks a second language (see figure 2; Marian & Hayakawa, 2021). Hence, one bilingual is not equal to another. Therefore, the need to clarify the linguistic experience of the bilingual group a researcher works with is essential. Among the parameters that allow to contour the characteristic of a bilingual group, there is, the age of acquisition, learning context (or manner of acquisition), proficiency, the balance of linguistic skills (reading, writing, speaking, listening), language use and/or regularity of exposure to the language.

Figure 2

Illustration taken from Marian & Hayakawa (2021) which depicts the difference of bilingual profiles.



The bilinguals studied in the work that follows are defined using the same characteristics mentioned previously. As such, the bilinguals in this dissertation had the following profile:

- Age of acquisition: acquisition of L2 (English) around the age of 6-10 years old after adequate L1 language skills (French) had been acquired. Intrinsically, they are considered sequential and late bilinguals. The term "late bilinguals" is the one we will keep throughout this dissertation. They differ from bilinguals who have acquired their L1 and L2 simultaneously, i.e., simultaneous bilinguals or early bilinguals.
- Learning context: L1 was learned at home/school and was the main language of their environment. L2 was mainly learned throughout school programs, and later, consolidated in young adulthood with media and social exchange.
- Proficiency: A wide range of proficiency was evaluated from low-proficiency to high-proficiency bilinguals. Most of them had an intermediate level of proficiency.
- Balance of linguistic skills: Reading skills are more developed than all other skills (writing, listening, and speaking) as the language was mainly taught through this modality.
- Language use and/or regularity of exposure: exposed daily to L1 and living in an L1 environment, L2 is used in specific modalities (work or media). The exposition to L2 is therefore limited.

To sum up, this dissertation will focus on late adult bilinguals who have a dominant L1 (French) and learned their L2 (English) late during childhood, mainly in a reading context. They live in a L1 environment and have limited exposure to English. Their proficiency will vary from low to high proficiency and their skills will be expected to be better in reading as it is how they first and mainly learned English.

2.2 Evaluating bilinguals' profile: subjective vs. objective tests

To evaluate our participants' proficiency, we used both subjective (questionnaires; adapted and translated version of Li et al., 2006) and objective tests (translation tasks from Casalis et al., 2015; and LexTale from Lemhöfer & Broersma, 2012). The subjective questionnaires aimed for us to control for the previous parameters mentioned above: age of acquisition, learning context, language use and balance of skills.

Participants' objective proficiency was evaluated with different tests. Translation tasks and the LexTale. There were two translation tasks. One task in which participants translated from L1 to L2 and one from L2 to L1. The first task was retrieved from Casalis et al. (2015) and contained 3 levels of difficulty (Beginner level, Intermediate level, and Expert level). Each level contained 25 words to be translated from French (L1) to English (L2). Words were always presented in the same order for each level. The second translation task aimed to evaluate the participants' ability to translate words from L2 to L1. This task was based on materials published in Mclean & Kramer (2015) from which we selected 60 words. The task aimed to present an increasing difficulty throughout the test similar to the one from Casalis et al. (2015), with the easiest level at the beginning and the most difficult one at the end (Beginner, Intermediate and, Expert). There were 20 words in each section.

The LexTale (Lemhöfer & Broersma, 2012) was used as a quantitative reference of proficiency for the overall analysis. We chose to use it as a continuous variable in this dissertation. This decision holds on the ground that bilingualism should be considered as a continuum rather than a categorized ability.

For comfort purposes, language tests provide a categorization of proficiency levels. At the individual level, categorization can be helpful as it traces the evolution of one's language level. But at the collective and research level, which aim is to account for the evolution of proficiency, categorization appears arbitrary and misleading. Bilinguals do not turn from low to high proficient overnight. Rather, learning is a continuous process. Hence, recent literature strongly suggests avoiding proficiency categorization. Instead of using discrete groups, bilinguals' proficiency should be implemented and analyzed continuously (e.g., Baum & Titone, 2014; de Bruin, 2019; Guliffer & Titone, 2020; Luk & Bialystok, 2013). In agreement with those recommendations, the studies presented in this dissertation will systematically be presented with proficiency used as a continuous variable. This use also provides the advantage of depicting an evolutive picture of proficiency development.

2.3 Database for French-English derived words

The overall interest of this dissertation was to give an overlook of cross-linguistic transfer in derivational morphology. To study derivational processes, we specifically chose to focus on suffixes. Suffixes are morphemes that create new lexemes by changing the syntactic category or adding substantial new meaning (or both) to a word (e.g., *beautiful* is an adjective derived from the noun *beauty* to which was added *-ful*).

To focus the matter on cross-language influence, we gathered a total of 20 L2-English suffixes. They were divided into two sub-categories. Suffixes that were common between L1 and L2 (e.g., -able) and suffixes that were not common between L1 and L2 but rather specific to L2 (e.g. -ness). There were 10 suffixes in each category. In the common category, the suffixes were: -al, -ion, -ment, -ive, -age, -able, -ous, -er, -ure, -ance. In the L2-unique category, the suffixes were: -ly, -ful, -ship, -ness, -y, -less, -ish, -ing, -hood, -th.

As all suffixes do not possess the same productivity in a native language (Bertram et al., 1999, 2000), we chose high productivity suffixes in both English-L1 and French-L1. L2-unique suffixes could be considered more productive in English than common suffixes. But in our group of participants, common suffixes are highly productive in French. In turn, the overall suffixes in L2 gave a selection that ensured familiarity and balance of suffix productivity for our groups of bilinguals.

This base of 20 suffixes allowed us to look for derived words that were composed of the aforementioned suffixes. MorphoLex (Sánchez-Gutiérrez et al., 2018) was the first database for the creation of the material. Unfortunately, the database mainly focuses on nouns, and the studies we computed needed other word types. Also, we needed a database that would include information on French translations and the status of suffixes. So, we created our own with a total of 536 derived words using word research tools, a dictionary, and an etymology repertory. For each word, derivation length and frequency, as well as root length and frequency were listed. Frequency was retrieved from the SUBTLEX-UK database (van Heuven et al., 2014) with the Zipf scale which is a logarithmic scale ranging from 1 to 7: 1-3 represents low frequency words while 4-7 represent high frequency words. Words frequencies correspond to the frequencies in English as the native language. Due to the lack of a frequency database of L2 words, we could suppose that the frequencies of English in L1 and L2 are close. We acknowledge however that this is based on an assumption.

Two choices of material construction were considered. The first method was building a material set with a variety of strict control variables (e.g., length, frequency, neighborhood, bigram, syllables). Such material would have allowed us to pick on a very specific effect. In turn, this would also make it harder to generalize the results and more importantly, harder to create materials with sufficient items. The alternative method was to focus on fewer parameters but to gather more representative derived words of the target language (English). As such, although more noise would be in the data, the generalization of the results would be easier. This would also allow us to build a material with enough items. Hence, we chose to focus on length and frequency as indicators to create the lists of words in each experiment presented in this thesis. To ensure equivalence of length and frequency, we used the TOST test (Lakens et al., 2018) that we ran under R software. This test offers an advantage over the commonly used t-test as it gives results of two one sided t-tests. One tests the null hypothesis which assumes that

there is an effect, a difference between the two values. We seek to reject ($p < .05$) this hypothesis. The other, the alternative hypothesis, tests that the effect is comprised of the equivalence bounds (lower bounds = −0.4; higher bounds = 0.4). All along this dissertation, we usually report one of the sided tests, the one having the smallest test statistic (here, t) with the largest p value (as preconized in Lakens, 2017).

2.4 Online studies, an alternative to laboratory studies

The worldwide pandemic accelerated the transition of lab-based experimental psychology to online research tools. Our studies were no exceptions, and we had the chance to be able to transfer our laboratory studies to online web-based studies. Online experimentations may raise concerns as to whether web-based experimentations could be legitimately compared to laboratory experimentations. But, several researches evidenced that results with cognitive psychology experimentation through internet web-based tools were reliable (Giraudier et al., 2022) and comparable to laboratory experimentations, and even, outlined larger effects (Hilbig, 2016). It is however important to beware of the different web-based research platforms and acknowledge that not all could be reliable. For example, recent research (Uittenhove et al., 2022) evidenced that not all online platforms gathered comparable datasets as one of the typical university students poles. Precautions still need to be taken and this is why, when we solicited online recruitment platforms, we only operated with Prolific. Still, in light of the replication crisis in psychology online studies represent a real opportunity (Vasishth et al., 2018) as they remove significant barriers to research experiments. They offer the possibility to enlarge participants' poles and create properly powered studies (Brysbaert, 2019). They also allow us to take a step back from university samples and offer a wider representation of the population of interest with a more specific screening thanks to online preset (Gosling & Mason, 2015).

CHAPTER 3

FIRST EXPERIMENTAL STUDY

3. First experimental study: Derivational awareness in late bilinguals increases along with proficiency without a clear influence of the suffixes shared with L1.

Published article: Menut, A., Brysbaert, M., & Casalis, S. (2022). Derivational awareness in late bilinguals increases along with proficiency without a clear influence of the suffixes shared with L1. *Bilingualism: Language and Cognition,* 1-14. DOI: 10.1017/S1366728922000402

Talk presentation: Menut A., Brysbaert M., & Casalis, S. (2022, April). Derivational awareness in late bilinguals increases with proficiency without clear influence of the L1. Colloque des Jeunes Chercheur.se.s en Sciences Cognitives 2022 - Fresco

Poster communication: Menut A., Brysbaert M., & Casalis S. (2021, June). Morphological awareness in late L2 learners: proficiency matters while the L1 does not. XV International Symposium of Psycholiguistics 2021, online.

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Abstract

Morphological awareness contributes to vocabulary acquisition and reading in bilingual children who learned English after their native language. In line with these considerations, we further investigated L2 processing in late adult bilinguals where questions related to morphology need to be clarified. French-English speakers (N = 92) were assessed for three morphological awareness stages: lexical semantic knowledge, syntactic knowledge, and distributive knowledge. We investigated whether the evolution of morphological awareness was related to L2 proficiency and whether it was facilitated by the presence of suffixes shared in L1 and L2. Our results confirmed the influence of language proficiency at each stage of morphological awareness. However, the hypothesis of an advantage of suffixes shared between French and English was not confirmed as no clear advantage was found for those suffixes. Our findings are discussed in line with the morphological congruence hypothesis and compared with the previous results in the literature.

Keywords: bilingualism, morphological awareness, proficiency

3.1 Introduction

3.1.1 English as a second language

English is the most popular second language (L2) learned worldwide (Ethnologue, 21st edition website). As its acquisition involves economic, political, and social challenges, countries develop strategies to improve their population's proficiency in English. In France, for instance, political measures were taken in 2005 under the "Plan de rénovation de l'enseignement des langues vivantes étrangères" (Plan for the renewal of foreign language teaching) to improve L2 acquisition by encouraging more interactivity between teachers and students. Despite these political measures, France is still only 31st in the EF rankings (2021), as a country with intermediate to high English proficiency. The EF ranking describes intermediate English speakers as able to understand songs' lyrics, to write professional emails on familiar matters, and to take part in meetings. However, such a level does not permit speakers to interact efficiently in a professional context, to fully understand movies and TV shows, and/or to read newspapers. A lower inclusion of English culture in France is likely to explain the discrepancy between France and countries with a higher English L2 proficiency. France has been more protective of its own culture and language than other countries such as The Netherlands, Denmark or Norway, which provide deeper and earlier English immersion. These countries start teaching English to children at a very young age with specific teaching strategies. They encourage exchange programs and provide English media in the original language (movies, TV shows, video games) so that there are many opportunities for out-of-school learning (De Wilde et al., 2020; Leona et al., 2021).

Like most non-English speaking countries, France is characterized by sequential bilingual language acquisition, which is the focus of the current study. Unlike simultaneous acquisition, sequential acquisition happens late in development, typically starting in the last years of primary school. Although official curricula state that English must be taught in elementary school, so that pupils can express themselves with common expressions, the systematic teaching -including both written and oral modalities – only starts in grade 6. At that time, children already have well-established literacy skills in French, mostly acquire English through writing and reading (Cornut et al., 2021), and live in a context where L2 is not much present. We are interested in knowing more about the morphological mechanisms underlying French speakers learning English in such a context.

3.1.2 Morphological awareness

A characteristic L2 learners rapidly notice is that many words take different inflections, depending on the message conveyed. The more forms verbs, nouns and adjectives can take, the more difficult a language is to learn as L2 (the small number of inflections is arguably one of the advantages of English as L2). However, relations between form and meaning also provide advantages when they introduce redundancy and systematicity in a language. This is the case for derivation, where affixes allow language users to express and understand meanings related to pre-acquired concepts. Thus, English speakers can understand words such as "redundancy", "systematicity" and "derivation" when they know the words redundant, systematic and derive.

English vocabulary includes about ten thousand word families, consisting of stem words and transparent derivations (Brysbaert et al., 2016; Nation, 2006) which implies that many words are complex and composed of more than one morpheme (the smallest meaning-bearing unit of a language; (O'Grady, 1997)). Interestingly, while inflections are given much explicit attention in L2 classes because of the acquisition challenges they cause, the beneficial role of morphological relations is often left implicit (Kotzer et al., 2021). Sánchez-Gutiérrez and Hernández Muñoz (2018) recommended including explicit morphological instruction in English-Spanish learners, to support the development of morphological awareness abilities (see also Rastle et al., 2021).

In this paper, we focus on derivational awareness (as part of morphological awareness) in L2 speakers, which can be defined as the ability to decompose derived words into roots and affixes (Carlisle, 2000). Derivational morphology refers to word patterns that create new words by either adding meaning and/or changing the syntactic category of a word. For example, the suffix *–ness* can be used to turn an adjective into a noun referring to "the state of" (vividness refers to the state of being vivid). Similarly, one can derive adjectives from verbs by adding the suffix *–able* to indicate the feasibility of an action (e.g., swimmable, washable, thinkable). This process allows language users to express more meanings and helps listeners understand meanings of previously unencountered words (which is more difficult when the derivation does not follow the usual pattern of the language, as in "vanity" or "edible").

Tyler and Nagy (1989) provided an overview of the linguistic and cognitive constraints involved in derivational awareness. Other authors focused on the categorization of tasks (Apel, 2014) or formulated a reading model of morphology (Levesque et al., 2021), but up to now Tyler and Nagy (1989) is the main developmental model making a distinction between three stages: the lexical semantic knowledge stage, the syntactic knowledge stage, and the distributional knowledge stage. The lexical semantic knowledge is the first aspect to be acquired. It refers to the ability to recognize the complex internal structure of words (e.g., "worker" [-stem "work" + affix "-er"]) as well as to notice when two or more words share a common morpheme (e.g., to be able to recognize that amazement shares a morpheme with *amaze* but that *apartment* does not share a morpheme with *apart*). This stage can be evaluated with a judgment task (Casalis & Louis-Alexandre, 2000; Duncan et al., 2009; Kuo & Anderson, 2006; Nagy et al., 2006) in which participants are asked to evaluate if there is a semantic relationship between pairs of words.

The second aspect of derivational awareness, syntactic knowledge, refers to the ability to identify the syntactic category of a complex word depending on the suffix used. Speakers knowing the adjective *blind* recognize it as an adverb when it is suffixed with *-ly* (*blindly*) and as a noun when suffixed with *-ness* (*blindness*). This stage can be evaluated with a productive task (Carlisle, 2000; Casalis et al., 2009; Desrochers et al., 2018; Kraut, 2015; Lam & Chen, 2018; Ramírez et al., 2013) in which participants are asked to fill in a missing word in a sentence based on a root word (e.g., they are asked to fill in *breakable* in the sentence: "Remember to pack anything ___ in bubble wrap." [BREAK]).

The third and last aspect of derivational awareness is distributional knowledge. This refers to knowing the constraints of morphological combinations. Speakers at this stage understand that not all suffixes can be attached to every base word. For example, they know that *-ness* can be attached to adjectives but not to verbs, while *-able* attaches to verbs but not to nouns. This

stage can be assessed with a task in which participants are asked to select an acceptable derivation of a given root word among lures (Deng et al., 2016; C. H. Sánchez-Gutiérrez & Hernández Muñoz, 2018). For example, they are asked which derivation of *loud* is acceptable: loudness, loudable, loudify, or loudment.

Derivational awareness, as defined by Tyler and Nagy (1989), refers to the conscious ability to decompose derived words into their counterparts. This is also true for the definition of morphological awareness (e.g., Carlisle, 2000). As morphological relationships can be learned implicitly (i.e., without awareness), other researchers have been motivated to develop implicit tests of morphology knowledge, such as masked priming (Ciaccio & Clahsen, 2020; Rastle & Davis, 2008) or self-paced reading (Jiang et al., 2011). We will return to this issue in the discussion section.

3.1.3 Morphological awareness correlates with language proficiency in L1

Morphological awareness correlates with proficiency in the mother tongue. Studies focusing on monolingual children have evidenced the role familiar morphemes play in the acquisition and use of new vocabulary. In a seminal study, Anglin (1993) showed that children from 6 to 10 year-old use the different morphological structures they acquired to infer word meaning. Later studies confirmed the finding and established the benefit of morphological awareness in monolingual children for vocabulary learning (Kieffer & Lesaux, 2012; McBride-Chang et al., 2008). In addition, morphological awareness is involved in literacy, including spelling accuracy (Casalis et al., 2011; Desrochers et al., 2018; Rispens et al., 2008), and reading fluency and comprehension (Casalis & Louis-Alexandre, 2000; Deacon et al., 2007; Desrochers et al., 2018; Levesque et al., 2019). Note that the contribution of morphological awareness to reading comprehension was also found in adults (Kotzer et al., 2021).

3.1.4 Morphological awareness plays a role in L2 and increases with proficiency

Knowledge about morphological relations benefits L2 acquisition as well. Several studies have documented the contribution of morphological awareness to L2 reading comprehension in children enrolled in immersion programs or studying a L2 in school (D'Angelo et al., 2017; Kieffer & Lesaux, 2008, 2012; Lam et al., 2020; Marinova-Todd et al., 2013; Zhang & Koda, 2014). Fewer studies have addressed the contribution for adults learning L2 in adolescence. Zhang & Koda (2012) reported that Chinese-English adult bilinguals' ability to recognize the root of morphologically complex words contributed both directly and indirectly to L2 vocabulary. On the other hand, it only contributed indirectly to reading comprehension through vocabulary knowledge and lexical inferencing. Along the same lines, Zhang (2021) studied Chinese students acquiring English as L2 and observed that English morphological awareness at the beginning of the academic year predicted reading comprehension ability at the end of the year.

In contrast, several findings suggest that although derivational processing increases as individuals become more proficient in L2, the full skill may be limited to high proficiency levels (Diependaele et al., 2011; Jiang & Kuo, 2019; Kim et al., 2015; Kraut, 2015). Kraut (2015)

evaluated morphological awareness in L2 speakers of English (L1s: Chinese, Portuguese, Arabic and Spanish). She found a significant improvement from intermediate to advanced proficient level. Sánchez-Gutiérrez & Hernández Muñoz (2018) also explored the increase of morphological knowledge through four different tasks focusing on detection skills (i.e., relational knowledge) in English-Spanish bilingual university students. Just like Kraut (2015) they highlighted that students who learnt Spanish in a classroom did improve on Spanish derivational awareness over the three years of the study. This was particularly true for tasks that tapped into a low level of procedural complexity. However, despite three years of practice students did not develop a systematic use of morphological knowledge. They improved at the lowest level of difficulty but even highly proficient L2 speakers struggled at the highest level of difficulty. Jiang & Kuo (2019) further confirmed these results. They tested a large group of Chinese-English college freshmen and found that intermediate to highly proficient bilinguals were able to identify word bases in complex words. In addition, highly proficient bilinguals could interpret the meaning of a suffix. All these skills were absent or less developed in low proficiency readers, leading to the conclusion that morphological awareness increased with proficiency. Furthermore, the research highlighted that even highly proficient bilinguals did not make use of morphology to the same extent as L1 speakers.

3.1.5 Transfer of morphological awareness from L1 to L2?

The observation that L2 learners acquire morphological awareness in L2 has raised the question to what extent they can profit from morphological awareness in L1 (Jarvis & Pavlenko, 2008; Kieffer & Lesaux, 2008; T. J. Kim et al., 2015; Koda, 2000, 2008; Koda & Miller, 2018; Ramírez et al., 2013). This has been investigated mainly by comparing speakers of different languages acquiring English as L2. For instance, Wu & Juffs (2021) examined morphological awareness for English in native speaking university students, Turkish-English bilinguals and Chinese-English bilinguals. Turkish is a language making extensive use of derivational suffixing, whereas this is not true in Chinese. In line with their predictions, Wu and Juffs (2021) observed better performance on a series of morphological awareness tests in Turkish-English bilingual students than in Chinese-English bilingual students. The Turkish-English bilinguals even outperformed the English native speakers on one test (morphological relatedness, in which participants had to indicate that happy and happiness are related but cat and catalogue not). Kim et al. (2015) explored the same question in native English speaking children and bilingual children with Spanish and Chinese as mother tongue. They unexpectedly found that both bilinguals' groups outperformed native English children on morphological awareness tests, which they attributed to the fact that morphology is more likely to be taught explicitly in L2 classes than in L1 classes (see also Rastle et al., 2021). Most importantly, Kim et al. (2015) found that Spanish-English children outperformed Chinese-English children, which the authors interpreted as a result of Spanish and English having more structural similarities in common than Chinese and English.

Jiang et al. (2011) proposed the morphological congruency hypothesis to explain morphological transfer from one language to another. She compared English bilingual adults (L1s: Russian and Japanese) to native English speakers in a self-paced reading task focusing on

inflectional morphology (more specifically, on plural errors). The study highlighted a similar sensitivity to errors involving both plural markers and verbal subcategorization in natives English and Russian-English bilinguals. However, Japanese speakers were only sensitive to verb subcategorization errors. Jiang et al. (2011) interpreted this finding as evidence for the hypothesis that a new morpheme that is incongruent with morphemes known in L1 is harder to acquire than a morpheme congruent with morphemes in L1. As a result, Japanese bilinguals were less sensitive to plural markers, because it is a morphological marker incongruent with their L1. A similar finding was reported by Jiang and Kuo (2019) who observed adverbial suffix learning was easier for Chinese-English bilinguals than verb suffix learning, arguably because of the cross-language differences between the languages.

3.1.6 The present study

The present study was built following Jiang et al. (2011) and Jiang and Kuo (2019) and further investigated to what extent L2 morphological awareness depends on L1 morphological characteristics. We speculated that L2 features absent from L1 will be more difficult to acquire in L2 (also see Callies, 2015). On the contrary, grammatical features existing in L1 should be easier to transfer to L2 (also see Jarvis & Pavlenko, 2008).

In close languages, such as English and French, some morphemes are the same or very similar in both languages. This is the case for the suffixes –age and –able, which are used in both English and French. In contrast, some suffixes are English-specific, for example –less and –ing. Based on the morphological congruency hypothesis (Jiang, 2011), we hypothesized that French learners of English would display better performances in morphological awareness tasks for words with shared suffixes than for language-unique suffixes.

Evidence regarding the importance of shared morphemes in L2 acquisition was published by Lam et al., (2020) with Canadian English-speaking primary school children learning French. The authors assessed awareness of cross-language suffix correspondences (e.g., -ity/-ité) and found that this awareness correlated positively with reading comprehension in L2 after two years of regular French instruction.

We hypothesized that adult L2 learners would profit from morphemic overlap between L1 and L2 to a similar extent as children, certainly at low proficiency levels. We expected that low-proficiency learners would understand derived words with shared suffixes more easily than words with L2-specific suffixes. We also expected that knowledge of derived words with shared suffixes would increase more rapidly as a function of language proficiency than knowledge of derived words with unshared suffixes.

3.1.7 Objectives

In the present research, we addressed two questions: (1) how does morphological knowledge in L2 increase with L2 proficiency, and (2) is the increase faster for morphological relationships shared in L1 and L2? To achieve these aims, we tested French-speaking people of various English L2 proficiency levels on English derived words that either had or did not have French counterparts. Specifically, we predicted that:

- English L2 morphological awareness in French-speaking participants will increase with their English proficiency (see also Jiang & Kuo, 2019; Kraut, 2015; Sánchez-Gutiérrez & Hernández Muñoz, 2018).
- An interaction will exist between proficiency and whether the morphological characteristics are shared with French. For all L2 speakers, we expect that derived words will be easier to process when the derivation exists in the native language as well, but the advantage will be larger for low proficiency L2 speakers (see also Jiang et al., 2011; Kim et al., 2015; Lam et al., 2020).

3.2 Methodology

3.2.1 Material

3.2.1.1 Stimuli

The study consisted of three morphological awareness tasks (see below). For these tasks, we needed 240 English word-pairs (root words and derived words), which were selected from the SUBTLEX-UK database (Van Heuven et al., 2014). We created 3 lists of 80 word-pairs, one unique list for each task. They were all composed of 40 words with shared suffixes and 40 words with unshared suffixes. In two lists, the words with shared and unshared suffixes were matched on length and frequency both for roots and derived words. The last list was composed of pseudowords and only needed to be matched on length. While suffixes were repeated across tasks, no words or pseudowords appeared twice in the experiment. The frequencies of the selected words were retrieved from SUBTLEX-UK. Equivalence of word length and word frequency was checked with the TOST test run with R software (Lakens et al., 2018). This test allows performing two one sided t-tests. One will test the null hypothesis which here assumes that there is an effect. We are thus looking for its rejection ($p<.05$). The other, the alternative hypothesis, will test that the effect falls in the equivalence bounds (lower bounds = -0.4; higher bounds = 0.4). We report one of the sided tests, the one having the smallest test statistic (here, *t*) with the largest *p* value.

The derived English words belonged to two categories. The first category (Shared condition) included words whose suffixes are similar in English and French. This category included the following 10 suffixes[1]: -al, -ion, -ment, -ive, -age, -able, -ous, -er, -ure, -ance. The second category (Unshared suffixes) included words whose suffixes only exist in English. This category included the following 10 suffixes: -ly, -ful, -ship, -ness, -y, -less, -ish, -ing, -hood, -th. The number of suffixes used within each condition as well as their length information is available in Supplementary Material.

[1] The suffixes "-er" and "-ous" in English are equivalent to the the suffixes "-eur" and "-eux", respectively

Suffix productivity refers to the degree to which speakers use a particular suffix frequently and consistently in word formation. Here, we chose the most productive suffixes in English to build three extensive tasks with the same suffixes. The productivity of the suffixes has an impact in monolingual studies (Bertram et al., 1999, 2000) but its impact in bilingual studies seems harder to define because productivity should be considered relative to word formation in both languages. In fact, shared suffixes exist both in English and French which could be used as an argument for more productivity of shared suffixes in French-English bilinguals, even though they might be less productive in English alone. Hence, we chose suffixes that were productive in both the shared and unshared condition so that any effect, if present, would likely to be much smaller than the effect we expected.[2]

3.2.1.2 Morphological awareness tasks

We used three morphological awareness tasks each corresponding to a stage of morphological derivation awareness development (Tyler & Nagy, 1989).

The lexico-semantic task (LST)

The lexico-semantic task corresponds to the first stage of morphological derivation awareness (Tyler & Nagy, 1989), addressing lexical semantic knowledge (Kuo & Anderson, 2006; Nagy et al., 2006).

The task was constructed with a total of 80 pairs of words: 40 word-pairs with shared suffixes and 40 word-pairs with unshared suffixes. Each condition contained 20 transparent word pairs (Transparent Condition) and 20 opaque, pseudo-morphological word pairs (Opaque Condition). The transparent word pairs were semantically and morphologically related pairs (e.g., *washable – WASH*; *really – REAL*) whereas the opaque word pairs were morphologically but not semantically related (e.g., *available – AVAIL*; *gingerly – GINGER*). The full list of word-pairs used in the LST can be found in the supplementary materials. Equivalence of frequencies and length between Transparent and Opaque words was evaluated with the TOST test (Lakens, 2018; see Table 1). We checked whether the difference between the two conditions was significantly larger than d = -.4 and significantly smaller than d = +.4 (i.e., was close to 0). In addition, we asked a group of 20 native speakers to rate the semantic relatedness of the pairs of stimuli on a scale from 1 to 7 points scale. While the semantic relatedness for the transparent pairs was rated at $\bar{x}$= 5.6 (*SD* = 1.7), the opaque pairs were rated at $\bar{x}$= 2.2 (*SD* = 1.7). They were significantly different *t(*78) = -18.88, $p < .001$; *d* = -4,22.

To increase the likelihood that the words were known to late L2 learners, we made sure that both root words and derived words were frequent ($\bar{x}_{\text{frequency}}$: Zipf = 4.4 and $\bar{x}_{\text{frequency}}$: Zipf

[2] We thank a reviewer for this suggestion

= 3.6 respectively). The Zipf scale of word frequency is a logarithmic scale roughly ranging from 1 to 7, with 1-3 representing low frequency words (with a frequency of 1 per million words or less) and 4-7 representing high frequency words (with frequency of 10 per million words or more; see Van Heuven et al., 2014, for more information). Derived words were matched on frequencies ($t(77.11) = 1.73$, $p = 0.04$) and length ($t(75.32) = -1.92$, $p = 0.029$, respectively) and length according to the TOST test. Root words were also matched on frequencies ($t(77.99) = 1.74$, $p = 0.04$) and length ($t(77.22) = 1.67$, $p = 0.049$, respectively) Frequencies and length of roots and derived words, as well as the results of the equivalence tests, are summarized in Table 1.

Table 1

Mean (sd) and TOST equivalence test result for both frequency and length of derived and root words in the Opaque and Transparent conditions for the LST.

		Frequency	***TOST test results***	**Length**	***TOST test results***
Derived words	Transparent	3.8 (*0.9*)	$t(77.11) = -1.73$, $p = 0.04$	6.7 (*1.1*)	$t(75.32) = -1.92$, $p = 0.029$
	Opaque	3.9 (1)		6.6 (*1.3*)	
Root words	Transparent	4.4 (*0.8*)	$t(77.99) = -1.74$, $p = 0.04$	4.1 (*0.9*)	$t(77.22) = 1.67$, $p = 0.049$
	Opaque	4.4 (*0.8*)		4.1 (*0.9*)	

The LST comprised 80 questions. For each pair of words, participants were asked to choose one answer among three (“YES”, “NO” or “NO ANSWER”) to indicate whether the words of the pair were connected/linked semantically to each other. Participants were invited to use the last answer option only if they had no idea at all regarding the connection between the words, and/or if one or two of the words were unknown. Participants were invited to respond spontaneously. For each participant, all word pairs were presented on a single page, in a random order generated by the online software LimeSurvey.

The word completion task (CT)

The word completion task corresponds to the second stage of morphological derivation awareness (Tyler & Nagy, 1989), that is syntactic knowledge (Carlisle, 2000; Casalis et al., 2009).

The CT was a production task in which participants had to complete 80 “fill-in-the-blank” sentences. To complete each sentence, a root word was proposed, and participants had to write the proper derived word. For instance, the participants were presented with the sentence “BREAK. Remember to pack anything _ _ _ _ _ _ _ in bubble wrap.” and had to fill in “breakable”. Sentences were retrieved from the website wordreference.com with the agreement of the website’s owner. Details of the word lists, and the sentences used for the CT are available in Supplementary Material.

For the CT task, we used 80 new word pairs. All pairs consisted of a root word and its derived word. Root words were highly frequent (Zipf $\bar{x}_{\text{frequency}}$ = 4.3) while derived words were moderately frequent (Zipf $\bar{x}_{\text{frequency}}$ = 3.4) hence, probably less familiar. Derived words were matched on frequencies (t(76.17) = 1.86, p = 0.03) and length (t(73.81) = -1.92, p = 0.029). Root words were also matched on frequencies (t(77.4) = 1.86, p = 0.03) and length (t(53.71) = -1.86, p = 0.03). . Frequencies and length of both roots and derived words as well as results of equivalence are summarized in table 2. Among the 80 pairs, 40 were shared with French (e.g., breakable – BREAK) and 40 were not shared (e.g., womanhood – WOMAN).

Table 2

Mean (sd) and TOST equivalence test results for both frequency and length of derived and root words regarding the shared and unshared conditions for the CT.

		Frequency	***TOST test results***	**Length**	***TOST test results***
Derived words	Shared	3.4 (*0.8*)	t(76.17) = 1.86, p = 0.03	8.6 (*1.2*)	t(73.81) = -1.92, p = 0.029
	Unshared	3.4 (*0.7*)		8.6 (*1.5*)	
Root words	Shared	4.3 (*0.7*)	t(77.4) = 1.86, p = 0.03	5.6 (*1.1*)	t(53.71) = 1.86, p = 0.03
	Unshared	4.3 (*0.6*)		5.6 (*1.5*)	

The suffix detection task (SDT)

The Suffixation detection task corresponds to the third stage of morphological derivation awareness (Tyler & Nagy, 1989); that is distributional knowledge.

The SDT consisted of 80 multiple-choice questions. Each question contained the root word (e.g., THINK / WIDOW) and four possible derived words. Among the four, only one was a correctly derived word (e.g., *thinkable* / *widowhood*). The alternatives were three pseudowords serving as distractors. One distractor was a pseudoword with a shared suffix (e.g., *thinkal* / *widowure*), the second was a pseudoword with an unshared suffix (e.g., *thinky* / *widowless)*. And the third distractor was a pseudoword with an ending dependent on the shared/unshared status of the correct derived word (unshared if the latter had a shared suffix and shared in the opposite case). It aimed to balance the number of shared and unshared suffixes within one trial (e.g., *thinkdom* / *widowine*). The full list of suffixes and details of the tasks' word list are available in Supplementary Materials.

Half of the stimuli (40 items) belonged to the Shared suffixes condition (e.g., eatable – EAT) and 40 to the Unshared suffixes condition (e.g., godhood – GOD). To evaluate participants' distributional knowledge, we chose to focus on derived words with frequencies as low as possible ($\bar{x}_{\text{frequency}}$ = 2.1) and on root words with moderate frequencies ($\bar{x}_{\text{frequency}}$ = 4.1). For this task, we could not fully match the frequencies and lengths of the lists for two reasons. First, the task mainly contained pseudowords. Second, the purpose of the task itself (proposing rare, derived words coming from frequent root words) made it difficult to perfectly match the

Shared and Unshared suffix conditions. Frequencies and lengths as well as the tests of equivalence for the Shared and Unshared suffix words pairs are summarized in table 3.

Table 3

Mean (sd) and TOST equivalence test results "for both frequency and length of derived and root words regarding the shared and unshared conditions in the SDT task.

		Frequency	***TOST test results***	**Length**	***TOST test results***
Derived words	Shared	2.1 (*0.7*)	*t*(69.9) = -06.30, *p* = 0.27	8.6 (*1.4*)	*t*(77.35) = -0.47, *p* = 0.032
	Unshared	2.0 (*0.5*)		8.2 (*1.6*)	
Root words	Shared	3.8 (*1.0*)	*t*(62.91) = 0.58, *p* = 0.28	5.6 (*1.4*)	*t*(77.96) = -0.38, *p* = 0.35
	Unshared	4.1 (*0.8*)		5.2 (*1.4*)	

3.2.1.3 Evaluation of participants' language skills

Participants' language proficiency was evaluated with three tasks. The first one was a Translation task broken down into 3 levels of difficulty (Beginner level, Intermediate level, and Expert level). Each level contained 25 words to be translated from French (L1) to English (L2; Casalis et al., 2015). Details of the task are available in Supplementary Materials. Words were always presented in the same order for each level. The Cronbach alpha for this task was $\alpha = .96$ (with 4 items dropped because of lack of variance, i.e., these items were always answered correctly).

The second task was LexTale (Lemhöfer & Broersma, 2012), a yes/no lexical selection task to assess participants' level of English and their vocabulary knowledge. A random list of 40 words and 20 pseudowords was presented to participants who had to indicate which word they knew. Participants were informed that not all stimuli were existing words and that they would be penalized if they selected non-existing words as "known". Words were presented in the same random order to all participants, on the same page. Cronbach alpha for this task was $\alpha = .83$ (with 10 items removed because they correlated negatively with the total scale). The correlation between the Translation task and LexTale was $r = .66$.

The third task was a Questionnaire of English personal history (based on Li et al., 2017). It consisted of a subjective questionnaire about participants' learning and practicing experiences in English. For instance, participants were asked when they started to acquire English, how much they practiced English every day, if they had travelled abroad for more than three months, and what their subjective perspective was about their level in English. Details of the questionnaire are given in Supplementary Materials.

