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# The Acquisition of French (L3) Coda Consonant Clusters by English (L2) Learners Speakers of Persian (L1): An Optimality Account

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**Abstract**

The present study presents an Optimality Theoretic account of syllable codas in French by the learners whose first and second languages are Persian and English respectively. Additionally, it investigates transfer at the L3 initial state, testing between the three hypotheses of Full Transfer/ Full Access (Schwartz & Sprouse, as cited in Özçelik, 2009) i.e., the main L1 transfer effect, L2 Status Factor (Bardel & Falk, 2007, 2011) i.e., the main L2 transfer effect, and Cumulative Enhancement Model (Flynn et al., 2004) i.e., all previously known languages' positive or neutral transfer effect. As a matter of fact, OT is also used to see whether it supports what is obtained through transfer effects or not. To do so, two groups of Persian native speakers, but with differing English proficiencies (lower-intermediate and upper-intermediate) that were at the initial state of acquiring L3 French were asked to complete two tests, namely oral judgment test and production test. The analysis of the data was done through the mixed between-within subjects ANOVA. Results of the transfer effect provided a major role for the "L2 status factor", while casting doubt on the tenability of several aspects of the CEM and provided no support for the FT/FA hypothesis. Regarding OT, the following constraint hierarchies were obtained for OJT and PT respectively: MAX-IO>> DEP-IO>>COMPLEX>> INDENT-IO and DEP-IO>> MAX-IO>> INDENT-IO>> COMPLEX. In fact, these rankings, especially the latter one, advocated the L2 constraint hierarchy and this was in accordance with the results of cross-linguistic effect, providing a major role for the L2 status factor.

**Keywords:** cumulative enhancement model, FT/FA, L2 status factor, optimality theory, third language acquisition, transfer

## 1. Introduction

The use of multiple languages by an individual or a speech community made a growing interest in the burgeoning field of generative third language (L3) acquisition. In this relation, researchers consider the interplay between the L1, the L2 and the L3, and the sources of transfer from the previously known languages. Regarding this transfer effect is tested between the three hypotheses of Full Transfer/ Full Access i.e., the main L1 transfer effect (Schwartz & Sprouse, as cited in Özçelik, 2009), L2 Status Factor i.e., the main L2 transfer effect (Bardel & Falk, 2007, 2011), and Cumulative Enhancement Model i.e., all previously known languages' positive or neutral transfer effect (Flynn, Foley, & Vinnitskaya, 2004). In fact, several studies have been conducted in this relation especially on L3 syntax, L3 lexicon and to a lesser extent on L3 phonology that has received its due attention recently. Therefore, further studies need to be conducted that delve deeper into the factors influencing multilingual acquisition to confirm the previous investigations.

In recent years, Optimality Theory (hereafter, OT) as a more recent model of phonology that was originally introduced by Prince & Smolensky (1993) is used to remedy perennial problems posed by earlier non-linear frameworks. As demonstrated by Broselow, Chen, & Wang (1998) these non-linear frameworks provide no place for interlanguage rules that are not motivated by surface representation and markedness constraints effects. As a matter of fact, OT differs from such earlier generative frameworks by virtue of having no rules, no intermediate representation and no restrictions on underlying representation (Levelt, 2003). According to Zuraw (2003), OT is not used in syntax and semantics so widely and its use in phonology has largely supplanted rule-based frameworks. In fact, OT has had little exposure in the field of L2 acquisition and there are a few published studies in this relation (Hancin-Bhatt, 2000). Furthermore, concerning L3 acquisition, there are even fewer studies which focus on OT analysis of L3 acquisition, and so more studies need to be conducted in this regard.

Bringing these together, a study on OT analysis of L3 coda acquisition seems to be fairly new.

The aim of the present study is twofold: (a) the cross-linguistic influences of background Languages (i.e., Persian and English) on the subsequent acquisition of French coda cluster relying on the three aforementioned models of L3 acquisition (b) the role of OT in the acquisition of French (L3) coda cluster by learners whose first and second language are Persian and English respectively. In fact, OT is used to clarify if learners' previously known ranking still has an effect in comprehending or producing French syllable and to see whether OT supports what is obtained through transfer effects or not.

## 2. Material Studied

Over the last decade, L3 acquisition has been considered as a unique process different from L2 acquisition that is worthy of study in its own right (Rothman & Amaro, 2010). In this sense, Wang (2013) proposes that an apprehension of humans' full capacity to acquire language requires the study of language learning beyond first and second language acquisition. As a matter of fact, transfer in L3 acquisition has been investigated at different domains like lexicon, syntax, phonology, etc. In line with this, it can be said that although lexical (e.g., De Bot, 2004; Dewaele, 1998; Ecke, 2000; Wei, 2006) and syntax level (e.g., Amaro, 2010; Bardel & Falk, 2007; Flynn et al., 2004; Rast, 2010; Rothman & Amaro, 2010) have been the subject of a considerable amount of research, "empirical investigations on cross-linguistic influence on L3 phonology are still far and few between" (Gut, 2010, p. 21).

