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# Do French speakers have an advantage in learning English vocabulary thanks to familiar suffixes?

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Abstract

Previous research has shown that languages from nearby families are easier to learn as second languages (L2) than languages from more distant families, attributing this difference to the presence of shared elements between the native language (L1) and L2. Building on this idea, we hypothesized that suffixes present in L1 might facilitate complex word acquisition in L2. To test this hypothesis, we recruited 76 late French-English bilinguals and tasked them with learning a set of 80 English derived-words containing suffixes that also exist in French (e.g., -able) or are unique to English (e.g., -ness). Consolidation of the learned words was assessed one week after the last learning session. The results showed a significant learning effect across the learning trials and consolidation, suggesting that the bilingual participants were able to acquire the derived words. However, contrary to our hypothesis, suffixes also existing in French did not give a significant advantage over English-unique suffixes. Further analysis revealed that this was due to variations in the consistency of familiar suffixes from L1. While some translation pairs shared the same suffix (e.g., amazement-étonnement), others had different suffixes (e.g., slippage-glissement). The type of translation pair with inconsistent suffix overlap (slippage-glissement) carried learning costs, preventing the bilingual participants from benefiting from the presence of familiar suffixes in L2 words. These findings suggest that shared information can be used effectively for L2 learning only if the mapping between L1 and L2 is consistent.

Keywords: bilingualism, morphological processing, proficiency, cross-language





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## 1.1 Introduction

Languages of nearby families are easier to learn as second languages (L2) than languages of more distant families. This can be seen in the foreign language training that U.S. diplomats must go through before being sent to a country (U.S. Department of State, Foreign Service Institute, 2023). The time typically required for a student to achieve "General Professional Skill" in the language ranges from 24 weeks for other Indo-European languages such as Danish, Dutch, Italian, Portuguese and Spanish, to 88 weeks for genealogically distant languages such as Arabic, Chinese, Japanese and Korean. French gets 30 weeks.

Genealogically close languages are easier to learn because they share more features. This creates a transfer of information from the native language (L1) to L2 (Koda, 2008). Information overlap exists at many levels, ranging from shared orthography (e.g., the Roman alphabet) to analogies in syntax and discourse. In this paper, we focus on morphological similarity.

Most words in English are combinations of meaningful units (morphemes). Morphological knowledge refers to the (tacit) use of morphemes, which in turn helps learners of English 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 in children 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 L1 poses an interesting question for adults learning English as L2, certainly if the L1 has morphological cues as well. Then, morphological knowledge and awareness are already well established in L1 by the time the adults 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 of English can profit from L1 morphological knowledge when learning new words. The study presented here aims to bring further insight to this question. But first, we discuss the main findings reported in the literature.





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## 1.2 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; 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





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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. They started from the finding that pseudowords with familiar suffixes are more difficult to reject in a lexical decision task than control pseudowords (Caramazza et al, 1988), at least when the suffix is placed at its usual end position (Crepaldi et al., 2010). Dawson et al. (2021) 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.



### 1.2.1 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; 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; Li & Koda, 2022; 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.



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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 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 __." [friend] and "SIDEWALK. The baby is learning how to __." [walk]). 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







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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." [breakable]). 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.

### 1.2.2 The present study

The research reported here is a continuation of our previous studies on the processing of English L2 derived words by French-English bilinguals. The question was whether French speakers have an advantage in learning English derived words containing a familiar suffix that also exists in French. Rastle et al. (2004) presented evidence that proficient language users automatically parse words that look multimorphemic. Thus, English readers automatically parse swimmer into swimmer+er and corner into corn+er, but they do not parse brothel into broth+el (see also Duñabeitia et al., 2008 and Heyer & Kornishova, 2018; but see Feldman et al. (2009) for questions about whether the effect is truly morphological). We hypothesized that the automatic parsing would transfer from L1 to L2, in which case familiar L1 suffixes (but not unfamiliar L2 suffixes) would be automatically separated from the stem, making it easier to understand the structure of the word.

As described in the preceding section, we were unable to find the expected advantage of familiar suffixes in two previous studies. 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 (2022, Chapter 4), 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, because we thought this would increase our chances of finding an advantage of familiar suffixes. Participants were asked to learn 80 English words through a translation task. We chose this task because it is the way French students learn English in school: First they had to learn word translations and then use the English words in text and speech. It has been shown that explicit knowledge of L1-L2 translations is an efficient way to learn words (e.g., Comesaña et al., 2009) and is also the best predictor of reading comprehension (Zhang & Zhang, 2020).

Half of the English words had suffixes which exist in both French and English (e.g., -age in slippage). Because they are familiar suffixes in L1, we expected their processing to transfer to L2 based on Rastle et al. (2004). The other half of the stimuli had suffixes which





DOI: 10.1177/17470218241245685

 

exclusively exist in English (e.g, -th in growth). Because they are not familiar to French speakers, we expected them to be more difficult to learn. Importantly (as will become clear when discussing the results), not all translation pairs with familiar suffixes shared the same suffix (as in amazement- étonnement). More than half of the stimuli with familiar suffixes had another suffix in English than in French (as in slippage-glissement).