3.2.2 Procedure

Participants were recruited through media announcements. All tasks were run online and together took about an hour. To access the experiment, participants were given a link that would lead them to the experiment handled by the software LimeSurvey. They were directed to a "welcome page" where they had access to the information letter. They were asked to give their consent to participate by pressing the "START" button. Before starting the study, participants were asked to take the tests in a quiet place equivalent to the conditions they would experience if they did the tests on the university campus.

The study began with the Questionnaire of English personal history. Then participants successively completed the LST, the CT, the SDT, the Translation task and finally LexTale. Items were randomized in the three morphological awareness tasks while they were not in the Translation and LexTale tasks for which the order mattered.

3.2.3 Participants

A total of 92 native French-speaking participants ($\bar{x}_{age}$ = 24.4, *SD* = 3.86, of whom 50 women) were recruited online through media announcements and word of mouth. All participants were raised as French monolinguals. Forty-four participants (47.8 %) were completing a master's degree, 16 participants (17.6%) were completing an undergraduate degree, 20 participants (21.7%) had a bachelor's degree, and 12 participants (13.0%) another type of degree (2 participants had a youth worker diploma, 7 participants a PhD, 1 participant a high school degree, and 2 participants an advanced technician's certificate).

Participants were recruited according to two criteria: their mother tongue (French native speakers) and at least some knowledge of English. Participations were voluntary and without compensation whatsoever.

Participants' level of English was assessed with LexTale (Lemhöfer & Broersma, 2012). LexTale allows conversion of the numerical results in line with the Common European Framework of Reference (Capel, 2012), which divides language proficiency into six levels:

- A1: Understand and use a few familiar everyday expressions.
- A2: Communicate in simple and routine tasks.
- B1: Deal with situations that are familiar and of personal interest.
- B2: Interact with a degree of fluency and spontaneity that makes regular interaction with native speakers possible without strain for either party.
- C1: Express ideas fluently and spontaneously in a multitude of contexts without much obvious searching for expressions.
- C2: Close to native language use; Summarize information from different spoken and written sources can reconstruct arguments and accounts in a coherent presentation.

The LexTale results indicated that 12 participants (13%) had a B1 level in English or lower, 50 participants (54%) had a B2 level, and 30 participants (33%) had a C1-C2 level. In the results section, LexTale results were centered to fit the mixed model analysis. On the centered scale (used in the graphs), the B1 level ranges from *-27* to *-14*, B2 from *-13* to *6*, and C1-C2 from *7* to *22*.

On average, participants started to be exposed to English at the age of 8.7 (*SD* = 2.4). They estimated their level to be sufficient (4.5/7, *SD* = 1.4). Details regarding their subjective English proficiency and age of exposition in reading, writing, speaking, and listening are summarized in Table 4.

A group of 32 participants considered themselves as reasonably proficient French-English bilinguals (35%). We investigated how they acquired English as L2 through a multiple-choice question. On this question, 7 participants (22%) chose social interactions as their main source of learning, 5 participants (16%) chose school education, 19 participants (61%) chose both social interactions and school education, and finally, 12 participants (38%) indicated that media (TV, internet video-games) and personal experiences (travelling, reading) were the sources that helped them acquire English. [3]

Table 4

Summary of the characteristics regarding participants of the study – Means (standard deviations).

	Measure	**Participant's response**
Age of exposition		8.7 (*2.4*)
Reading		8.5 (*2.4*)
Writing		8.8 (*2.3*)
Speaking		8.1 (*3*)
Listening		8.1 (*3.3*)
English proficiency (subjective evaluation)	/7 *	4.5 (*1.4*)
Reading		5.0 (*1.2*)
Writing		4.2 (*1.4*)
Speaking		4.3 (*1.4*)
Listening		4.7 (*1.4*)
English Proficiency - Translation	/75	45.7 (*13.6*)
Level 1	/25	23.4 (*2.9*)
Level 2	/25	15.4 (*6.2*)
Level 3	/25	7 (*6*)
English Proficiency – LexTale	percent of success	73.2 (*11.3*)

[3] The question was multiple choice and participants could select more than one alternative, which explains why the percentages exceed 100% (there were 43 selected alternatives in total).

3.3 Results

Statistical analyses were conducted using R software, version 3.5.1 (R Core Team, 2019) and R Studio, version 1.1.456 as well as Jamovi software (2020) for the signal detection analysis. In this study, data were analyzed using linear mixed-effects models (LME; Baayen et al., 2008). This type of analysis was chosen because it allows analyzing data accounting for both subjects' and items' variability (Barr et al., 2013; Judd et al., 2012). Because our data were binary (correct/wrong), we used a binomial generalized linear mixed-effects model, using the glmer function of the lme4 1.1-21 package (Bates et al., 2019). Data and analysis programs are available at the following link: https://osf.io/cv8ny/

Before we look at the individual tasks, Table 5 shows the means and standard deviations for the three tasks and the two proficiency tests. We also looked at the stability of the individual differences. To do so, we calculate Cronbach's alpha for each task. For LST it was .91, for CT it was .98, and for SDT it was .90. This indicates that there were reliable differences between participants. Furthermore, we conducted a correlation analysis between the three various measures. These are shown in Table 5 as well. The correlations were all high ($r > .65$), indicating that all tests largely measured a single proficiency. This was confirmed in a confirmatory factor analysis, which showed that the intercorrelations were accounted for with a single proficiency factor ($\chi^2(5) = 5.72$, $p = .33$; RMSEA = .04).

Table 5

Pearson correlation matrix between the two proficiency tests (translation and LexTale) and the three morphological awareness tasks, LST, CT and SDT. On the diagonal we give the reliability of each task as measured with Cronbach alpha.

	Translation	LexTale	LST	CT	SDT
Translation	.96				
LexTale	.66**	.83			
LST	.70**	.74**	.91		
CT	.82**	.79**	.83**	.98	
SDT	.73**	.65**	.68**	.77**	.90
Mean (sd)	45.7 (*13.6*)	73.2 (*11.3*)	58.6 (*12.7*)	38.6 (*21.5*)	43.1 (*14.1*)

** $p < .001$

3.3.1 Lexico-semantic task (LST)

We started by analyzing the data of the Lexico-Semantic task (LST), in which participants had to indicate whether a root word and a "derived" word were semantically related or not (*washable – WASH* vs. *available – AVAIL*). We used a LME model with three fixed-effect factors for which we analyzed the main effects and their interactions: Condition (type of pair:

Transparent/Opaque - discrete categorical variable, contrast coding [-0.5, +0.5]), the Suffix (Shared with French, Unshared – discrete categorical variable, contrast coding [-0.5, +0.5]),) and the participants' Proficiency in English as measured with LexTale (continuous numerical variable, centered to measure the interaction more accurately). As random-effect factors, the model included random intercepts for participants and items; it also included random slopes by participants for Condition. This model explained the most important part of the variance of our dataset. Further and more complex models failed to converge.

The analysis returned a significant main effect of Condition (estimate = -0.47, SE = 0.15, *z* = -3.087, p = 0.002) with more correct responses on the Transparent trials than the Opaque trials. There was also a main effect of Proficiency (estimate = 0.08, SE = 0.01, *z* = 10.752, p <.001) with better performance for participants with high proficiency in English as measured with the LexTale (the same result was found with the Translation task). The main effect of Suffix was not significant (estimate = -0.121, SE = 0.13, *z* = -0.87, p= 0.383), but the interaction Suffix x Proficiency was significant (estimate = -0.01, SE = 0.003, *z* = -2.65, p = 0.008). As shown in Figure 1, this interaction shows that performance grew faster as a function of L2 proficiency for the Unshared suffixes between English and French than for the Shared suffixes. The interaction Condition x Proficiency was also significant (estimate = -0.02, SE = 0.01, *z* = _2.84, p = 0.004), because high proficiency participants were better on the Transparent trials (yes-responses) than on the Opaque trials (no-response), as shown in Figure 2. The interaction Condition x Suffix x Proficiency was not significant (estimate = -0.007, SE = 0.03, *z* = -0.22, p= 0.824).

Figure 1

Suffix x Proficiency interaction on the proportion of correct responses in LST. Proficiency measured with LexTale and centered.

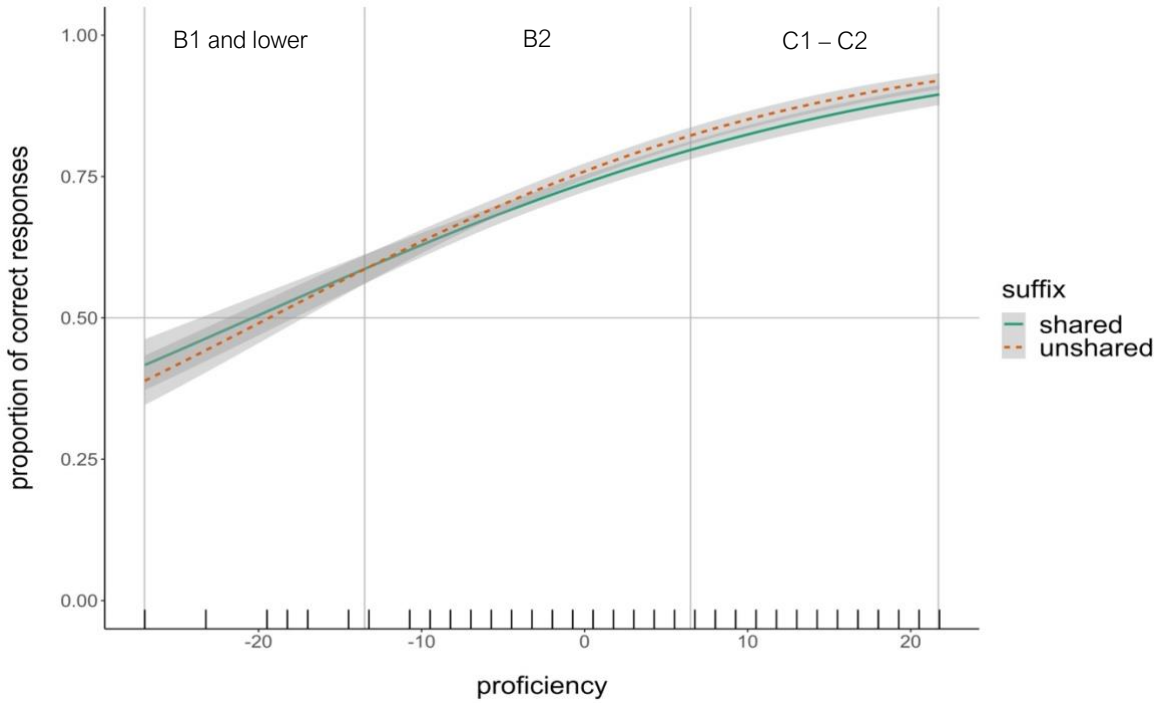
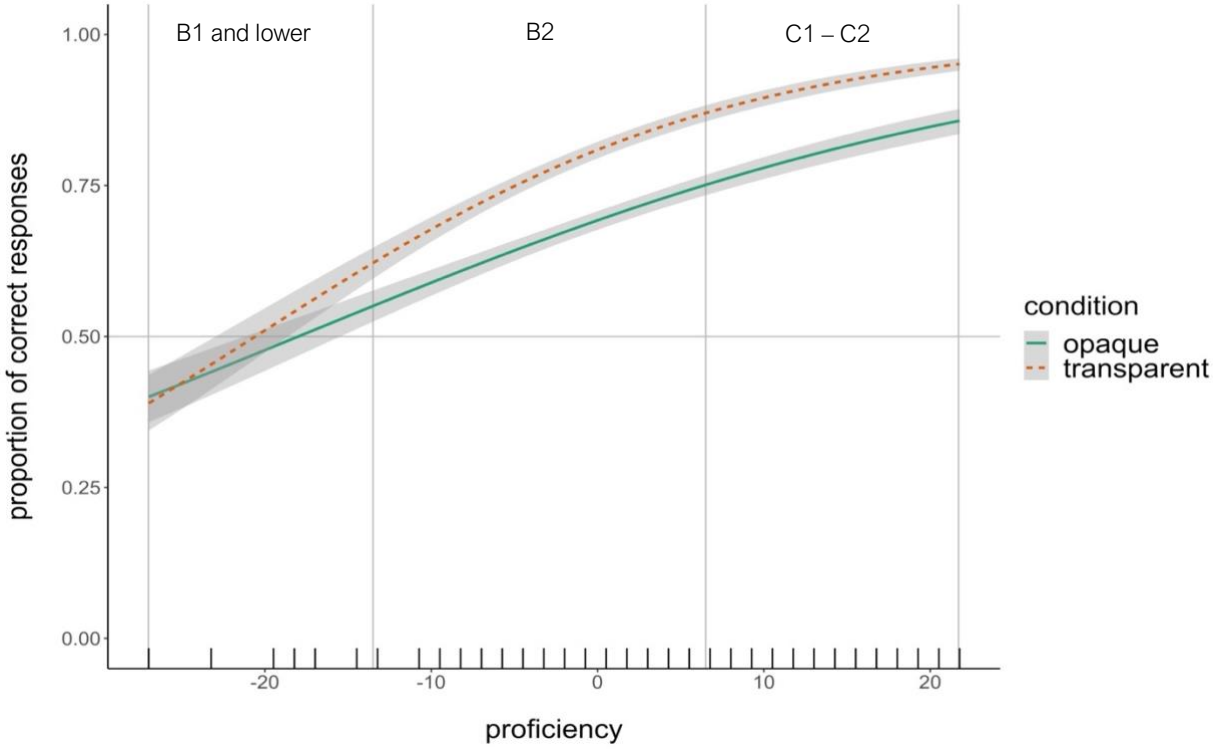


Figure 2

Condition x Proficiency interaction effect on to the proportion of correct responses in LST. Proficiency measured with LexTale and centered.



Because the LST data were the outcome of vocabulary knowledge and a bias to say "yes" or "no", we ran an additional signal detection analysis, which allows us to disentangle sensitivity (word knowledge) from response bias (Stanislaw & Todorov, 1999). For each participant, we calculated hit and false-alarm rates for both the shared and the unshared conditions to calculate sensitivity (*d'*) and bias (*c*). Sensitivity was found by subtracting the z-transformed proportion of incorrect "yes" responses to Opaque items (false-alarms) from the z-transformed proportion of correct "yes" responses to Transparent responses (hits). The bias was calculated by dividing the sum of hits and false alarms by two. Sensitivity and bias were calculated separately for the stimuli with suffixes shared in English and French, and for the stimuli with unshared suffixes.

A generalized linear model was used for the analysis of *d'* and *c*. The analysis comprised two fixed factors, Suffix (contrast: -0.5, +0.5) and Proficiency. The analysis for *d'* returned a significant main effect of Suffix (estimate = 0.54, SE = 0.13, $\chi^2(1) = 17.32$, $p < 0.001$) with more correct responses on the trials with unshared than with shared suffixes. There was also a main effect of Proficiency (estimate = 0.08, SE = 0.01, $\chi^2(1) = 173.97$, $p < .001$) with better performance for participants with high proficiency in English. The interaction Suffix x Proficiency was significant (estimate = 0.03, SE = 0.01, $\chi^2(1) = 6.03$, $p = 0.014$) as shown in the figure 3. In line with Figure 1, it indicated that performance increased more as a function of language proficiency for the unshared suffixes than for the shared suffixes. This result is in line with our second prediction according to which low proficiency L2 speakers will be more dependent on L1-L2 similarity than high proficiency speakers.

The analysis for bias *c* returned a significant main effect of Suffix (estimate = -0.23, SE = 0.06, $\chi^2(1) = 16.10$, $p < 0.001$) with a stronger bias to say "yes" on trials with suffixes not shared in English and French than on trials with shared suffixes. There was also a main effect of Proficiency (estimate = -0.01, SE = 0.01, $\chi^2(1) = 6.53$, p 0.011) with a stronger bias to say "yes" in high proficiency participants than in low-proficiency participants. The interaction Suffix x Proficiency was not significant (estimate = -0.00, SE = 0.01, $\chi^2(1) = 0.29$, p = 0.593) as displayed in the figure 4.

Figure 3

Interaction between Proficiency and Suffix type for sensitivity (d') in LST. Proficiency measured with LexTale and centered.

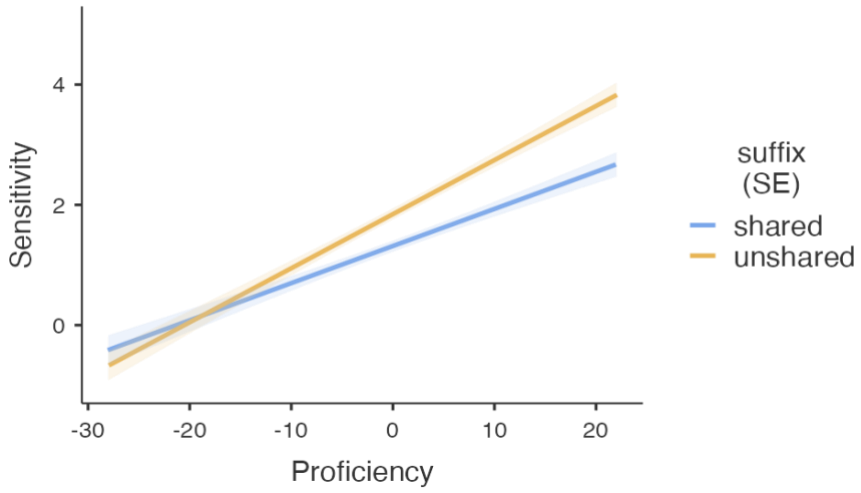
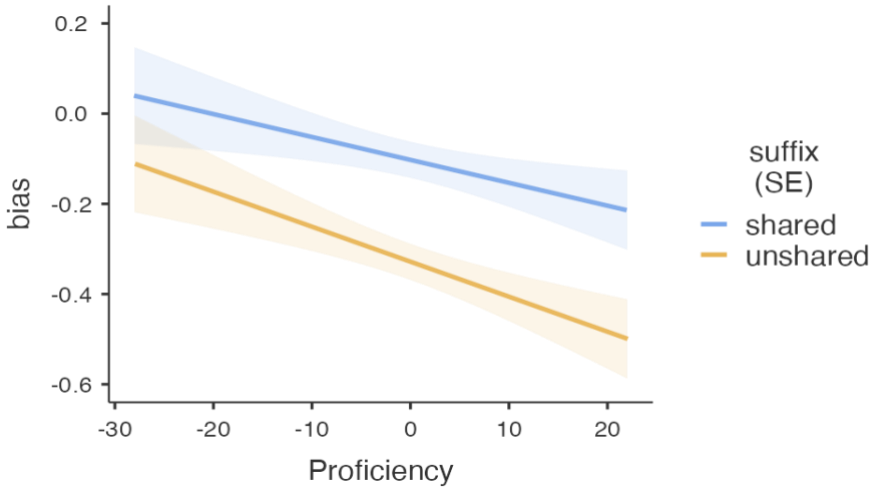


Figure 4

Interaction between Proficiency and Suffix type on the response bias (c) in LST. Proficiency based on LexTale and centered.



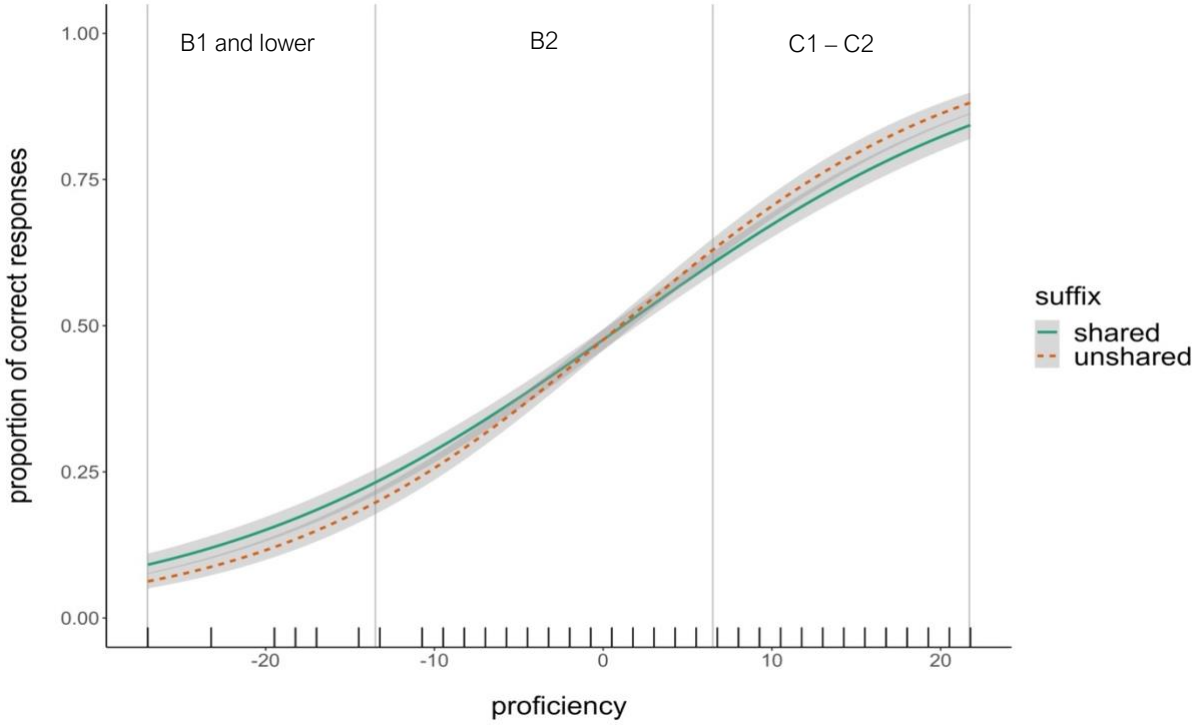
3.3.2 Completion task (CT)

In the CT participants had to fill in the correct derived word given a context sentence and a root word. The data were also analyzed with a LME. The model incorporated two fixed factors for which we analyzed the main effects and the interaction: Suffix (Shared, Unshared – discrete categorical variable, contrast coded) and Proficiency (continuous numerical variable, centered). As random effects, our model included random intercepts for participants and items and slope by participant for Suffix.

The main effect of Proficiency was significant (estimate = 0.145, SE = 0.01, z = 11.26, p <.001) with better performances for participants with high proficiency. Neither the main effect of Suffix (estimate = 0.06, SE = 0.19, z = 0.31, p= 0.755) nor the interaction Suffix x Proficiency were significant (estimate = -0.002, SE = 0.004, z = -0.7, p = 0.491), as can be seen in Figure 5.

Figure 5

Effects of Suffix and Proficiency on the proportion of correct of responses in CT. Proficiency measured with LexTale and centered.



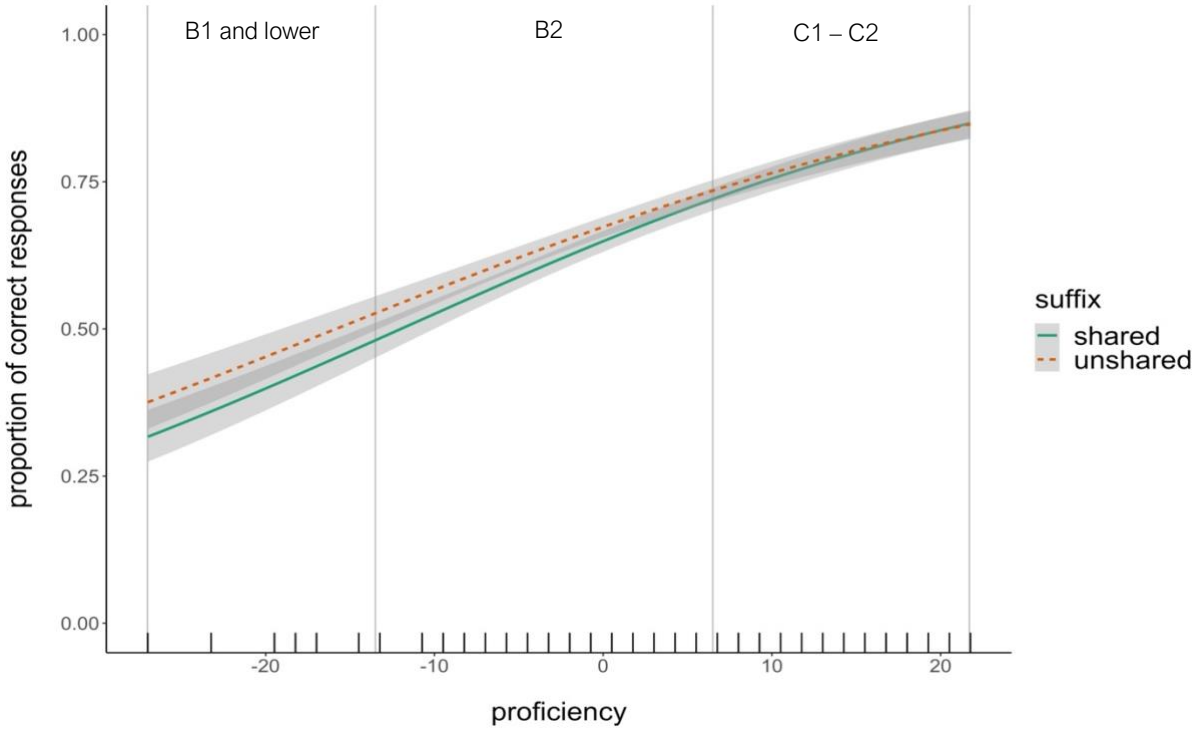
In a further exploratory analysis limited to the words with shared suffixes, we made a distinction between cases in which the English words and their French translations used the same suffix (breakable – cassable) or not (avoidance –évitement), to see if this distinction would make a difference. This was not the case, as we found 43% correct responses for fully overlapping suffixes against 51% for non-overlapping shared suffixes.

3.3.3 Suffix detection task (SDT)

In the SDT, the participants had to select the correct derivation of a root word among three decoys. The LME analysis (same as for CT) gave the following results. The main effect of Proficiency was significant (estimate = 0.06, SE = 0.01, *z* = 10.82, p <.001) with better performance for participants with high proficiency than low proficiency. The main effect of Suffix was not significant (estimate = -0.02, SE = 0.13, *z* = -0.17, p= 0.88), but the interaction Suffix x Proficiency was significant (estimate = -0.01, SE = 0.003, *z* = 2.18, p = 0.03). Visual inspection reveals a better performance on the unshared trials for participants with low proficiency but similar performance for both types of suffixes for the participants with high proficiency (see Figure 6). No post hoc could be conducted due to the continuous nature of the proficiency variable and no other effects came out significant.

Figure 6

Sufix x Proficiency interaction effect according to the correct number of response (proportion) for SDT.



3.3.4 Power analysis[4]

Power analysis is becoming increasingly important in research on bilingualism. Hence, we were interested in knowing how much power our design had to detect differences at the population level. The best way to explore this is by using simulation. We illustrate the approach with the Completion Task (CT), as we think this is the one that most resembles usual language processing conditions.

Assuming no difference between the shared and the unshared suffixes, we can consider the completion task as a Rasch model in which 92 participants respond to 80 stimuli. Whether or not a particular participant gave a correct response to a particular stimulus depends on the ability level of the participant and the difficulty level of the stimulus. A Rasch analysis calculates these values. We used the ltm() package in R (Rizopoulos, 2006) and found that the data could indeed be captured quite well with a traditional Rasch analysis, with participant abilities ranging from -4 to +4, and item difficulties from -2.5 to +2.5 (R code for all analyses can be found at the osf website). This allowed us to generate new datasets with the eRm package in R (Mair & Hatzinger, 2007). Assuming a rectangular distribution of participants between -4 and +4, and a rectangular distribution of items between -2.5 and +2.5, resulted in data that strongly resembled the data obtained in the experiment. The rectangular distributions reflect the investments we made to have participants of very different ability levels, and items distributed across the entire range. To finalize the simulation, we created a proficiency index that correlated r = 0.7 with the participant ability used to create the Rasch data. This reflects the imperfect validity of our proficiency measures (if this is not done, there is no variability left in participants' intercepts, as there is a perfect correlation between proficiency and participant intercept).

A first simulation with no difference between the two suffix conditions confirmed that the mixed-effects analysis we ran was appropriate. Recognition rates corresponded largely to the rates found in the experiment, and power of the main effect of suffix and the interaction with proficiency were around the alpha level of .05. Increasing the difference between shared and unshared suffixes by making the stimuli with shared suffixes d = .4 easier (so that they ranged from -2.9 to +2.1) increased the power of the main effect to .23; the interaction stayed at .05. Further increasing the difference between shared and unshared suffixes gave power = .69 for d = .8, and power = .87 for d = 1.0. For each simulation, the interaction effect stayed at the alpha level. The effect of proficiency was always significant. So, the completion task we used was able to pick up suffix effect sizes larger than d = .8 but was not precise enough to consistently pick up smaller effect sizes.

A similar analysis of the lexico-semantic task (with proficiency and suffix condition as fixed effects) showed that this task required a two-parameter model (with changes in stimulus discrimination in addition to stimulus difficulty). A good approximation of the data was obtained by having participants vary between -2 and +2 (different values are needed because

[4] We thank the editors of the journal for requiring this information.

now the guessing level was .25 instead of 0) and stimuli between -2 and +1. Simulating data according to these parameters resulted in data patterns similar to those obtained in the experiment and the expected power of alpha = .05 when there was no difference between the suffix conditions. Power reached .78 when d = .6. At the same time, we observed that there was an elevated significance level of .15-.20 for the interaction between suffix condition and participant proficiency. Half of the time, the proficiency effect was larger for the unshared suffixes than for the shared ones, whereas half of the time the difference was reverse. This suggests that we should be cautious interpreting significant interactions between proficiency and suffix condition in LST.

The suffix detection task is expected to have power similar to the other two tasks. However, it is not clear how much the task adds, given that all three tasks were obtained from the same sample of participants.

3.4 Discussion

Morphological awareness is defined as the ability to decompose words consciously into their components (Carlisle, 2000). It is a skill that helps increase vocabulary and reading comprehension in monolingual children (McBride-Chang et al., 2008; Rispens et al., 2008). Several studies addressed the matter in bilingual children, who are schooled at least partially in their L2, and showed that morphological awareness also helps the development of a L2 (Altman et al., 2018; D'Angelo et al., 2017; Kieffer & Lesaux, 2008, 2012; Kim et al., 2015). Data regarding adult bilinguals, who learned L2 at school with small exposure to L2, are more recent and the role of morphological awareness in L2 is less evident (Jiang & Kuo, 2019; Koda & Miller, 2018; Kraut, 2015; Sánchez-Gutiérrez & Hernández Muñoz, 2018; Wu & Juffs, 2021).

According to Tyler and Nagy (1989), three developmental stages can be identified in derivational awareness: lexical semantic knowledge, syntactic knowledge, distributional knowledge. The methodology used in studies on late bilinguals has yet to explore all these aspects simultaneously. To have a clearer view of the evolution of morphological awareness in L2, we chose to use three tasks, one for each stage. The first question we wanted to address was whether L2 proficiency was related to every stage of morphological awareness. The second question was whether shared suffix structures between L1 and L2 are better understood than suffixes unique to the L2. This question was inspired by the morphological congruency hypothesis of Jiang (2011), which holds that a morpheme with a similar function in the mother tongue is easier to acquire in L2 than a morpheme that does not exist in the mother tongue. We expected that cross-linguistic similarity would benefit the development of derivational awareness.

As for proficiency, we found that it influences all stages of morphological awareness. Scores noticeably improved with proficiency in the three tasks we used. This finding is consistent with the results observed by Kraut (2015) who found that the ability to make explicit use of morphological knowledge in English improves with proficiency level. The learning process is gradual with lower performances at low proficiency level and increasing with the level of proficiency. Moreover, evidence can be drawn from the difference observed between Transparent and Opaque words. As proficiency increases, bilinguals' speakers appear more

sensitive to composed words. Higher proficiency could underline a better distinction of bases and suffixes. A further interesting finding is that high-proficiency French-English speakers were not reaching ceiling level. This finding is in line with Jiang & Kuo (2019) who found that although morphological awareness improves with proficiency, highly proficient Chinese-English bilinguals still seem to treat highly frequent bases as low frequent bases. In English-Spanish bilinguals, Sánchez-Gutiérrez & Hernández Muñoz (2018) reported that even after three years of study, high proficiency L2 speakers did not develop a systematic use of morphological knowledge. This study, which focused on lexical semantic knowledge, showed that derivation seems hard to grasp for language learners. We find similar results in the present study, using more extensive measures, with 80 word-pairs per task. We tested participants from A1-level up to C2-level. From visual inspection, it looks as if morphological awareness is not present before stage B2 (when L2 speakers can interact with a degree of fluency and spontaneity that makes fluid interactions with native speakers possible). An interesting extension will be to see how well native speakers perform on our tasks relative to C2 bilinguals. Based on the existing evidence, we expect them to do better but probably not at ceiling level either (T. J. Kim et al., 2015; Kraut, 2015).

Even more interesting is that performance on the morphological tasks closely follows performance on the vocabulary tests (LexTale and Translation), as shown in Table 5. This finding suggests that morphological awareness is strongly related to vocabulary knowledge, as has been argued in previous studies (in L1: Carlisle, 2000; Nagy et al., 2006; in L2: Gottardo et al., 2018). Gottardo et al. (2018) found that morphological awareness and vocabulary shared a large degree of variance and suggested that the contribution of morphological awareness to reading comprehension may be mediated by vocabulary. If so, this would suggest that known derived words are stored independently in the learners' lexicon. A different position was taken in a recent article by Wu and Juffs (2021). These authors reported that Turkish-English bilinguals significantly outperformed Chinese-English bilinguals in English derivation, morphological relatedness, and suffix-ordering, even when differences in proficiency were considered. The Turkish group even outperformed a native English group in the morphological relatedness task, which the authors ascribed to the extensive use of suffixes in Turkish. Wu and Juffs (2021) further advised researchers to use tasks with pseudowords for the exploration of morphological awareness in bilinguals independent of lexical/vocabulary knowledge, as pseudowords, by definition, do not have a representation in the mental lexicon. This would be an interesting extension of the present research.

Our second research question was whether derivational awareness is better for suffixes shared with L1 than for suffixes unique to L2. Based on the morphological congruency hypothesis, we expected such a difference, certainly at low proficiency levels. Shared suffixes would be easier to acquire than unique suffixes because of L1-to-L2 transfer. This, however, is not what we found: There was no consistent advantage for English words with shared French suffixes. Only the lexico-semantic task (LST) displayed a pattern that could be wrung in line with the predictions (Figure 1). However, part of the shared suffix effect in LST was due to a bias for saying no to words with shared suffixes (Figure 4). In this task, French-English bilingual students hesitated more about saying yes to words with shared L1-L2 suffixes if they did not recognize the stimulus as familiar (possibly because they anticipated trick items). Furthermore, simulations suggested that chances of finding a spurious interaction effect tended

to be relatively high in this paradigm (20% instead of 5%). Finally, the effect was not corroborated in the other tasks. There was no interaction at all in the word completion task (CT; Figure 5) and an interaction in the *opposite* direction in the suffix detection task (SDT; Figure 6). We expected shared suffixes to benefit all stages of derivational awareness, particularly so for bilinguals with limited knowledge of L2.

We can think of several reasons why we did not observe the expected distinction between shared and non-shared suffixes. First, the L1-to-L2 transfer of morphological awareness could depend on the how morphologically rich the L1 is (Ciaccio & Clahsen, 2020; Jarvis & Pavlenko, 2008; Kieffer & Lesaux, 2008; Kim et al., 2015; Koda, 2000, 2007; Koda & Miller, 2018; Ramírez et al., 2013; Wu & Juffs, 2021). In this view, the transfer would result from the overall morphological complexity of L1 and not from specific morphemes used in both languages (Wu & Juffs, 2021). What would be relevant is the awareness that words can be derived from other words and not the specific suffixes used in the languages. Deng et al. (2017) published evidence that bilinguals can decompose complex L2 words on the condition that they possess a high level of morphological knowledge in L1. Within this view, morphological awareness in L2 depends on the degree of morphological knowledge attained in L1 rather than on whether suffixes are shared in the languages.

A second reason why we failed to find the expected effect may be that the effect was too small to pick up in our studies. As shown by the power simulations, our experiments were not able to reliably pick up differences of d = .4 or smaller, even though we tested 92 participants on 40 stimuli per condition. To assess the severity of this shortcoming, it is important to keep in mind that we were investigating one of the biggest effect sizes in psychological research: the difference in vocabulary size between L1 and L2 speakers. Effect sizes of d > 2.0 are common here (e.g., Brysbaert, 2013), as can also be seen in the results we obtained. Performance on the tasks ranged from virtually at random to nearly perfect. Therefore, we expected quite clear differences between shared and non-shared suffixes as well and we can be quite sure that such effects do not exist. Small differences can be of theoretical interest, but do not have the practical relevance we foresaw.