Nowadays, there is a growing interest in the L2 coda structure acquisition even with an optimality theoretic account (e.g., Broselow, Chen, & Wang, 1998; Hancin-Bhatt, 2000; Hancin Bhatt & Bhatt, 1997; Jabbari & Arghavan, 2010; McCarthy, 2007). However it is noteworthy to point that both L3 coda structure acquisition and optimality theory in L3 acquisition are amongst the new phenomena that need further research. A brief introduction to some studies conducted with respect to cross-linguistic influence in L3 phonology and syntaxis provided in the following. Additionally, a brief introduction to OT and some studies carried out on the optimality theoretic account of syllable structure acquisition is referred to.

### *2.1 Cross Linguistic Influence in L3 Phonology*

In order to assess the influence of L1 or L2 in second or third languageoral production, a study was conducted by Llisterri & Poch-Olivé (as cited in Wang 2013) on bilingual and monolingual students of English or French. Results showed that in both cases learners relied entirely on their L1 and transferred L1 feature to their L2 or L3. Considering vowel reduction transfer, Hammarberg & Hammarberg (1993) conducted a study on a learner with L1 English, L2 German and L3 Swedish and found a major role for L1 phonological transfer in reading a Swedish passage. Nevertheless, they found the transfer of L2 German in the first week of learning and considered L2 influence to be more task dependent as it appeared more in a read-on-your-own than a read-after-me task. Generally, they found a negative L1 transfer.

In the same vein, a longitudinal case study of an adult learner Sarah Williams (SW) of L3 Swedish with language backgrounds of L1 British English, L2 German (fluent, near-native), L2 French (advanced, non-fluent), and L2 Italian (elementary, non-fluent) was conducted by Williams & Hammarberg (1998). In fact, in the first week of research and one year later SW was asked to narrate a same picture story and her voice was recorded at both times. Further analysis of the data by native Swedes showed two speakers with different L1s background, German and English respectively. Summing up, William & Hammarberg concluded that in the initial state of L3 phonology SW preferred to block L1 influence and relied on L2 phonology but through time as her knowledge of L3 increased, L1 influence on L3 became more apparent.

In an investigation of possible sources and directions of cross-linguistic influence in the prosodic phonology area, a study was conducted by Gut (2010) on four trilingual speakers with different L1s, L2 German or English and L3 English or German. Contrary to the findings of Hammarberg & Hammarberg (1993) study, no evidence was found for L1 cross-linguistic influence in L3 for this study. Furthermore, Gut proposed that learners' some use of vowel reduction in their L3 might be due to either a possible positive L2 influence or L3 phonological properties influence on L3 productions.

Another study was conducted by Wrembel (2010) aimed at finding the impact of L2 on L3 phonological acquisition provided by Polish native speakers with a good knowledge of German as their L2 having L3 English proficiency levels of beginner/elementary and pre-intermediate / intermediate. Results showed that higher proficiency group identified correctly more as Polish native speakers in 58% of cases than lower proficiency group with only 24%. Furthermore, lower proficiency group tended to be identified more as German native speakers in 53% of cases in contrast to the other group that showed 17% for this. In fact, Wrembel's findings

provided a support for Williams & Hammarberg's (1998) study that considered L2 as a major source of transfer at the initial stages of phonological acquisition leading to L2-accented speech in L3 performance. Further, it was said that this L2-accented speech diminishes as learner's L3 proficiency improves.

*2.2 Cross-Linguistic Influence in L3 Syntax*

A brief introduction to some studies done in L3 syntax is provided in the following. A study was conducted by Flynn et al. (2004) examining the acquisition of restrictive relative clauses by Japanese (head-final), Spanish (head-initial) and Kazakh (head-final) native speakers with L2 Russian and L3 English. With L1 Kazakh/L2 Russian/L3 English, they postulated that considering a major role for L1 influence in the acquisition of subsequent languages and regarding typological differences as a determiner of developmental patterns, one should expect that L3 learners behave similar to Japanese group because it has the same head direction. On the other hand, in a situation contrary to this that L1 has not such a role and learners' L3 Complementizer Phrase (CP) is consistent with the L2, learners were expected to behave like the Spanish group. The results showed that, while L1 did not play a major role in the acquisition of the English CP structure, having a prior knowledge of CP in L2 influenced this structure's development in subsequent language acquisition. In line with this, Flynn et al. proposed the Cumulative Enhancement Model (CEM) meaning learner's any prior language plays some role in subsequent language acquisition either by aiding the process or remaining neutral.