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 existed both in French and in 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 English education in France.[1] Students are given a list of L2 words with their L1 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 familiar suffix (already acquired in L1) in an L2 word help late L2 bilinguals learn new complex L2 words (derived words composed of two morphemes)? Facilitation would occur if L2 derived words with suffixes familiar from L1 (purposive-intentionnel) are learned more efficiently than L2 derived words with suffixes unique to L2 (bitterness- amertume).

- 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? Is the overlap between L1 and L2 particularly helpful for beginning learners? Or on the contrary, does morphological knowledge requires a reasonably good L2 proficiency to be used?

# 1.3 Method

## 1.3.1 Participants

A total of 76 French-English late bilinguals ($\bar{x}_{\text{age}}$ = 24.2, *SD* = 3.7) took part in the study. This 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).

[1] As a reviewer noted, this differs from the United Kingdom, where implicit teaching by language use is more common.



DOI: 10.1177/17470218241245685

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 available on the osf-site at https://osf.io/gmwsz/.

Insert here Table 1

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.



DOI: 10.1177/17470218241245685

 

### 1.3.2 Stimulus materials

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

The study was a learning paradigm. We created a list of 80 English derived words, half of which had a suffix also existing in French (-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.





DOI: 10.1177/17470218241245685

Insert here Table 2

### 1.3.3 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. By pressing "START" on the screen, they gave 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.

### 1.3.4 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 English words were presented in a random order (different for each participant and each learning session) with their French translations. 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 of the French translations and asked to give the English word (20 with familiar suffixes and 20 with L2-unique suffixes). In the backward translation task (from L2 to L1), participants were given the other 40 words in English (20 with familiar suffixes and 20 with L2-unique suffixes) and asked to give the French translations.

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


DOI: 10.1177/17470218241245685

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 (Familiar vs. L2-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 exercises (results of the absence of effect is described below).







DOI: 10.1177/17470218241245685

insert here Figure 1

## 1.4 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 (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/.



### 1.4.1 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 familiar and L2-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: Familiar/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 after 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 descriptive results).



DOI: 10.1177/17470218241245685

Importantly, there was no main effect of suffix condition (estimate = .00, SE = .22, $z$ = .02, $p$ = 0.98), nor 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 familiar and L2-unique suffixes and this for all measurement times.

Insert here Table 3





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Insert here Figure 2

<u>Day 1</u>

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: Familiar/L2-Unique suffix - discrete categorical variable, contrast coded [−0.5, +0.5])), Step of learning ($1^{st}$ time/$2^{nd}$ 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 familiar suffixes 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).

A reviewer suggested to look again at our data removing multi-word expressions and multiple word translations as these may influence the results. This new analysis contained 59 words out of the 80 words. The results were the same as the analysis reported above for day 1 (analysis is available in osf "review" file) which suggest no influence in the first learning day.

Insert here Figure 3







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Insert here Figure 4

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).

In continuance with a reviewer's suggestion, we further explored our dataset, deleting the stimuli with French translations that consisted of multiple words or multi-word expressions. For this analysis, although the model remained the same, we could not include a random slope of suffix condition across participants (this model failed to converge). Only a random slope per word and per participant could be included. This might be explained by the number of words: 59 words out of 80 words remained for the analysis.

First, as in the previous analysis, there were main effects of Proficiency (estimate = .60, SE = .14, *z* = 4.44, *p* <.001) and of measurement time (estimate = -.83, SE = .09, *z* = -10.43, *p* <.001). More interesting, however, was a main effect of condition (estimate = -.97, SE = .35, *z* = -2.75, *p* <.01), which went against our hypothesis and showed that L2-unique suffixes were better learned than familiar suffixes. There also was a significant interaction between condition and measurement step (estimate = -.09, SE = .08, *z* = -3.05, *p* <.01). This interaction showed that participants with high proficiency had better performances for L2 unique suffixes on the 3rd measurement but that the opposite was observed for low-proficiency participants. On the 4th measurement, all L2-unique suffixes display better performance for all proficiency levels. No other interaction came out as significant.

insert here Figure 5

*Day 3*

On Day 3 participants translated the stimulus words one week after they learned the words. The LME model included two fixed-effect factors: suffix condition (Target type: Familiar/L2-Unique - discrete categorical variable, contrast coding [−0.5, +0.5])), and the participants'



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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)

In line with the previous analyses, we explored the dataset without multiple word translations and multi-word translations in French. The new analysis provided the same results (details of the analysis are available at osf)

### 1.4.2 Post-hoc Analysis

Because there was no difference between words with suffixes familiar from French and words with English-unique suffixes, we had a closer look at the familiar suffixes. For about half of the items, the suffix was the same in L2 and in L1 (e.g., amazement-étonnement). For others, the English word had a suffix existing in French, but the suffix was not the same as the one used in French translation (e.g., avoidance-évitement).