A third explanation why we did not find the expected difference between shared and non-shared suffixes could be due to schooling. As indicated in the introduction, the benefit of morphological overlap is often left unmentioned in classes (Rastle et al., 2021; Sánchez-Gutiérrez & Hernández Muñoz, 2018). Because of this oversight, students may be deprived of useful strategies to cope with the new language they try to master. Possible benefits of explicit morphological instructions are a worthwhile investigation with tasks such as those used in the present article.

A final reason why we failed to obtain a difference between shared and non-shared suffixes may be that we did not use the best task, even though the tasks we used are quite prominent in current research. Above, we already referred to Wu and Juffs's (2021) suggestion to use pseudowords to avoid the problem of lexical contributions to morphological knowledge. Another possible weakness of the tasks we used may be that derivational overlap could be both a help and a hindrance for good performance. This is particularly true for the two tasks with unclear data (LST and SDT). The fact that *-able* is shared between English and French does not help to decide that *available – AVAIL* are **not** related to each other. The same could be true for deciding that *billionable* is not a possible derivative of *billion*. If so, a better task may be one

in which morphological overlap is always helpful, such as reading for text comprehension. This could be examined with self-paced reading (SPR) or eye tracking.

Jiang (2011) used SPR to examine differences in sensitivity to inflectional morphology between bilinguals with different L1s. Elgort et al. (2018) used eye tracking to investigate L2 word learning. They asked Dutch-English bilinguals to read an English text of 12 thousand words containing 14 new English words that were presented several times (up to 40 occurrences). Participants' eye movements were tracked, and Elgort et al. (2018) documented how word reading times decreased as a function of repetition, with fast speeding during the first 8 encounters and slower improvement later on.

Using SPR or eye tracking, we could compare the learning of new English L2 derived words with suffixes shared or not with French. If the findings of the present study replicate, we expect no difference between both types of words. This is the opposite of what the L1 transfer hypothesis predicts. According to this hypothesis, reading and understanding derived words with shared suffixes should be easier than reading and understanding words with unique suffixes. Such a reading study would be a nice complement to the study presented here.

Altogether, the present study revealed several interesting findings for adult late bilinguals. The results were not in line with our prediction that derived L2 words with a suffix existing in L1 would be easier to process (in line with the morphological congruence hypothesis). Further research with more sensitive tasks is needed to see whether the lack of transfer from L1 to L2 is a general phenomenon or applies only to the tasks we used. At the same time, our results are in line with the existing literature by demonstrating a strong correlation between language proficiency and morphological awareness. Future studies may benefit from developing word learning paradigms to shed light on the processes involved in the use of morphological information in L2.

Supplementary material

For supplementary material accompanying this paper, visit https://osf.io/cv8ny/

CHAPTER 4

SECOND EXPERIMENTAL STUDY

4. Second experimental study: Does morphology shared between L1 and L2 help in reading L2 sentences?

Article in preparation for resubmission: Menut, A., Casalis, S., & Brysbaert, M. (in prep). *Does morphology shared between L1 and L2 help in reading L2 sentences?*

Communication orale: Menut A., Casalis S., & Brysbaert M., (2022, September). Does morphology shared between L1 and L2 facilitate reading in L2? *Barcelona Summer School on Bilingualism and Multilingualism, Barcelona, Espagne*

Grant: foundation I-SITE ULNE

Abstract

We used the self-paced reading paradigm to examine whether complex derived words influence reading comprehension in sentence context. More precisely we investigated the transfer between L1 and L2 at the suffix level. We hypothesized that morphemes acquired in L1 and existing in L2 (shared suffix) would facilitate L2 reading as opposed to morphemes specific to the L2 (unshared suffix). Words with shared suffixes are expected to be read faster than words with unshared suffixes. We also considered proficiency as a continuous variable in our analysis to gather a clear picture of reading comprehension in L2 at all levels. Finally, we hypothesized that L1-L2 morphological sharing and proficiency could interact.

The study focused on how French-English late bilinguals (N=133) processed words (control-non-derived, shared, unshared) in English (L2) sentences. We also compared the late bilingual group with a group of native speakers (control group, N=153). The results displayed a clear effect of proficiency. Higher proficiency led to faster reading times. Some high proficient bilinguals even reached speed reading times of native speakers. However, the L1 morphological transfer to the L2 seemed rather limited. We argue that further investigation may be needed to clarify this effect. Results are discussed in line with the current literature on L2 sentence processing and with the morphological congruency hypothesis.

Keywords: second language processing, self-paced reading, morphology, derivation, cross-language transfer

4.1 Introduction

4.1.1 Similarity of L1 and L2

In Europe, most children are introduced to a second language in primary education around the age of 7-10 (European Commission/EACEA/Eurydice, 2017). More time is dedicated to second language learning in secondary education. By that time, late bilingual speakers possess a stable first language (L1) at lexical, phonological, orthographical, and morphological levels, on which they can build their second language (L2).

Acquiring a second language presents a challenge and learners make use of different strategies to learn the new language. One of the types of information they can use, is the similarity between L1 and L2. Research has suggested that L1 has an impact on the learning of L2 (Callies, 2015; Jarvis & Pavlenko, 2008) and that, late bilinguals may transfer their L1 knowledge to L2 (Cummins, 1979; Koda, 2000, 2008). If such transfer exists, then L1 could be both a help and a hinderance in learning the L2. Late bilinguals could take advantage of characteristics shared between both languages but could also be hindered in learning L2 characteristics that contradict L1 patterns.

Language overlap can be situated at several levels. Verhoeven (1994), for instance, made a distinction between phonological, lexical, syntactic, and pragmatic overlap of Turkish as L1 and Dutch as L2 in primary school children. He observed transfer from L1 to L2 for phonological and pragmatic skills, but not for lexical and syntactic skills. Menut et al. (2022) focused on morphological overlap of French as L1 and English as L2. The latter is the topic of the present paper as well.

4.1.2 Morphological awareness

Conscious morphological processing is mostly investigated with morphological awareness tasks. Morphological awareness is identified as the ability to decompose consciously morphologically complex words into their components (Carlisle, 2000; Kuo & Anderson, 2006). In native languages, morphological awareness contributes to the growth of vocabulary, reading comprehension, and spelling accuracy in children (Casalis & Louis-Alexandre, 2000; Desrochers et al., 2018; Levesque et al., 2019) and in adults (Kotzer et al., 2021). In second language learning studies, similar conclusion have been drawn for bilingual children (D'Angelo et al., 2017; Kieffer & Lesaux, 2008, 2012; Kim et al., 2015; Lam et al., 2020; Ramírez et al., 2013) as well as for bilingual adults (Wu & Juffs, 2021; D. Zhang & Koda, 2012). These studies also showed that L1 could influence L2 vocabulary acquisition.

In a longitudinal study focused on cross-language influences in morphological awareness, Kim et al. (2015) compared 3 groups of children: English native speakers, Chinese-English and Spanish-English bilinguals. The tasks aimed to measure morphological awareness in English. Unexpectedly, the authors observed better performance in the bilingual groups than in the native group. In the bilingual group itself, Spanish-English children outperformed the Chinese-English children. The authors hypothesized that the latter may be due to the structural similarities between Spanish and English. Compared to Chinese-English bilinguals, Spanish-

English bilinguals may benefit from the shared morphological structures between L1-Spanish and L2-English facilitating the inference of complex words' meaning.

Another study conducted by Lam et al. (2020) looked at the effect of cross-language suffix correspondences (-ité/ity; -eur/-or) in English-French children enrolled in a French immersion program. They found that cross-language suffix correspondence predicted French reading comprehension and suggested that both English and French morphological awareness could be used for reading comprehension in L2-French.

A different conclusion was reached by Menut et al. (2022) for late bilinguals, adult French-English speakers. They examined the difference between derivational suffixes shared between L1 and L2 (e.g., -able) and suffixes specific to L2 (e.g., -ing). They hypothesized that if cross-language transfer from L1 to L2 existed in late bilingual adults, then shared suffixes should be processed better than L2-specific suffixes. The difference was evaluated with three tasks involving increasing levels of morphological awareness: lexico-semantic, syntactic and distributional knowledge (Tyler & Nagy, 1989). As expected, in all three tasks participants with higher L2 proficiency performed better. However, no difference was observed between shared and L2-specific suffixes, neither for high proficiency nor low proficiency participants. The results suggested that the transfer of morphological information may be more limited in late adult learners than in children.

4.1.3 Limitations of explicit morphological tasks

One reason why Menut et al. (2022) failed to find a difference between shared and L2-specific suffixes may be that their morphological awareness tasks were suboptimal. Two tasks capitalized on recognition and comparison processes. First, in the lexico-semantic task, participants had to indicate that washable-wash and really-real were related to each other, whereas available-avail and gingerly-ginger were not. The second task was the suffix detection task, where participants had to select the correct derivation for a list of target words (e.g. thinkable, thinkal and thinky; for think). In such tasks, morphemes shared in L1 and L2 (-able) may not be particularly beneficial for performance. Only in the word completion task (third task) did participants not have to choose between illegal combinations of stems and suffixes. Participants were asked to write the correct existing derivation of an existing target word (e.g., BREAK. Remember to pack anything _ _ _ _ _ _ _ in bubble wrap.). Arguably, here L1 and L2 overlap should influence performance. Menut et al. (2022) therefore expected a clear effect of suffix type for this task. This was not the case, possibly because the task, being an explicit morphology task, was not sensitive enough to detect implicit L1-L2 transfer of morphological knowledge.

Cross-language benefit of morphology in late adult bilinguals may be bounded to contexts where the processing of words is implicit and automatic (e.g., text reading). So far, automatic morphological processing has mainly been studied with single-word paradigms, the most popular of which is the masked priming paradigm. In this task, a prime (e.g., breakable) is presented briefly before a target (BREAK) and researchers investigate whether the target is processed more efficiently after a related prime than after an unrelated prime. The main question addressed with this methodology was whether late bilinguals attain native-like priming

effects (Bosch et al., 2017; Diependaele et al., 2011; Kimppa et al., 2019; Pliatsikas & Marinis, 2013; Silva & Clahsen, 2008). So far, the evidence for L1-like priming in L2 is clear for inflections (breaks-BREAK), but much less so for derivational priming (breakable-BREAK).

Bosch et al. (2017) examined how late Russian-German bilinguals process morphosyntactic features of inflected word forms. Their study focused on both behavioral cross-modal priming and ERP methodology. The priming results indicated that native-like processing could be achieved in highly proficient L2 learners. Lexical-semantic reaction times were similar in native readers and highly proficient bilinguals. However, a difference between the two groups remained in ERP processing. Bilinguals displayed temporally and spatially extended ERP responses in L2 when compared to the L1 group. Even though the proficient L2 learners showed native-like lexical-semantic processing in overt responses to inflected words in L2, the grammatical processing as measured by EEG was more demanding and less automatic than in L1 readers. This study further confirmed previous results which highlighted that late bilinguals rely on rule-based decomposition for regular inflected forms (Pliatsikas & Marinis, 2013). Notwithstanding, Bosch et al. (2017) also reinforced the idea that native-like processing does not seem to be easily achieved in L2. Achieving L1-like morphological sensitivity in late bilinguals seems significantly modulated by the proficiency level of the bilinguals (Bosch et al., 2017; Bultena et al., 2014, 2015; Dudley & Slabakova, 2021; Kimppa et al., 2019; Kraut, 2015; Liang & Chen, 2014).

A recent study by Kimppa et al. (2019) provided further evidence for processing of both inflectional and derivational morphology. They studied Finnish-German late bilingual ERPs responses for inflected words, derived words, novel derivations (combinations of an existing stem + suffix) and pseudo-suffixed words (existing stem + pseudo-suffix). ERPs responses were analyzed in both beginning and advanced L2-Germans learners. The results confirmed that although advanced learners showed early automatic parsing both for inflections and derivations, beginners seemed to rely to a greater extent on full forms and this for all types of stimuli used. These results suggested that beginners may not possess decomposed representations of morphologically complex words. Similar results were reported for compound words by Zeng et al. (2019) for Chinese-English bilinguals.

Proficiency is a parameter that must be considered when looking at L2 processing, as increased proficiency leads to more native-like performance. Other parameters, such as age of acquisition, L2 exposure and cross-language similarity have been reported as modulators of L2 processing (Dijkstra et al., 2010).

4.1.4 Sentence processing as an alternative way to study L2 morphological decomposition

Bosch et al. (2017) hypothesized that late bilinguals need more time to process morphological information in L2 than in L1. If so, L2-readers may benefit more from context, which is absent in single-word studies. Sentences are a way to meaningfully frame words and investigate how words' characteristics affect reading fluency. Two techniques are possible: self-paced reading and eye movement registration.

4.1.4.1 Self-paced reading

Self-paced reading (SPR) is a technique in which a sentence is fragmented (Keating & Jegerski, 2015). The fragments can be individual words of the sentence or segments of words (composed of function and content words). Readers control how long they need to process each fragment by pressing on a key to see the next fragment (hence the name self-paced). Reading times are registered. Compared to masked priming, SPR allows researchers to explore when and how readers are facilitated or hindered in meaningful language contexts. The analysis focuses on the critical region of interest and gives information on whether the reader is sensitive to the manipulation introduced. Higher reading times point to more effortful processing (Avery & Marsden, 2019).

In the case of L1-L2 influence, we can expect that L2-specific characteristics may be harder to process than characteristics shared between languages (Tokowicz & Warren, 2010; Tolentino & Tokowicz, 2011). Tokowicz & Warren (2010) provided evidence along this line in a study with English-Spanish bilinguals. Their results highlighted sensitivity to morphosyntactic violations in L2 (Spanish) with reading times slower for morphosyntactic violations similar in L1 and L2 but not for violations unique to L2. Other studies focusing on the influence of L1 on L2 in SPR have evidenced this effect in morphosyntactic (Gerth et al., 2017; Jiang, 2004, 2007; Jiang et al., 2011, 2017; Kim & Wang, 2014; Park & Kim, 2021; Roberts & Liszka, 2013, 2021; Tokowicz & Warren, 2010). To our knowledge, there is no published studies which looked at the morphological transfer between L1 and L2 at the derivational level. As such we based most of our literature review here on existing results on morphosyntactic.

In a series of studies, Jiang and colleagues (Jiang 2004, 2007; Jiang et al., 2011) used SPR to investigate reading times in English-L2 bilinguals with various L1s (Chinese, Japanese, and Russian). The study highlighted different processing towards plural marking errors and verb subcategorization errors as function of the L1. Russian bilinguals were sensitive to both type of errors (plural marking and verb subcategorization) but Japanese only were sensitive to subcategorization errors.Jiang et al. (2011) interpreted this finding by proposing the morphological congruency effect. This effect hypothesizes that in L2 there are congruent and incongruent morphemes. Congruent morphemes are morphemes that are already acquired in L1, while incongruent morphemes are the ones that only exist in L2. The former would be more easily acquired than the latter.

Not all studies support the idea that L1 helps sentence reading in L2 (Dudley & Slabakova, 2021; Juffs, 2005; Papadopoulou & Clahsen, 2003). Papadopoulou and Clahsen (2003), for instance, evaluated highly proficient Greek-L2 bilinguals (L1s: Spanish, German and Russian) on their ability to parse temporary ambiguous sentences containing relative clauses. The results did not show differences between the three bilingual groups. This finding was later supported by Gerth et al. (2017), who evaluated German-L2 bilinguals with different L1s (Italian, Korean, Russian). The results showed that the participants were sensitive to both case and agreement cues in German (L2), but there was no clear evidence for L1 morphological influences on L2.

Another SPR study failing to find a cross-language effect was Bultena et al. (2015), who investigated the influence of verb cognateness in switch sentence processing. In their switching

material, verbs would precede a language switch between L1-Dutch and L2-English. The verbs could be cognate (publiceren-publish) or non-cognate (beloven-promise). Research with single word paradigms established that cognates are processed more efficiently than matched non-cognates. No such effect was found in the SPR study, however. The results showed no facilitation for cognate verbs in either switching direction.

Inflections rely on simpler syntactic rules which could explain why results tend to show stronger evidence of cross-language transfer for inflections compared to other language features. Much more complexity is present in meaning-related language features where rules are more contrasted. If such cross-language exists in derivation, we could expect the effect to be smaller than inflection studies.

4.1.4.2 Eye movement registration

Eye tracking is a methodology which consists of recoding eye movements in reading. It allows recording of real-time processing. Just like SPR, it evaluates cognitive processes (Keating & Jegerski, 2015) that are automatic and unconscious. Eye tracking studies on cross-linguistic effects between L1 and L2 predominantly focused on morphosyntactic processing (Bultena et al., 2014; Dudley & Slabakova, 2021; Elgort et al., 2018; Lim & Christianson, 2014; Van Assche et al., 2013).

Van Assche et al (2013) conducted a study focused on Dutch-English bilinguals in which they evaluated the facilitation effect of cognate verbs (present tense verbs and past tense verbs) in low constraint sentence contexts. Although seen at a later measure of eye movement (go-past time) cognate verbs compared to non-cognate verbs seemed to elicit shorter and fewer regressions in reading. Bultena et al. (2014) further confirmed that the cognate effect for verbs was contingent on proficiency, with low proficiency readers showing stronger cognate verb effects than highly proficient readers.

A recent study by Dudley & Slabakova (2021) suggests that English-French bilinguals may not be sensitive to morphosyntactic mismatches in online contextual processing. They evaluated whether English-French bilinguals would be less sensitive to subjunctive mismatches (subjunctive vs. indicative) given that this structure is less present in English than in French. Results showed that English-French bilinguals were able to differentiate between subjunctive (acceptable) and indicative (unacceptable) in an acceptability judgment task, but they were not sensitive to such mismatch in sentence contexts. Moreover, the longer durations in spillover regions for subjunctive compared to indicative sentences did not seem to be moderated by the L1 grammar. Their results suggested that L1-L2 morphosyntactic differences did not modulate L2 processing patterns but rather that L2 reading was slower that L1 processing. Bilinguals take more time to access lexical representations. Such interpretation further confirms the limitations of bilingual speakers in L2 processing. A similar conclusion was reached by Lim & Christiansan (2014) who studied Korean-English bilinguals and English native speakers processing sentences with violations in English (agreement violations and noun phrase mismatch). They showed that violations in native speakers appeared on the word itself while L2 speakers showed sensitivity on the following word indicating a potentially slower

processing of syntactic information. From these results, it seemed that L2 speakers can process information, but they simply take more time to do so.

Eye tracking data seem to converge with those provided by SPR studies. The difference mainly concerns equipment and costs. Therefore, we chose to explore derivational morphology with SPR first.

4.1.5 The present study

The present study is a continuation of Menut et al. (2022). As described above, Menut et al. failed to find differences between L1-L2-shared suffixes and L2-specific suffixes in three morphological awareness tasks. Arguably, automatic morphological processing may be more sensitive to L1-L2 transfer. Roberts and Liszka (2013) provided an example. They matched German-English and French-English participants on L2 knowledge and asked both groups to read sentences with verb tens violations (past simple tense vs past progressive). The results showed cross-linguistic differences: the French-English bilingual group was sensitive to violations in both simple past and present perfect while the German-English bilingual group did not show a processing cost. The authors hypothesized that the processing differences were due to L1. German does not make a distinction between both tenses, whereas French does. The findings of Roberts and Liszka (2013) suggested that the effect of morphological overlap between L1 and L2 may be limited to automatic processing in sentence reading.

In the present study, we compare both shared and L2-unique morphological features in a self-paced reading (SPR) task, with participants reading English L2 sentences. SPR measures automatic and implicit language processing and creates a situation in which overlap of L1 and L2 is always helpful. Whereas the French-English shared suffix –able may not help in the decision that available is unrelated to avail, it is more likely to help in understanding that the meaning of workable is related to that of work.

Specifically, we had two predictions. First, we expected that reading times would decrease for highly proficient bilinguals compared to less proficient bilinguals. This is a very robust finding with effect sizes often larger than d = 1.5. We also expect that even though highly proficient bilinguals will display faster reading times, they will still be slower than native speakers, indicating slower processing in L2, even at the highest level of proficiency. Second, as predicted by the morphological congruency hypothesis (Jiang et al., 2011), we expected that reading times would be lower for suffixes shared between L1 and L2 than for L2-specific suffixes (Bultena et al., 2014; Van Assche et al., 2013). Finally, an interaction between both effects was possible, given that the differences of the two suffix types could be larger for low-proficiency participants (with long reading times) than for high-proficiency participants. This interaction relies on the hypothesis that low proficiency participants rely more strongly on their L1 than high proficiency participants (Kimppa et al., 2019).

Given that the effect of suffix type is likely to be rather small (Avery & Marsden, 2019; Menut et al., 2022), we put extra efforts to include a considerable number of participants and sentences within the financial and covid-related restrictions we had to operate. We also took into account the guidelines provided by Keating and Jegerski (2015) for running SPR studies.

4.2 Method

4.2.1 Participants

A total of 309 participants were recruited. The group of French-English bilinguals consisted of 156 participants. However, only 133 provided useful data. 13 participants had to be dropped because they did not follow the instructions properly or answered less than 70% of the comprehension questions correctly in the SPR experiment (we considered such a low accuracy rate as evidence for a lack of focus); 10 more declared having another second language than English in the questionnaires. The native English group initially consisted of 172 participants. As in the other group, we had to remove 19 participants who made more than 30% errors on the comprehension questions.

After selection, a group of 133 French-English participants remained ($\bar{x}_{age}$ = 24.2, *SD* = 3.7) and 153 native English-speaking participants ($\bar{x}_{age}$ = 24.45, *SD* = 4.2). Of the French-English bilinguals, 59 completed a master's degree, 40 completed an undergraduate degree, 22 were completing graduate studies, and 12 had a high school degree or a certificate degree. Of the native speakers, 36 completed a master's degree, 95 completed an undergraduate degree, 3 were taking graduate studies, and 19 had a high school degree or a certificate degree.

Participants were recruited via two channels. The first channel was Prolific, a company that recruits online participants, who are compensated for taking part. The website allows researchers to pre-screen participants according to several criteria, so that we could match all samples of bilinguals and native speakers. The second channel consisted of university students who were compensated with course credits (n = 18 bilinguals).

Among the bilingual participants, different measures of English proficiency were collected, which are summarized in Table 1. First, a Questionnaire of English personal history was administered (same as in Menut et al., 2022). The questionnaire was a French adaptation of Li et al. (2017) and assessed the participants' subjective learning and practicing experiences in English. The questions related to different aspects of L2 experience; at what age did they start to speak, listen, read, write in English, how would they evaluate their English level in general and on specific aspects (speaking, reading, writing, listening), what was their daily use of English and did they have a long-time experience abroad (more than 3 months). Details of the questionnaire are given in Supplementary Materials available at https://osf.io/hma74/

On average, participants were first exposed to English at the age of 8.6 (*SD* = 3.4) except for listening, to which they were exposed to at the age of 7.8 (*SD* = 2.8). Participants estimated their proficiency level to be 4.35 on a scale from 1 to 7 (1= bad level; 7 = native level; SD = 1.44). Using the TOST test (Lakens et al., 2018) we evaluated the difference between subjective abilities. We reported here the bound-sided of the test that evidenced the difference. Participants' reading abilities were thought to be better than writing skills ($t(123) = 12.44$, $p < .001$), speaking skills ($t(123) = 9.03$, $p < .001$) and listening skills ($t(123) = 7.06$, $p < .001$).

Table 1

Summary of the characteristics regarding participants of the study – Means (standard deviations).

	Measure	Participant's response
Age of exposition		8.6 *(3.4)*
Reading		8.6 *(1.4)*
Writing		8.7 *(1.5)*
Speaking		8.7 *(1.4)*
Listening		7.8 *(2.8)*
Subjective proficiency	/7	4.3 *(1.4)*
Reading		5.0 *(1.4)*
Writing		4 (*1.5*)
Speaking		4 (*1.4*)
Listening		4.4 (*1.5*)
Translation - French to English	/56	34.5 *(10.7)*
Level 1	/12	11.4 *(1)*
Level 2	/24	15.4 *(5.2)*
Level 3	/20	7.5 *(5.3)*
Translation - English to French	/60	31.5 *(10.4)*
Level 1	/20	6.4 *(4.3)*
Level 2	/20	9.4 *(4.8)*
Level 3	/20	6.4 *(4.3)*
English Proficiency – LexTale	percent of success	78.8 *(10)*

The second proficiency measure we administered was the LexTale (Lemhöfer & Broersma, 2012). This is an English vocabulary test consisting of yes/no questions. Participants were presented with 60 items (40 words and 20 pseudowords). They were asked to indicate which words they knew and which not. They were also informed that not all stimuli were existing English words and that they would be penalized for saying that they knew these "words". Stimuli were always presented in the same order, one at a time. Cronbach alpha for this task was .85 (non-words were reversed in the analysis). Scores on the LexTale can be converted into the six levels of the CEFR (Common European Framework of Reference; Capel, 2012): A1-beginner, A2-Elementary, B1-Intermediate, B2-Upper Intermediate, C1-Advanced, C2-Very advanced. The LexTale results indicated that overall, our participants had B2 level (M = 78.8, SD=10): 3 of the bilingual participants (2,2%) had a B1 level in English or lower, 71 participants (53,4%) had a B2 level, and 58 participants (44,4%) had a C1-C2 level. In the results section, LexTale results were centered for the mixed model analysis. On the centered scale (used in the graphs), the B1 level ranges from -2.65 to -2, B2 from -2 to 0.1, and C1-C2 from 0.1 to 2.13.

Two more objective tasks were administered consisting of translations: one forward and one backward. Both tasks measured participants' vocabulary knowledge. The first one evaluated participants' ability to translate words forward (from L1 to L2). This task was taken from Casalis et al. (2015), which contained 75 French words, and narrowed down to 56 items

based on Menut and al. (2022) which identified some redundant items. Words were always presented in the same order of increasing difficulty, starting from Beginner level (12 items), then Intermediate Level (24 items) and finally Expert level (20 items). The Cronbach alpha this task was 0.94 (with 1 dropped item that correlated negatively). The second translation task aimed to evaluate the participants' ability to translate words backward (from L2 to L1). This task was based on materials published in Mclean & Kramer (2015) from which we selected 60 words. The task aimed to present an increasing difficulty throughout the test, with the easiest level at the beginning and the most difficult one at the end. The words were divided into 3 sections: Beginner, Intermediate and, Expert. There were 20 words in each section. The Cronbach alpha for this task was 0.93 (with 3 items dropped because of lack of variance and 1 dropped because of its negative correlation).

Finally, we asked participants with a multiple-choice question about how they acquired English. They could choose multiple answers to describe their acquisition of English. Among the choices, classroom teaching without any other influence was the smallest source of learning (16%). Social interactions were more frequent (27%). Other sources of learning were Internet, videogames, TVs and reading (37%). The combination of social interactions and classroom teaching was selected as the main source of learning (45%).

4.2.2 Stimuli materials

All stimulus materials are available at https://osf.io/hma74/

The study was based on a self-paced sentence reading task. To create sentences, we first selected 60 derived words to which we associated 60 matched non-derived control words, so that we had 60 pairs of target words (Derived vs. Control).

Within the derived words, half of the words (n = 30) contained a suffix shared between English and French (-ous, -er, -al, -ure, -age, -ment, -able, -ive, -ance, -al). The other half contained an English-specific suffix (-ly, -ing, -y, -ful, -ness, -th, -hood, -ship). For each derived word, the best matching control word was sought. So, the design of the experiment was 2 (Control or Derived) x 2 (Shared, Unshared).

Words were all retrieved from the SUBTLEX-UK database (Van Heuven et al., 2014). To increase the chances that the words would be known to the bilingual participants, we only retrieved high-frequency words, as shown in Table 2. We used the TOST test (Lakens et al., 2018) under the R software to verify that all derived and control words were equivalent in frequency and length. The TOST test examines whether the difference is significantly smaller than two predefined borders (in this study: d = -.4 and +.4).

Table 2

Characteristics of the target words (derived and control words) used in the study. Results of the TOST test are used to confirm the equivalence between the two types of words (d = -.5 ; +5).

		Frequency	TOST tests	Length	TOST tests
Derived	**Shared**	4.4 *(0.4)*	*t*(57.90) = 1.69, *p* = 0.049	8 *(1.3)*	*t*(57.84) = -1.84, *p* = 0.049
	Unshared	4.4 *(0.4)*		8 *(1.3)*	
	TOTAL	4.4 *(0.4)*		8 *(1.3)*	
			Control vs. Derived		**Control vs. Derived**
Control		4.4 (0.5)	*t*(112.38) = 2.25, *p* = 0.013	8 (1.3)	*t*(117.99) = 2.60, *p* = 0.005

For each pair of words, two different contextual sentences were created (version A and B), as shown in Table 3. This allowed us to present all derived and control words to the participants without having to repeat the sentences. Sentences were matched in both versions, so that we did not expect major differences between them (same number of words and position of the target word). In addition, we counterbalanced the presentation of the sentences by distinguishing two lists (1 and 2) so that across participants each word was encountered half of the times in version A and half of the time in version B.

Sentences were declarative main clauses with a Subject Verb Object construction, a structure that is common in both French and English. The Target words were positioned, on average, at the fifth position (x= 5.5; min = 4; max = 7) in a sentence that contained some 12 words (x = 11,88; min = 9; max = 15). 48 sentences were followed by comprehension questions to assess the participants' focus. Questions were randomly presented throughout the experiment so that participants could not anticipate their appearance. Only participants with more than 70% correct responses were kept for the analysis.

Table 3

Sentences created for the critical word pairs and allocation to Version A and B.

Version	List	Sentence
A - derived	1	The evening gown seemed **suitable** for the gala she was going to.
A - control	2	The evening gown seemed **relevant** for the gala she was going to.
B - derived	2	The next event seemed **suitable** for all ages and is wheelchair accessible.
B - control	1	The next event seemed **relevant** for all ages and is wheelchair accessible.

4.2.3 Procedure

Participants were recruited through Prolific. All tasks were run online and together took about 45 minutes for bilinguals and 25 minutes for native speakers. The experiment began with an informed consent form presented with the software LimeSurvey. Participants were informed that pressing the "START" button was associated with them giving consent in participating in the experiment and in us using the anonymized data for scientific manuscripts. Participants were asked to carry out the experiment in a quiet place.

After pressing the start button, participants were first given the subjective questionnaire (on LimeSurvey). They were then redirected to an online host of Psychopy (Pavlovia) where they completed the SPR task and Lextale. Next, they were redirected to LimeSurvey again where they finished the experiment with the two translations task. At the end of the experiment, participants were given feedback about their level of English (based on Lextale) and an explanation of the experiment and the research questions we were interested in.

Instructions for the SPR task were given in English on the computer screen, which informed participants that a total of 120 sentences would be presented to them and that some random sentences would be followed by a question. They were invited to read at a normal pace. The instructions specified that the space bar could be used to pass from one group of words to the next. The task started with 5 practice sentences.

Sentences were aligned to the middle of the screen, written in white Courier font on a grey background. Letter heights were 0.03 of the screen size. Sentences were presented using a moving window paradigm (Just et al., 1982). Sentences were initially dashed, each dash corresponding to a letter, each group of dash corresponding to one word (spaces were visible). Upon pressing the bar, the first segment became visible. When participants pressed again, the previous segment returned to dashes and the next segment became visible. This configuration aimed to resemble normal reading as much as possible: participants could anticipate the size of the sentences and the words.

The presentation of the sentence word by word could make the reading cumbersome, especially for the function words (e.g., "for/the/gala"). To ensure more fluent reading, words were presented in segments of 1 to 3 words long, so that articles and prepositions were not presented separately (i.e., /for the gala/). The critical word, which was always a content word, was presented as one single word in a segment.

Reading times were recorded from the moment of appearance of a segment until it disappeared. A fixation cross was presented in the middle of the screen for 1000 ms in-between sentences. As an indication of focus, participants were asked to answer 48 yes/no comprehension questions out of 120 sentences. Sentences were randomized so that no participant saw the same order of sentences nor could anticipate the appearance of questions. Lists 1 and 2 were also counterbalanced over participants. This made sure that each word (derived and control) was presented in both version of sentences an equal number of times.

4.3 Results

The statistical analyses were carried out with R software, version 4.1.1 (R Core Team, 2019), R Studio. Data were analyzed with linear mixed-effects models (LME; Baayen et al., 2008) because these take into account the fact that both participants and items are random factors (Barr et al., 2014; Judd et al., 2012). Variables were contrast-coded. The dependent variable consisted of reaction times (in milliseconds). The overall model was fitted with log transformed data. This transformation was described as the most effective for SPR analysis (Nicklin & Plonsky, 2020). We used the glmer function of the lme4 1.1-21 package (Bates et al., 2019). Data and analysis programs are available at the following link: https://osf.io/hma74/

English proficiency of the bilingual group

Before we look at the reading data, we evaluated the reliability of the individual differences by calculating the intercorrelations between the three objective proficiency tests (see the method section for the reliability of the tasks). As can be seen in Table 4, all correlations were high (r > .63), indicating that the three tests largely measured a single proficiency. In particular, forward and backward translation correlated as highly with each other as could be expected from their reliability.

Table 4

Pearson correlation matrix between the three proficiency tests (translation and LexTale). The diagonal indicates the reliability of each task measured with Cronbach alpha.

	From L1 to L2	From L2 to L1	LexTale
From L1 to L2	.94		
From L2 to L1	.92**	.93	
LexTale	.61**	.63**	.85
Mean (sd)	34.5 *(11)*	31.5 *(10)*	78 .8 *(10)*

**p<.001

4.3.1 Reading times of bilinguals in the critical region

Among the 133 bilingual participants, 66 saw the first list and 67 saw the second list. Using a two one-sided t-test (TOST test; Lakens et al., 2018) we observed that the absolute difference at the critical region between List 1 and List 2 was significantly smaller than d = .4 (t(111.71) = 2.24, p = 0.01) As a result, List was not retained as a variable of interest in the analyses.

Data over 5 seconds and under 0.2 s (0.82%) were removed before analysis. The LME model included two fixed effects and we analyzed both main effects and their interactions:

Condition[5] (Target type: control, shared, unshared - discrete categorical variable, contrast coding [-1, 0, +1]) and participants' proficiency in English with Lextale (continuous numerical variable, centered). As random-effects, the model included random intercepts for participants, target words, and sentences. A random slope was added for proficiency by words because this improved the fit of the model substantially.[6]

The analysis on the critical region showed a significant main effect of Proficiency (estimate = -.093, SE = .023, t = -3.93, p <.001) with faster reading for high proficient compared to low proficient participants. The other effects were not significant, also not when separate comparisons were made. Neither the comparison between control and shared (estimate = .003, SE = .02, t = .12, p = .90) nor the comparison between shared and unshared (estimate = -.009, SE = .02, t = -.37, p = .71) were significant. No interactions were found (estimates = -.00, SE = .008, t = .05, p = .96 and estimate = -.006, SE = .005, t = -.60, p = .55 for control and unshared respectively).

Figure 1 shows the effects that no difference as a function of word type could be discerned. The descriptive results with a categorical division (given by LexTale) of the response times are displayed in table 5. These are given to facilitate the figures' reading. Note however that the analysis was only conducted with proficiency as a continuous variable.

Table 5

Response times (in sec) to the critical regions (Target and Spillover) as function of Conditions (Control, Shared, Unshared) and Proficiency shown here categorically.