In an attempt to consider Flynn et al.'s CEM, Bardel & Falk (2007) conducted a study on two groups of learners with different L1s and L2s acquiring the placement of sentence negation in the initial state of L3 Swedish and Dutch. Having two groups, the first set consisted of five L3 Swedish (V2) learners three of whom had a V2 language as L1 and a non-V2 language as an L2 (EN group) and the other two had a non-V2 language as an L1 and a V2 language as an L2 (D/G group); the second group consisted of four L3 Dutch/Swedish (V2) learners that similar to the first group two of them had a V2 language as L1 and a non-V2 language as an L2 and the other two had a non-V2 language as an L1 and a V2 language as an L2.The results showed that the D/G group outperformed the E/N group and so it was concluded that L2 status factor precedes the typology factor in L3 acquisition. Summing up, the data corroborated the third hypothesis and provided support for L2 status factor, while casting doubt on what has been held by CEM (Flynn et al., 2004).

In terms of the acquisition of null-subject properties, a study was carried out by Rothman & Amaro (2010) testing the three hypotheses of the L1 transfer hypothesis, L2 transfer hypothesis and the CEM (Flynn et al., 2004). The data were collected from two groups of L1 English, L2 Spanish, L3 French/Italian and two groups of L1 English, L2 French/Italian. Results showed that although the L3 French and L3 Italian groups had a similar performance, the L2 French and L3 French groups performed quite differently. Rothman and Amaro attributed this to the deterministic role of L2 Spanish in the L3 morphosyntax domain and considered it as a support for L2 status factor.

In discussing syntactic transfer from L1/L2 to L3, a study was carried out by Falk & Bardel (2011) on the acquisition of the placement of object pronouns in both main and subordinate clauses. Data was collected from two groups of learners with L1 English/L2 French/L3 German and L1 French/L2 English/L3 German background languages. Results showed that the two groups behaved differently and they judged the sentences in a way that could be attributed to their L2s. Finally, Falk & Bardel stated that while their study was in contrary with both the L1 transfer and the CEM (Flynn et al., 2004) hypotheses, it provided a strong role for the L2 status factor (Bardel & Falk, 2007) even at an intermediate level of L3.

*2.3 Optimality Theory: A Brief Introduction*

Optimality Theory was originally introduced by Prince & Smolensky (1993) as a theory of linguistics, and later expanded by many other researchers especially McCarthy & Prince (1994). Arnold (2000, p. 281) defines OT as "a version of generative grammar that defines well formedness in terms of constraint interaction". OT consists of a set of innate, universal and violable constraints on the well formedness of output structures that are ranked relative to each other on a language-specific basis where ranking determines each constraint's strength in a particular language. The higher ranked constraint has priority over the lower ranked one, but if there is no conflict between them they are not ranked relative to each other (Hancin-Bhatt & Bhatt, 1997). Within phonology, OT's impact has been felt more than other areas of linguistics (Arnold, 2000). According to Zuraw (2003), OT has been applied more commonly to phonology than syntax and semantics and it has largely supplanted rule-based frameworks in this field. As demonstrated by Hancin-Bhatt (2000), acquisition occurs when learners learn the constraint ranking of the target language through some re-rankings. The rankings seem to be unstable at the earlier stages of acquisition, but become stabilized and more like to the target language as learners progress. Relevant constraints to the present study are as follows:

1) Well-formedness constraints

NOCODA: A syllable must not have a coda.

COMPLEX: No more than one C or V may associate to any syllable position node.

Prince & Smolensky (2004, pp. 106, 108)

2) Faithfulness constraints

MAX-IO: Every segment of the input has a correspondent in the output. (No phonological deletion.)

DEP-IO: Every segment of the output has a correspondent in the input. (No phonological epenthesis.)

IDENT-IO(F): Output correspondents of an input [γF] segment are also [γF].

McCarthy & Prince (1995, p. 16)

OT's constraint rankings can be demonstrated by a tableau in which output candidates are organized in rows randomly and constrains in columns ranking from high to the low (Kager, 2004). This is demonstrated in tableau below.