To explore possible differences between these two types of familiar suffixes, we made a distinction between words with familiar-shared suffixes (N = 17) and words with familiar-unshared suffixes (N = 23). The new analysis consisted of a 3 (Familiar-shared, Familiar-unshared, L2-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 post-hoc 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 French-English translation pairs with shared suffixes were learned better than translation pairs with L2-unique suffixes (estimate = -1.46, z = 5.55, $p$ < .001) but that French-English translation pairs with unshared familiar suffixes were learned worse than translations with L2-unique features (estimate = -2.36, z = -8.09, $p$ < .001). This was true at all measurement times.

Insert here Figure 6

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 (i.e., averaged over the five measurements). 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





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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).

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 Levenshtein 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 familiar-unshared compared to familiar-shared suffixes (estimated difference = -.16, t(76) = -3.57, p < .001), but the difference between translations with L2-unique suffixes and translations with familiar-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 familiar-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).

Suffix Levenshtein distance did not have a negative impact (slope = -.01, t(53) = -0.07, p = 0.94). The effect of Levenshtein distance was entirely due to the distance between the roots (slope = -.04, t(53) = -2.46, p < .01).[2]

insert here Figure 7

[2] We thank a reviewer for suggesting the analysis on the Levenshtein distances between roots and suffixes, separately. This post-hoc analysis only contained 60 words out of the 80 words of the study. In line with another reviewer comment, we deleted all items with French translations that either consisted of multiple words or multi-word expressions.







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## 1.5 Discussion

In this study we investigated whether L2 words are easier to learn when they contain a suffix that exists in L1 as well. Research by Rastle et al. (2004) suggested that proficient readers automatically parse visually presented words consisting of a stem and a familiar 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 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 the overall experience of a native language. Speakers of L1 languages with a complex morphology (Spanish, French, Finnish,…) learn English morphology more easily than speakers of languages with less morphological experience (Havas et al., 2015; Kim et al., 2015; Luk & Shirai, 2009; Wu & Juffs, 2021). Studies focusing on the transfer of specific morphological units (e.g., specific suffixes) has presented predominantly negative results, at least as far as fluent language use is concerned (Havas et al., 2015; Marks et al., 2022; Menut, 2022; Menut et al., 2022; Miguel, 2020).

The study presented here is the last in a series of three studies (Menut, 2022, Chapter 4; Menut et al., 2022) in which we tried to find evidence that L2 suffixes familiar from 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, 2022, Chapter 4), in which we asked participants to read English L2 sentences with derived words. Participants did not read derived English words with French-English suffixes faster than derived words with unique English suffixes.

The present experiment was designed to tap into the very first moments of L2 word acquisition. We set up a word learning experiment very familiar to learners of English in the French school system, in which pupils are first asked to memorize French translations of a list of English words (this is usually checked with a vocabulary test in class), followed by using the words in text and speech. This method was also used in previous studies regarding L2 word learning (e.g., Comesaña et al., 2009).The participants of the present study were asked to study 80 English-French 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 if late bilinguals rely on L1 morphological knowledge, then they should display an advantage for learning English derived words with





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suffixes that are familiar from French (e.g., -age, -ment) compared to learning English derived words with suffixes that are unique to English (e.g., -ness, -th). If morphological transfer helps, complex words composed with familiar L1 suffixes in English would be learned better. Moreover, if this effect appeared, we expected low-proficiency participants to display it more strongly because of their greater reliance on L1.

However, our results did not support our expectations. The acquisition process did not show an overall advantage for suffixes familiar from L1. As a matter of fact, there was some evidence for an *opposite* effect. This finding is in line with our previous failures to find a difference between familiar and unfamiliar suffixes (Menut, 2022; Menut et al., 2022) and those of Marks et al. (2022).

Our finding does 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 L2 words with familiar suffixes 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 English word and its French translation share the same suffix (amazement-étonnement) and items in which the English and French word have different familiar suffixes (slippage-glissement). We explored the consequences of this difference.

Post-hoc analysis indicated that there indeed is a difference between both types of stimuli (Figures 6 and 7). Relative to English words with English-unique suffixes, English words with familiar French suffixes were learned *better* when the familiar suffix was shared between the English and the French word (amazement-étonnement) but *worse* when the familiar suffixes were different (slippage-glissement).

The opposite effects of the two types of suffixes familiar to French and English gave the initial, erroneous impression that there were no differences between words with familiar and L2-unique suffixes in our study of word learning (Figures 2-5). However, the inconsistencies in suffix assignments between English words and their French translations may have broader implications. As Tamminen et al. (2015) showed, inconsistent morphemes are more difficult to learn (and of less use). Thus, one reason why we found no effects of familiar vs. L2-unique suffixes in our earlier studies (Menut, 2022; Menut et al., 2022) may be that the mappings between French and English are not consistent enough for French speakers to pick up on the fact that English words 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).

One way to understand the opposite effects for familiar-shared vs. familiar-unshared translation pairs, could be to think of different degrees of competition in the mental lexicon. In such a scenario, translation pairs with shared familiar suffixes would be easier to process because the activation converges more quickly to the correct word representations. In contrast,





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translation pairs with divergent familiar suffixes 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 familiar-shared and familiar-unshared suffixes not only in the present translation learning task, but also in other word processing tasks, such as reading.