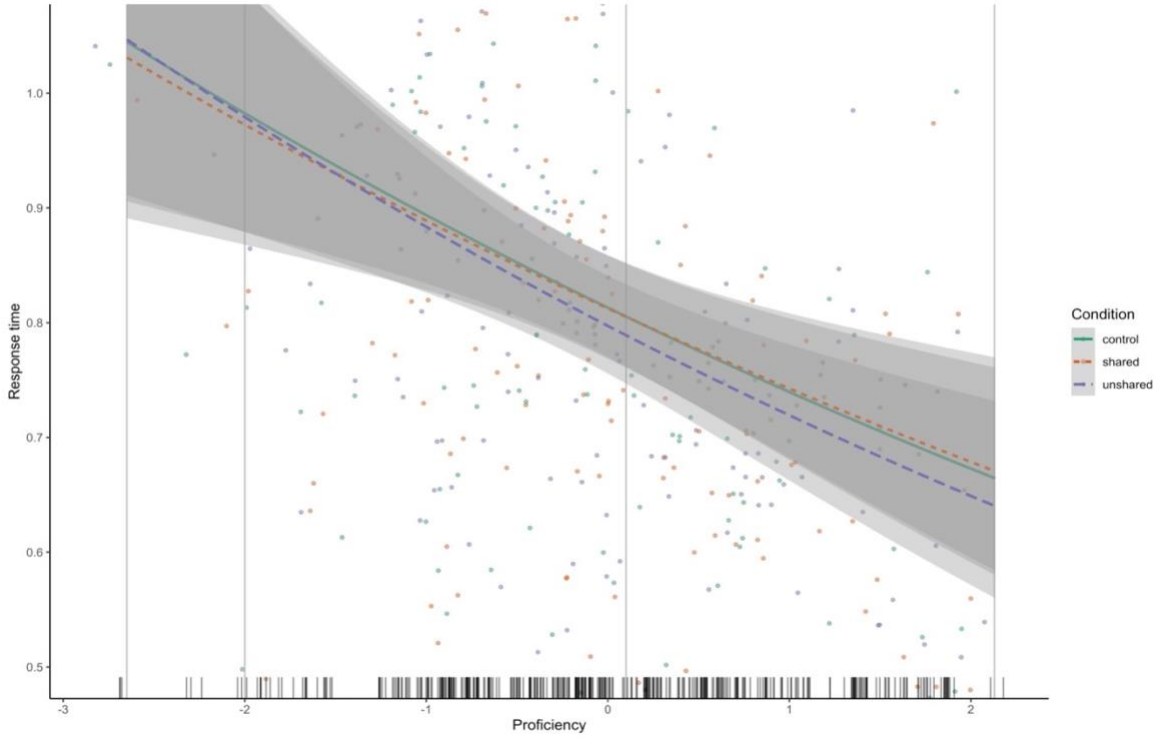
		Control	**Shared**	**Unshared**
Target	B1 and lower	0.87 *(0.34)*	0.87 *(0.37)*	0.95 *(0.53)*
	B2	0.88 *(0.52)*	0.88 *(0.51)*	0.87 *(0.49)*
	C1-C2	0.73 *(0.42)*	0.74 *(0.45)*	0.71 *(0.40)*
Spillover	B1 and lower	0.86 *(0.42)*	0.81 *(0.42)*	0.90 *(0.51)*
	B2	0.83 *(0.46)*	0.80 *(0.44)*	0.86 *(0.50)*
	C1-C2	0.70 *(0.41)*	0.67 *(0.37)*	0.70 *(0.40)*
	means	0.77 *(0.44)*	0.74 *(0.41)*	0.79 *(0.46)*

[5] In this analysis, the controls for shared and unshared suffixes were combined, leaving us with three types of stimuli.

[6] The variance accounted for by the random slopes of proficiency across target words was very small, though, and often resulted in a warning. Therefore, for the simulations in the power analyses it had to be dropped.

Figure 1

Reaction times (in sec) to target word as function of the interaction between Suffix x Proficiency. Proficiency here is measured with LexTale and scaled to CEFR with the vertical lines (B1 and lower, B2, C1-C2). Data is jittered for clarity.



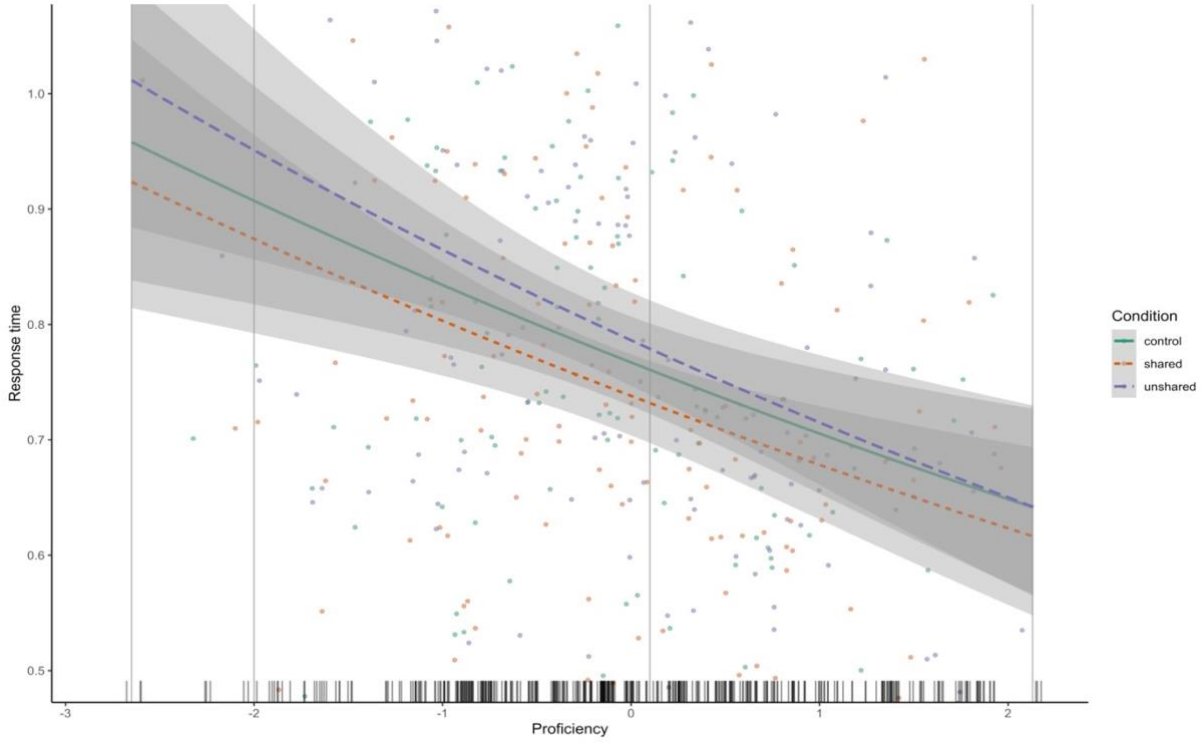
4.3.2 Reading times of bilinguals in the spillover region

In SPR studies, the critical manipulation often has an effect in the region after the critical region (Keating & Jegerski, 2015).[7] To check whether this was the case in our study, we analyzed the spillover region (segment after the critical region). This analysis was based on the same model as that of the critical region analysis. The results showed a significant main effect of Proficiency (estimate = -0.08, SE = 0.022, t = -3.75, p <.001) with faster reading times for highly proficient participants compared to lowly proficient ones. No other effect was significant in the analysis. Suffix type group did not show an effect between the shared and the control condition (estimate = .03, SE = .02, t = 1.26, p = .21), or between shared and unshared condition (estimate = .05, SE = 0.03, t = -1.77, p = .08). No interactions were found (estimates = -.00, SE = .008, t = -.08, p = .93 and estimate = -.01, SE = .009, t = -1.12, p = .26 for control and unshared respectively) as shown in Figure 2.

[7] In our experience, this is particularly true when stimuli are presented word by word, because participants develop a tendency to rapidly go through sequences of function words.

Figure 2

Reading times (in sec) for the spillover region as a function of the interaction between Suffix x Proficiency. Proficiency here is measured with LexTale and scaled to CEFR with the vertical lines (B1 and lower, B2, C1-C2). Data is jittered for clarity.



4.3.3 Comparison of bilinguals with native speakers

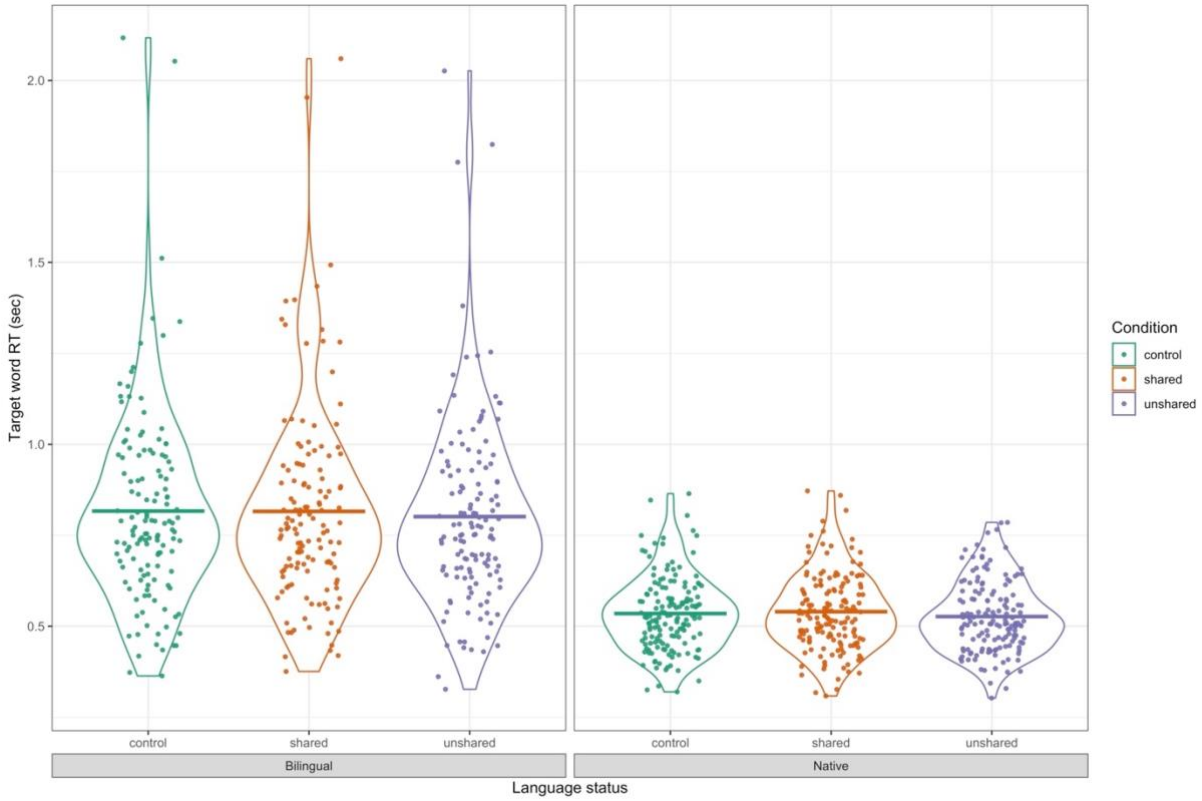
Our design contained an extra group, the native speakers, which made extra controls possible. If derived words and their controls were well matched, we did not expect to see any difference between shared and unshared suffixes in the native speakers, for whom this difference does not exist.

We conducted an LME model on the critical region with two fixed effects in which we analyzed two main effects and their interactions: Condition (control, shared, unshared - discrete categorical variable, contrast coding [-1, 0, +1]) and Language (bilingual, native - discrete categorical variable, contrast coding [-1, +1]). As random effects, the model included random intercepts for participants, sentences, and target words. A random slope was included for language group by words. This model was used as it was the one that best fitted the data.

The analysis showed a significant main effect of Language (estimate = -.36, SE = .03, *t* = -12.74, *p* <.001) with faster reading times for native speakers than bilingual speakers. There was no statistical difference between shared and control words (estimate = .002, SE = .02, *t* = .16, *p* = .87) nor a difference between unshared and control words (estimate = --.009, SE = .02, *t* = -.47, *p* = .64). The interactions between Language and Condition were not significant either (control: estimate -.011, SE = .008, *t* = -1.38, *p* = .17; unshared: estimate -.009, SE = .010, t = -.98, p = .33), as shown in Figure 3.

Figure 3

Reaction times in the Target region of bilinguals compared to native speakers as function of condition (shared, unshared, control).

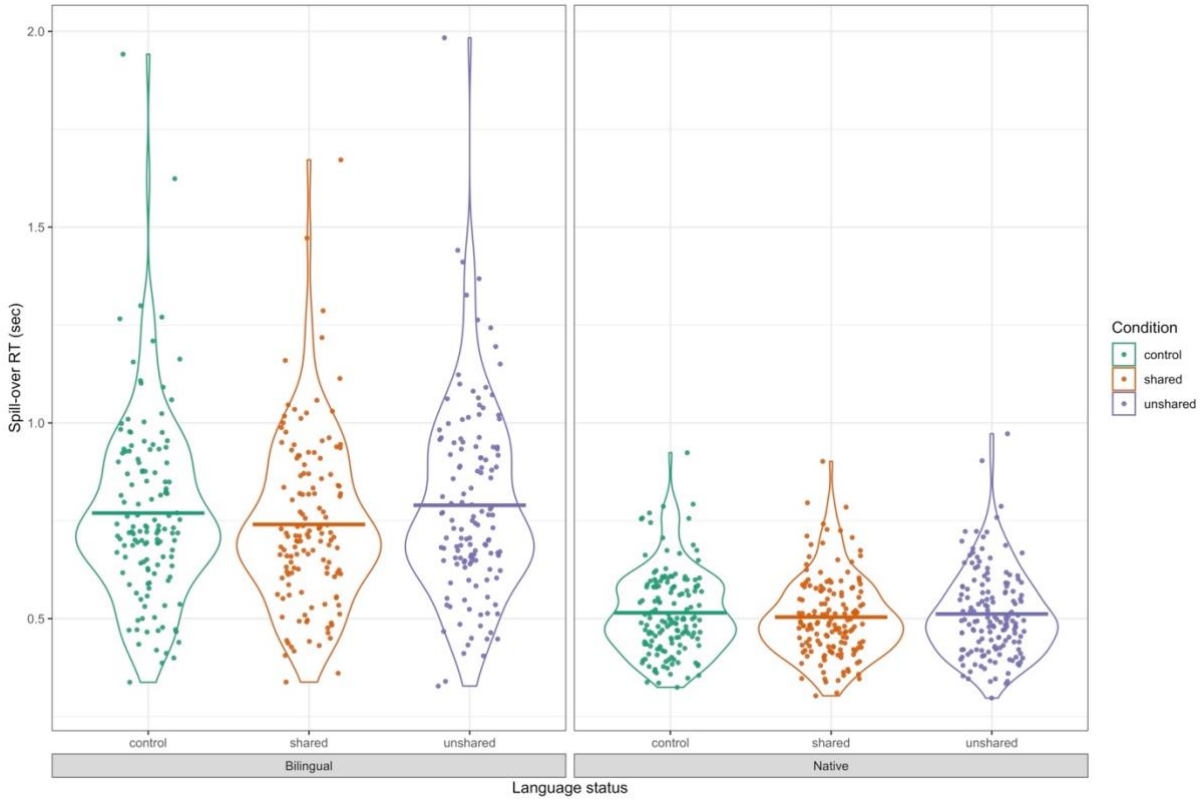


Similarly, to the first analysis, we explored whether any difference would be observed in the spillover region. As the previous model, this model included random intercepts for participants, sentences, and target words and a random slope was included for language group by words.

The results revealed the same pattern as in the critical region. There was a significant main effect of Language (estimate = -.337, SE = .031, t = -10.96, p <.001) with faster reading times for the native speakers than the bilingual speakers. There were no further effects. The difference between shared and control (estimate = -.032, SE = .025, t = 1.27, p = .21) and unshared and shared did not come out significative (estimate = .05, SE = .029, t = 1.79, p = .08). The interaction between Language and Condition was not significant for control compared to shared (estimate = -.016, SE = .017, t = -.93, p = .35) but it was between unshared and shared (estimate = -.043, SE = .020, t = -2.16, p < .05), as shown in Figure 4.

Figure 4

Reaction times in the Spillover region of bilinguals compared to native speakers as function of condition (shared, unshared, control).



4.3.4 Retrospective power analysis

Our study failed to find a clear difference between suffixes shared between French and English versus suffixes that were unique in English or non-derived control words. When we set up the experiment, we wanted it to be powerful enough to be able to detect small differences, given the null effects observed in Menut et al. (2022). Therefore, we had 133 bilingual participants and 30 sentences per condition.

Now that the data are collected, it is possible to run a retrospective analysis of the design power. For instance, we can use the simr() package (Green & Macleod, 2016) to check through bootstrapping how often we would find a significant effect of Condition in the bilingual group if the variable proficiency is left out. For the target region, this was .10 (CI: .05 - .18), in line with the fact that there were virtually no differences between the conditions and a large degree of variability in each condition (Figure 3). Interestingly, for the spillover region we observed a power of .52 (CI: .42 - .62) to obtain a significant effect of Condition, in line with the observation that the average reading time in the shared condition (741 ms) was shorter than the control condition (770 ms) and the unshared condition (790 ms).

By subtracting a small value from the shared condition, we can determine how good the power is for realistic differences. We studied this by taking log10 of the reading time in milliseconds and subtracting multiples of .02 from the values in the shared condition (equal to

a difference of some 30 ms in geometric means; e.g., 691 vs. 724 ms). For the target word, a first subtraction resulted in a power of .57 (CI: .47 - .67) and a second subtraction in a power of .95 (CI: .89 - .98). So, the design was powerful enough to pick up an advantage of some 50 ms in the shared condition.

In the spillover condition, an extra advantage of 30 ms already resulted in a power of 90% (CI: .82 - .95), given the difference already present.

We also examined the power of the design for the native group. The power analysis included Condition as the only variable. It was run on the obtained reading times of the target word and the spillover region (random intercepts for participant, word, and sentence). This analysis confirmed that there were no reliable differences between the conditions, not for the target word (power = .13, CI: 7.1 – 21.2), nor for the spillover region (power = .25; CI: .17 - .35). Subtracting .2 from log10 (RT in ms) in the shared condition increased the power to .60 (CI: .50 - .70) in the target word region and to .98 (CI: .92 – 1.0) in the spillover region. A difference of .2 coincides with a difference of 22 ms in the geometric means (e.g., 479 vs 501 ms). Subtracting .4 (equivalent to a 44 ms difference) gave a power of 100% for the target word region. So, our design was powerful enough to pick up an advantage for shared suffixes of some 30 ms in the native group.

4.4 Discussion

Text comprehension is likely to be enhanced if the reader is able to parse derived words into their constituents. So far, studies focusing on online processing of derived words have privileged the use of single word paradigms (e.g., masked priming). We argue that sentence processing aligns better with real-life reading and thus should be favored to explore cognitive processes in reading. Reaction times (SPR) and eye movements are tools that can be used to investigate sentence reading. We used SPR to explore whether derivational morphology may facilitate word comprehension in sentence context and how proficiency levels would influence the reading.

Our study investigated the processing of derived words by French-English bilinguals reading English (L2) sentences. Target words had suffixes either shared between L1 and L2 (e.g., -able) or only existing in L2 (e.g., - ing). Starting from the morphological congruency hypothesis (Jiang et al., 2011) proposed for morphosyntactic, we hypothesized that shared suffixes could facilitate the processing of derived words, with faster reading times for words with shared than unshared suffixes. We also hypothesized that there could be an interaction between the type of suffix and the L2 reader's proficiency, with the difference between shared and unshared suffixes larger for low proficiency than high proficiency bilinguals.

The first hypothesis focused on the improvement of reading times along with proficiency. We used three proficiency tests and defined proficiency as a continuous variable in our analysis. Our results aligned with what is already known in the literature: higher proficiency leads to faster reading times (Bosch et al., 2017; Bultena et al., 2014, 2015; Diependaele et al., 2011; Dudley & Slabakova, 2021; Kimppa et al., 2019; Kraut, 2015; Liang & Chen, 2014). More importantly, using proficiency as a continuous variable, we could illustrate the full relationship between L2 proficiency and reading times (Figures 1 and 2). In

addition, we were able to compare a large group of L2 readers to a considerable group of L1 readers (Figure 3 and 4).

The literature suggests that even highly proficient bilinguals struggle to achieve native like processing. One possible explanation to this difference is that bilinguals readers would take more time to process the information in L2 compared to native speakers (Bosch et al., 2017; Cop et al., 2015; Kimppa et al., 2019; Kraut, 2015; Kuperman et al., 2022). Our findings do not fully confirm this picture. Most of the bilinguals we tested were slower than the average L1 readers indicating that our bilingual group took more time to process L2 information. But there was a group of 10-15 bilinguals who displayed faster reading than the L1 means (correlations between the conditions were high, so that participants fast in one condition were also fast in the other conditions[8]) and therefore suggests that highly proficient French-English bilinguals could catch up with the average L1 readers (although probably not with the fastest L1 readers). One possible explanation to these results is that high proficiency L2 readers have been as exposed to L2 than the average L1 readers to their native language. Another hypothesis would be that the French-English bilinguals are advantaged by the linguistic closeness. An intriguing finding in this respect was published by Nisbet et al. (2022). They observed that German-English bilinguals were potentially able to reach the same level of English reading performance as native speakers, but that the same was not true for Finnish-English bilinguals. The authors attributed this to the smaller linguistic distance between German and English than between Finnish and English. French is also closer to English than Finnish (Chiswick & Miller, 2005) which could give an advantage to reach native-like processing. Of course, word processing time is only one element of language understanding. Further research with text comprehension tests will have to indicate how often proficient French-English bilinguals reach the average time reading of an English reader.

The second hypothesis we investigated, was based on the morphological congruency hypothesis (Jiang et al., 2011). On the basis of this hypothesis, we reasoned that morphemes existing in L1 and L2 would facilitate L2 derived word processing compared to words with suffixes unique to L2. In a previous study (Menut et al., 2022), we failed to find the expected difference. In three morphological awareness tasks, there were no differences in performance to words with shared or L2-unique suffixes (see also Dudley & Slabakova, 2021; Gerth et al., 2017; Kraut, 2015; Papadopoulou & Clahsen, 2003). The study by Roberts and Liszka (2013) on cross-language effect in reading showed a clear difference in online processing (L2-English and L1s: German, French). That being so, we hypothesized that the L1-L2 effect of morphology may be limited to automatic processing in sentence reading. Our present results partially agree with theirs. Bilinguals seem to have acquired sufficient knowledge to manipulate morphemes consciously (Menut et al., 2022) but L1 derivation does not seem to strongly influence reading processing. One possible reason for the lack of evidence could be that bilinguals did not fully assimilated L2 derivational knowledge and thus do not yet use it automatically while reading. This interpretation was proposed by Dudley & Slabakova (2021) when they failed to find L1

[8] See supplementary material for the correlation matrices on osf

influence on sensitivity to mood-modality mismatches. Another explanation, yet less enthusiastic, is that the morphological congruency hypothesis is limited to inflectional morphology (Jiang, 2004, 2007; Jiang et al., 2011, 2017; Kim & Wang, 2014; Park & Kim, 2021; Roberts & Liszka, 2013, 2021; Tokowicz & Warren, 2010). Derivational morphology delivers information about the meaning of the word itself and would not influence the context's understanding as much as morphosyntactic. The observable impact might be less evident for derivational morphology. However, the inflectional studies mostly examine how reaction times are impacted by morphosyntactic violations. This could increase the chance of finding a cross-language effect in inflectional studies (Avery & Marsden, 2019; Tokowicz & Warren, 2010) and explain the smallest impact in our derivational processing study.

Our results also pointed out an interaction between the type of derived word and the status of language in the spillover region. Logically, native speakers are not influenced by the presence of suffixes "shared" or "unshared" as they all exist in L1. Compared to native speakers, bilinguals showed faster reaction times in the region following derived word with shared suffixes. This seems to suggest that the existing L1 derivational knowledge may influence L2 derivational processing. Considering that bilinguals process the information slower than native speakers (Bosch et al., 2017) the facilitation would spill onto group. This would somehow coincide with the results of Roberts & Liszka (2013). They found that French-English bilingual were sensitive to violations in both simple past and present perfect while the German-English bilinguals' group did not show any processing cost. The authors hypothesized that the processing differences were due to L1. German does not make a distinction between both tenses, whereas French does. Similarly here, English native did not have a distinction between shared and unshared suffixes while French-English bilinguals did. This interpretation is to take with caution as the effect only appeared when the difference between shared and unshared was compared to a native group but not when comparing the effect in the bilingual group itself.

The results of our self-paced reading (SPR) reading study are ambiguous, unfortunately, despite the efforts we made to test a large group of participants on a large number of sentences. On the basis of statistics, we must conclude that the evidence is not strong enough to reject the null hypothesis of no difference between shared and unshared suffixes, in line with Menut et al. (2022). There is a non-significant (tiny) advantage for unshared suffixes on the target word (Table 5 and Figure 1) and there is a fairly larger advantage for shared suffixes in the spillover region (Table 5 and Figure 2). The difference observed in the spillover region close in with what the morphological congruency hypothesis predicted.

In conclusion, we think best not to take position and to wait for more empirical evidence. A future interesting direction would be to conduct an eye movement study in which processing costs can be investigated in more detail. Such a study would require an extensive effort, however, because our retrospective power analysis indicated the need for many participants to get enough power. A group of 130 French-English bilinguals minimum would be needed for a laboratory test with an eye tracker. On the positive side, our present research may simplify the design. First, the data of the L1 group confirmed the quality of the stimulus materials we developed (there were no unexpected differences between the stimulus types). So, this group can be dropped in an eye tracking study. Second, our findings showed that the derived words with shared and unshared suffixes are equivalent to the control words and so that there is nothing untoward to them. As a result, the control words can be dropped as well, resulting in a

design that includes 60 derived words with shared suffixes and 60 matched derived words with L2-unique suffixes. The larger number of observations in the critical conditions will increase the stability of the findings (Brysbaert & Stevens, 2018) and, hence, the chances of being able to observe a small effect. Ideally, such an eye-tracking experiment also includes the stimulus materials of MECO-L2 (Kuperman et al., 2022). MECO-L2 provides eye-tracking records of 543 students reading 12 short English L2 texts; it also includes a battery of tests assessing English proficiency. This would allow for a comparison of the participants taking part in the study to a large sample of bilinguals with different L1s.

An alternative approach would be to use a learning task rather than a reading task. In the present study, we used high-frequency words likely to be known to most L2 speakers. But morphology might help inferring the meaning of **new words** in sentence contexts. A study by Havas et al. (2015) with Finnish and Spanish native speakers showed that their L1 modulated the learning of grammatical features of an artificial language. An interesting prospective study would be to look at the facilitation effect of the L1 suffixes in learning. Would it be easier to learn the meaning of new L2 words with familiar suffixes than with L2-unique suffixes?

All in all, our study has illustrated the increase in L2 word processing speed as French-English late bilinguals become more proficient in English. It also shows that late bilinguals can reach the same speed as average native readers at high proficiency levels, possibly due to the close relationship between English and French. Finally, the data corroborate the finding of Menut et al. (2022) as there is no big advantage for suffixes shared between L1 and L2 compared to L2-specific suffixes. However, the group comparison with the natives let appear a small advantage for shared suffixes, which is of enough theoretical interest to pursue.

CHAPTER 5

THIRD EXPERIMENTAL STUDY

5. Third experimental study: Suffixes common to French and English can both help and hinder learning of English words in late bilinguals

Article in preparation for resubmission: Menut, A., Brysbaert, M., & Casalis, S. (in preparation). *Suffixes common to French and English can both help and hinder learning of English words in late bilinguals.*

Communication orale: Menut, A., Brysbaert, M., & Casalis, S. (2022, September). Do shared suffixes facilitate L2 complex word learning in late bilinguals? - Conference of the European Society for Cognitive Psychology, *Lille, France*

Grant: foundation I-SITE ULNE

Abstract

Morphological knowledge helps in inferring the meaning of new complex words. Learners can decompose the components of the word, which improves comprehension. We investigated to what extent prior morphological knowledge in the native language (L1) can help acquisition in second language (L2) learners. We hypothesized that suffixes common to L1 and L2 (e.g., -able for French-English bilinguals) can facilitate the acquisition of L2 complex words. A group of 76 French-English late bilinguals learned a list of 80 English derived words over two days and were tested additionally one week after the second day of learning. Half of the words had suffixes that exist both in French and in English (e.g., -able in teachable); the other half had suffixes unique to English (e.g., -ness in freeness). The results showed a significant learning effect across learning moments, and consolidation one week later. However, at no time was there an advantage of suffixes common to both languages over L2-unique suffixes. Further analysis revealed that common suffixes only help when they are the same in the French word and the English translation (e.g., -ment in étonnement-amazement). They are a hindrance when a different suffix is used in L2 than in L1 (as in the translation pair glissement-slippage). Inconsistencies in the mapping of common suffixes does not seem to offer a strong and regular help for French speakers learning English. In conclusion, the results tackle the prior hypothesis that similar features between L1 and L2 are facilitative for L2 learning.

5.1 Introduction

Most words in a language are combinations of meaningful units (morphemes). Morphological knowledge refers to the (tacit) use of morphemes which in turn helps language learners understand (and create) new complex words (e.g., handful = hand + -ful; Tyler & Nagy, 1989). Morphological knowledge helps speakers understand both the meaning and the grammatical functions of words (Kotzer et al., 2021). Adding the suffix –ful, for example, usually leads to an adjective (beautiful), although a noun is also possible (handful).

Morphological knowledge is built up as a result of exposure to the language. According to Kuo and Anderson (2006), knowledge of inflectional morphology is acquired before knowledge of derivational morphology and morphology of compounds (e.g., watermelon). As children grow older, morphological awareness becomes an increasingly important predictor of language comprehension (Marinova-Todd et al., 2013; Zhang & Koda, 2012).

The build-up of morphological knowledge in the native language poses an interesting question for adults who learn a second language (L2), because morphological knowledge and awareness are already well consolidated in the first language (L1) by the time they acquire L2. Koda (2008) hypothesized that L1 structures influence the development of structures in L2. Structures similar in L1 and L2 would be easier to acquire than structures only existing in L2. Applied to morphology, one can wonder to what extent adult L2 learners can profit from L1 morphological knowledge when learning new words. The study presented here aimed to bring further insight to this question. But first, we discuss the main findings reported in the literature.

5.1.1 Morphological knowledge contributes to lexical learning in an artificial language

In native language acquisition, morphological knowledge strongly correlates with vocabulary acquisition in children (Casalis & Louis-Alexandre, 2000; Desrochers et al., 2018; Levesque et al., 2019) and in adults (Kotzer et al., 2021). A similar connection has been observed in late bilinguals (Wu & Juffs, 2021; D. Zhang & Koda, 2012).

A particularly interesting line of research is one in which participants are taught new morphemes. For instance, Merkx et al. (2011) investigated the acquisition of novel derivational suffixes in English speakers. Their paradigm consisted of native English speakers learning new nonwords composed of an existing stem plus a novel suffix (e.g.; sleepnept, buildnept, in which -nept referred to the costs associated with an activity). Participants were divided in two training groups: Form training and semantic training. Importantly, in neither group did the teaching include reference to the morphological composition of the words. Neither the stem nor the suffix was explicitly mentioned. Participants were simply taught the full words, focusing on the word itself (form training) or on the meaning of the word (semantic training).

Word learning was measured with a memory recognition task, a lexical decision task, and a definition selection task. The results showed that in the memory recognition task, the participants struggled to reject new combinations of trained stems and trained suffixes. In the definition selection task, information about the new suffixes was generalized: Participants were above chance in selecting the right meaning of untrained stems with trained suffixes. In the

lexical decision task, an effect of training was observed, but only after a night sleep and mostly after semantic training. Merkx et al. (2011) demonstrated that adults can learn to extract the meaning of new suffixes without being explicitly taught so.

Tamminen et al. (2015) further investigated the acquisition of novel affixes combined with existing stems in meaningful novel words (e.g., sleepafe). They examined to what extent morphological learning and generalization were affected by memory consolidation, family size (whether the affix is associated with multiple word stems) and semantic consistency (does the affix modify the meaning of all stems in the same way). They also made a clearer distinction between fast, automatic effects (e.g., in semantic priming) and slow, deliberate effects (in reasoning tasks).

The findings indicated rapid effects of morpheme knowledge in online tasks. But these effects appeared only after a memory consolidation opportunity following training (i.e., after a night of sleep) and only if the training included a sufficient number of unique exemplars. Semantic inconsistency hindered speeded learning. By contrast, learning could be achieved largely irrespective of the constraints (memory consolidation, family size and semantic consistency) in tasks that required slow, deliberate reasoning. The authors interpreted their findings as evidence for two different mechanisms of word suffix learning, which have different cognitive demands and rely on different types of memory representations. The slow, deliberate use of morpheme information relied on episodic memory, stored in the hippocampus, whereas the automatic effects in online language processing depended on lexical information in the neocortex (see Havas et al., 2017; Palma & Titone, 2021; Zion et al., 2019 for further discussion).

Dawson et al. (2021) added interesting new information to the use of suffix in word learning. They examined whether the presence of familiar suffixes in nonwords would help learning the nonwords (both meaning and form). They manipulated the semantic and the syntactic properties of the suffixes and looked at the impact on semantic recall, phonological learning, lexicalization, and spelling of newly learned nonwords. The results showed better recall of nonwords learned with a congruent definition, which suggests that familiar suffixes can help the acquisition of new words and their integration in the mental lexicon.

5.1.2 The influence of L1 morphology in L2 learning

Studies with artificial languages are likely to be relevant for second language research and point to ways in which late bilingual speakers use morphological information in the new language they learn. First, the studies of Merkx et al. (2011) and Tamminen et al. (2015) correspond to the learning of cognates in L2 (words having the same form and meaning in L1 and L2) as it involves the addition of new suffixes to known L1 stems (e.g., abandoning = abandon + -ing; abandon is a cognate stem in French and English). Secondly, the research of Dawson et al. (2021) can apply to the learning of L2 words as it addresses the combination of known affixes with new stems (e.g., laudable = laud + -able; -able is a suffix used both in French and English).

Evidence of L1 influence on L2 acquisition has been reported in phonology, orthography and vocabulary (Aoyama et al., 2004; Callies, 2015; Dijkstra & Rekké, 2010; Escudero et al., 2013; Jarvis & Pavlenko, 2008; X. Li & Koda, 2022; Schepens et al., 2020)

which aligns with the transfer facilitation model (Koda, 2008) predicting that two languages sharing a feature have potential for cross-linguistic transfer.

Studies focusing on transfer between L1 and L2 in morphology have centered mainly on inflectional morphology (De Zeeuw et al., 2013; Havas et al., 2015; Hawkins & Liszka, 2003; X. Li & Koda, 2022; Z. P. S. Luk & Shirai, 2009; Portin et al., 2008). Hawkins and Liszka (2003) were among the first to note that L2 learners have difficulty using inflections absent from their L1. They pointed out, for instance, that Chinese-English bilinguals often make verb tense errors in spontaneous English speech, such as "The police caught the man and *take* him away". These errors are rarely seen in L2 speakers from languages that make a grammatical distinction between present and past tense.

Luk and Shirai (2009) reviewed the evidence of L1 influences on the acquisition of L2 articles, plurals, and possessives morphemes. Their analysis based on different L1 languages (Spanish, Korean, Chinese, and Japanese) showed that morphological similarity between L1 and L2 facilitates the acquisition of the new language, whereas inconsistencies between L1 and L2 delay the acquisition.

Later, Kim et al. (2015) reported that Spanish-English bilingual children performed better on English morphological awareness tasks than Chinese-English bilingual children and argued that this was because Spanish has a richer morphology than Chinese (see also Wu & Juffs, 2021).

A question about the previous findings is which morphological knowledge is transferred from L1 to L2: Is it a general sensitivity that words may contain multiple morphemes, or the transfer of specific morphological information? Havas et al. (2015) reported relevant findings. They investigated how native speakers of Finnish and Spanish learn grammatical features in an artificial language. Both languages differ in their morphological structures. Spanish has a gender rule, which does not exist in Finnish. This could help the acquisition of such a rule in the artificial language. In contrast, Finnish is a language with multiple derivational suffixes, making Finnish speakers more sensitive to affixes. The results showed that the Spanish participants surprisingly did not transfer the gender rule in their L1 to the new, artificial language. The Finnish participants were more sensitive to the morphological structure in recognition tasks and had higher accuracy rates on a gender rule generalization task. Havas et al. (2015) argued that more experience in morphological decomposition (in the Finnish language) provided an advantage when it came to acquire a gender rule in a new language, rather than knowledge of a specific morphological correspondence.

Positive evidence about the transfer of specific morphological information was reported by Miguel (2020), who studied a group of English-Spanish late bilinguals learning a set of new words and evaluated with an intra-word recognition test and a decomposition test. The results showed that all learners, from all proficiency levels, used morphologically related strategies to infer word meaning. Moreover, they showed that increase of proficiency was correlated with stronger use of those strategies. A cognate suffix shared between Spanish and English (-oso/-ous) was recognized more easily by the participants. Interestingly, this was not the case for the suffix -miento in the intra-word recognition task. Two explanations were put forward by the author. The first is that English-Spanish bilinguals may not see -miento as shared with English because it is usually found in cognates (tratamiento/treatment). The second is that English-Spanish bilinguals may confuse -miento (-ment) with -mente (-ly), which would interfere with

recognition. In any case, there was some evidence for L1 to L2 transfer of common suffixes. Importantly, Miguel (2020) used two slow, explicit reasoning tasks. So, the findings may not generalize to spontaneous language use (Taminnen et al., 2015).