Table 1. Sample tableau (adapted by Hancin-Bhatt & Bhatt, 1997, p. 349)

| /INPUT/ | Constraint 1 | Constraint 2 | Constraint 3 |
|---|---|---|---|
| **Description A** | *! | * | |
| **Description B** | | * | *! |
| ⇒ **DescriptionC** | | | * |

The solid and the dotted line denote dominance and lack of dominance relationship respectively. This is demonstrated as constraint 1>> constraint 2, constraint 3. Furthermore, *denotes a constraint violation and *! denotes a fatal violation. The optimal output is also shown by ⇒ symbol

*2.4 Background: Optimality Theory*

Nowadays, there is a growing interest in the syllable structure acquisition even with an optimality theoretic account (e.g., Broselow, Chen, & Wang, 1998; Hancin-Bhatt, 2000; Hancin Bhatt & Bhatt, 1997; Jabbari & Arghavan, 2010; McCarthy, 2007). A brief introduction to some studies carried out on the optimality theoretic account of syllable structure acquisition has been provided in the following.

Using OT to assess whether the Minimal Sonority Distance Parameter Setting (MSD) can account for learners' error patterns in syllable structure, a study was conducted by Hancin-Bhatt & Bhatt (1997) on Japanese and Spanish speakers enrolled in English programs in the beginning and intermediate levels. Results showed; however, the study supported the predictions that were generated based on the MSD model for consonant cluster difficulty in specific syllable positions, it did not make predictions for the learners' error types. Further, Hancin-Bhatt & Bhatt concluded that OT provides the most explicit model of the interlanguage phonology and makes a more explicit account of transfer and developmental effects interactions in L2 syllables.

In order to assess an optimality theoretic account of syllable codas in Thai, a study was carried out by Hancin-Bhatt (2000) on eleven native speakers of Thai with L2 English. Two tasks were used in this study: the coda identification task and the production task. Results of both tasks showed an interaction between the native Thai constrain ranking and the target English constraint ranking. In fact, learners still used their native ranking in parsing English syllables especially at the earliest stages of acquisition and the constraint re-rankings occurred in an ordered fashion.

A study was conducted by Jabbari & Arghavan (2010) on Optimality Theoretic account of acquisition of consonant clusters of English syllables by Persian EFL learners. The learners had two levels of English proficiency: low level and high level and the data were collected via two tasks namely comprehension and production test. Results showed that while lower level group had more difficulty both in onset and coda clusters, all learners had more difficulty with initial consonant clusters. Further, OT revealed that in the case of onset clusters, adjustments were more due to L1 transfer, but in the case of coda cluster modifications, simpler structures were less marked than more complex structures.

Further, Durand & Eychenne (2007) carried out a study on challenging the traditional view of assuming French schwa deletion and epenthesis as categorical phenomena. After such reviewing, a novel account framed within OT was provided. Finally, Durand & Eychenne (2007, p. 89) concluded that "non-categorical schwa emerges as

an optimal output configuration to resolve the conflict between markedness and vocalic faithfulness constraints." They also proposed that a fully developed theory of segmental structure can account for final schwa variation, but its role for word-initial and word-internal contexts is questionable.

## 3. Area Descriptions

Every language has its own unique syllable structure, though there may be some similarities between them, e.g. Persian, English and French's syllable structures are CV (C) (C), (C) (C) (C) V (C) (C) (C) (C) and (C) (C) (C) V (C) (C) (C) respectively. Due to the differences that exist in coda structure of the three languages under the study, French (L3) learners whose first and second language are Persian and English may be exposed to some potential problems pronouncing French words. These challenges are due to the differences between Persian and French on the one hand, and English and French on the other hand. Herein, the contexts under the study are highlighted in

Table 2. Persian, English, and French contexts

| | Context | L1 Persian | L2 English | L3French |
|---|---|---|---|---|
| | '-ʃt' | /nəvəʃt/ | /wa: ʃt/ | Ø |
| L1=L2#L3(CEM) | '-mp' | /pomp/ | /grump/ | ø |
| | '-Kt' | Ø | /l'fekt/ | /ækt/ |
| L1#L2=L3(L2status) | '-ts' | ø | /əˈkaʊnts/ | /ɛrzats/ |
| | '-lp' | ø | /help/ | /scalp/ |
| L1=L3#L2(FA/FT) | '-sm' | /tələsm/ | Ø | /məˈtləriəlIsm/ |

In the first two contexts, both coda clusters of /-ʃt/ and /-mp/ are possible in Persian and English, while they are not permitted in French. In fact, in French whenever /m/ or /n/ is preceded by a vowel, they are not pronounced and there is "voyelle nasales" (nasal vowel) instead. For example, the French words beau /bo/ "beautiful" and bon /bõ/ "good" are different in the fact that the former is oral and the latter is nasal (https://en.wikipedia.org/wiki/Nasal_vowel).

Another difference among these languages is with regard to three coda clusters of /-kt/, /-ts/ and /-lp/. While, the use of contexts as two-consonant coda cluster is not permitted in Persian, both French and English allow this context to occur syllable finally. It is worth mentioning that in the case of /-ts/, French coda cluster written as 'tz ' is pronounced /-ts/.