On the other hand, it could be that the advantage of familiar-shared suffixes is an artefact. Translations with shared suffixes could be learned better, simply due to the larger orthographic overlap between the English and the French words. Indeed, orthographic distance between the English word and the French translation negatively affected word learning. This was particularly true for the distance between the roots, but some effect due to orthographic similarity of the suffix cannot be excluded. Differences in orthographic overlap are less likely to account for the poorer performance in the familiar-unshared condition, as the orthographic distance here was the same as in the L2-unique condition.

The opposite effects of familiar-shared and familiar-unshared items make it less likely that the null effect between familiar and L2-unique effects was due to an absence of automatic morphological decomposition (hypothesized by Rastle et al., 2004). Some researchers have argued that morphological parsing without semantics does not exist (Feldman et al., 2009), but more recent studies seem to confirm Rastle et al.'s (2004) interpretation, at least in English as L1 (Crepaldi et al., 2016; Duñabeitia et al., 2008; Heyer & Kornishova, 2018; Tseng et al., 2020). Our findings seem to be in line with the latter interpretation. Familiar suffixes made a difference; it was just not always advantageous.

As is true for all studies, our study is limited in its conclusions. For a start, we wanted to have a true word learning study, in which French participants were learning useful words from a language (English) they are interested in and motivated to learn. This is different from studies in which participants learn words from a non-existing language or from a language they are unfamiliar with but not interested in either. This choice meant that the items we could select were limited in number, because they had to be difficult enough, consist of a familiar stem, and contain French-English vs. English-only suffixes. As a result, we sometimes had to select words that did not have a straightforward French equivalent (so that we had to describe the words by using multiple approximations or multi-word expressions). Also, as noted by a reviewer, this meant that we could not fully exclude the possibility that some French or English words had competing translations (e.g., précisément can be translated with precisely instead of accurately). Negative impact of competition has been reported by Antón and Duñabeitia (2020). They showed that learning a new translation of a word was more difficult when previously a cognate had been taught for the target word than when a non-cognate translation had been taught.

The material was also built to avoid a focus on morphology while learning. The aim was to keep the morphological aspect of the learning implicit. That is why not all English words with familiar suffixes had the same suffix as in French. A dichotomy between familiar-shared suffixes and L2-unique suffixes without orthographic overlap would have been salient to the participants and would have encouraged them to use all types of strategies to optimize their performance, morphology-based or not. Our focus was on L2 word learning, not on exploiting differences in orthographic overlap to optimize performance.





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However, the post-hoc analysis suggesting opposite effects for familiar-shared and familiar-unshared suffixes gives food for thought and may oblige us to revisit some of the choices we made. This could include taking into account a recent chart flow proposed by Kahraman and Beyersmann (2023). This chart flow suggests that L2 words not only activate the L2-stem and the L2-morpheme, but also their L1 equivalents. This could mean that cognate suffixes could activate word candidates from the orthographic input (bottom-up) while non-cognate morphemes could not.

In conclusion, returning to the question asked in the title, our study largely shows that French speakers do *not* have an advantage in learning English vocabulary due to the fact that French and English share some suffixes. They may have some advantage if the French and English suffixes are the same, but this is offset by the many cases where English translations of French words contain a different "French" suffix (as in furtherance-advancement, annoyance-agacement). The findings offer interesting leads for theoretical interpretation but require more data (preferably from multiple language pairs and tasks) to truly triangulate the underlying mechanisms.

## Supplementary Material

The Supplementary Material is available at: qjep.sagepub.com

## Data Accessibility Statement

The data and materials from the present experiment are publicly available at the Open Science Framework website: https://osf.io/gmwsz/





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Figure Captions

**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.*

**Figure 2**

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

**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 (Familiar 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 (Familiar, full line and L2-Unique, dotted line).*

**Figure 5**

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

**Figure 6**

*Proportion of words correctly learned per measurement (and number of times the list was seen) as a function of Condition (from left to right: familiar_shared, familiar_unshared, L2-unique suffix).*

**Figure 7**

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





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**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.*