One of the most recent studies on the topic (Marks, Labotka, et al., 2022) reported further negative evidence in online language use. The authors investigated English word knowledge in elementary school children. Three groups were studied: monolinguals English, Chinese-English bilinguals, and Spanish-English bilinguals. A comparison was made between compound words (frequent in English and Chinese but not in Spanish) and derived words (frequent in English and Spanish but not in Chinese). The children were asked to produce the stem of morphologically complex words in sentences (e.g., "FRIENDLY. She is my best __." and "SIDEWALK. The baby is learning how to __."). The authors predicted that Spanish–English bilingual children would show advantages in English derivational morphology, whereas Chinese–English bilingual children would show advantages in English compound morphology. However, no differences were found between the bilingual groups in terms of their accuracy on the matched subset of derived items or compound items.

Negative evidence was also reported by Menut et al. (2022). French-English bilinguals were asked to complete three English morphological awareness tasks. First, participants had to indicate whether two words were morphologically related (washable-wash vs. available-avail). Then they completed sentences with a required derived word (BREAK. "Remember to pack anything _ _ _ _ _ _ _ in bubble wrap."). Finally, participants chose which derivation exists for given stem words (THINK – thinkable, thinky, thinkal, thinkdom). Half of the stimuli had suffixes common to French and English (e.g., -able), half had suffixes that were unique to English (e.g., -ness). In no task was an advantage found for suffixes common to L1 and L2.

5.1.3 The present study

The study reported here is a follow-up to our previous studies on the processing of English L2 derived words by French-English bilinguals. In Menut et al. (2022), we found no evidence that suffixes common to English and French lead to better performance in explicit morphology awareness tasks. In Menut et al. (in prep), we presented the same type of stimuli in a self-paced reading task. Again, we found no difference in reading times for derived English L2 words having a suffix that also exists in French than for words with a unique English suffix.

In the current study, we used both types of stimuli in a word learning task. Participants were asked to learn the English translations of French words. Half of the translations had suffixes which exist in both French and English (e.g., -age in slippage), while the other half had suffixes which exclusively exist in English (e.g, -th in growth). We investigated whether the first type would be easier to learn than the second. Rastle et al. (2004) presented evidence that proficient language users automatically parse words that look multimorphemic. So, English readers automatically parse swimmer in swim+er and corner in corn+er, but they do not parse brothel in broth+el. We hypothesized that this processing skill could easily be transferred from L1 to L2, certainly in a direct word translation learning task.

Although we used an explicit L2 learning task, use of morphology was tested implicitly. The study did not mention the fact that the words were derived words and that some suffixes

were similar in French and English. Thus, our task is similar to that of Merkx et al. (2011), Tamminen et al. (2015), and Dawson et al. (2021). We chose this format because it is the most used in formal L2 education. Students are given a list of L1 words with their L2 translations and asked to study them for an exam.

As previous studies pointed to the importance of a consolidation period between study and test (Havas et al., 2017; Merkx et al., 2011; Palma & Titone, 2021; Tamminen et al., 2015), we included one night of sleep between the initial learning and one of the tests. In addition, we had a posttest after one week, to measure long term retention. We also tested participants of various proficiency levels to investigate their effect on this type of learning process.

Specifically, these were the questions we wanted to answer:

- Does the presence of a suffix in L1 help late L2 bilinguals learn new complex words (derived words composed of two morphemes)? Facilitation would occur if derived words with suffixes common to L1-L2 (rêveur – dreamer) are learned more efficiently than derived words with suffixes unique to L2 (amertume – bitterness).

- Does the difference between both types of words depends on the time of learning? If yes, does it appear immediately after initial learning and/or later, after a consolidation time and extra learning?

- Is there an interaction between the type of suffix and L2 proficiency? Does the overlap between L1 and L2 may be particularly helpful for beginning learners? Or on the contrary, does morphological knowledge requires a reasonably good L2 proficiency to be used?

5.2 Method

5.2.1 Participants

A total of 76 French-English late bilinguals ($\bar{x}_{age}$ = 24.2, *SD* = 3.7) took part in the study. It gives us enough power for the comparison of the two types of suffixes (.92 for d = .4) but is at the low end for the interactions if the effect is only present in one condition and not in the other (going from .40 for d = .4 vs. d = .0 up to .92 for d = .8 vs d = .0).

On average, participants were first exposed to English at the age of 8.6 (*SD* = 3.4) except for listening, to which they were exposed slightly earlier, around the age of 7.8 (*SD* = 2.8). Seven out of the 76 participants described English as their third language. Second languages then were Spanish (n= 4), Italian (n=2) and Arabic (n=1). However, when asked about their daily practice of the languages, they indicated they rarely used their second language and used English more. We decided to keep these participants in the analysis. Out of the 76 participants, 7 had a high school degree or a certificate degree, 34 were completing an undergraduate degree, 27 a master's degree, and 8 were completing postgraduate studies. We asked participants to estimate their proficiency level subjectively. On a scale from 1 to 7 (1= bad level; 7 = native level) they estimated their level to be functional ($\bar{x}$ = 4, *SD* =1.2). Looking in detail we observed that participants considered their reading abilities to be better than writing skills (t(75) = 6.70, p <.001), speaking skills (t(75) = 7.32, p < .001) and listening skills (t(75) = 3.07, p = 0.03). Details a presented in table 1.

Recruitment occurred through media announcement and participants were offered a compensation after completing the 3 days of learning. We also accepted university students who wanted to participate and be compensated with course credits.

We gathered information about the participants' language history with a questionnaire (same as in Menut et al., 2022; French adaptation of Li et al., 2017). As a result, information was gathered regarding subjective learning and practicing experiences with English but also details about English's experience: At what age did you start to speak, listen, read, write in English? How would you rate your overall English level? What about your level on specific aspects (speaking, reading, writing, listening)? What is your daily use of your languages? Did you go abroad for a long-time language experience (more than 3 months)? Details of the questionnaire are given in Supplementary Materials available at https://osf.io/gmwsz/.

Table 1

Summary of the characteristics regarding participants of the study – Means (standard deviations).

	Measure	**Participant's response**
Age of exposition		8.6 *(3.4)*
Reading		8.7 *(2.24)*
Writing		8.7 *(2.2)*
Speaking		8.4 *(2.6)*
Listening		7.8 *(2.9)*
Subjective proficiency	/7	3.97 *(1.2)*
Reading		4.7 *(1.4)*
Listening		4.3 (*1.5*)
Writing		3.9 (*1.3*)
Speaking		3.6 (*1.3*)
English Proficiency – LexTale	percent of success (% of correct words - % false alarms on non-words)	72.4 *(9.6)*

We also measured participants' proficiency objectively with the LexTale (Lemhöfer & Broersma, 2012). This test measures vocabulary knowledge through yes/no questions of 60 items (40 words and 20 pseudowords). Participants had to indicate whether or not they knew the words on the screen. They were also told that some words were not real words and that determining them as "words" would be penalized. In this task, the stimuli were always presented in the same order, one at a time. The Cronbach alpha for the LexTale was of .87. LexTale is of particular interest because it allows scores to be converted into the six levels of the Common European Framework of Reference (Capel, 2012): A1-Beginner, A2-Elementary, B1-Intermediate, B2-Upper Intermediate, C1-Advanced, C2-Very advanced. On average, participants in our study had B2 level ($\bar{x}$ = 72.4, SD = 9.6). Details showed that 8 of the bilingual participants (10.5%) had a B1 level and below in English, 48 participants (63.1%) had a B2

level, and 20 participants (26.3%) had a C1-C2 level. In the results section, the LexTale results are shown in the graphs with a centered scale: the B1 level and below ranged from -2.08 to -1.43, B2 from -1.30 to 0.67, and C1-C2 from 0.80 to 2.63. This transformation was necessary to introduce the Lextale as a continuous variable in the analysis of the mixed model.

5.2.2 Stimulus materials

All stimulus materials are available at https://osf.io/gmwsz/. The word stimuli are also shown in the Appendix.

The study was a learning paradigm. We created a list with 80 derived words with half of the English translations having a suffix that exists in French and in English (-ous, -er, -al, -ure, -age, -ment, -able, -ive, -ance). The other half contained an English-specific suffix (-ly, -ish, -ing, -y, -ful, -ness, -th, -less, -hood, -ship). We opted for 40 stimuli per condition, because this optimizes the power of a design with stimuli as a random variable (Brysbaert & Stevens, 2018).

Words were retrieved from the SUBTLEX-UK database (Van Heuven et al., 2014). We aimed to present unfamiliar words to the participants but could not exclude the possibility that some words were familiar (especially for high proficient participants). At the same time, the base words of the new, derived words needed to be as familiar as possible, so that the learning process focused on the suffixes. So, all roots were high-frequency words, but the derived words were low frequency, as shown in Table 2. To verify that all roots and derived words were equivalent in length and frequency we used the TOST test (d = -.4 and +.4; Lakens et al., 2018) under the R software.

Table 2

Characteristics of the target derived words (Common vs. L2-unique) used in the study. Results of the TOST test are used to confirm that the difference between the two types of words is larger than d = -.4 and smaller than d = +.4).

	Derivations		**Roots**	
	Frequency	Length	Frequency	Length
Common	2.83 (*0.98*)	8.18 (*1.20*)	4.49 (*0.62*)	5.05 (*1.01*)
L2-unique	2.83 (*0.87*)	8.18 (*1.52*)	4.50 (*0.65*)	5.08 (*1.51*)
TOST tests	$t(73.56) = 1.72$, $p = 0.044$	$t(73.96) = -1.79$, $p = 0.044$	$t(77.85) = 1.77$, $p = 0.04$	$t(68.17) = 1.70$, $p = 0.047$

Note. Frequency = Zipf values of SUBTLEX-UK (2 = .1 per million words, 3 = 1 per million words, 4 = 10 per million words, 5 = 100 per million words). Length = number of letters in the word.

5.2.3 Procedure

Participants were recruited through media announcements. The experiment began with the welcome page on LimeSurvey on which participants were informed of the purpose of the experiment (learning new English words). They were also given information regarding their consent and their right to withdraw at any time of the learning process. Moreover, by pressing "START" on the screen, they were giving their consent to participate in the study and for their data to be anonymized and used for scientific manuscripts and publication. For each step of the learning, participants were asked to do the experiment in a quiet place.

5.2.4 Learning process

The learning process is summarized visually in figure 1 for clarity. On day 1, participants were exposed to the list of 80 derived words on the online host of Psychopy (Pavlovia). All 80 words were presented in a random order (different for each participant and each learning session) with their French translation. Participants could scroll the screen to see all the words. They were told to learn as many translations as possible in 8 minutes. After those 8 minutes, participants were redirected to LimeSurvey where they first completed part of the Language experience questionnaire. Then, they were presented with two translation exercises. In the forward translation task (from L1 to L2), participants were given 40 French words (20 with common suffixes and 20 with unique suffixes) and asked to give the English translation. In the backward translation task (from L2 to L1), participants were given the other 40 words in English (20 with common suffixes and 20 with unique suffixes) and asked to give the French translation.

After the translation tasks, participants were redirected to Pavlovia to study the list again for 8 minutes. After the study phase, they were redirected to LimeSurvey, completed another part of the questionnaire, and repeated the two translation exercises. The order of translation exercises was the same (forward then backward). However, the words were counterbalanced. The 40 words translated from forward in the first exercise were translated backward in the second exercise and vice versa, so that words were translated both ways across test 1 and test 2. Each exercise presented the words in a new random order, different for each participant.

After the second test, participants were told that the learning session for that day was finished and that they would receive an email the following day to pursue phase 2.

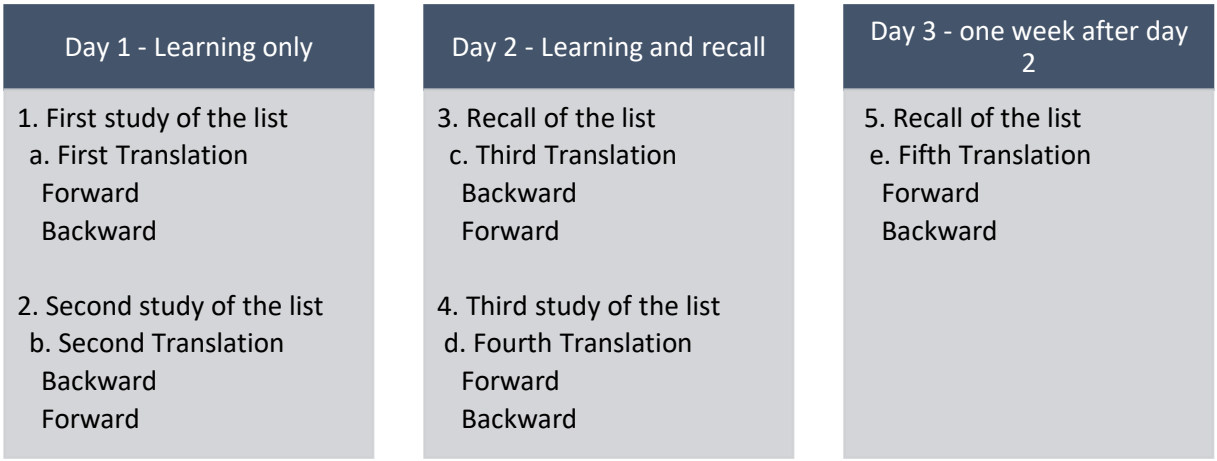
On day 2, participants started with a recall exercise on LimeSurvey. Recall involved both translation exercises with new random permutations. This time participants started with the backward translation and continued with the forward translation (details of the counterbalancing are available at https://osf.io/gmwsz/). After the recall exercises, participants were directed to Pavlovia to study the list of words once more. After the allotted 8 minutes of studying, they were redirected to LimeSurvey, where they completed the third part of the Language experience questionnaire and continued with the translation exercises. As previously, we counterbalanced the order of the words' translation direction. The 40 words translated backward at the beginning of day 2 were now translated forward and vice versa. Again, words presented in a new random permutation, different for each participant.

Day 3 happened one week after Day 2. This session only consisted of recall exercises. Participants translated 40 words forward and then 40 words backwards. Allocation of the words to the conditions was the same as in test 1 on Day 1. The presentation of the words was again randomized across participants. After the exercises, participants completed the last part of the questionnaire and LexTale.

So, the design of the experiment was 2 (Common, Unique suffix) x 5 (Test 1 – Test 5). In addition, we had participant L2 proficiency as a continuous covariate. Translation direction was treated as a control variable. We did not expect differences between both translation exercices (results of the absence of effect is described below).

Figure 1

Summary of the learning of process. Day 1, participants studied the list in two phases. Day 2, participants did the translation tests, studied the list, and did the translation tests again. Day 3, which happened one week after Day 2, participants translated the list one last time.



5.3 Results

The statistical analyses were computed using R software, version 4.1.1 (R Core Team, 2019) and R Studio version 2021.09.0. Mixed effects models (Baayen et al., 2008) was used for the analysis as it accounts for both items and subjects variability but also deals better with missing values (D. J. Barr et al., 2013; Judd et al., 2012). Because the dependent variable was binary (right/wrong), a binomial link was applied to the dataset using the glmer function of the lme4 1.1-21 package (Bates et al., 2019). Z values are reported as outcome of the models.
Data and analysis code are available at https://osf.io/gmwsz/.

5.3.1 Learning session analysis

Before starting the analysis, we used the two one-sided t-test (TOST test; Lakens et al., 2018) to verify that no difference existed between forward translation and backwards translation. We

observed that the difference between the two groups was significantly smaller than d = .4 and larger than d = -.4 (t(149.98) = 1.81, p = 0.03).

To begin the analysis of the data, we first looked at the difference between common and unique suffixes and the interaction with the measurements. To do so, we ran an LME model with two fixed-effect factors for which we analyzed the main effects and their interactions: Condition (Target type: Common/L2-Unique suffix - discrete categorical variable, sum coded [−1, +1])) and Measurement (1st time, 2nd time, 3rd time, 4th time, 5th measurements - discrete categorical variable, also sum-coded). Random intercepts were included in the model for words but there were no random slopes as more complex models failed to converge.

Measurement 5 was taken as reference value for effect of measurement time (long-term retention). Post hoc comparisons showed that there was a significant difference between measurement 5 on day 3 and measurement 1 on day 1 (estimate = -.74, SE = .07, z = -10.5, p < .001). More words were recalled on the 5th measurement compared to the 1st measurement, indicating that participants had learned some of the translations and retained them over one week. As a matter of fact, long-term learning was larger than suggested by the difference between measurement 5 and 1, because measurement 1 took place after the first study phase, which likely had a positive effect on performance as well (there was no pretest before learning started). There was also a significant difference between measurement 3 (first measurement of day 2) and measurement 1 (estimate = -.74, SE = .07, z = -10.48, p < .001), but not between measurement 3 and measurement 5 (estimate = -.06, SE = .07, z = -.82, p = 0.41), indicating that the extra learning of measurement 4 was offset by the forgetting across one week. Learning was further evidenced by the increase in performance between measurement 1 and 2 on day 1 and between measurement 3 and 4 on day 2 (see Figure 2 for details and Table 3 for descriptives results).

Importantly, there was no main effect of suffix condition (estimate = .00, SE = .22, z = .02, p = 0.98), nor for an interaction between suffix condition at measurement 5 and the other measurement times: measurement 1 (estimate = -.06, SE = .09, z = -.64, p = 0.52), measurement 2 (estimate = .12, SE = .09, z = 1.33, p = 0.18), measurement 3 (estimate = -.02, SE = .10, z = -.16, p = 0.87) and measurement 4 (estimate = -.15, SE = .09, z = -1.59, p = 0.11). No difference emerged between common and unique suffixes and this for all measurement times.

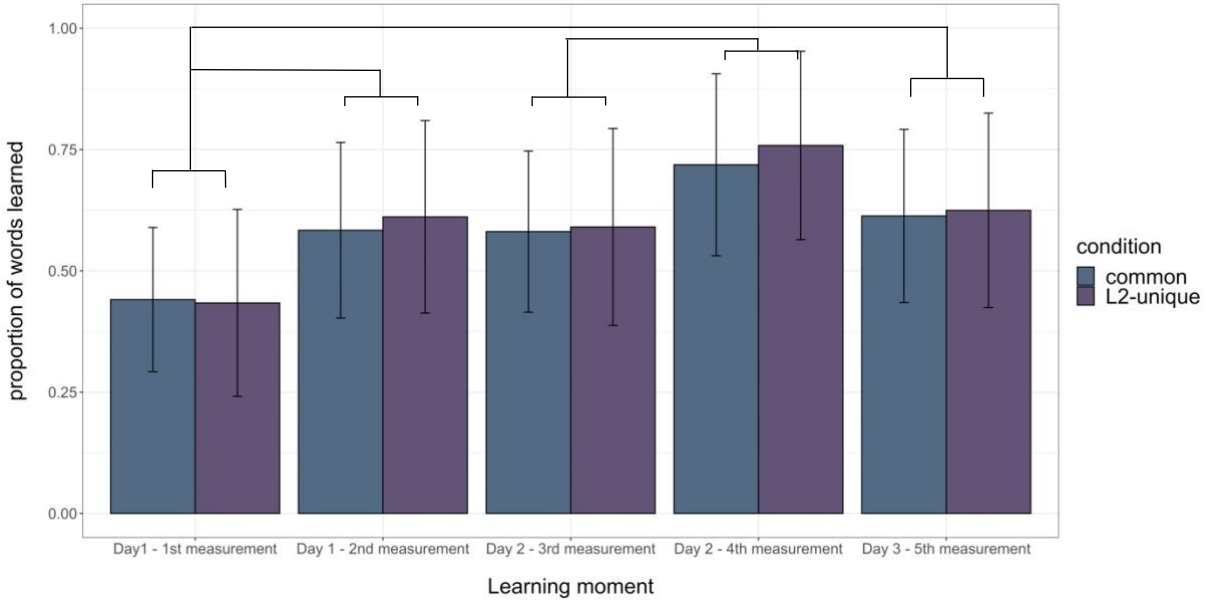
Table 3

Proportion of words correctly recalled (Mean, standard deviations) in the translation tasks as function of Conditions (Common, L2-Unique).

	Common	**Unique**
	Mean (sd)	Mean (sd)
Day 1 – 1st measurement	0.44 *(0.15)*	0.43 *(0.19)*
Day 1 – 2nd measurement	0.58 *(0.18)*	0.61 *(0.20)*
Day 2 – 3rd measurement	0.58 *(0.17)*	0.59 *(0.20)*
Day 2 – 4th measurement	0.72 *(0.19)*	0.76 *(0.19)*
Day 3 – 5th measurement	0.61 *(0.18)*	0.63 *(0.20)*

Figure 2

Proportion of words correctly recalled per measurement (and number of times the list was seen) as a function of Condition (Common, L2-Unique suffix).



Day 1

In the first session, participants studied the words twice and were tested twice. We ran an LME model with three fixed-effect factors for which we analyzed the main effects and their interactions: Condition (Target type: Common/L2-Unique suffix - discrete categorical variable, contrast coded [−0.5, +0.5])), Step of learning (1st time/2nd time - discrete categorical variable, contrast coded [−0.5, +0.5]), and the participants' Proficiency in English evidenced with the LexTale (continuous numerical variable, centered). Random intercepts were included in the model for words and participants. There were no random slopes included in the model for two reasons: The model had a lower fit or did not converge.

The analysis of the first learning day showed a significant main effect of Proficiency (estimate = .40, SE = .10, z = 3.80, p <.001) with high proficiency bilinguals performing better than low proficiency bilinguals. There was also a significant main effect of measurement time (estimate = .85, SE = .09, z = 9.74, p <.001), which indicated that more words were recalled after studying the list anew. These effects are illustrated in figure 3.

There was no effect of suffix condition (estimate = -.12, SE = .25, z = -.49, p = .63) indicating that derived translations with suffixes existing in L1 and L2 and translations with L2-unique suffixes were learned equally well. There was no interaction between suffix condition and measurement time either (estimate = .14, SE = .12, z = 1.21, p = .22).

The interaction between suffix condition and proficiency was not significant (estimate = .11, SE = .06, z = 1.81, p = .07), as shown in Figure 4. Proficiency did not interact with measurement time either (estimate = .06, SE = .06, z = 0.91, p = .36), nor was it involved in a triple interaction with suffix condition and measurement time (estimate = -.03, SE = .09, z = -.37, p = .71)

Figure 3

Proportion of words translated correctly on Day 1 after 1st time of studying and after 2nd time of studying, as a function of suffix condition (Common on the left side of the figure and L2-unique on the right side).

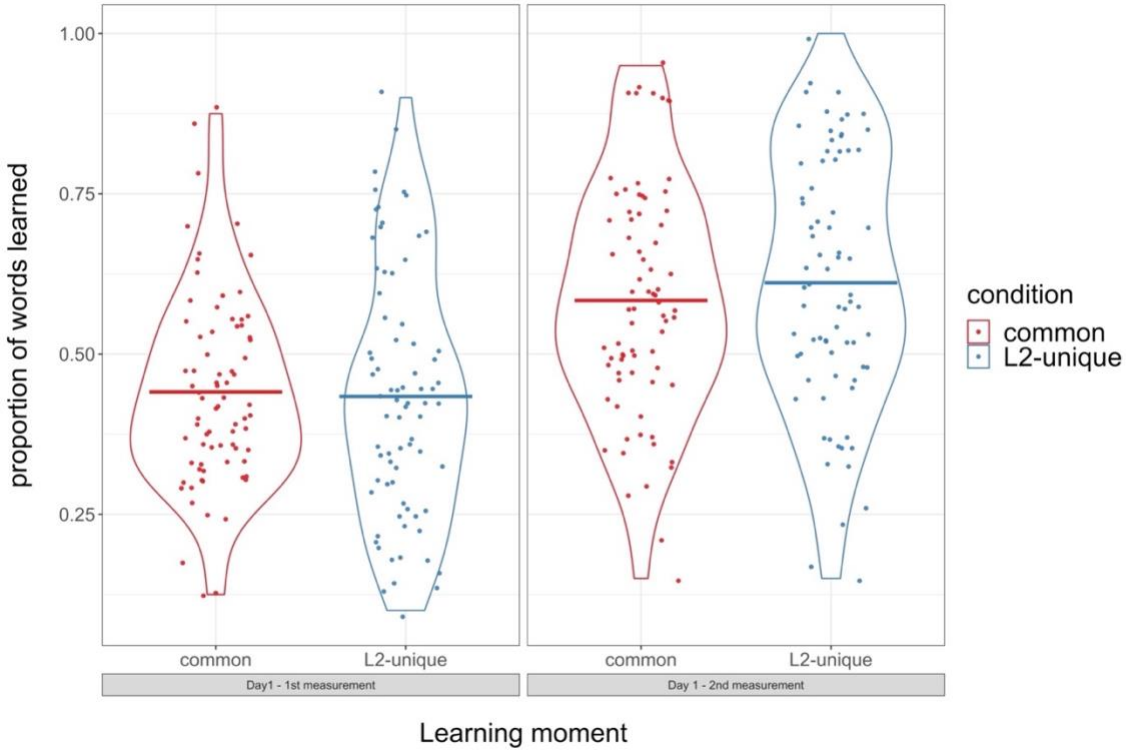
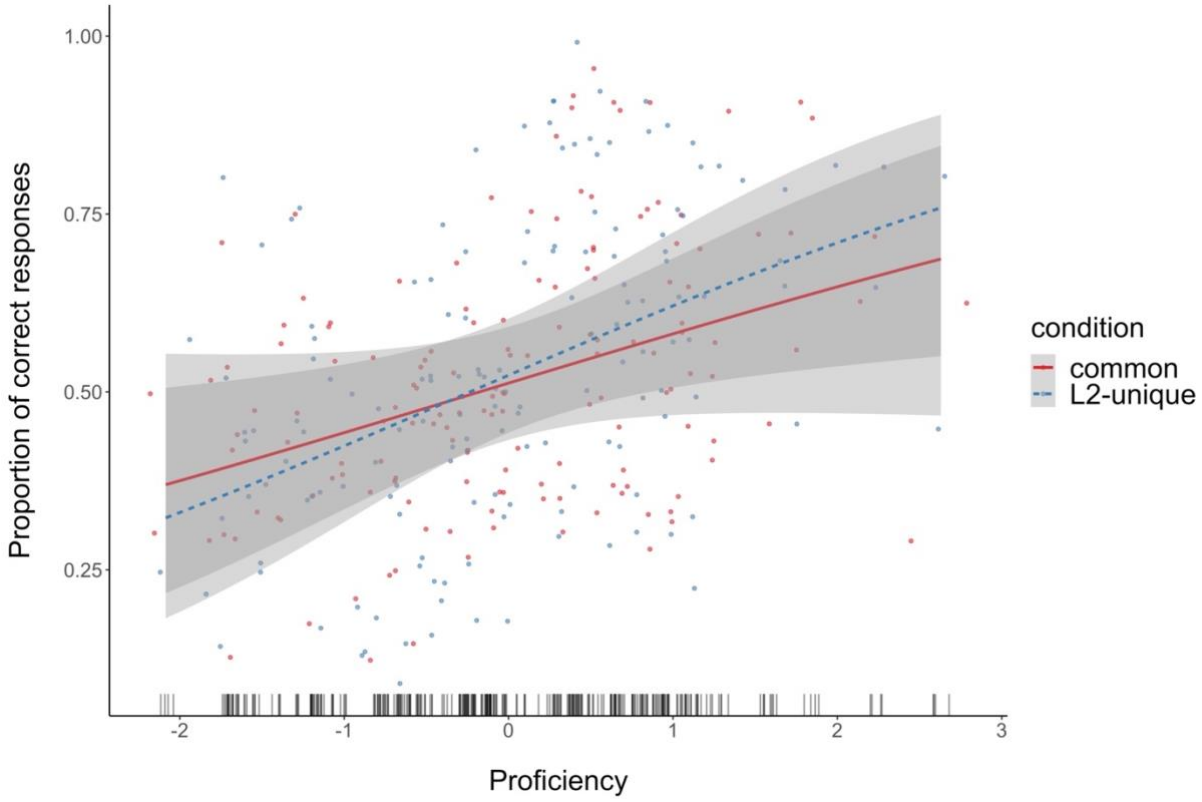


Figure 4

Proportion of correct responses on Day 1 across Proficiency (scaled, centered) as a function of suffix condition (Common, full line and L2-Unique, dotted line).



Day 2

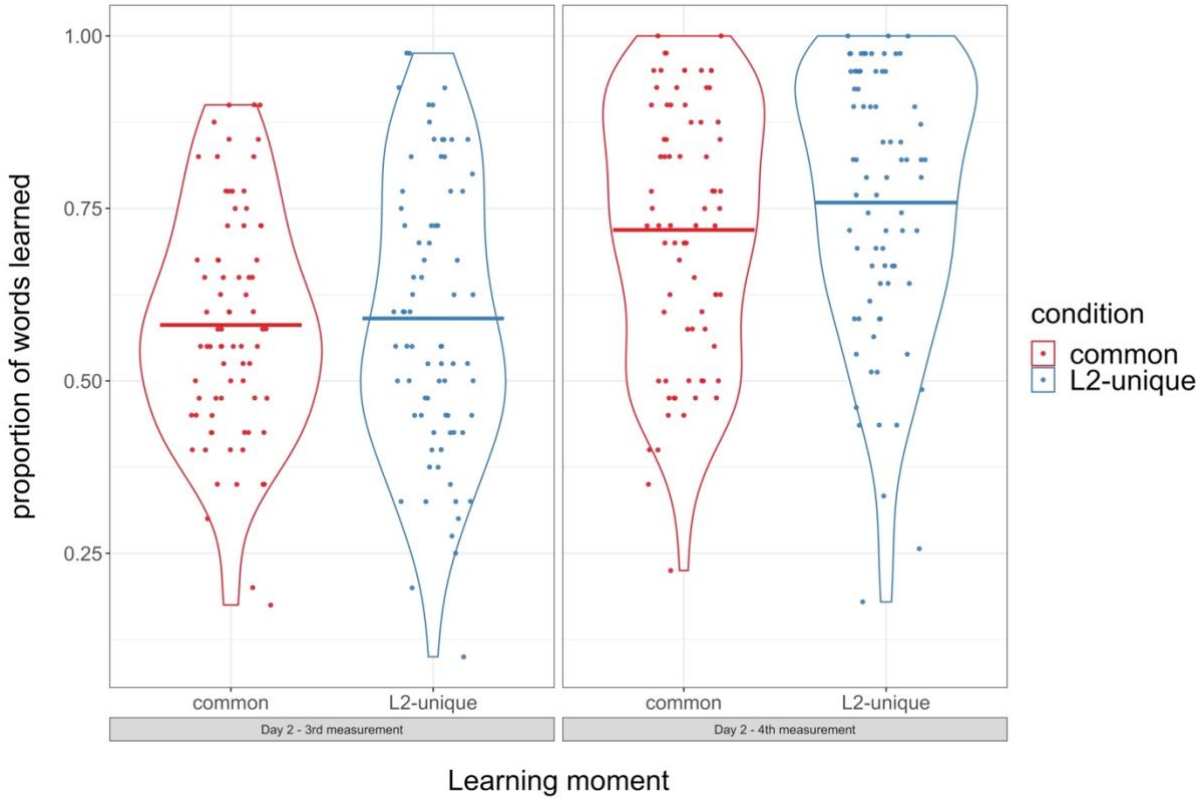
On day 2, participants again translated the words twice, with another learning session of 8 minutes in-between. The same LME model as on Day 1 was run. This time, however, the best model included a random slope of suffix condition across participants.

The analysis of the second day showed a significant main effect of Proficiency (estimate = .60, SE = .14, z = 4.24, p <.001) with high proficiency bilinguals performing better than low proficiency bilinguals. There was also a significant main effect of measurement time (estimate = -.58, SE = .98, z = -5.95, p <.001) which indicated that more words were translated correctly after studying the list anew. There was no effect of suffix condition (estimate = .02, SE = .32, t = .07, p = .94), nor an interaction between suffix condition and measurement time (estimate = -.16, SE = .13, z = -1.23, p = .22). The effects are illustrated in figure 5.

There was no significant interaction between suffix condition and proficiency (estimate = .11, SE = .08, z = 1.34, p = .18), nor a triple interaction between suffix condition, measurement time, and proficiency (estimate = -.10, SE = .098, z = -1.03, p = .30)

Figure 5

Proportion of words learned on Day 2 after recall and viewing the list 1 time as a function of Condition (Common on the left and L2-Unique the right in the figure).



Day 3

On Day 3 participants translated the stimulus words on last time one week after they learned the words. The LME model included two fixed-effect factors: suffix condition (Target type: Common/L2-Unique - discrete categorical variable, contrast coding [−0.5, +0.5])), and the participants' proficiency (continuous numerical variable, centered). Random effects in the model were random intercepts for words and participants and a random slope for suffix condition across participants.

The analysis of Day 3 showed a significant main effect of Proficiency (estimate = .57, SE = .14, z = 3.95, p <.001) with high proficiency bilinguals performing better than low proficiency bilinguals. There was no effect of suffix condition (estimate = -.15, SE = .37, z = -.39, p = .69), nor an interaction between proficiency and suffix condition (estimate = -.02, SE = .07, z = -0.29, p = .77)

5.3.2 Posteriori Analysis

Because there was no difference between words with suffixes common to French and English and words with English-only suffixes, we had a closer look at common suffixes. For about half of the items, the suffix was fully shared between L1 and in L2 because it was present in both the L1 and the L2 word (e.g., étonnement- amazement). For others, the English word had a

suffix existing in French as well, but the suffix was not present in the French translation (e.g., évitement- avoidance).

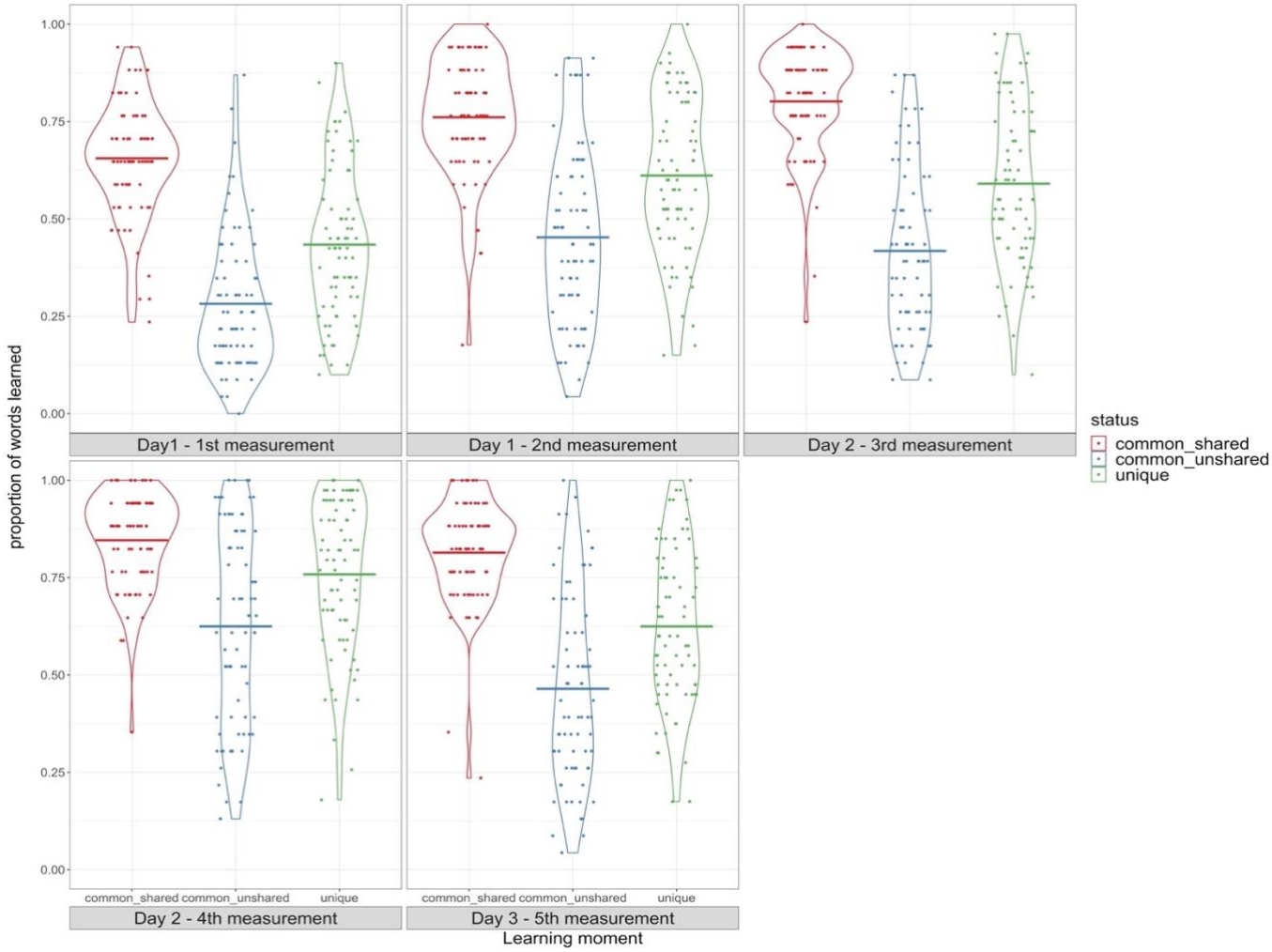
To explore possible differences between these two types of common suffixes, we made a distinction between words with common-shared suffixes (N = 17) and words with common-unshared suffixes (N = 23). The new analysis consisted of a 3 (Common-shared, Common-unshared, Unique) x 5 (Measurement) design with participant proficiency as covariable. The model did not converge when all interaction terms were included, as can be expected given the unbalances in the a posteriori design. Because there were no indications of important interactions, we limited the analysis to the main effects. Random intercepts for participants and French target words were included.