Moreover, coda cluster of /-sm/ is another factor which differs among the languages under the study. This context is acceptable in Persian and French, but not in English; in English it is pronounced /-zəm/, while in Persian and French it is pronounced /-sm/. (For sampling in the case of two-consonant codas in Persian, English and French, see Appendix A)

Furthermore, OT is used to account for the various productions that French learners with Persian and English background languages make in the process of the above mentioned coda clusters acquisition. In fact, this study further presents an OT analysis of French two-consonant codas acquisition by learners of first language Persian and second language English. The role of the participants' previously known languages' constraint hierarchy in the L3 acquisition process is another point that is investigated. As the aforementioned, the role of three affecting factors in the L3 acquisition namely, Full Transfer/ Full Access (FT/FA), L2statusFactor, Cumulative Enhancement Model (CEM), and the proficiency level to find the relation between L2 proficiency and L3 acquisition at the initial stage of learning L3 French is also explored.

In order to account for the role of the participants' previously known languages' constraint hierarchy (Persian and English) in the process of French coda cluster acquisition, a general reference to Persian and English constraint hierarchy within two-consonant codas in OT seems to be beneficiary. In fact, this analysis is conducted in order to have a more comprehensive view of how these previously known languages' rankings affect French coda cluster acquisition, forming the source of learners' error types. In the following, the relevant constraint ranking for two-consonant codas is presented in both Persian and English languages.

A generalization on Persian constraint ranking within two-consonant codas is referred to in the following. Firstly, it should be noted that the most likely repair strategy in encountering two-consonant codas is to delete rather than epenthesizing or substituting segments. With regard to Persian two consonant codas substitution and epenthesizing that demonstrate constraints INDENT-IO and DEP-IO respectively, it should be said that no one's violation seems to be worse than the other. Furthermore, since Persian allows up to an optimal amount of two consonants in coda position and no more than it (CVCC), COMPLEX must rank low and above MAX-IO, but

below INDENT-IO and DEP-IO. Thus, the following dominance hierarchy is obtained for Persian within two-consonant codas: DEP-IO, INDENTIO>>COMPLEX>>MAX-IO. This is illustrated for word /komoni:sm/ in the following tableau:

Table 3. Analyses of /komoni:sm/

| /komoni:sm/ | DEP-IO | INDENT-IO | COMPLEX | MAX-IO |
|---|---|---|---|---|
| ⇒ a. /komoni:s/ | | | | * |
| b./komoni:sem/ | *! | | | |
| c. /komoni:zm/ | | *! | * | |
| d. /komoni:zem/ | *! | * | | |
| e. /komoni:sm/ | | | *! | |

Comparing Persian (CVCC) and English (CCCVCCCC) syllable structure, it is obviously known that English allows a greater range of codas than Persian. The constraint ranking for English two-consonant codas is argued in the following. First, the preference is to have substitution over deletion and epenthesis in English codas, and so INDENT-IO should be in a lower ranking position than MAX-IO and DEPIO. Regarding MAX-IO and DEP-IO, vowel insertion between the two consonants seems to be worse than consonant deletion and so DEP-IO should be in a higher ranking position. Additionally, in a general sense since English allows complex codas, COMPLEX must rank low in the grammar below the faithfulness constraints, MAX-IO, INDENT-IO and DEP-IO. Thus, the following dominance hierarchy is obtained: DEP-IO>> MAX-IO>> INDENT-IO>> COMPLEX.

Finally, it can be said that the relevant constraint ranking for codas in French is somehow similar to English. In fact, since French allows complex codas, COMPLEX should be demoted below the faithfulness constraints (FAITH) and so the following dominance hierarchy is obtained: FAITH>> COMPLEX. Considering these discussions, some predictions can be made on the learners' errors types as follows:

1) If Persian is the determining language, due to having COMPLEX in a higher ranking position than MAX-IO, two-consonant codas will be a bit difficult to produce and deletion is the preferred coda simplification strategy for the intended speakers.

2) If English is the determining language, due to low ranking COMPLEX and INDENT-IO in English, there will be little or no difficulty in producing complex codas and substitution is the preferred coda simplification strategy for the intended speakers.

## 4. Methodology

*a. subjects:* The present study was conducted among 40 B.A. university students of English literature who were attending French as one of their courses. In fact, all participants had learned English as their L2 and were learning French as their L3 at the lower-intermediate level. To check the role of L2 proficiency, 30 students who were assigned into lower-intermediate level in French were given the Oxford Quick Placement Test (OQPT). Based on the results obtained from the OQPT, the participants were assigned into two groups of lower-intermediate and upper-intermediate. The participants aged 21/22 years old and they did not have any prior language experience in French.