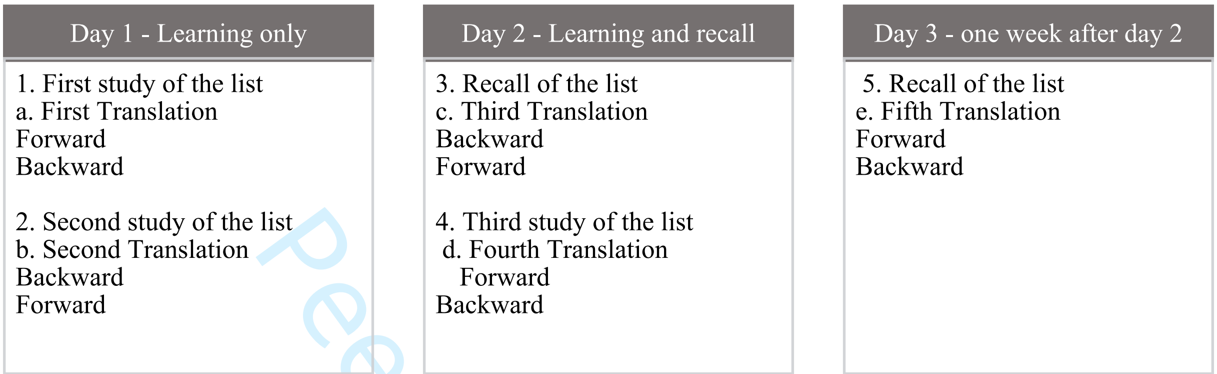






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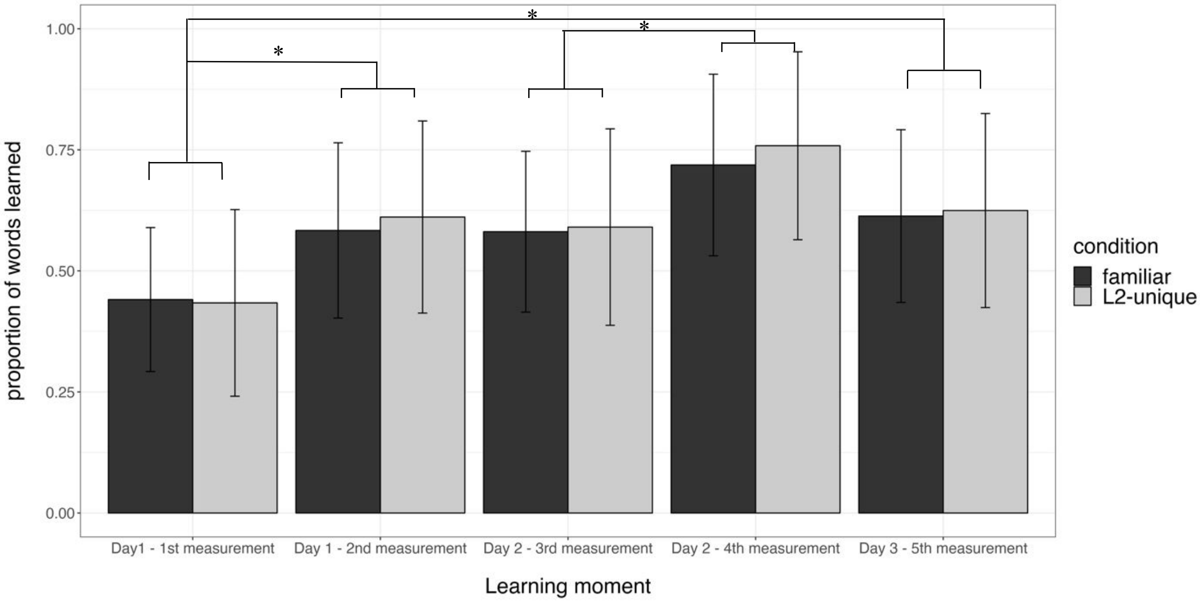
**Figure 2**

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




*Note. *p<.001*





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**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 (Familiar on the left side of the figure and L2-unique on the right side).*