Figure 6 summarizes the findings. It shows that English translations shared with French target words were learned better than translation pairs with L2-unique suffixes (estimate = -1.46, z = 5.55, $p < .001$) but that English translations with unshared suffixes common to French were learned worse than translations with L2-unique features (estimate = -2.36, z = -8.09, $p < .001$). This was true at all measurement times.

To make sure that the difference between the three types of suffixes was not due to differences in orthographic overlap, we created a new dataset consisting of the stimulus items only. In addition to average learning rate as dependent variable, it contained the predictors (1) suffix type, and (2) Levenshtein distance between the French word and its English translation. The latter was the orthographic overlap variable that correlated most with learning rate. It is calculated by counting how many letters must be changed, added, transposed, or deleted in the French word to make the English translation (Schepens et al., 2012). It is influenced by the similarity between the French word and the English translation, and by the length of the French word (the Levenshtein distance on average is larger for long words, because more letters must be changed).

Figure 6

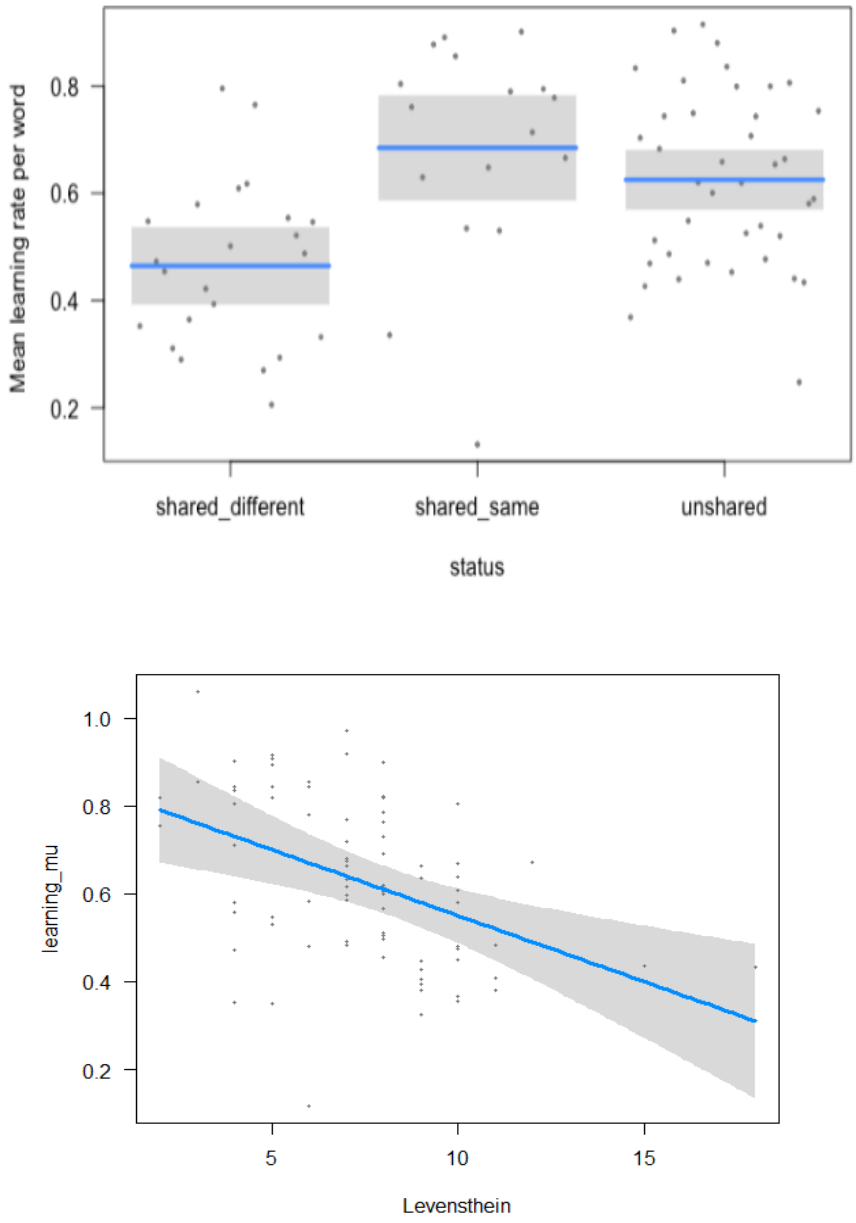
Proportion of words correctly learned per measurement (and number of times the list was seen) as a function of Condition (common_shared, common_unshared, L2-unique suffix).



A multiple regression analysis with suffix type (discrete categorical variable) and Levenshtein distance (continuous variable) as predictor variables and with L2-unique suffixes as reference level indicated that the Leventshein distance between the French words and its English translation negatively impacted the probability that the translation was learned (slope = -.03, t(76) = -3.49, p < .001). Learning remained slower for words with common-unshared compared to common-shared suffixes (estimated difference = -.16, t(76) = -3.57, p < .001), but the difference between translations with L2-unique suffixes and translations with common-shared suffixes was no longer significant (estimated difference = .06, t(76) = .99, *p* = .32). The results suggest that this effect is partially due to the orthographic similarity of word pairs with common-shared suffixes. R^2 of the regression analysis was .39 ($R^2_{adjusted}$= .36). Figure 7 shows the effects of suffix type and Levenshtein distance on the probability of learning the English translation).

Figure 7

Learning probability per word as a function of the status of the suffix (common_same, common_different, L2-unique) and Levenshtein distance.



5.4 Discussion

In this study we investigated whether translations of derived L1 words are easier to learn when the translation contains a suffix that exists in L1 as well. Research by Rastle et al. (2004) indicated that proficient readers automatically parse visually presented words consisting of a stem and an affix (e.g., swimmer = swim+er, corner=corn+er). Given the automatic parsing of L1 affixes, we investigated whether L2 derived words with L1 familiar suffixes would be easier to learn than L2 words with unfamiliar suffixes. Helpful transfer from L1 to L2 would be in

line with the facilitation transfer model of Koda (2008), which predicts that L1 skills can transfer to L2.

Previous research has shown L1 to L2 transfer for phonology, vocabulary and orthography (Aoyama et al., 2004; Callies, 2015; Dijkstra & Rekké, 2010; Escudero et al., 2013; Jarvis & Pavlenko, 2008; Schepens et al., 2020). Evidence for transfer of morphology is less strong and mainly limited to transfer of morphological experience in general. Speakers of L1 languages with a complex morphology (Spanish, French, Finnish,…) appear facilitated in their process to learn English morphology compared to speakers of languages with less morphological experience (Havas et al., 2015; T. J. Kim et al., 2015; Z. P. S. Luk & Shirai, 2009; Wu & Juffs, 2021). Studies focusing on the transfer of specific morphological information has presented predominantly negative results, at least as far as fluent language use is concerned (Havas et al., 2015; Marks et al., 2022; Menut et al., 2022, in prep; Miguel, 2020).

The study presented here is the last in a series of three studies (Menut et al., 2022; Menut et al., in prep) which tried to find evidence that L2 suffixes common to L1 are easier to learn/process than suffixes unique to L2. Against our expectations, the very first study we ran (Menut et al., 2022) provided no evidence for such an advantage. The same was true for a second experiment (Menut et al., in prep), in which we asked participants to read English L2 sentences with derived words. Participants did not read derived English words with English-French suffixes faster than derived words with unique English suffixes.

Because the two previous studies evaluated the outcome of L2 acquisition, in the present study we looked at the learning process itself. We looked at whether transfer might be restricted to the first moments of word acquisition and for specific participants (e.g., with low proficiency, when reliance on L1 may be stronger). We hypothesized that if late bilinguals rely on L1 morphological knowledge, then they should display an advantage for learning English derived words with a familiar suffix (e.g., -able) than learning English derived words with a suffix that does not exist in the mother tongue (e.g., -ness). If morphological overlap helps, complex words composed with common L1-L2 suffixes in English would be expected to be learned better.

We set up a word learning experiment very familiar to L2 learners. They were asked to study 80 French-English translation pairs and were tested five times. Learning happened in four sessions of 8 minutes with one night between the first two and the last two learning sessions (spaced practice instead of massive practice with a night of consolidation in-between; Kim & Webb, 2022; Palma & Titone, 2021). In addition, we had a fifth test after one week, to track the development from early practice to long-term (one week) retention.

The main hypothesis we had was that suffixes common with L1 would help the acquisition of new L2 morphologically complex words, because participants automatically parse such suffixes (Rastle et al., 2004). However, our results did not support this premise. The acquisition process did not show an advantage for suffixes in common with L1. This finding is in line with those reported in our previous studies (Menut et al., 2022, in prep) and those of Marks et al. (2022). They do not converge with the main findings of Miguel (2020), discussed in the introduction, who reported that cognateness of suffixes was used to infer the meaning of new words. One reason for the difference may be the tasks used. Whereas our studies and those of Marks et al. (2022) made use of online word processing tasks, the tasks used by Miguel (2020) relied more on slow, deliberate reasoning. As indicated by Tamminen et al. (2015), reasoning tasks may include more information than is used in spontaneous language use.

Because we did not find the expected difference between translations with suffixes in common and translations with L2-unique suffixes, we had a closer look at possible origins. We in particular looked at whether a distinction must be made between items in which the French and the English word share the same suffix (étonnement-amazement) and items in which the French and English word have different suffixes (glissement-slippage). We explored the consequences of this difference.

A posterior analysis indicated that there indeed is a difference between both types of stimuli (Figures 6 and 7). Relative to the translations with L2-unique suffixes, translations with common suffixes were learned *better* when the suffix was shared between the French and the English word (étonnement-amazement) but *worse* when the suffixes were different (glissement-slippage). Translations with shared suffixes were learned better, in part because of greater orthographic overlap between the French and English words, but differences in orthographic overlap cannot explain the poorer performance in the common_unshared condition.

The opposite effects of the two types of suffixes common to French and English gave the initial, erroneous impression that there were no differences between words with common and L2-unique suffixes in our study of word learning (Figures 2-5). However, the inconsistencies in suffix assignments between French words and their English translations may have broader implications. As Tamminen et al. (2015) showed, inconsistent morphemes are more difficult to learn (and also of less use). Thus, one reason why we found no effects of shared vs. unshared suffixes in our earlier studies (Menut et al., 2022, in prep) may be that the mappings between French and English are not consistent enough for French speakers to pick up on the fact that English translations sometimes use the same suffix as in the original French word. If so, we may find a stronger effect of suffix overlap in a language with more consistent suffix mappings between L1 and L2 (e.g. Dutch).

Another possibility is that inconsistent suffix mappings create different degrees of competition in the mental lexicon. In such a scenario, translation pairs with fully shared suffixes would be easier to process because the activation converges more quickly to the correct word representations. In contrast, translation pairs with divergent suffixes that exist in both L1 and L2 would activate incorrect word candidates to a greater extent. The greater competition would result in longer translation times. If this explanation is correct, we would find a difference between common-shared and common-unshared suffixes not only in the present translation learning task, but also in other word processing tasks, such as reading. This possibility will be explored in the next chapter, although a limiting factor will be the small number of stimuli with common-shared and common-unshared suffixes tested in the self-paced reading study.

In conclusion, this study aimed to evaluate whether L1 morphological knowledge could impact L2 while learning complex words. We expected a suffix such as -able to facilitate the acquisition of a novel complex word (e.g., slippage) because it exists in both French and English. Our results do not outline such evidence. Late bilinguals were able to acquire novel complex words and retain the newly learned words over the following week. But, the common suffixes between French and English in L2 complex words seemed to be both a help and a hinderance because of the inconsistencies in the mapping. L1 facilitation in L2 may not be systematic.

CHAPTER 6

POSTERIORI ANALYSIS

6. A Posteriori analysis

6.1 A difference between common suffixes themselves?

As mentioned in Chapter 5, the third experimental study highlighted some interesting results in the posterior analysis. English words with common suffixes in French and English but with a different suffix translation in French (common-unshared; e.g., glissement-slippage) seemed to induce a hindrance in learning compared to words with common suffixes in French and English that used the same suffix in the translation (common-shared; e.g., étonnement-amazement)[9]. As this difference was not considered in the studies of the previous chapters, we conducted a posteriori analysis with this new distinction. The analyses were conducted on both the data collected with the morphological awareness tasks (Chapter 3; binomial data) and the data focusing on morphological processing with the self-paced reading task (Chapter 4; response time). The results of the analysis are provided below. The data and statistical analyses are available on osf: https://osf.io/ychjx/

6.2 Reanalysis of Study 1 - Morphological awareness (Chapter 3)

For a reminder, the first experimental studies explored the cross-language transfer of L1 to L2 in morphological awareness tasks. The tasks were based on the three developmental stages of derivational awareness as described by Tyler and Nagy (1989): lexico-semantic knowledge, syntactic knowledge, and distributional knowledge. In the Lexico-semantic task, participants were presented with pairs of words (e.g., *washable – WASH* vs. *available – AVAIL*) and had to indicate whether the pairs were semantically related. The Completion task made use of a fill-in-the-blank principle. Participants completed a sentence with a derived word based on a given root word (e.g., BREAK. Remember to pack anything _ _ _ _ _ _ _ in bubble wrap.; the answer would be "breakable"). The last task was the Suffix detection task. Participants had to choose which derivation was the correct one based on a root word (e.g., think). Four alternatives were given, one of which was the correct word (e.g., thinkable), and the other three were pseudowords with suffixes that made the word morphologically illegal (e.g., thinkal, thinkdom, thinky).

At the time, there was no distinction between common suffixes shared and common unshared suffixes. The material used aimed to examine the difference between common suffixes in French and English and L2-unique suffixes in English. The results showed no specific difference between the status of the suffix in all morphological awareness tasks which

[9] In chapter 5, a new perspective was used to distinguish the type of suffixes: common vs. L2-unique. We will keep the term common vs. L2-Unique in the rest of the discussion, even for results of Chapter 3 and 4 where the distinction was not made yet (we used shared vs. unshared at the time)

suggested that the status of the suffix in L2 (common vs. L2-unique) did not impact L2 morphological awareness.

A post-analysis was conducted in the completion task as we suspected that the difference between words which had common-shared suffixes (e.g., breakable – cassable) and common-unshared suffixes (e.g., avoidance –évitement) could trigger different results. But, both type of suffix elicited the same performance with 43 % of correct responses for common-shared suffixes and 51% of correct responses for common-unshared suffixes.

Given the findings with the learning paradigm in Chapter 5, we found it necessary to look back further at the results, to see whether there was a difference between common-unshared and common-shared suffixes in all three morphological awareness tasks. So, we computed a more thorough analysis of the common-shared, common-unshared and L2-unique suffixes. In all three tasks, common-shared was the modality with the fewest items (Details in table 1).

Table 1

Number of items per modality of the Suffix condition (Common-shared, Common-unshared, L2-unique) in all the three morphological awareness tasks.

	Lexico-semantic Task	Completion Task	Suffix Detection Task
Common-shared	14	16	15
Common-unshared	26	24	25
L2-unique	40	40	40
Total items	80	80	80

As for the previous analysis, we used a linear mixed-effects model (LME; Baayen et al., 2008). The data for all tasks were binary (correct/wrong) so we used a binomial generalized linear mixed-effects model, using the glmer function of the lme4 1.1-21 package (Bates et al., 2019). For all three tasks, the model was the same. It computed the fixed-effect factor of the Status of suffix (Common-shared, Common-unshared, L2-Unique; contrast coding [-1, 0, +1]) and used the modality "Common-shared" as the reference for comparison. As random-effect factors, the model included random intercepts for participants and items and random slopes by participants for the Status of suffix. This model explained the main part of the variance of the dataset of each task. Other and more complex models did not converge. As the analysis was post-hoc with unequal numbers of observations, we decided not to include the effect of proficiency, as any interaction with this variable was unlikely to be robust.

Table 2 shows the proportions of correct answers in the various conditions.

Table 2

Proportions of correct words (Mean, sd) in the three morphological awareness tasks as function of the status of suffix (Common-shared, Common-unshared, L2-Unique).

	Lexico-semantic	Completion	Suffix detection
Common-shared	0.69 *(0.10)*	0.49 *(0.07)*	0.68 *(0.10)*
Common-unshared	0.72 *(0.10)*	0.47 *(0.07)*	0.61 *(0.10)*
L2-Unique	0.75 *(0.10)*	0.48 *(0.07)*	0.66 *(0.09)*

The outcome of the analysis for the LST showed no difference between Common-shared and Common-unshared (estimate = 0.22, SE = 0.41, *z* = 0.54, p= 0.59) nor a difference between Common-shared and L2-unique suffixes (estimate = 0.53, SE = 0.39, *z* = 1.38, p= 0.17).

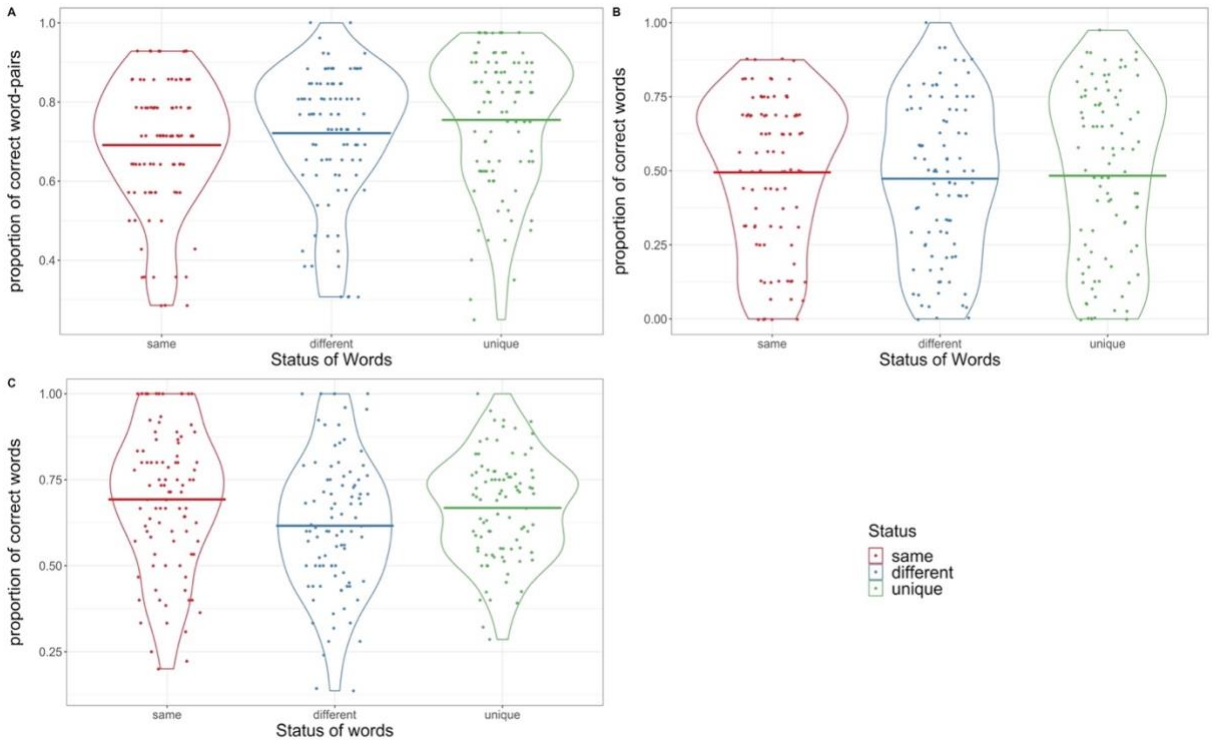
The analysis for the Completion task gave similar results. There was no difference between Common-shared and Common-unshared (estimate = -0.14, SE = 0.55, *z* = -0.26, *p*= 0.79) or between Common-shared and L2-unique suffixes (estimate = -0.21, SE = 0.51, *z* = -0.41, *p*= 0.68).

Finally, the analysis of the data of the SDT did not show any difference either between Common-shared and Common-unshared (estimate = -0.53, SE = 0.39, *z* = -1.36, *p*= 0.17) or between Common-shared and L2-unique suffixes (estimate = -0.29, SE = 0.36, *z*
-0.80, *p*= 0.42).

Figure 1 summarizes the results for all three tasks.

Figure 1

Description of the proportion of correct words as function of the status of the words (Common-shared, Common-unshared, L2-Unique).



*Note. For readability, common-shared is replaced with "same" and common-unshared with "different". **Figure A**. Represents the number of correct word-pairs identified in the lexico-semantic task (washable – WASH vs. available – AVAIL). **Figure B**. represents the number of correct derived words produced in the Completion task (e.g., BREAK. Remember to pack anything _ _ _ _ _ _ _ in bubble wrap. ; the answer would be "breakable"). **Figure C.** represents the number of correct words identified in the Suffix-detection task (THINK as the root word; thinkable, thinkal, thinky, thinkdom as choices; thinkable being the correct answer and others the decoys). Dots show the performance of the participants in the different conditions.*

6.3 Reanalysis of Study 2 - Morphological processing in a self-paced reading task (Chapter 4)

For a reminder, Chapter 4 focused on evaluating the influence of L1 morphological knowledge on L2 processing of morphologically complex words in sentence reading. To do so, we used a self-paced reading paradigm. Target words were included in sentences, which brought context to the reader and emphasized meaning recognition. Sentences were all main clauses with a Subject Verb Object construction, a structure that is common in both French and English. Target words were positioned at the fifth position in the sentence on average. Sentence length was 11,9 words on average (min = 9; max = 15). Targets word could be derived words (e.g., suitable) or control words (e.g., relevant). Derived words were composed with either a common L1-L2 suffix (e.g., suitable) or an L2-unique suffix (e.g., darkness). As before, we did not include the distinction between common-shared and common-unshared. The task did not show any main effect between common and L2-unique suffixes on the reading times of the target

word and the spillover region. Only an interaction between the Language (monolingual vs. bilingual) and the Status of the suffix (common vs. L2-unique) came out.

In consideration of the results of Chapter 5, we explored the data with the new distinction. Here again, the number of stimuli in the Common-shared modality (n=9) was way less than the Common-unshared (n=21) and L2-unique (n=30).

The a posteriori analysis focused on the derived words only (there was no inclusion of the control words) using the glmer function of the lme4 1.1-21 package (Bates et al., 2019). We conducted the new analysis using linear mixed-effects models (LME; Baayen et al., 2008). The dependent variable consisted of reaction times (in milliseconds). A log transformation was applied to the data for the analysis. Before the analysis, data over 5 seconds and under 0.2 s (0.72%) were removed for both target words and spillover regions.

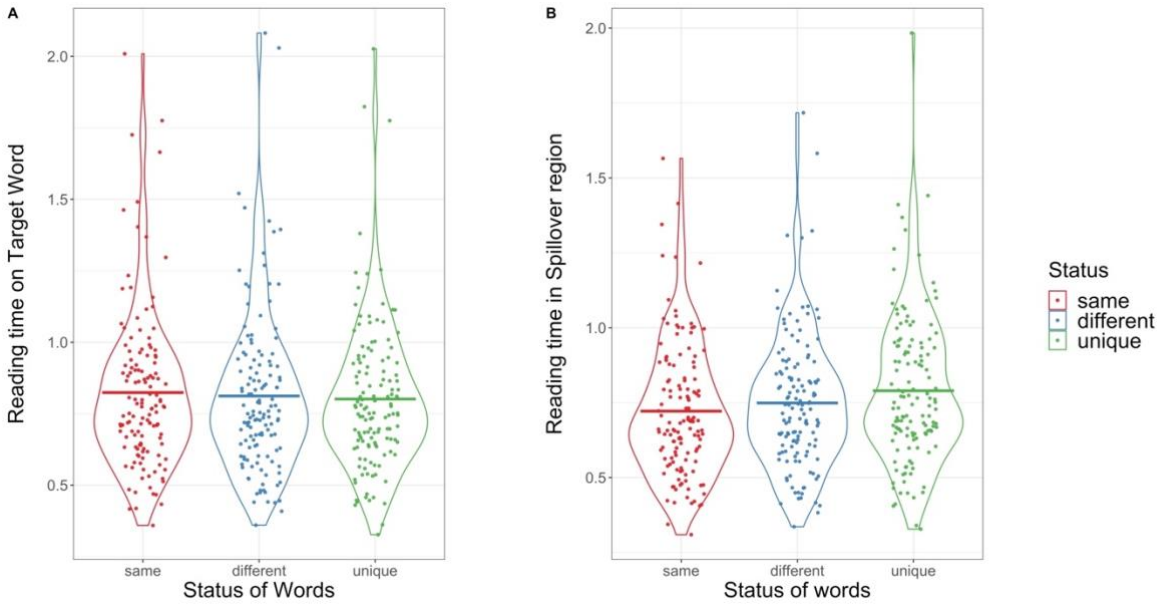
The LME model was the same for both the target and the spillover region. It included the fixed effect of the Status of suffix (Common-shared, Common-unshared, L2-Unique; contrast coding [-1, 0, +1]). The modality "Common-shared" was used as the reference for comparison. As random-effect factors, the model included random intercepts for participants, target words, and sentences. No random slopes by participants were included because more complex models failed to converge.

The analysis of Target words showed no difference between the modality Common-shared and Common-unshared (estimate = -0.02, SE = 0.03, t = -0.56, p= 0.58) or between Common-shared and L2-unique suffixes (estimate = -0.02, SE = 0.03, t = -0.66, p= .50).

Likewise, the analysis of the Spillover region showed no difference between the modality Common-shared and Common-unshared (estimate = 0.03, SE = 0.04, t = 0.66, p= 0.51) or between Common-shared and L2-unique suffixes (estimate = 0.07, SE = 0.04, t = 1.72, p= .09), although there is a slight tendency towards faster processing of words with Common-shared suffixes than words with L2-unique suffixes (see figure 2 for details). This will be discussed in the next section.

Figure 2

the reaction times on target words (figure A) and the spillover region (Figure B) as function of the Status of the Suffix (Common-shared, Common-unshared, L2-Unique).



Note. For readability of the graph, Common-shared is replaced with "same" and Common-unshared with "different".

CHAPTER 7

DISCUSSION

7. General conclusions of the thesis

The present dissertation examined whether there is a cross-linguistic transfer of morphological information between L1 and L2, in line with the extensive literature providing such evidence in other linguistic parameters. All three studies explored the influence of L1 morphological knowledge on L2 and how L2 proficiency may modulate this influence.

More specifically, the first study explored the influence of L1 on L2 in morphological awareness tasks, the second study explored the same phenomenon in sentence reading tasks, and the third study examined it during translation learning. The hypotheses for the various studies were the following:

The first experimental study (Chapter 3):

- Will suffixes common in L1 and L2 lead to better performance in morphological awareness tasks compared to L2-unique suffixes?
- How will L2 proficiency affect the increase of L2 morphological knowledge (Jiang & Kuo, 2019; Kraut, 2015; Sánchez-Gutiérrez & Hernández Muñoz, 2018)?
- Will there be an interaction between proficiency and the status of the suffix? Low L2 proficiency L2 speakers were expected to display a larger advantage for common suffixes than for L2-unique suffixes as compared to L2 speakers with high proficiency (Jiang et al., 2011; Kim et al., 2015; Lam et al., 2020).

The second experimental study (Chapter 4):

- Will suffixes common in L1 and L2 show faster reading times than L2-unique suffixes (Bultena et al., 2014; N. Jiang et al., 2011; Van Assche et al., 2013).
- Will an increase in proficiency display a decrease in reading time? And can high proficiency bilinguals achieve a speed of reading as fast as native speakers?
- Can an interaction be found, with the facilitation of the suffix type being larger for low-proficiency participants (with longer reading times) than for high-proficiency participants (Kimppa et al., 2019)?

The third experimental study (Chapter 5):

- Are complex words composed with a suffix common in L1 and L2 (e.g., teachable) better acquired than complex words with L2-unique suffixes (e.g., prideful)
- Will the effect be different depending on the time of learning?
- Can an interaction be observed between the status of the suffix and L2 proficiency? Common suffixes were expected to be more beneficial to low proficient bilinguals.

Below we regroup the findings and provide a transversal analysis of the findings.

7.1 Does being proficient lead to better processing and use of morphology?

Late bilinguals' objective proficiency was evaluated with the LexTale (Lemhöfer & Broersma, 2012) and with vocabulary knowledge tasks (Casalis et al., 2015; Menut et al., 2022) in Experiments 1 and 2. As the correlation between vocabulary knowledge and LexTale was high in Experiments 1 and 2, only LexTale was kept in the third experiment.

Throughout all studies, we found the same pattern of results for proficiency. The more proficient bilinguals were, the better they performed. The results of Experiment 1 were consistent with previous results in the literature, which evidenced a significant improvement of morphological awareness as proficiency increases (Kraut, 2015) but also showed that highly proficient bilinguals do not seem to reach a ceiling level of performance and remain below L1 performance (Sánchez-Gutiérrez & Hernández Muñoz, 2018).

The second experiment brought nuance to the finding of the maximum performance below the L1 level. In Experiment 2, late bilinguals were on average slower than L1 readers, in line with Bosch et al. (2017), but the data also showed that some of the late bilinguals (10 to 15 of them) reached the level of the average L1 readers, or even exceeded it. So, reaching native-like does not seem unachievable, although arguably not every highly proficient L2 speaker can reach native-like processing. One reason put forward to explain those results was that highly performing bilinguals were exposed to L2 as much as the average L1 reader (or even more), leading to equivalent reading times. Another suggestion would be that it depends on the native language (Nisbet et al., 2022). French has a small linguistic distance from English, which could explain why the group studied here reached the L1 level of performance.

Altogether, the tasks used in all three experimental studies displayed clear sensitivity to proficiency level. Nevertheless, the interaction between proficiency and the Status of the suffix was not significant. This absence of effect was a surprise. Koda (2008) mentioned that the effect of L1 over L2 should be permanent, no matter the proficiency level. We expected the effect to be stronger in low-proficiency late bilinguals supposably relying more extensively on their L1 as compared to highly proficient bilinguals (Kroll & Stewart, 1994; van Heuven et al., 1998). The overall absence of effect led us to wonder whether we should reconsider the existence of morphological transfer from L1 to L2. Below is a summary of the question followed by an interpretation of the results.

7.2 Is there a cross-language transfer from L1 morphology to L2?

In the first experimental study (chapter 3), late bilinguals appeared to have acquired conscious knowledge to manipulate morphemes at the different stages of derivational awareness: lexico-semantic knowledge, syntactic knowledge and distributional knowledge (Tyler & Nagy, 1989). Morphological knowledge was also strongly correlated to vocabulary knowledge (Gottardo et al., 2018). The main hypothesis of this study was that common L1-L2 suffixes would influence all stages of derivational awareness. Common suffixes were expected to lead to better performances than L2 unique suffixes. But the pattern of results did not reflect such difference.

First, the results in the Lexico-semantic task could not be interpreted as a clear facilitation effect of common suffixes over L2-unique suffixes. In this task, French-English bilinguals tended to reject pairs of words with common L1-L2 suffixes if they did not recognize the stimulus as familiar (one reason may have been that they anticipated misleads). Second, there was no main effect nor interaction in the word completion task. Finally, in the Suffix detection task, the interaction was going in the opposite direction of the posited hypothesis.

One possibility for the unexpected findings in Study 1 could be that the tasks were not sensitive enough to detect an influence of L1 morphological knowledge on L2. Looking for an

appropriate task, we turned to automatic processing. We hypothesized that L1 influence on L2 might be more easily observed in an automatic word processing task. Therefore, in the second experiment (Chapter 4), we asked late bilinguals to read sentences in English. The sentences contained derived words composed of a common or an L2-unique suffix. In light of the morphological congruency hypothesis proposed for morphosyntactic processing (Jiang et al., 2011), we predicted facilitation for common morphemes as opposed to L2-unique suffixes. Results, however, showed that on the target itself there was no advantage for common suffixes over L2-unique suffixes. Therefore, our results did not extend the morphological congruency hypothesis to derivational morphology but rather aligned with previous findings which failed to find evidence of an influence of L1 morpho-syntactic on L2 (Dudley & Slabakova, 2021). Interestingly, a small advantage of the common suffixes compared to control words was observed in the spillover region but only when compared to the group of native speakers. The effect in the spillover region tends to support the idea that bilinguals process linguistic information slower than native speakers (Bosch et al., 2017). In conclusion, the results of Study 2 drew a rather blurry picture of the influence of L1 morphology on L2. Although the results seemed to point to an absence of an effect, the finding of a small difference in the spillover region did not allow us to draw any firm conclusion on our hypothesis.

The first and the second experiment evaluated processing in L2, i.e., the outcome of L2 acquisition. The results of the two experiments put into perspective one last hypothesis that was not considered before: cross-language transfer of morphological units may be restricted to the first moments of the acquisition of new words, when reliance on L1 may be stronger. Hence, the third experiment was conducted using a list of derived words in which late bilinguals learned a set of 80 derived words with common or L2-unique suffixes.

But again, the analysis did not give any difference as function of the status of the suffix, at any moment of learning. These results were convergent with the previous studies we conducted as well as recent results with children (Marks, Sun, et al., 2022). However, an a posteriori analysis showed a difference between suffixes that were common-shared (amazement-étonnement) and suffixes that were common-unshared (slippage-glissement). Translations with common-shared suffixes were learned better than translations with common-unshared suffixes. Although this could be explained in part by the orthographic overlap in pairs of words with common-shared suffixes, there was little evidence for this alternative explanation for the common-unshared. A more likely explanation advanced here was that the inconsistency in the mapping of morphemes made complex words harder to learn (and use). Such interpretation was consistent with previous findings in artificial learning (Tamminen et al., 2015).

Because of the post-hoc analysis of Experiment 3, Experiments 1 and 2 were re-evaluated with the additional distinction of common-shared vs. common-unshared words. The analysis for the first experiment did not highlight any difference between the two types of words. Inconsistency in the mapping did not influence performance on the morphological awareness tasks. The analysis of the second experiment did not show a big difference either. There was no difference between common-shared and common-unshared during the reading of the target words and the spillover region. There was however a tendency for a difference between common-shared and L2-unique suffixes. Reaching significance may have been contingent on the number of items in the analysis. Only 9 items were common-shared suffixes, which

considerably reduced the power of the analysis. As such, the posterior analysis should be taken as exploratory rather than as providing a reliable conclusion.

7.3 Interpretation

7.3.1 How do the results fit with the current model of cross-language transfer?

The transfer facilitation model (Koda, 2008) focuses on how L1 metalinguistic awareness can be transferred to L2. Koda (2008) supposed that the transfer from L1 to L2 would be continuous throughout L2 development, independent of the proficiency level. The results provided by Lam et al. (2020) in English-speaking children learning French showed facilitation from cross-language suffix correspondences (e.g., -ity/-ité) on L2 reading comprehension. We expected a similar pattern in adults, with a stronger effect in low-proficiency bilinguals than in high-proficiency bilinguals. But this was not the case. Our data did not highlight a facilitative effect of L1 influence on L2 at any level of proficiency (lack of interaction in the data).