*b. Testing Instruments:* Four testing instruments were used in this study: The first test that was used in this study was the French oxford placement test. In fact, because participants' third language was French, it was necessary to determine their L3 proficiency level.

In order to decide upon the participants' English proficiency level, the second test that was OQPT (2001) was administered to 30 participants that were selected in the French placement test. The test was divided into two main parts and it consisted of 60 test items in the multiple-choice format targeted mainly at lexis and syntax of the students. Further, it was used to know the learners' performance and to compensate for any possible deficiencies of the OJT. The test was in the written form and consisted of 35 flashcards containing French words and participants were asked to read them aloud. This took approximately 5 minutes for each participant. Their voice was recorded and transcribed by two judges to have a reliable judgment. (For PT, see Appendix B)

To know about the learners' competency, the fourth test that was an Oral Judgment Test (OJT) was given to the participants. It consisted of 31 items for the six intended coda clusters out of which three, two and one coda clusters were used to test L2 status factor, CEM and FT/FA, respectively. In fact, 15 items were allocated to coda clusters /kt/, /ts/and /lp/ that were used to test L2 status factor. Further, 11 items were allocated to coda clusters

/ʃt /, /mp/ that were used to test CEM and 5 items were allocated to /sm/ that was used to test FT/FA hypothesis. (For OJT, see Appendix C)

The correlation coefficient was used to check the degree of agreement between the two independent transcriptions made of the participants' responses in the PT. The results showed that there was a strong positive correlation between the two transcriptions in all the intended items and the highest and lowest degree of correlation were 1.00 and .52 respectively.

## 5. Results

This section deals with the results of both the production test and the oral judgment test as follows:

*Results of the Oral Judgment Test*: Firstly, the mean performance of participants on the six intended contexts (/-kt/, /-ts/, /-lp/, /-sm/, /-mp/, /-ʃt/) and for the possible answers of both groups (lower-intermediate and upper-intermediate) was obtained. The possible responses included accurate coda cluster, epenthetic vowel between the two consonants, one consonant deletion (consonant addition only in cases of /-ʃ / forming /-ʃt/) and consonant substitution. Regarding /-mp/, it should be noted that for the possible responses an added segment was considered instead of an epenthetic vowel due to the fact that epenthesis vowel insertion was not possible for French words with / -mp/ context.With respect to the mean performance of participants on the correct perception of the six intended contexts (i.e., /-kt/, /ts/, /-lp/, /-ʃt/, /-mp/ and /-sm/), it was found that the upper-proficiency group outperformed the lower proficiency one. In fact, considering two groups' performance, it can be said that substitution was considered as the major error category that occurred primarily in /-sm/ (M= .7533), /-mp/ (M= .6667) and /-ts/ (M= .2467) contexts. Furthermore, the most frequent errors in both / -kt/ and /-lp/ contexts were substitution (/-kt/, M= .1533; /-lp/, M= .1067) and epenthesis (/-kt/, M= .1467; /-lp/, M= .0800). Finally, the most common strategy used by two groups in encountering /-ʃt/ context was addition (M= .5167). The following table presents the mean performance of two groups on the six intended contexts.

Table 4. The mean performance of two groups on the two-consonant codas in OJT

| | /-kt/ | /-ts/ | /-lp/ | /-sm/ | /-mp/ | /-ʃt/ |
|---|---|---|---|---|---|---|
| Accurate | .6867 | .6133 | .7800 | .1867 | .3067 | .4222 |
| Epenthesis | .1467 | .0867 | .0800 | .0600 | .0067[a] | .0111 |
| Deletion | .0133 | .0533 | .0333 | .0000 | .0200 | .5167[a] |
| substitution | .1533 | .2467 | .1067 | .7533 | .6667 | .0500 |

*Note*. [a] The data are for the participants' mean performance on the addition case.

Furthermore, a mixed between-within subjects ANOVA was conducted to investigate the effect of proficiency (lower-intermediate and upper-intermediate) and context (/-kt/, /ts/, /-lp/, /-ʃt/, /-mp/ and /-sm/) in OJT, producing the following results for the participants' errors. There was a substantial main effect of context for all accurate and inaccurate comprehensions of learners. Nonetheless, the interaction effect between context and proficiency level was not significant in all cases. Furthermore, there was a significant difference between the two groups' performance only in case of accurate answers in OJT.