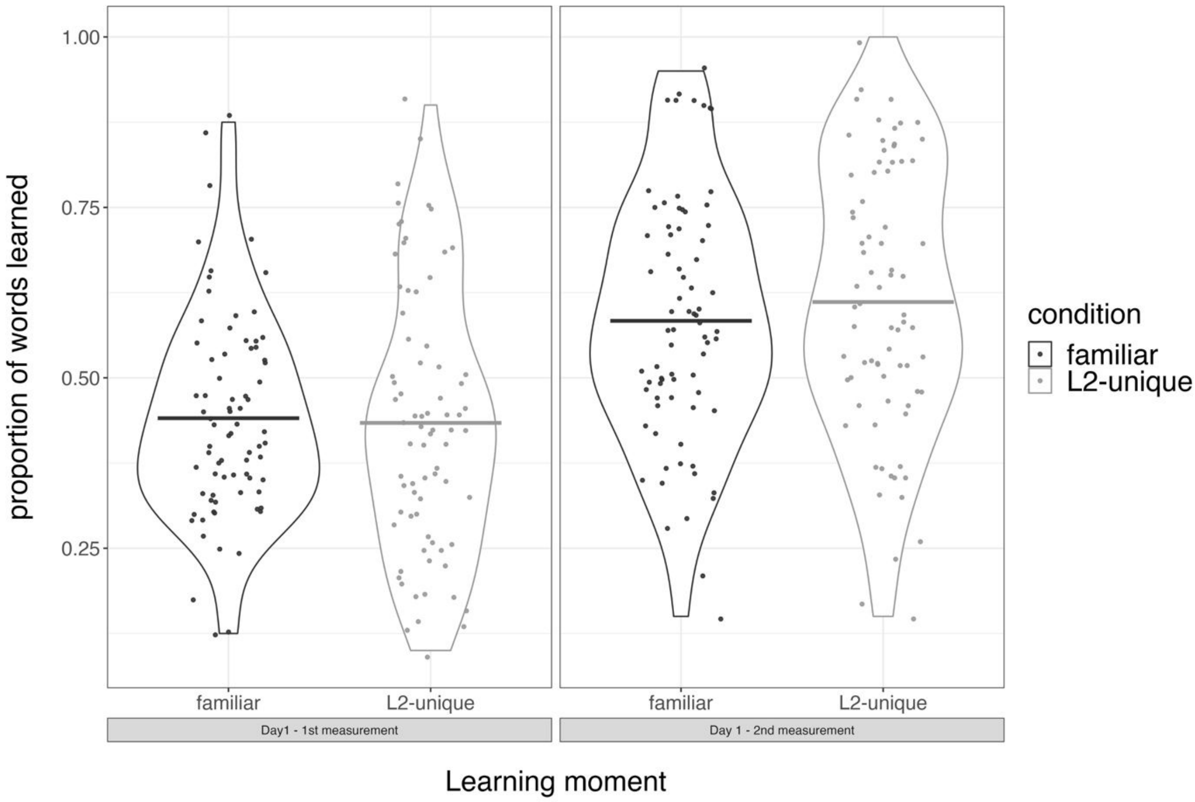






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**Figure 4**

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

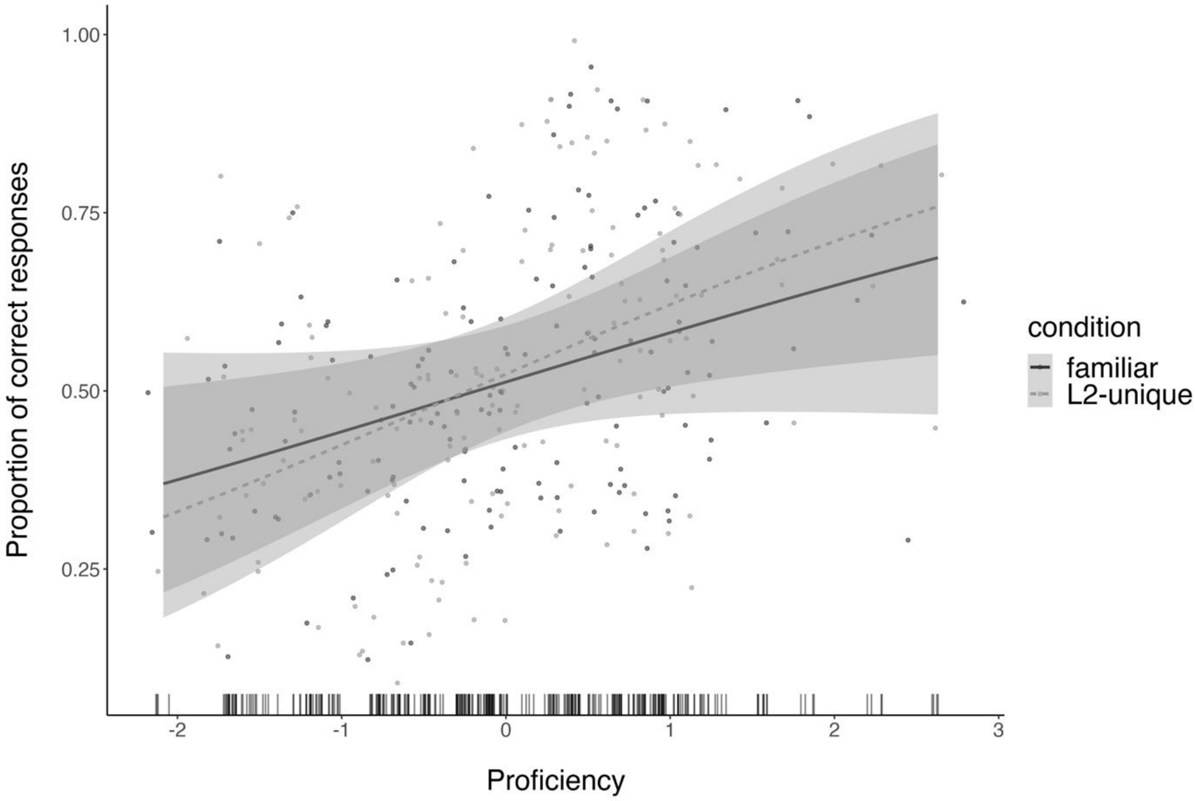






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**Figure 5**

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