In light of the data collected in the three experimental studies, we cannot bring ourselves to conclude that we found support for the model at the morphological level. Our results rather provide evidence for no influence of L1 morphological knowledge on L2 morphological learning. One reason could be that this is because the mapping of the suffix is not consistent. It is not the case that common suffixes are always the same in French and English (as in étonnement-amazement). As the posterior data highlighted, suffixes differ quite often, even when they exist both in French and in English (as in slippage-glissement). The a posteriori analysis of the learning study (Chapter 5) showed a difference between these two types of words. Whereas translations with common-shared suffixes were learned as well as translations with L2-unique suffixes, words with common-unshared suffixes were learned less well.

The UCM (MacWhinney, 2005, 2018) accounts for both positive and negative transfers. Here, the negative transfer was evidenced during learning. However, the other experiments (morphological awareness and self-paced reading) did not provide any evidence, either way. Hence, it appears that we cannot provide strong evidence to support the UCM either. One explanation may be that inconsistency in the mappings of suffixes may not provide sufficient ground for transfer to occur between French and English.

There may be another speculative possibility. The UCM points out four risk factors to L2 learning: transfer, entrenchment, overanalysis, and isolation. It does not indicate a chronicle order of the risk factors nor whether one risk factor is more prominent than another. But if there is an asymmetry in the risk factors, then we could speculate that overanalysis hinders transfer. Late bilinguals could be overanalysing when they learn to read in L2. Transferring morphological knowledge would therefore be complicated for L2 late learners. If chunking (the support factor of overanalysis) is not yet acquired, then the transfer of morphological knowledge in L2 would be obstructed.

Although evidence for positive and negative transfer has been found for other linguistic parameters, it seems that morphology must be considered differently. At least, specific suffix information does not seem to be transferred from L1 to L2. It is important to distinguish this from the transfer of general knowledge that is: morphological complexity which may transfer from L1 to L2. There, the evidence is more mixed, as we will see in the next section.

7.3.2 A transfer of general morphological knowledge

Our interest was to disentangle whether the presence of familiar suffixes from L1 in L2 facilitated L2 processing, learning, and morphological awareness. The absence of effect throughout our experimental studies could lead us to conclude that morphology does not transfer from L1 to L2. However, we must remember that our studies only focused on the morphological units. But morphological knowledge in L1, as a general metalinguistic awareness, could still influence L2 (Kim et al., 2015; Nisbet et al., 2022; Wu & Juffs, 2021). Indeed, several studies have suggested that L2 morphological processing is affected by L1 morphological richness, both in children and adult L2 learners.

Nisbet et al. (2022) for example found differences in L2 patterns of reading, which they ascribed to differences in L1. In particular, they explored the difference in reading performances between German-English bilinguals and Finnish-English bilinguals. They found that German-English could reach the same reading performances in English as native speakers while Finnish-English bilinguals could not. This difference was interpreted as an effect of the linguistic distance being smaller between German and English than between Finnish and English. German and English would share several linguistic features: phonology, orthography, and morphology.

Kim et al. (2015) examined three groups of children. One group of native speakers of English, and two groups of bilinguals who had different mother tongues (Spanish and Chinese). Their aim was to evaluate how L2 morphological awareness would differ across groups. The results highlighted interesting findings. First, the authors unexpectedly found that both bilingual groups performed better in the morphological awareness tasks than native English children. This result was supposedly due to bilinguals children being more exposed to morphological knowledge instructions than their monolingual peers (see also Rastle et al., 2021). Second, the bilinguals showed inter-group differences. The Spanish-English children displayed better performances than the Chinese-English children. Such results could be interpreted as a function of the structural differences between the languages. Spanish-English bilingual children could benefit from Spanish and English sharing structural and semantic similarities which is less the case for Chinese-English children.

In adults, Wu & Juffs (2021) also conducted a cross-language study comparing native speakers of English with two groups of bilinguals (Turkish and Chinese as L1). Turkish and Chinese were interesting languages to compare because Chinese does not use derivational suffixes while the Turkish language does extensively. The results were in line with the authors' predictions. Turkish-English bilinguals outperformed Chinese-English bilinguals on the morphological awareness tasks. This was supposedly due to the Turkish morphological complexity, benefitting L2 morphological awareness. Also, in line with the results of Kim et al. (2015), Turkish-English bilinguals outperformed English native speakers on a morphological relatedness task in which participants had to indicate whether "happy" was related to "happiness" and "catalogue" to "cat".

What seems clear is that morphological knowledge in L1 can influence L2 morphological processing. But we do not seem to know how exactly. What the results of our experimental studies seem to suggest is that it does not depend on having suffixes shared between the two languages. In the following sections, we hypothesize why this may be the case and how the question can be explored further.

7.3.3 Similar, dissimilar and unique L1-L2 suffixes

Studies focusing on cross-language transfer in morphology specifically looked at the effect of similar patterns on L2 reading comprehension (Lam et al., 2020) and morphological awareness (Miguel et al., 2020). Lam et al. (2020) studied a group of English children speakers learning French in an immersion program. Their focus was on how cross-language suffix correspondences between L1 and L2 would affect the use of L2 reading comprehension. Cross-language suffix correspondence means that affixes carry the same meaning in L1 and L2 and produce the same changes in grammatical class, and this being independent of sounds and/or spellings (e.g., -ly in English, -ment French). The task assessing the effect of cross-language suffix correspondence was a matching task. Based on a French word (e.g. activité), children had to choose what was the correct English word among three choices (e.g. activity, active, actively). Complex words were composed of cognate stems that differed in their derivational suffixes (e.g., -ité/-ity). Among the suffixes, two pairs had no orthographic overlap or phonological overlap (-ment/-ly, -er/-y). Overall, the authors found that morphological awareness correlated positively with L2 reading comprehension. They did not distinguish the effect due to the orthographic overlap of the pairs as the interest was to account for all kinds of cross-language suffix correspondences. Arguably, there were not enough non-overlapping pairs to control for this difference.

Similarly in adults, Miguel et al. (2020) focused on English learners of Spanish. Participants learned new words and were evaluated with an intra-word recognition test and a decomposition test. The results showed that, independently of proficiency level, all learners applied morphologically related strategies to infer words' meaning, and this was even more frequent in L2 learners with the highest proficiency. Moreover, the presence of a cognate suffix common between Spanish and English (e.g., -oso/-ous) showed better recognition for all participants. This suggested that common suffixes between L1 and L2 were beneficial to the L2 learners in slow, explicit reasoning tasks.

The above studies confirm the positive effect that common suffixes can have on both L2 reading comprehension in children and new L2 word decomposition in adults. However, it should be noted that these studies only focused on the beneficial effect of common suffixes or cross-linguistic correspondences of English learners of French or Spanish. This makes sense. English learners of French and Spanish will encounter common suffixes between L1 and L2, whether they share orthographic patterns (-oso/-ous in Spanish-English; -ité/-ity in French-English) or only semantic information (-ment/-ly).

Our studies initially distinguished between common suffixes and L2-unique suffixes. In the learning experiment (Chapter 5), the post hoc analysis provided interesting results. It showed that common-shared suffixes (-ment/-ment in French-English) helped L2 word acquisition. However, the facilitation was not significantly larger than that observed for L2-unique suffixes suggesting that both types of suffixes benefit L2 learning. In contrast, common-unshared suffixes (-ment/-age) more clearly hindered word acquisition in L2.

Our understanding is that, in line with Lam et al. (2020) and Miguel et al. (2020), we found a positive effect of suffixes that shared coherent mappings between L1 and L2. But we in addition had common-unshared suffixes, which had a negative effect. These two aspects bring further insight into the results of Lam et al. (2020) and Miguel et al. (2020). Using a

distinction between L2-unique and common shared/unshared suffixes allowed us to show that it might not be as much whether the suffixes are common but rather if the L1 translations and its equivalent L2 word align to create a congruent mapping.

A similar distinction was made by Tolentino & Tokowicz (2014). They distinguished between similar, dissimilar and unique characteristics of L1 and L2 in morpho-syntactic studies. Applied to derivational morphology, similar morphemes are ones that have the exact same translation (-ment/-ment), dissimilar morphemes are the ones that have different translations even if the suffix exists in both languages (-ment/-age), and unique suffixes would be the ones only existing in L2 (-ly which can often be translated to French by -ment but not systematically; e.g., blindly/aveuglément and queenly/"comme une reine"). Clearly, the status of a suffix must be developed further than we did in the present studies. We will depict this hypothesis below.

7.3.4 New perspectives to consider

As mentioned above, our studies focused mainly on the distinction between L2-unique and L1-L2 common suffixes. But a posteriori analysis suggests that it might be more interesting in the future to distinguish between consistent and inconsistent translations of suffixes.

In the self-paced-reading paradigm, late French-English bilinguals read sentences. The first analysis did not show any difference between common, L2-unique and control words in the bilingual group. However, when we compared with English monolinguals, an interaction came out with common L1-L2 suffixes being faster than L2-unique suffixes. More interestingly, the a posteriori analysis suggested that common-shared suffixes might be processed the most rapidly (according to the tendency outlined). This analysis, however, only contained 9 items in the common-shared condition, 17 items in the common-unshared condition, and 30 in the L2-unique condition. Future studies should use more common-shared suffixes, to see whether stronger and more reliable results can be obtained. Because the number of items was not sufficient in our study, at present this remains hypothetical. In the same way, future studies may want to compare L2-unique suffixes that are translated consistently (e.g. -able/-able) versus L2-unique suffixes that are translated inconsistently (e.g., -ly/-ment).

Our studies focused on cross-linguistic effects from L1 to L2 processing. The material was therefore focused on L2 only. But there may be more complex characteristics to consider. There is evidence that L1 and L2 are activated at the same time (Dijkstra & van Heuven, 2002; van Heuven et al., 1998). So, considering the material within the L2 prism only might be insufficient. Not only should the material consider L1 and L2 similar features in L2 but also, the L2 to L1 correspondences. In addition, it may be good to look at both suffixes and stems. Whether this will be possible with the French-English language pair only, remains to be seen. Adding other language pairs (e.g., Dutch-English) may be helpful here.

A recent Flow Chart of Visual Recognition of Complex Words tried to account for the cross-language transfer mechanisms in morphological processing (Kahraman & Beyersmann, 2023). The model is based on the idea that access to language is non-selective. Also, it depicts the parallel activation of both a target word and its translation equivalent in an integrated lexicon. This activation starts right at the early stages of processing for both the embedded word and the affix. The activation spreads in three layers, from bottom to top: orthographic input,

orthographic lexicon, and semantic representations. The flow chart assumes that the status of the L2-stem and the L2-morphemes (here, suffixes) activate the L1 translation equivalent independently. Cognate suffixes can be activated right from the orthographic input (bottom-up) while non-cognate morphemes cannot.

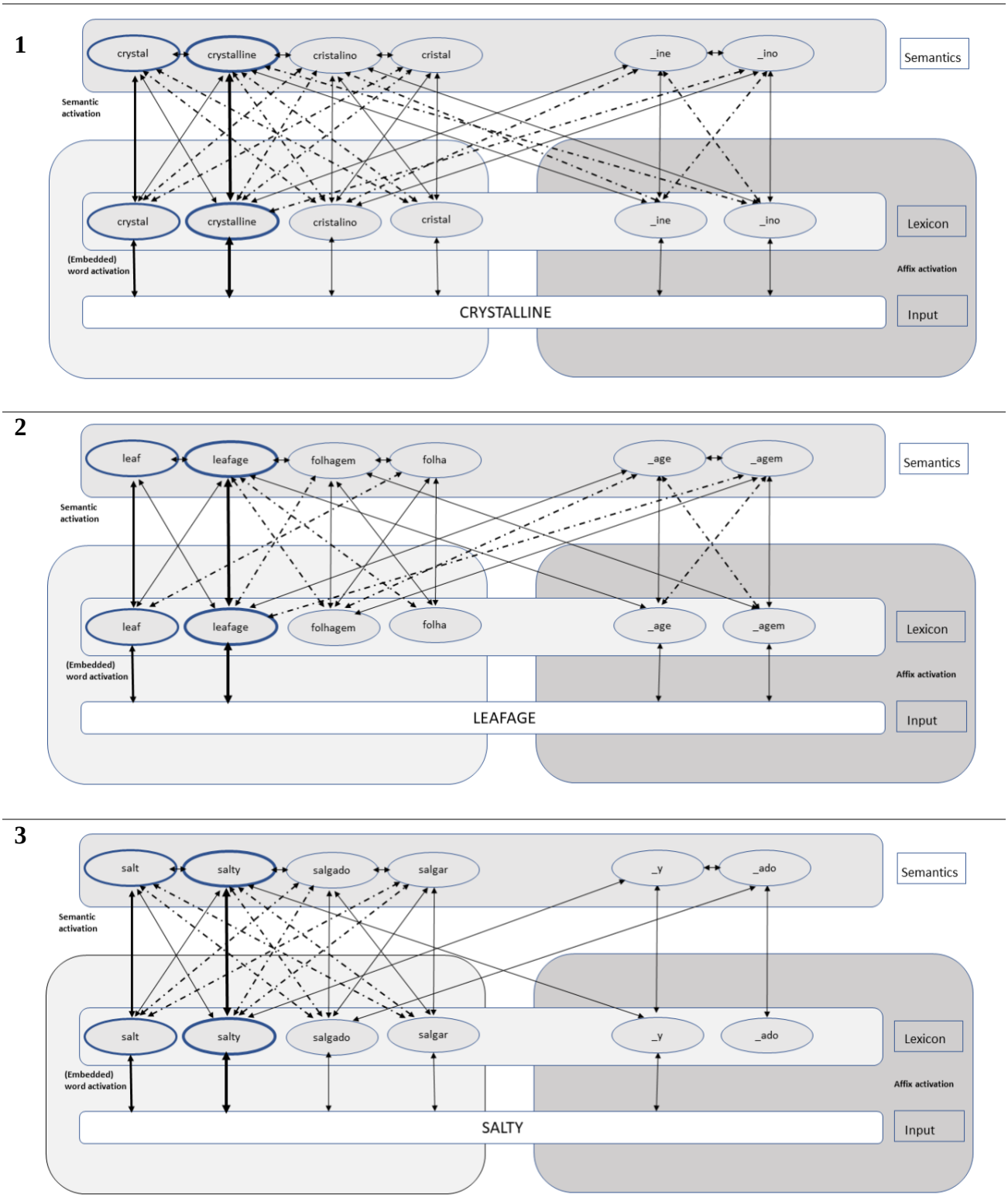
The flow chart in Figure 2 shows an example of English-Portuguese based on the research of Comesaña et al. (2018). This example fits with the present data in English-French late bilinguals as French and Portuguese are very close languages (e.g., crystalline – cristallino – cristalline, for English, Portuguese and French respectively).

In Comesaña et al. (2018), they studied the difference in processing as a function of the status of the suffixes and of the stems in Portguese-English bilinguals. The paradigm relied on a masked morphological translation priming. The study was composed of four experimental conditions: cognate stem with cognate suffix (prega<u>dor</u>/preach<u>er</u>), noncognate stem with cognate suffix (joga<u>dor</u>/play<u>er</u>), cognate stem with noncognate suffix (simplici<u>dade</u>/simplic<u>ity</u>) and noncognate stem with noncognate suffix (adestra<u>mento</u>/dress<u>age</u>). The results showed that when the stem was a cognate, then the cognateness of the suffix also had an impact on reading time. Full cognateness displayed faster reading time than cognate stems with noncognate suffixes. However, the effect of suffix cognateness between cognate stems was not as clear.

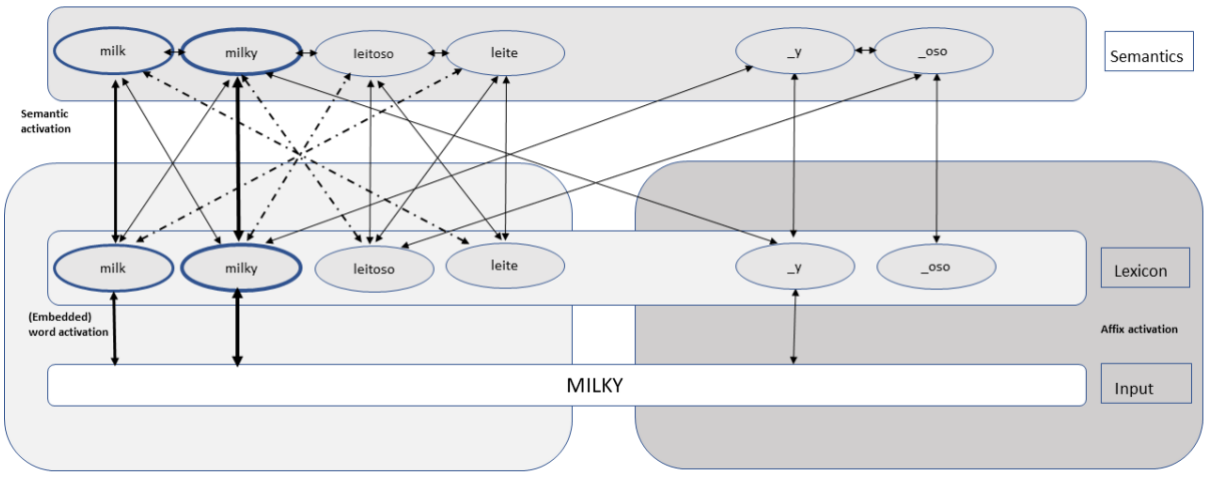
The flow charts propose conducting a similar paradigm as Comesaña et al. (2018). However, to study the effect of transfer in L2, we would propose to keep a study such as the self-paced reading paradigm. Using the masked translation paradigm will account for simultaneous activation. However, looking at L2 only, in a self-paced reading task, would account for the transfer effect from L1 to L2, without explicitly targeting L1.

Figure 1

Flow chart of visual recognition of complex words in European Portuguese-English Bilinguals as described in Kahramand & Beyersmann (in press), depicting processing differences between Cognate Stem + Cognate Suffix (Panel 1), Noncognate Stem + Cognate Suffix (Panel 2), Cognate Stem + Noncognate Suffix (Panel 3), Noncognate Stem + Noncognate Suffix Words (Panel 4).



4



A final point to consider is that we focused on late French-English bilinguals in order to disentangle the specific effects of L1 suffix units on L2. But, as mentioned in the introduction, one group of bilinguals is not equal to another (Bialystok et al. 2013). For this reason, the interpretation of the results cannot be generalised to all bilingual groups. Other studies need to be conducted on derivational transfer of L1 to L2 to see whether this lack of effect is observed in early bilinguals as well in other language pairs than French-English bilinguals. We see two different opportunities to look at the effect of L1 on L2. First, using the most common approach in cross-language research would be to use different L1s and see their effects on L2. But, another way to study the effect may be to use the same L1 learning two different L2s. For example, here we studied a group of French people learning English, but it would be interesting to see how much the findings will differ if the same group learns German. A problem with this research will be to find matched samples of learners, considering the importance of learning English as a second language, especially for French speakers.

In conclusion, the three experimental studies depicted in this dissertation tend to advocate that L2 morphological awareness, automatic reading and word learning are not strongly influenced by L1 morphological information. More specifically, in learning, L1 and L2 common suffixes are not more facilitative than L2-uniques suffixes for knowledge of morphology in L2. If anything, when presented with both L1 and L2 translations, common suffixes with inconsistent suffix mappings hinder learning. This was not the case for morphological awareness or reading where patterns of results were more confused. Thus, the inexactitude and the punctuated negative effect of L1 morphology on L2 do not support the idea that there should be more focus on morphological sharing when learning a new language. Nevertheless, a new account for morphological processing also leads us to believe that more distinction of the suffixes' characteristics could lead to a clearer effect (or no effect) of L1 on L2 in the future.

CHAPTER 8

French Resume

8. Résumé en français

8.1 Introduction

Il est courant pour une personne qui parle deux langues de mélanger le vocabulaire de ces langues dans une conversation. Tellement courant que même de nouveaux termes tels que le « franglais » ont fait leur apparition dans le langage informel. Ce phénomène désigne le mélange linguistique entre le français et l'anglais. Le locuteur comble les lacunes lexicales avec la langue non ciblée lorsqu'il parle l'une des deux langues (par exemple, Je suis so excited d'aller au concert / I am so excited to go to the concert). Bien que ce type d'influence interlinguistique soit aujourd'hui considéré comme courant, l'influence interlinguistique n'a pas toujours été considérée comme bénéfique pour le développement (Epstein, 1915 ; Smith, 1923). Les travaux d'Epstein (1915) ont apporté des évidences décourageant le développement du bilinguisme. Selon ces travaux, le bilinguisme ralentirait le traitement cognitif en raison des options linguistiques alternatives qu'il déclenche dans l'esprit. Pour éviter ces désavantages cognitifs, les travaux d'Epstein soutenaient l'idée, d'une part, d'attendre la fin de l'enfance avant d'apprendre une seconde langue (L2), et d'autre part, de réduire cette utilisation à la lecture et aux expressions de base de tous les jours. Ses travaux ont également montré que les comportements de transfert de langue (comme le franglais) étaient dus à la paresse des apprenants. Le contexte historique (avant la Première Guerre mondiale) entourant les recherches d'Epstein en Suisse (pays multilingue) pourrait expliquer la prise de position et le besoin de promouvoir le language monolingue. En effet, la langue principale en Suisse était l'allemand. La montée en force de la germnsation et la sympathie développée par les germanophones suisses menaçait les langues minoritaires du pays, comme les francophones qui défendaient les alliés. Plus tard, l'Allemagne nazie a repris cette idéologie et a soutenu que le bilinguisme était associé à une détérioration intellectuelle et à une infériorité mentale (voir Pavlenko, 2014 pour plus de détails).

L'opinion qui prônait la minimisation de l'éducation bilingue a perduré longtemps après les recherches du 20ème siècle. Jusqu'à récemment, l'apprentissage de langues étrangères était encore limité ou découragé dans le but de limiter l'interférence de la L2 dans le développement (Cenoz & Gorter, 2014). Néanmoins, Epstein (1915) représente l'un des projets de recherche pionniers de ce que nous appelons aujourd'hui l'alternance codique (code-switching) et le transfert interlinguistique. Ce dernier est l'objet de cette thèse.

Le transfert interlinguistique (ou influence interlinguistique) fait référence à une influence de la langue maternelle (L1) vers la langue seconde (ou vice-versa). Tout comme Jarvis et Pavlenko (2008) l'ont suggéré, ces termes se veulent neutres sur le plan théorique et font référence à la manière dont, à bien des égards, les connaissances en L1 peuvent moduler les connaissances et l'utilisation en L2.
Odlin (1989) a défini la notion de transfert linguistique comme suit :

> " Le transfert est l'influence résultant des similitudes et des différences entre la langue cible et toute autre langue précédemment acquise " p.27.

Dans cette thèse, le transfert interlinguistique sur lequel nous souhaitons nous concentrer est celui qui concerne le traitement et l'apprentissage de la langue seconde à l'âge adulte. Les adultes (ou jeunes adultes) construiraient leur L2 sur la base de ce qu'ils ont déjà acquis et consolidé en L1. Ainsi, les connaissances en L1 serviraient de base à l'apprentissage et au traitement de la L2 (Koda, 2008 ; MacWhinney, 2018). Bien que des preuves de transfert de la L2 à L1 aient également été avancées (Pavlenko & Jarvis, 2002), ce ne sera pas le sujet de la présente thèse.
Nous avons ici souhaité centrer notre investigation sur le transfert des informations morphologiques de la L1 sur la L2.

Les morphèmes sont définis comme les plus petites unités porteuses de sens d'une langue (O'Grady et al., 1997). Ils constituent la structure interne des mots. Ils se peuvent être des morphèmes dits « libres » ou « liés ». Les morphèmes libres sont des morphèmes qui composent un mot en lui-même, non décomposable (ex., "maison", "haut"). Les morphèmes liés sont des morphèmes qui doivent être combinés avec un autre pour avoir une signification (ex., "in-", "-able") et peuvent être définis comme des affixes. Par conséquent, un mot sera nécessairement composé d'un seul morphème (ex., "danse", "travail") dans le sens où il ne peut pas être décomposé en unités plus petites qui seraient porteuses de sens ou de fonction. Ensuite, les mots complexes sont des mots qui sont caractérisés par au moins deux morphèmes ou plus (par exemple, "travailleur" qui serait décomposé en son radical "travail" et son affixe "-eur").

On peut distinguer deux types de morphologie : la morphologie dérivationnelle et la morphologie flexionnelle. La morphologie dérivationnelle permet de créer de nouveaux mots composés à partir d'un radical. L'ajout d'un affixe modifie le sens du radical (par exemple, "surmontable" composé des affixes "sur-" et "-able", et du radical "monter"). La morphologie flexionnelle, quant à elle, concerne les mots qui sont créés pour jouer un rôle particulier dans une phrase, mais qui ne modifient pas le sens du discours ("travaillé", composé avec le radical "travail" et l'affixe "-é"). Les affixes flexionnels visent à souligner les nombres, les temps, les personnes, les modes et les genres.

La compréhension et l'intériorisation des structures morphémiques sont associées à une augmentation de la capacité d'orthographe, de sorte que les personnes plus sensibles à la structure morphémique des mots seraient davantage aptes à utiliser les règles d'orthographe morphologique (Figueredo & Varnhagen, 2004 ; Marinova-Todd et al., 2013).

8.2 Les études expérimentales

La présente thèse a pour but d'examiner l'existence d'un transfert inter-linguistique entre la L1 et la L2. La littérature fournit déjà des preuves qu'il existe un transfert L1-L2 au sein d'autres paramètres linguistiques (phonology, orthographe et sémantique). Dans la continuité de ces études, nous avons concentré nos trois études sur l'influence des connaissances morphologiques de la L1 sur la L2 . Nous avons également exploré comment la compétence en L2 pourrait moduler cette influence.

Plus précisément, la première étude a exploré l'influence de la L1 sur la L2 dans des tâches de conscience morphologique, la deuxième étude a exploré le même phénomène dans

des tâches de lecture de phrases auto-segmentées, et la troisième étude a examiné le transfert pendant l'apprentissage de nouveaux mots. Les hypothèses ainsi que les fondements de nos recherches sont décrits ci-après.

8.2.1 La conscience morphologique

Le premier domaine sur lequel nous avons voulu nous concentrer est la conscience morphologique (chapitre 3). Des études antérieures sur des enfants monolingues ont mis en évidence le rôle que jouent les morphèmes familiers dans l'acquisition et l'utilisation d'un nouveau vocabulaire (Kieffer & Lesaux, 2012 ; McBride-Chang et al., 2008), la lecture et l'orthographe (Casalis et al, 2011 ; Desrochers et al., 2018 ; Rispens et al., 2008) ainsi que la fluidité et la compréhension de la lecture (Casalis & Louis-Alexandre, 2000 ; Deacon et al., 2007 ; Desrochers et al., 2018 ; Levesque et al., 2019). Des données ont également montré que la conscience morphologique, chez les adultes, contribue à la compréhension de la lecture (Kotzer et al., 2021).

En langue seconde, chez les enfants, il a également été bien documentée que la conscience morphologique L1 contribue à la compréhension de la lecture L2 (D'Angelo et al., 2017 ; Kieffer & Lesaux, 2008, 2012 ; Lam et al., 2020 ; Marinova-Todd et al., 2013 ; Zhang & Koda, 2014). D'autres résultats encourageants semblent indiquer que l'on pourrait s'attendre à des résultats similaires chez des adultes bilingues ayant appris la L2 à l'adolescence (Wu & Juffs, 2021 ; Zhang & Koda, 2012 ; Zhang, 2021). Il est intéressant de noter que la compétence semble être un modulateur important de cet effet (Jarvis & Pavlenko, 2008 ; Kieffer & Lesaux, 2008 ; Kim et al., 2015 ; Koda, 2000, 2008 ; Koda & Miller, 2018 ; Ramírez et al., 2013).
Suite aux résultats de la littérature actuelle, nous avons exploré dans le chapitre 3 les hypothèses suivantes :

Les suffixes communs en L1 et L2 conduisent-ils à une meilleure performance dans les tâches de conscience morphologique par rapport aux suffixes uniques en L2 ?
Comment la compétence en L2 affecte-t-elle l'augmentation des connaissances morphologiques en L2 (Jiang & Kuo, 2019 ; Kraut, 2015 ; Sánchez-Gutiérrez & Hernández Muñoz, 2018) ?
Y a-t-il une interaction entre la compétence et le statut du suffixe ? Plus précisément, par rapport à des locuteurs très compétents, nous pouvons attendre à ce que les locuteurs débutants en L2 bénéficient davantage des suffixes communs par rapport aux suffixes uniques en L2 (Jiang et al., 2011 ; Kim et al., 2015 ; Lam et al., 2020).

8.2.2 L'influence morphologique en lecture

L'hypothèse de la congruence morphologique (Jiang et al., 2011) s'appuie sur une série de preuves démontrant l'influence de la morphologie flexionnelle L1 sur la L2 dans la lecture de phrases (Gerth et al., 2017 ; Jiang, 2004, 2007 ; Jiang et al, 2011, 2017 ; Kim & Wang, 2014 ; Park & Kim, 2021 ; Pliatsikas & Marinis, 2013 ; Roberts & Liszka, 2013, 2021 ; Tokowicz & Warren, 2010). Cette hypothèse n'est cependant pas soutenue par toutes les études sur ce sujet, certaines montrant plutôt l'absence d'influence de la L1 sur la L2 (Bultena et al., 2014 ; Dudley & Slabakova, 2021 ; Juffs, 2005 ; Papadopoulou & Clahsen, 2003).

Dans le chapitre 4, nous présentons une étude qui a eu pour but d'évaluer si l'hypothèse de Jiang et al. (2011) en morphologie flexionnelle pouvait être étendue à la morphologie dérivationnelle. Le bénéfice interlinguistique de la morphologie dérivationnelle pourrait être mis en évidence lors de traitements automatique et implicite des mots (au cours de la lecture). Comme le suggère le Transfer Facilitation Model (Koda, 2008), le transfert est automatique et non volatil. Compte tenu de la difficulté d'interpréter les résultats avec le paradigme d'amorçage masqué ou les mots sont présentés isolés (Diependaele et al. 2011 ; Silva & Clashen, 2008 ;Viviani & Crepaldi, 2019), nous avons émis l'hypothèse que les lecteurs L2 pourraient bénéficier d'une présentation des mots contextualisés (Bosch et al., 2017). Les phrases encadrent les mots dans un contexte qui garantit des contours sémantiques. Elles offrent également un moyen riche d'étudier comment les caractéristiques des mots vont influencer la fluidité de la lecture.

La deuxième étude expérimentale est présentée dans le chapitre 4. Les hypothèses associées à cette étude étaient les suivantes :

- Les suffixes communs en L1 et L2 présentent-ils des temps de lecture plus rapide que les suffixes uniques en L2 (Bultena et al., 2014 ; Jiang et al., 2011 ; Van Assche et al., 2013).
- Une augmentation de la compétence se traduit-elle par une diminution du temps de lecture ? De plus, les bilingues très compétents peuvent-ils atteindre une vitesse de lecture aussi rapide que les locuteurs natifs ?
- Existe-t-il une interaction ? La facilitation du type de suffixe serait plus importante pour les participants à faible compétence (avec des temps de lecture plus longs) que pour les participants à haute compétence (Kimppa et al., 2019).

8.2.3 L'apprentissage morphologique

L'influence de la L1 sur la L2 en phonologie (Aoyama et al., 2004 ; Kartushina & Frauenfelder, 2014), orthographe (Sparks et al., 2008 ; Yamashita, 2018), sémantique (De Groot & Keijzer, 2000) et morphologie flexionnelle (De Zeeuw et al., 2013 ; Jiang et al., 2011 ; Li & Koda, 2022 ; Portin et al., 2008) tend à supposer que cette influence est présente tout au long de l'acquisition de la L2. Mais peu de preuves existent vis-à-vis de l'acquisition de la morphologie dérivationnelle. C'est ce que nous avons testé dans le chapitre 5.

Bien que l'apprentissage artificiel ne soit pas directement lié à l'apprentissage de la L2, des études ont montré que la connaissance préalable des morphèmes pouvait être utile pour l'acquisition de nouveaux mots (Dawson et al., 2021). Cependant, dans les études sur les bilingues, les résultats semblent ambigus (Marks et al., 2022 ; Miguel, 2020). Nous avons donc voulu déterminer si l'acquisition de mots pourrait être facilitée par la présence de suffixes communs entre L1 et L2, et ce, tant chez les bilingues peu compétents que chez les bilingues très compétents.

La troisième étude expérimentale est présentée dans le chapitre 5. Les hypothèses associées à cette étude étaient les suivantes :

- Les mots complexes composés avec un suffixe commun en L1 et L2 (par exemple, teachable) sont-ils mieux appris que les mots complexes avec des suffixes uniques en L2 (par exemple, prideful) ?

- L'effet sera-t-il différent selon le moment de l'apprentissage ?
- Peut-on observer une interaction entre le statut du suffixe et la compétence en L2 ? On s'attend à ce que les suffixes communs soient plus bénéfiques aux bilingues peu compétents.

Nous regroupons ci-dessous une analyse transversale des résultats liés aux trois études expérimentales.

8.3 Résumé et interprétation des résultats

8.3.1 Le fait d'être compétent entraîne-t-il un meilleur traitement et une meilleure utilisation de la morphologie ?

La compétence des bilingues tardifs a été évaluée avec le LexTale (Lemhöfer & Broersma, 2012) et avec des tâches de vocabulaire (Casalis et al., 2015 ; Menut et al., 2022) dans les expériences 1 et 2. Comme la corrélation entre la connaissance du vocabulaire et le LexTale était élevée dans les expériences 1 et 2, seul le LexTale a été conservé dans la troisième expérience.

Dans toutes les études, nous avons trouvé le même modèle de résultats pour la compétence. Plus les bilingues étaient compétents, meilleures étaient leurs performances. Les résultats de l'expérience 1 sont ainsi cohérents avec les résultats de la littérature, qui ont mis en évidence une amélioration significative de la conscience morphologique à mesure que la compétence en L2 augmente (Kraut, 2015). Les résultats ont aussi montré que les bilingues très compétents ne semblent pas atteindre un niveau de performance plafond et restent en dessous de la performance de natifs anglais (Sánchez-Gutiérrez & Hernández Muñoz, 2018).

La deuxième expérience souligne néanmoins une nuance au constat d'une performance constamment inégale à celle de locuteurs natifs. Dans cette expérience, les bilingues tardifs étaient en effet en moyenne plus lents que les lecteurs natifs, conformément à Bosch et al. (2017). Cependant, les données ont également montré que certains des bilingues tardifs avec une haute compétence en L2 (10 à 15 d'entre eux) ont pu atteindre le niveau moyen des lecteurs natifs, voire l'ont dépassé. Ainsi, atteindre un niveau comparable à celui d'un natif ne semble pas irréalisable, même si on peut soutenir que tout locuteur de L2, même hautement compétents, ne peut pas systématiquement atteindre un traitement comparable à celui d'un natif. Ce développement langagier dépendrait de différents facteurs. L'une des raisons pourrait être que les bilingues très performants ont été exposés à la L2 autant que le lecteur natif moyen (voire plus), ce qui a conduit à des temps de lecture équivalents. Une autre suggestion serait que cela dépend de la langue maternelle (Nisbet et al., 2022). Le français présente une faible distance linguistique par rapport à l'anglais, ce qui pourrait expliquer pourquoi le groupe étudié ici a atteint un niveau de performance similaire aux natifs.

Dans l'ensemble, les tâches utilisées dans les trois études expérimentales ont montré une sensibilité claire au niveau de compétence. Néanmoins, l'interaction entre le niveau de compétence et le statut du suffixe n'était pas significative. Cette absence d'effet a été une surprise. Koda (2008) a indiqué que l'effet de la L1 sur la L2 devrait être permanent, quel que soit le niveau de compétence. Nous nous attendions à ce que l'effet soit plus fort chez les

bilingues tardifs à faible niveau de compétence, qui s'appuierait davantage sur leur L1 par rapport aux bilingues très compétents (Kroll & Stewart, 1994 ; van Heuven et al., 1998). L'absence globale d'effet nous a conduit à nous demander si nous devions reconsidérer l'existence du transfert morphologique de L1-L2. Nous présentons ci-dessous un résumé de la question suivi d'une interprétation des résultats.

8.3.2 7.2 Existe-t-il un transfert inter-langue de la morphologie de L1 à L2 ?

Dans la première étude expérimentale (chapitre 3), les bilingues tardifs semblaient avoir acquis des connaissances de conscience dérivationelle et ainsi pue manipuler les morphèmes : connaissances lexico-sémantiques, connaissances syntaxiques et connaissances distributionnelles (Tyler & Nagy, 1989). La connaissance morphologique était également fortement corrélée à la connaissance du vocabulaire (Gottardo et al., 2018). L'hypothèse principale de cette étude était que les suffixes communs L1-L2 influenceraient toutes les étapes de la conscience dérivationnelle. On s'attendait à ce que les suffixes communs conduisent à de meilleures performances que les suffixes uniques en L2. Mais le schéma des résultats ne reflète pas cette différence.