The results of oral judgment test was further used in OT to determine the constraint ranking of two-consonant codas. As indicated in table 5, learners had a relatively good performance in the intended consonant coda clusters but for /-sm/, /-mp/. This suggests that learners had a little difficulty with the intended two-consonant codas and so COMPLEX should be in a low ranking position, but before the last constraint. In fact, the major error category was substitution and the next errors were epenthesis and deletion respectively. Thus, a violation in MAX-IO is worse than DEP-IO and we have the following dominance hierarchy: MAX-IO>> DEP-IO>> COMPLEX>>INDENTIO. This ranking can be illustrated on the basis of one of the words of each coda clusters that was used in the coda identification task as follows:

Table 5. Analyses of /pakt/ as an illustration of the participants' performance in the /-kt/ context in OJT

| /pakt/ | MAX-IO | DEP-IO | INDENT-IO | COMPLEX |
|---|---|---|---|---|
| ⇒ a. pakt | | | | * |
| b. paket | | *! | | |
| c. pagt | | | *! | * |
| d. pat | *! | | | |

Table 6. Analyses of /ɛrzats / as an illustration of the participants' performance in the /-ts/ context in OJT

| /ɛrzats/ | MAX-IO | DEP-IO | INDENT-IO | COMPLEX |
|---|---|---|---|---|
| ⇒ a. ɛrzats | | | | * |
| b. ɛrzates | | *! | | |
| c. ɛrzatz | | | *! | * |
| d. ɛrzas | *! | | | |

Table 7. Analyses of /alp / as an illustration of the participants' performance in the /-lp/ context in OJT

| /alp/ | MAX-IO | DEP-IO | INDENT-IO | COMPLEX |
|---|---|---|---|---|
| ⇒ a. alp | | | | * |
| b.alep | | *! | | |
| c. alb | | | *! | * |
| d. ap | *! | | | |

Table 8. Analyses of /prism / as an illustration of the participants' performance in the /-sm/ context in OJT

| /prism / | MAX-IO | DEP-IO | INDENT-IO | COMPLEX |
|---|---|---|---|---|
| ⇒ a. prism | | | | * |
| b. prisem | | *! | | |
| c. prizm | | | *! | * |
| d. pris | *! | | | |

These four tableaus show that a candidate (b) is rejected immediately because of its violation of high-ranking DEP-IO. Further, candidate (d) is rejected because of its violation of MAX-IO that is in a high-ranking position, but lower than DEP-IO, leaving candidates (a) and (c), vying to be the optimal parse. While candidates (a) and (c) both violate COMPLEX, candidate (c) violates another constraint (INDENT-IO) that is placed in a higher ranking position and so candidate (a) is considered as the optimal output. In fact, the parse that incurs the least serious violations is considered as the optimal output.

Table 9. Analyses of /goʃ / as an illustration of the participants' performance in the /-ʃt/ context in OJT

| /goʃ/ | MAX-IO | DEP-IO | INDENT-IO | COMPLEX |
|---|---|---|---|---|
| ⇒ a. goʃ | | | | |
| b. goʃet | | **! | | |
| c. goʒ | | | *! | |
| d. goʃt | | *! | | * |

This tableau shows that candidate (b) is rejected immediately because of its vital violation of high-ranking DEP-IO. Candidate (d) is rejected because of its violation of high-ranking DEP-IO and low-ranking COMPLEX. Additionally, candidate (c) violates INDENT-IO, while candidate (a) violates no constraints, and thus the one in (a) is considered as the optimal parse.

Table 10. Analyses of /'ɑ̃p/ as an illustration of the subject's performance in the /-mp/ context in OJT

| /'ɑ̃p / | MAX-IO | DEP-IO | INDENT-IO | COMPLEX |
|---|---|---|---|---|
| ⇒ a. 'ɑ̃p | | | | |
| b. 'ɑ̃pe | | *! | | |
| c. 'ɑ̃b | | | *! | |
| d. 'ɑ̃ | *! | | | |

Regarding Tableau 10, the following is worth noting: (1) in candidate (b), /-e/ is added after /-p/ and so it violates DEP-IO (2) in candidate (c) consonant /-p/ is substituted with /b/ (3) in candidate (d) consonant /-p/ is deleted. Obviously, candidates (b) and (d) are rejected immediately because of their violation of high-ranking DEP-IO and MAX-IO respectively. Furthermore, out of the two remaining candidates (a) and (c), candidate (a) that violates no constraints is considered as the optimal output.