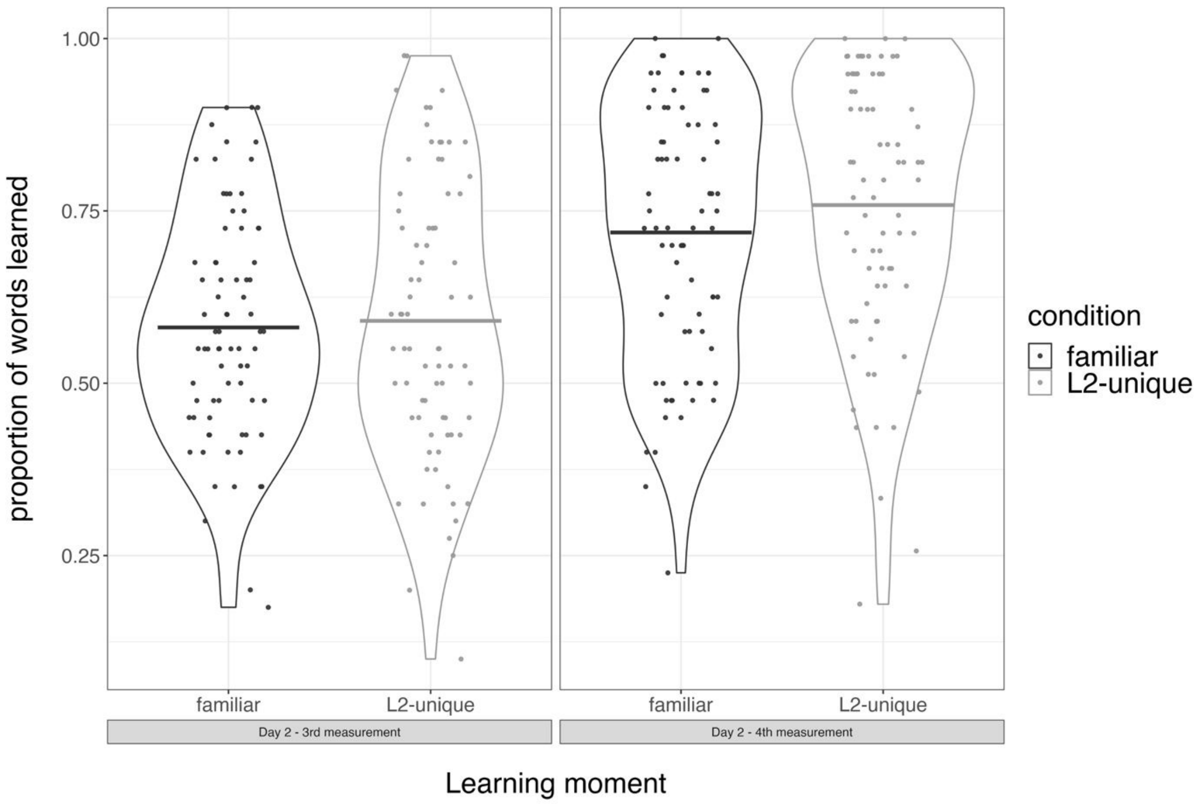






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**Figure 6**

*Proportion of words correctly learned per measurement (and number of times the list was seen) as a function of Condition (from left to right: familiar_shared, familiar_unshared, L2-unique suffix).*