Premièrement, les résultats de la tâche lexico-sémantique ne pouvaient pas être interprétés comme un effet de facilitation claire des suffixes communs par rapport aux suffixes uniques en L2. Dans cette tâche, les bilingues français-anglais avaient tendance à rejeter les paires de mots avec des suffixes communs s'ils ne reconnaissaient pas le stimulus comme étant familier (une des raisons pouvant être qu'ils anticipaient les fausses pistes). Deuxièmement, il n'y avait pas d'effet principal ni d'interaction dans la tâche de complétion de mots. Enfin, dans la tâche de détection des suffixes, l'interaction allait dans la direction opposée à l'hypothèse posée.

Les résultats inattendus de l'étude 1 pourraientt être expliqués par le fait que les tâches n'étaient pas assez sensibles pour détecter une influence des connaissances morphologiques de la L1 sur la L2. À la recherche d'une tâche appropriée, nous nous sommes tournés vers le traitement automatique. Nous avons émis l'hypothèse que l'influence de la L1 sur la L2 pourrait être plus facilement observée dans une tâche de traitement automatique des mots. Par conséquent, dans la deuxième expérience (chapitre 4), nous avons demandé à des bilingues tardifs de lire des phrases en anglais. Les phrases contenaient des mots dérivés composés avec un suffixe commun ou unique à la L2. À la lumière de l'hypothèse de congruence morphologique proposée pour le traitement morphosyntaxique (Jiang et al., 2011), nous avons prédit une facilitation pour les morphèmes communs par opposition aux suffixes uniques à la L2. Les résultats, cependant, ont montré que sur le mot cible, il n'y avait aucun avantage pour les suffixes communs par rapport aux suffixes uniques à la L2. Par conséquent, nos résultats n'ont pas étendu l'hypothèse de la congruence morphologique à la morphologie dérivationnelle. Ces résultats s’alignent davantage avec de précédents résultats qui n'ont, eux aussi, pas réussi à mettre en évidence une influence de la morpho-syntaxe L1 sur la L2 (Dudley & Slabakova, 2021). Il est intéressant de noter qu'un petit avantage des suffixes communs par rapport aux mots contrôles a été observé dans la « spillover region » (région suivant le mot cible), mais uniquement par rapport au groupe de locuteurs natifs. L'effet dans la « spillover region » tend

à soutenir l'idée que les bilingues traitent les informations linguistiques plus lentement que les locuteurs natifs (Bosch et al., 2017). En conclusion, les résultats de l'étude 2 ont dessiné une image inconsistante de l'influence de la morphologie de la L1 sur la L2. Bien que les résultats semblent indiquer l'absence d'un effet, la constatation d'une faible différence dans la « spillover region » ne nous a pas permis de tirer une conclusion ferme sur notre hypothèse.

La première et la deuxième expérience ont évalué le traitement en L2, c'est-à-dire un traitement qui se produit après l'acquisition de la L2. Les résultats des deux expériences ont mis en perspective une dernière hypothèse qui n'avait pas été envisagée auparavant : le transfert inter-langue des unités morphologiques pourrait être limité aux premiers instants de l'acquisition de nouveaux mots. Par conséquent, la troisième expérience a été menée en utilisant une liste de mots dérivés dans laquelle les bilingues tardifs ont appris un ensemble de 80 mots dérivés avec des suffixes communs ou uniques à la L2.

Mais encore une fois, l'analyse n'a pas souligné de différence en fonction du statut du suffixe, à tout moment de l'apprentissage. Ces résultats étaient convergents avec les études précédentes que nous avons menées ainsi que des résultats récents chez les enfants (Marks et al., 2022). Cependant, une analyse a posteriori a montré une différence entre les suffixes communs-partagés (étonnement-étonnement) et les suffixes communs-non-partagés (glissement-glissage). Les traductions avec des suffixes communs-partagés ont été mieux apprises que les traductions avec des suffixes communs-non-partagés. Bien que cela puisse s'expliquer en partie par le chevauchement orthographique pour les paires de mots avec des suffixes communs-partagés, il y a peu de preuves pour cette explication alternative pour les suffixes communs-non-partagés. Une explication plus probable avancée ici serait que l'incohérence de correspondance des morphèmes entre L1-L2 rendrait les mots complexes plus difficiles à apprendre (et à utiliser). Une telle interprétation serait cohérente avec les résultats obtenus dans des études portant sur l'apprentissage artificiel (Tamminen et al., 2015).

En raison de l'analyse post hoc de l'expérience 3, les expériences 1 et 2 ont été réévaluées avec la nouvelle distinction séparant les mots contenant des suffixes communs en deux catégories : suffixes communs-partagés et les suffixes communs-non-partagés. L'analyse de la première expérience n'a pas mis en évidence de différence entre les deux types de mots. L'incohérence de correspondance des morphèmes ne semble pas ici avoir influencé les performances dans les tâches de conscience morphologique. L'analyse de la deuxième expérience n'a pas non plus mis en évidence de différence significative. Il n'y avait pas de différence entre les suffixes communs-partagés et suffixes communs-non-partagés pendant la lecture des mots cibles et de la « spillover region ». Il y avait cependant une tendance à la différence entre les suffixes communs-partagés et les suffixes uniques à la L2. Le fait d’observer une tendance ici pourrait être conditionné par le nombre d'items dans l'analyse. Il n'y avait que 9 items avec des suffixes communs-partagés, ce qui a considérablement réduit la puissance de l'analyse. Ainsi, l'analyse a posteriori devrait être considérée comme exploratoire et indicative pour de futures études et non comme fournissant une conclusion fiable.

8.3.3 Interprétation

8.3.3.1 Comment les résultats s'accordent-ils avec les modèles actuels de transfert interlinguistique ?

Le modèle de facilitation du transfert (Koda, 2008) se concentre sur la manière dont la conscience métalinguistique de la L1 peut être transférée à la L2. Koda (2008) a supposé que le transfert de L1 à L2 serait continu tout au long du développement de la L2, indépendamment du niveau de compétence. Les résultats fournis par Lam et al. (2020) chez des enfants anglophones apprenant le français ont montré une facilitation des correspondances de suffixes interlinguistiques (par exemple, -ity/-ité) sur la compréhension de la lecture en L2. Nous nous attendions à un schéma similaire chez les adultes, avec un effet plus fort chez les bilingues peu compétents que chez les bilingues très compétents. Mais cela n'a pas été le cas. Nos données n'ont pas mis en évidence un effet facilitateur de l'influence de la L1 sur la L2, quel que soit le niveau de compétence (absence d'interaction dans les données).

À la lumière des données recueillies dans les trois études expérimentales, nous ne pouvons pas conclure, d'un point de vue morphologique, en faveur du modèle. Nos résultats fournissent plutôt des preuves de l'absence d'influence des connaissances morphologiques de la L1 sur l'apprentissage morphologique de la L2. En cause de ces résultats pourrait être la correspondance morphémique des suffixes qui ne s'avère pas systématiquement cohérente. Les suffixes communs ne sont pas toujours retranscrits par les mêmes suffixes en français et en anglais (comme par exemple dans la paire de mots : étonnement-amazement). En effet, comme l'ont souligné les données a posteriori, les suffixes diffèrent assez souvent (comme dans slippage-glissement). L'analyse a posteriori de l'étude d'apprentissage de mots (chapitre 5) a ainsi montré une différence d'acquisition des mots entre les correspondances de suffixes dites communs-partagés et communs-non-partagés. Alors que les traductions avec des suffixes communs-partagés ont été apprises aussi bien que les traductions avec des suffixes uniques à la L2, les mots avec des suffixes communs-non-partagés ont été moins bien appris. Ainsi, cette distinction entre la correspondance des suffixes souligne aussi bien un transfert positif que négatif dans l'apprentissage.

Le modèle de compétition unifié (Unified Competition Model – UCM ; MacWhinney, 2005, 2018) tient compte du transfert positif et négatif. Le transfert négatif a été mis en évidence au cours de notre étude sur l'apprentissage (chapitre 5). Cependant, les autres expériences (conscience morphologique et lecture auto-segementée) n'ont fourni aucune preuve, dans un sens ou dans l'autre. Il semble donc que nous ne puissions pas non plus fournir de preuves solides pour soutenir le modèle UCM. L'une des explications pouvant être avancée serait que l'incohérence de la correspondance L1-L2 des suffixes ne permettrait pas au transfert de se produire, faute de base solide et constante.

Une autre possibilité, bien que spéculative pourrait expliquer le manque d'évidence de transfert. L'UCM met en évidence quatre facteurs de risque pour l'apprentissage d'une L2 : le transfert, le retranchement, la suranalyse et l'isolement. Le modèle n'indique cependant ni l'ordre chronologique ni la prépondérance des facteurs de risque. Néanmoins, s'il existe une asymétrie entre les facteurs de risque, nous pourrions alors supposer, à la vue de nos résultats, que la suranalyse entrave le transfert. Les bilingues tardifs utiliseraient à une analyse de surface lorsqu'ils apprennent à lire en L2. Le transfert des connaissances morphologiques serait donc

compliqué pour les apprenants tardifs en L2. Si le chunking (le facteur de soutien de la suranalyse) n'est pas encore acquis, alors le transfert des connaissances morphologiques en L2 serait entravé.

Bien que preuves de transfert positif et négatif aient été trouvées pour d'autres paramètres linguistiques, la morphologie dérivationnelle semble différer. Du moins, d'après nos résultats, l'information des unités de suffixes ne semble pas être transférée de L1 à L2. Il est important de distinguer cela du transfert de connaissances générales, c'est-à-dire que la complexité morphologique peut être transférée de L1 à L2. Nous discutons des évidences dans ce domaine et leur distinction vis-à-vis des unités morphologiques dans la section suivante.

8.3.3.2 Un transfert de connaissances morphologiques générales

L'intérêt des recherches menées ici était de démêler si la présence de suffixes familiers entre la L1 et la L2 faciliterait le traitement, l'apprentissage et la conscience morphologique en L2. L'absence d'effet tout au long de nos études expérimentales pourrait nous amener à conclure que la morphologie ne se transfère pas de L1 à L2. Cependant, nos études se sont concentrées sur les unités morphologiques. Les connaissances morphologiques en L1, en tant que conscience métalinguistique générale, pourraient tout de même influencer la L2 (Kim et al., 2015 ; Nisbet et al., 2022 ; Wu & Juffs, 2021). En effet, plusieurs études ont suggéré que le traitement morphologique en L2 est affecté par la richesse morphologique en L1, aussi bien chez les enfants que chez les adultes apprenants en L2.

Nisbet et al. (2022), par exemple, ont constaté que selon la langue maternelle, les lecteurs manifestaient différents patterns de lecture en L2. Plus spécifiquement, ils ont exploré les différences de performances de lecture entre les bilingues allemand-anglais et les bilingues finlandais-anglais. Ils ont constaté que les germano-anglais pouvaient atteindre les mêmes performances de lecture en anglais que les locuteurs natifs, alors que les bilingues finnois-anglais ne le pouvaient pas. Cette différence a été interprétée comme un effet de la distance linguistique entre les langues car elle était plus faible entre l'allemand et l'anglais qu'entre le finnois et l'anglais. L'allemand et l'anglais partageraient plusieurs caractéristiques linguistiques : la phonologie, l'orthographe et la morphologie.

Kim et al. (2015) ont examiné trois groupes d'enfants. Un groupe de locuteurs natifs de l'anglais, et deux groupes de bilingues qui avaient des langues maternelles différentes (espagnol et chinois). Leur objectif était d'évaluer comment la conscience morphologique en L2 diffère selon les groupes. Les résultats ont montré que, tout d'abord, les deux groupes bilingues ont obtenu de meilleurs résultats dans les tâches de conscience morphologique par aux enfants de langue maternelle anglaise. Ce résultat inattendu pourrait être dû au fait que les enfants bilingues sont davantage exposés à des instructions portant sur les connaissances morphologiques par rapport à leurs pairs monolingues (voir également Rastle et al., 2021). Deuxièmement, les enfants bilingues ont montré des différences entre les groupes. Les enfants hispano-anglais ont affiché de meilleures performances que les enfants chinois-anglais. Ces résultats peuvent être interprétés comme une fonction des différences structurelles entre les langues. Les enfants bilingues espagnol-anglais pourraient bénéficier du fait que l'espagnol et

l'anglais partagent des similarités structurelles et sémantiques, ce qui est moins le cas pour les enfants chinois-anglais.

Chez les adultes, Wu & Juffs (2021) ont également mené une étude interlinguistique comparant des locuteurs natifs de l'anglais avec deux groupes de bilingues (turc et chinois comme L1). Le turc et le chinois étaient des langues intéressantes à comparer car le chinois n'utilise pas de suffixes dérivationnels alors que la langue turque en utilise beaucoup. Les résultats ont été conformes aux prédictions des auteurs. Les bilingues turc-anglais ont obtenu de meilleurs résultats que les bilingues chinois-anglais dans les tâches de conscience morphologique. Ce résultat semble être dû à la complexité morphologique du turc, qui favorise la conscience morphologique en L2. En outre, conformément aux résultats de Kim et al. (2015), les bilingues turc-anglais ont obtenu de meilleurs résultats que les locuteurs natifs de l'anglais dans une tâche d'appareillement morphologique dans laquelle les participants devaient indiquer si "happy" était lié à "happiness" et "catalogue" à "cat".

Ce qui semble clair, c'est que les connaissances morphologiques en L1 peuvent influencer le traitement morphologique en L2. Mais nous ne semblons pas exactement savoir comment exactement. Ce que les résultats de nos études expérimentales semblent suggérer, c'est que cela ne dépend pas de l'existence de suffixes partagés entre les deux langues. Dans les sections suivantes, nous émettons des hypothèses sur les raisons de cette situation et sur la manière dont la question peut être approfondie.

8.3.3.3 Suffixes similaires, différents et uniques L1-L2

Les études axées sur le transfert interlinguistique en morphologie ont examiné l'effet des patterns similaires sur la compréhension de la lecture en L2 (Lam et al., 2020) et la conscience morphologique (Miguel et al., 2020). Lam et al. (2020) ont étudié des enfants anglophones apprenant le français dans un programme d'immersion. Ils se sont concentrés sur la façon dont les correspondances des suffixes interlinguistiques entre L1 et L2 affectent l'utilisation de la compréhension de la lecture en L2. La correspondance des suffixes interlinguistiques signifie que les affixes portent la même signification en L1 et L2 et produisent les mêmes changements de classe grammaticale, et ce indépendamment de la phonologie et/ou de l'orthographe (par exemple, -ly en anglais, -ment en français). La tâche évaluant l'effet de la correspondance des suffixes entre les langues était une tâche d'appariement. À partir d'un mot français (par exemple, activité), les enfants devaient choisir le mot anglais correct parmi trois choix (par exemple, activité, actif, activement). Les mots complexes étaient composés de racines cognate qui différaient par leurs suffixes de dérivation (ex., -ité/-ity). Parmi les suffixes, deux paires ne présentaient aucun chevauchement orthographique ou phonologique (-ment/-ly, -er/-y). Dans l'ensemble, les auteurs ont constaté que la conscience morphologique présentait une corrélation positive avec la compréhension de la lecture en L2. À noter que les auteurs n'ont pas distingué l'effet dû au chevauchement orthographique des paires, car l'intérêt était de prendre en compte tous les types de correspondances suffixales interlinguistiques. On peut soutenir qu'il n'y avait pas suffisamment de paires non chevauchantes pour contrôler cette différence.

De même, chez les adultes, Miguel et al. (2020) se sont concentrés sur les apprenants anglais de l'espagnol. Les participants ont appris de nouveaux mots et ont été évalués avec un

test de reconnaissance intra-mot et un test de décomposition. Les résultats ont montré que, indépendamment du niveau de compétence, tous les apprenants appliquaient des stratégies liées à la morphologie pour déduire le sens des mots, et cela était encore plus fréquent chez les apprenants L2 ayant la plus grande compétence. De plus, de meilleure performances semblaient être obtenues, et ce pour tous les participants, lorsqu'il y avait un suffixe cognate commun entre l'espagnol et l'anglais (par exemple, -oso/-ous). Cela suggère que les suffixes communs entre la L1 et la L2 ont été bénéfiques aux apprenants de la L2 dans les tâches de raisonnement lent et explicite.

Les études ci-dessus confirment l'effet positif que les suffixes communs peuvent avoir à la fois sur la compréhension de la lecture en L2 chez les enfants et sur la décomposition des mots nouveaux en L2 chez les adultes. Toutefois, il convient de noter que ces études ne se sont concentrées que sur l'effet bénéfique des suffixes communs ou des correspondances interlinguistiques chez les anglophones apprenants du français ou de l'espagnol. Ce qui est logique. Les apprenants anglais du français et de l'espagnol sont amenés à rencontrer des suffixes communs entre L1 et L2, ayant les mêmes partagent orthographiques (-oso/-ous en espagnol-anglais ; -ité/-ity en français-anglais) ou sémantiques (-ment/-ly).

Nos études ont initialement distingué les suffixes communs des suffixes uniques à la L2. Dans l'expérience d'apprentissage (chapitre 5), l'analyse post hoc a fourni des résultats intéressants. Elle a montré que les suffixes communs partagés (-ment/-ment en français-anglais) facilitaient l'acquisition de mots en L2. Cependant, la facilitation n'était pas significativement plus importante que celle observée pour les suffixes uniques à la L2, ce qui suggère que les deux types de suffixes bénéficient à l'apprentissage de la L2. En revanche, les suffixes communs-non-partagés (-ment/-age) entravent plus l'acquisition de mots en L2.

Nous comprenons que, conformément à Lam et al. (2020) et Miguel et al. (2020), nous avons trouvé un effet positif des suffixes qui partageaient des mappings cohérents entre L1 et L2. Mais nous avions en plus des suffixes communs-non-partagés, qui eux, ont montré un effet négatif. Ces deux aspects apportent un éclairage supplémentaire aux résultats de Lam et al. (2020) et Miguel et al. (2020). L'utilisation d'une distinction entre les suffixes uniques à la L2 et les suffixes communs partagés/non-partagés nous a permis de montrer que ce n'est peut-être pas tant le fait que les suffixes soient communs qui compte, mais plutôt le fait que les traductions en L1 et leur équivalent en L2 s'alignent pour créer une correspondance congruente.

Une distinction similaire a été faite par Tolentino & Tokowicz (2014) dans leurs études centrées sur la morpho-syntaxe. Ils ont distingué les caractéristiques similaires, différents et uniques entre la L1 et la L2. Appliqués à la morphologie dérivationnelle, les morphèmes similaires sont ceux qui ont exactement la même traduction (-ment/-ment), les morphèmes dissimilaires sont ceux qui ont des traductions différentes même si le suffixe existe dans les deux langues (-ment/-age), et les suffixes uniques seraient ceux qui n'existent qu'en L2 (-ly qui peut souvent être traduit en français par -ment mais pas systématiquement ; par exemple, blindly/aveuglément et queenly/"comme une reine"). Il est clair que le statut du suffixe doit être développé davantage que ce que nous avons fait dans les études présentées ici. Nous allons maintenant décrire comment nous pourrions procéder en considérant ces éléments.

8.3.3.4 Nouvelles perspectives à considérer

Comme mentionné ci-dessus, nos études se sont principalement concentrées sur la distinction entre les suffixes uniques L2 et les suffixes communs L1-L2. Mais une analyse a posteriori suggère qu'il pourrait être plus intéressant à l'avenir de construire un matériel considérant la distinction entre les traductions cohérentes et incohérentes des suffixes.

Dans le paradigme de lecture auto-segmentée, un groupe de bilingues français-anglais tardifs ont lu des phrases comprenant des mots dérivés et non dérivés. La première analyse statistique n'a pas montré de différence de traitement entre les différentes catégories de mots (communs uniques à la L2, contrôle) dans le groupe bilingue. En revanche, une interaction est apparue lorsque nous avons comparé les bilingues français-anglais aux monolingues anglais : les suffixes L1-L2 communs étant plus rapides que les suffixes uniques à la L2. Plus intéressant encore, l'analyse a posteriori suggère que les suffixes communs-partagés pourraient être traités plus rapidement (selon la tendance décrite) que les suffixes uniques à la L2. Cependant, cette analyse ne contenait que 9 éléments dans la condition communs-partagés, 17 éléments dans la condition de communs-non-partagés et 30 dans la condition de unique à la L2. Les études futures devraient utiliser davantage de suffixes communs-partagés et non-partagés, afin de voir si les résultats seraient significatifs et par conséquent plus robustes. Comme le nombre d'items n'était pas suffisant dans notre étude, cela reste pour l'instant hypothétique. De la même manière, les études futures pourraient vouloir comparer les suffixes uniques à la L2 qui sont traduits de manière cohérente (par exemple, -able/-able) par rapport aux suffixes uniques à la L2 qui sont traduits de manière incohérente (par exemple, -ly/-ment).

Nos études se sont concentrées sur les effets interlinguistiques du traitement de la L1 à la L2. Le matériel était donc spécifiquement axé sur la L2. Mais il pourrait y avoir des caractéristiques plus complexes à prendre en compte. Il est prouvé que la L1 et la L2 sont activées en même temps (Dijkstra & van Heuven, 2002 ; van Heuven et al., 1998) lors du traitement L2. Ainsi, considérer le matériel dans le seul prisme de la L2 pourrait être insuffisant. Le matériel devrait non seulement prendre en compte les caractéristiques similaires de L1 et L2 en L2, mais aussi les correspondances entre L2 et L1. En outre, il serait bon d'examiner à la fois les suffixes et les racines. L'intérêt serait également de voir au-delà d'un groupe de bilingue uniquement (ici, français-anglais). L'ajout d'autres paires de langues (par exemple, néerlandais-anglais) pourrait également enrichir les résultats.

Un récent schéma de reconnaissance visuelle de mots complexes tente de rendre compte des mécanismes de transfert interlinguistique dans le traitement morphologique (Kahraman & Beyersmann, 2023). Le modèle est basé sur l'idée que l'accès au langage est non sélectif. En outre, il décrit l'activation parallèle d'un mot cible et de son équivalent en traduction dans un lexique intégré. Cette activation commence dès les premières étapes du traitement, tant pour le mot intégré que pour l'affixe. L'activation se propage en trois étapes, de bas en haut : entrée orthographique, lexique orthographique et représentations sémantiques. L'organigramme suppose que le statut du tronc L2 et les morphèmes L2 (ici, les suffixes) activent l'équivalent de la traduction L1 de manière indépendante. Les suffixes cognitifs peuvent être activés dès l'entrée orthographique (de bas en haut) alors que les morphèmes non cognitifs ne le peuvent pas.

L'organigramme de la figure 2 (p.120) propose un exemple basé sur la recherche de Comesaña et al. (2018) avec des bilingues anglais-portugais. Cet exemple pourrait correspondre aux données actuelles chez les bilingues tardifs anglais-français, car le français et le portugais sont des langues très proches (par exemple, cristallin - cristallino - cristalline, pour l'anglais, le portugais et le français respectivement).

Comesaña et al. (2018) ont étudié la différence de traitement en fonction du statut des suffixes et des racines chez des bilingues portugais-anglais. Le paradigme reposait sur un amorçage de traduction morphologique masqué. L'étude était composée de quatre conditions expérimentales : une racine cognate avec un suffixe cognate (pregad<u>or</u>/preach<u>er</u>), un radical non cognate avec un suffixe cognate (jogad<u>or</u>/play<u>er</u>), un radical cognate avec un suffixe non cognate (simplici<u>dade</u>/simplic<u>ity</u>) et un radical non cognate avec un suffixe non cognate (adestra<u>mento</u>/dress<u>age</u>). Les résultats ont montré que, lorsque le radical est un cognate, le caractère cognate du suffixe a également un impact sur le temps de lecture. Une paire de mots complètement cognate a ainsi démontré un temps de lecture plus rapide que les racines cognates avec des suffixes non cognates. Cependant, l'effet cognate du suffixe entre les racines cognates n'était pas aussi clair.

L'organigramme propose de mener un paradigme similaire à celui de Comesaña et al. (2018) pour étudier les effets d'activation en L2. Parallèlement, pour étudier l'effet du transfert en L2, nous proposons de conserver une étude telle que le paradigme de la lecture auto-segmentée. L'utilisation du paradigme de traduction masquée rendra compte de l'activation simultanée. Cependant, le fait de s'intéresser uniquement à la L2, dans une tâche de lecture à rythme autonome, rendrait compte de l'effet de transfert de L1 à L2, sans cibler explicitement la L1.

Un dernier point à souligner est que nous nous sommes concentrés sur les bilingues français-anglais tardifs afin de démêler les effets spécifiques des unités suffixales de la L1 sur L2. Néanmoins, un groupe de bilingues n'est pas égal à un autre (Bialystok et al. 2013). Pour cette raison, l'interprétation des résultats ne peut pas être généralisée à tous les groupes bilingues. D'autres études doivent être menées sur le transfert dérivationnel de la L1 vers la L2 afin de comprendre si l'absence d'effet de nos est également observée chez les bilingues précoces et chez d'autres bilingues. Nous voyons deux possibilités différentes d'examiner l'effet de la L1 sur la L2. Tout d'abord, l'approche la plus courante dans la recherche interlinguistique serait d'utiliser différentes L1 et de voir leurs effets sur la L2. Mais, une autre façon d'étudier l'effet peut être d'utiliser la même L1 pour apprendre deux L2 différentes. Par exemple, nous avons étudié ici un groupe de Français apprenant l'anglais, mais il serait intéressant de voir dans quelle mesure les résultats seraient différents si le même groupe apprenait l'allemand. Un problème de cette recherche sera de trouver des échantillons appariés d'apprenants, compte tenu de l'importance de l'apprentissage de l'anglais en tant que deuxième langue, en particulier pour les francophones.

En conclusion, les trois études expérimentales présentées dans cette thèse tendent à prouver que la conscience morphologique, la lecture automatique et l'apprentissage des mots en L2 ne sont pas fortement influencés par les informations morphologiques en L1. Plus spécifiquement, dans l'apprentissage, les suffixes communs L1 et L2 ne facilitent pas plus que

les suffixes uniques L2. Au contraire, lorsque l'on présente des traductions en L1 et en L2, les suffixes communs avec des correspondances inconsistentes entravent l'apprentissage. Ce n'était pas le cas pour la conscience morphologique, ni la lecture, où les résultats étaient plus confus. Ainsi, l'inexactitude et la ponctualité de l'effet négatif de la morphologie native sur la L2 n'apportent pas soutient à l'idée que le partage morphologique soit bénéfique pour l'apprentissage d'une nouvelle langue. Néanmoins, un nouveau modèle sur le traitement morphologique nous amène également à penser qu'une distinction plus précise des caractéristiques des suffixes pourrait conduire à un effet plus explicite (ou à une absence d'effet) de la L1 sur la L2.

9. References

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CURRICULUM VITAE

AMELIE MENUT

PH.D STUDENT IN PSYCHOLINGUISTICS
& PSYCHOLOGIST SPECIALIZED IN NEUROPSYCHOLOGY

CONTACT

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Faculté de Psychologie et Sciences de l'Education et de la Formation (PsySEF)

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Amélie Menut

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LANGUAGES

French: native language

English: level C1

Spanish: B2

HOBBIES

Climbing

Hiking / Trekking

Photography

SOFTWARE SKILLS

Jamovi

R

LimeSurvey

FORMATION

2019 - now — **Ph.D in psycholinguistic**
Joint PhD- University of Lille and Ghent (supervised by Séverine Casalis and Marc Brysbaert)
Cross-linguistic influence of L1 morphological knowledge in L2. The case of French-English late bilinguals.

2016 - 2018 — **Master's degree - University of Lille**
- Master 1: psychology with specialization in neuropsychology
- Master 2 - Double degree with the University of Minho (Braga, Portugal): psychology of neurocognitive processes and affective sciences

2013 - 2016 — **Bachelor's degree - University of Rennes 2**
- Bachelor of psychology
- Third year realized with BCI exchange program at the University of Quebec in Montreal (UQAM)

2012 - 2013 — **First year of Bachelor's degree - University of Rennes 2**
- Bachelor of Foreign applied languages

2012 — **High school diploma**

RESEARCH INTERESTS AND EXPERIENCES

My research interest mainly focuses on *Bilingualism*. I am interested in studies that lead to understand the processes underlying second language acquisition and processing.

Scientific contributions

2022 — **Oral communication**
Amelie Menut, Séverine Casalis & Marc Brysbaert (2022, September). Does morphology shared between L1 and L2 facilitate reading in L2? Barcelona Summer School on Bilingualism and Multilingualism, *Barcelone,Espagne*

Oral communication
Amelie Menut, Marc Brysbaert & Séverine Casalis (2022, September). Do shared suffixes facilitate L2 complex word learning in late bilinguals? - Conference of the European Society for Cognitive Psychology, *Lille, France*

Article
Amelie Menut, Marc Brysbaert & Séverine Casalis (2022). Derivational awareness in late bilinguals increases along with proficiency without a clear influence of the suffixes shared with L1. *Bilinualism and cognition*

Talk presentation
Amelie Menut, Marc Brysbaert & Séverine Casalis (2022, April). Derivational awareness in late bilinguals increases with proficiency without clear influence of the L1. Colloque des Jeunes Chercheur.se.s en Sciences Cognitives 2022 - Fresco

2021 **Poster presentation**
Amelie Menut, Marc Brysbaert & Séverine Casalis (2021, June). Morphological awareness in late L2 learners: proficiency matters while the L1 does not. XV International Symposium of Psycholiguistics 2021, online.

2018 **Poster presentation**
Amelie Menut, Séverine Casalis & Montserrat Comesaña (2018, April). Is morphological decomposition in low/intermediate L2 learners influenced by prime duration? A masked priming lexical decision study. 13th Encontro da Associação Portuguesa de Psicologia Experimental, Braga, Portugal.

Derivational morphological processing with a long masked priming task in low proficiency L2 English Speakers - Master 2 thesis project
Under the supervision of Séverine Casalis & Montserrat Comesaña

Research internship - Braga, Portugal
Development of methodological skills and data analysis competencies with Montserrat Comesaña.

2017 **Bilingualism's influence on Specific language impairment - Master 1 thesis project**
Under the supervision of Séverine Casalis

Responsabilities

2021 **Member of the organizing committee of the Scientific Day for Young Researchers (JSJC)**
Organization of an online scientific day (zoom)
Selection of oral communications and posters by abstracts.

2020 **Co-representative of the PhD students in the SCALab laboratory**
Link between PhD students' requests and the laboratory council

2019 **Member of the 2019 SCALab yearbook committee**
Yearbook update and organization of the year's publications by team.

2016 **Laboratory of language development - University of Québec in Montréal (UQAM)**
Help in collecting and coding data with Excel and Eye Tracking softwares under the supervision of Rushen Shi and Mireille Babineau.

CAREN (Activities center and students ressources in neurosciences) - Montreal, 2015 - 2016
Comity room member. Reception and help of students. Also a member of the web comity: responsibilities of the web design and of the content in the publications and resources section.

Teaching experience

2020-2022 **Bilingualism**
Master 2: Psychology of neurocognitive processes and affective sciences. Introduction to the cognition of the bilinguals.

Neurosciences
Year 3 of Bachelor in Computational mathematics applied to human and social sciences. Introducing neurosciences studies on language and neural recycling.

Cognitive psychology
Year 3 of bachelor in psychology. Teaching focused on language acquisition

Students' project
Year 2 of bachelor in psychology. Introduction to psychology's professions. Guiding students in the construction of their professional project

2018-2020 **Méhodologie disciplinaire**
Year 1 of bachelor in psychology. Introduction to experimental methodologies in psychology

General psychology
Year 3 of bachelor in psychology. Teaching focused on introduction to psycholinguistic research.

Developmental psychology
Year 1 of bachelor in psychology
study of the cognitive, linguistic and socio-affective development of young children.

CLINICAL EXPERIENCES

2021 **Centre SSR Marc Sautelet - Villeneuve-d'Ascq (59)**
Training in child neuropsychology tools
Development of neuropsychological evaluation tools: WWPSI II, NEPSY II, Tea-Ch, WISCV-V, CMS, Brunet-Lésine and various methods of memory and attentional rehabilitation

2018 **Hospital of Douai - Douai (59)**
Internship in Neuropsychology
Complete autonomy of neuropsychological assessments and memory assessments in adults and elderly populations.

Hospital Fontan 2 - Lille (59)
Internship in Psychiatry
Adaptation in a geriatric environment of neuropsychological assessments and improvement of clinical sense.

Medico-psychologic centre for children & young adults - Guingamp (22)
Internship in Developmental Neuropsychology
Improvement of knowledge of neuro-developmental assessments and pathologies.

2017 **Private consultations - Valenciennes (59)**
Internship in Developmental Neuropsychology
Neuropsychological assessments of children in development. Aim: learn about developmental tests and develop the clinical sense with patients and parents.

Hospital of Treguier - Tréguier (22)
Internship in Geriatric Neuropsychology
Automatization of neuropsychological assessments, interpretation of results and reports writing. Participation and realization of everyday's rehabilitation sessions.

Hospital Victor Provo - Lille (59)
Internship in Geriatric Neuropsychology
Neuropsychological assessments and memory evaluation. Aim: learn about the specialization by interpreting patients' results and draft reports.

DATA STORAGE FACT SHEETS

DATA STORAGE FACT SHEET FOR CHAPTER 3

% Derivational awareness in late bilinguals increases along with proficiency without a clear influence of the suffixes shared with L1. The case of French-English late bilinguals.
% Author: Amélie Menut
% Date: 19-10-2022

1. Contact details

1a. Main researcher

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If a response is not received when using the above contact details, please send an email to data.pp@ugent.be or contact Data Management, Faculty of Psychology and Educational Sciences, Henri Dunantlaan 2, 9000 Ghent, Belgium.

2. Information about the datasets to which this sheet applies

* Reference of the publication in which the datasets are reported:
Menut, A., Brysbaert, M., & Casalis, S. (2022). Derivational awareness in late bilinguals increases along with proficiency without a clear influence of the suffixes shared with L1. *Bilingualism: Language and Cognition*, 1-14. DOI: 10.1017/S1366728922000402

* Which datasets in that publication does this sheet apply to?:
The sheet applies to all the data reported in the publication

3. Information about the files that have been stored

3a. Raw data

* Have the raw data been stored by the main researcher? [X] YES / [ ] NO
If NO, please justify:

* On which platform are the raw data stored?
  - [X] researcher PC

- [X] research group file server
- [X] other (specify): Open Science Framework, https://osf.io/cv8ny/

* Who has direct access to the raw data (i.e., without intervention of another person)?
- [X] main researcher
- [X] responsible ZAP
- [X] all members of the research group
- [ ] all members of UGent
- [X] other (specify): the data is available on osf, made public

3b. Other files

* Which other files have been stored?
- [] file(s) describing the transition from raw data to reported results. Specify: ...
- [X] file(s) containing processed data. Specify: ...
- [X] file(s) containing analyses. Specify: ...
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% Does morphology shared between L1 and L2 help in reading L2 sentences?The case of French-English late bilinguals.
% Author: Amélie Menut
% Date: 19-10-2022

1. Contact details

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2. Information about the datasets to which this sheet applies

* Reference of the publication in which the datasets are reported:
Menut, A., Casalis, S., & Brysbaert, M. (in preparation). *Does morphology shared between L1 and L2 help in reading L2 sentences?*

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3a. Raw data

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DATA STORAGE FACT SHEET FOR CHAPTER 5

% Suffixes common to French and English can both help and hinder learning of English words in late bilinguals.
% Author: Amélie Menut
% Date: 19-10-2022

1. Contact details

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If a response is not received when using the above contact details, please send an email to data.pp@ugent.be or contact Data Management, Faculty of Psychology and Educational Sciences, Henri Dunantlaan 2, 9000 Ghent, Belgium.

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* Reference of the publication in which the datasets are reported:
Menut, A., Casalis, S., & Brysbaert, M. (in preparation). *Suffixes common to French and English can both help and hinder learning of English words in late bilinguals.*

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3. Information about the files that have been stored

3a. Raw data

* Have the raw data been stored by the main researcher? [X] YES / [ ] NO
If NO, please justify:

* On which platform are the raw data stored?
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* Who has direct access to the raw data (i.e., without intervention of another person)?
  - [X] main researcher
  - [X] responsible ZAP
  - [X] all members of the research group

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- [X] other (specify): the data is available on osf, made public

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