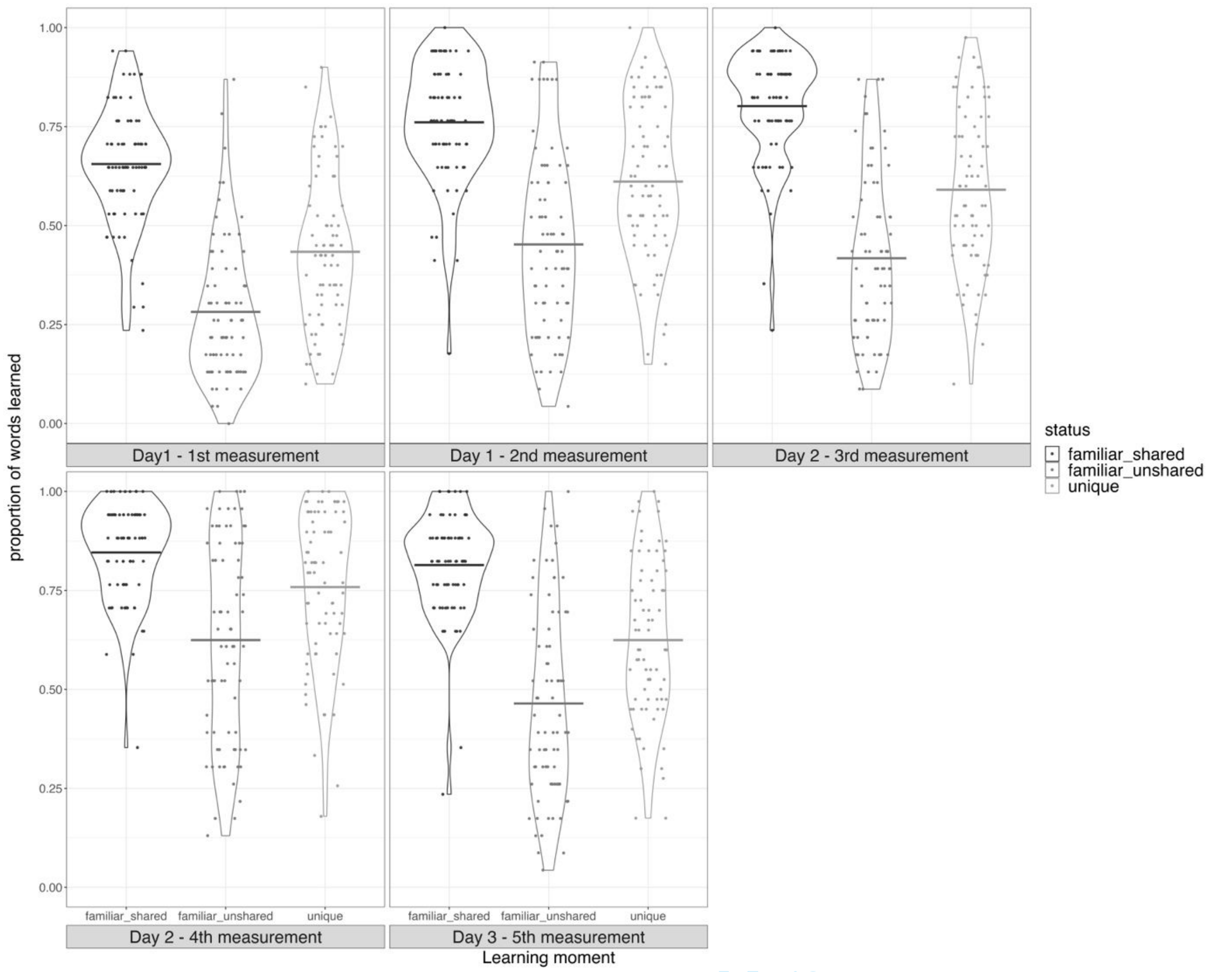




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**Figure 7**

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

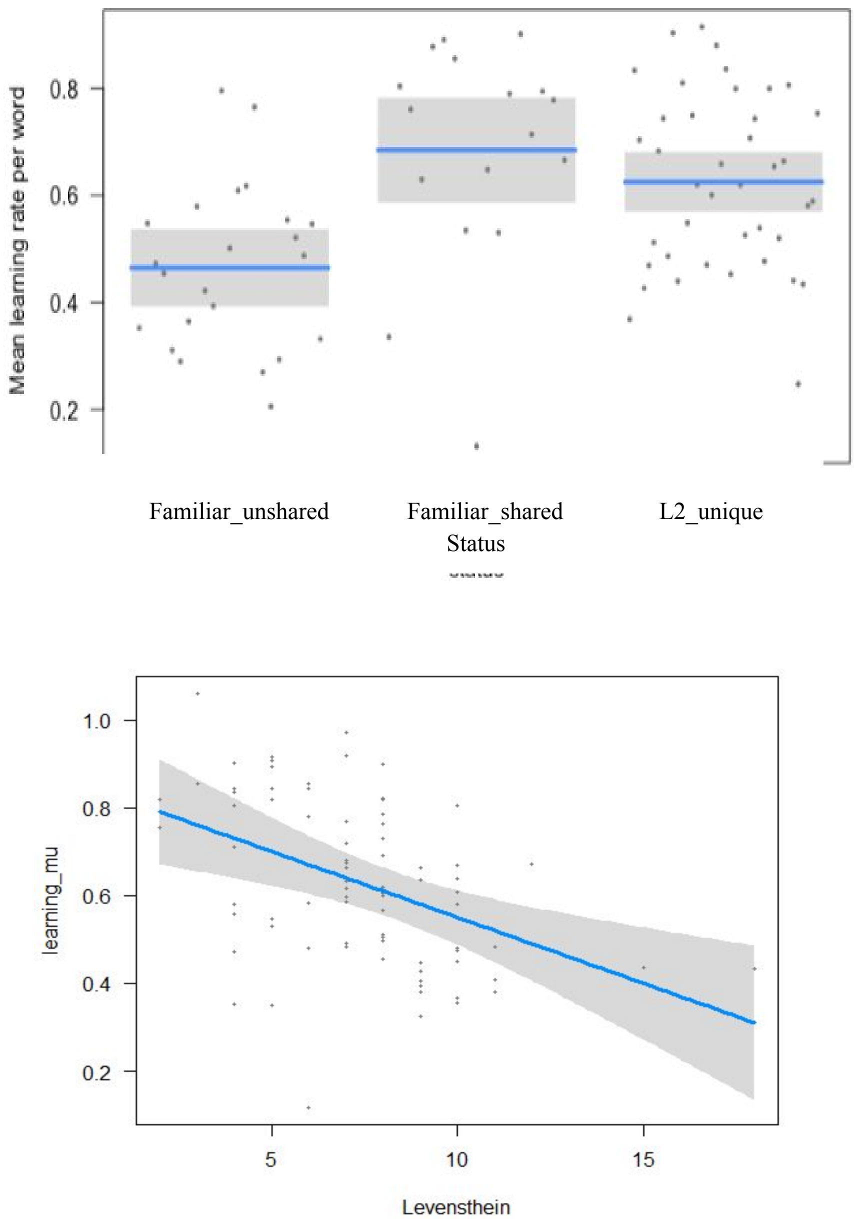




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**Table 1**
*Summary of the characteristics regarding participants of the study – Means (standard deviations).*

| | 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)* |





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**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.*





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**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)* |





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