*Results of the PT:* Production test was used to check the production ability of participants in terms of the six

aforementioned contexts under the study. An investigation of the participants' committed errors in the intended contexts classified errors into seven types of, deletion, addition, epenthesis, substitution, -substitution and epenthesis- and -substitution and addition. It is worth noting that substitution and epenthesis refer to productions in which one of the segments was substituted and the other one was epenthesized while substitution and addition refer to productions in which one of the segments was substituted and another one was added. With respect to the accurate production of the participants in the six intended contexts (i.e., /-kt/, /ts/, /-lp/, /-ʃt/, /-mp/ and /-sm/), results showed that the lower proficiency group had a better performance than the upper proficiency group in all contexts but for /-mp/. Regarding two groups' performance, addition was considered as the major error category that occurred primarily in /-mp/ (M= 0.5267) and /-ʃt/ (M= 0.1833) contexts. Furthermore, the most common errors in /-sm/ and /-ts/ were substitution (M= 0.2524) and deletion (M= 0.2533) respectively. Finally, there was no significant occurrence of errors in /-lp/, nor of /-kt/ while addition (M=.0333) and deletion (M= .0722) were considered as the most typical productions in each one respectively. The mean performance of two groups on the intended coda clusters is given in the following table.

Table 11. The mean performance of two groups on the two-consonant codas in PT

| | /-kt/ | /-ts/ | /-lp/ | /-sm/ | /-mp/ | /-ʃt/ |
|---|---|---|---|---|---|---|
| Accurate | .8833 | .7067 | .9333 | .4952 | .1800 | .6750 |
| Epenthesis | .0000 | .0200 | .0267 | .0238 | .0000 | .0000 |
| Deletion | .0722 | .2533 | .0000 | .0095 | .0000 | .0000 |
| Addition | .0222 | .0067 | .0333 | .0190 | .5267 | .1833 |
| Substitution | .0167 | .0133 | .0067 | .2524 | .0000 | .1208 |
| Substitution and epenthesis | .0000 | .0000 | .0000 | .1571 | .0133 | .0000 |
| Substitution and addition | .0056 | .0000 | .0000 | .0429 | .2933 | .0208 |

Additionally, similar to the OJT, a mixed between-within subjects ANOVA was carried out to investigate the effect of proficiency and context and to find out whether the differences observed were statistically significant or not. In brief, the obtained results showed that there was a substantial main effect of context for all accurate and inaccurate productions of learners. Nonetheless, the interaction effect between context and proficiency level was not significant in all cases. Furthermore, there was a significant difference between the two groups' performance only in cases of addition and accurate answers in PT.

The results of production task were used in OT to assess learners' performance on the production of six previously mentioned coda clusters. As demonstrated in Table 11, the mean performance of the two groups on the accurate production of the six intended coda clusters was relatively high in all cases ,excluding /-mp/. This suggests that COMPLEX should be placed in a low ranking position. Additionally, subjects' committed errors with a rising order were as follows: epenthesis, -substitution and epenthesis, -deletion, -substitution and addition, -substitution, and addition. In fact, addition and substitution were the major error categories committed by these participants and subjects were more intended to substitute a segment with another one than to delete it. Furthermore, subjects were more likely to underparse (delete) a segment in the intended coda clusters than to make an epenthetic vowel between the two consonants. Thus, we obtain the following dominance hierarchy: DEP-IO>> MAX-IO>>INDENT-IO>> COMPLEX. Like OJT, this ranking can be illustrated on the basis of one of the words of each coda cluster that was used in the production task as follows:

Table 12. Analyses of /abʒɛkt /as an illustration of the participants' performance in the /-kt/ context in PT

| /abʒɛkt / | DEP-IO | MAX-IO | INDENT-IO | COMPLEX |
|---|---|---|---|---|
| ⇒ a. abʒɛkt | | | | * |
| b. abʒɛket | *! | | | |
| c. abʒɛkte | *! | | | |
| d. abʒɛk | | *! | | |
| e. abʒɛgt | | | *! | * |
| f. abʒɛget | *! | | * | |
| g. abʒɛgte | *! | | * | |

Table 13. Analyses of / frits /as an illustration of the participants' performance in the /-ts/ context in PT

| /frits / | DEP-IO | MAX-IO | INDENT-IO | COMPLEX |
|---|---|---|---|---|
| ⇒ a. frits | | | | * |
| b. frites | *! | | | |
| c. fritse | *! | | | |
| d. fris | | *! | | |
| e. fritz | | | *! | * |
| f. fritez | *! | | * | |
| g. fritze | *! | | * | |

Table 14. Analyses of /scalp/as an illustration of the participants' performance in the /-lp/ context in PT

| /scalp/ | DEP-IO | MAX-IO | INDENT-IO | COMPLEX |
|---|---|---|---|---|
| ⇒ a. scalp | | | | * |
| b. scalep | *! | | | |
| c. scalpe | *! | | | |
| d. scap | | *! | | |
| e. scalb | | | *! | * |
| f. scaleb | *! | | * | |
| g. scalbe | *! | | * | |

Table 15. Analyses of /prism /as an illustration of the participants' performance in the /-sm/ context in PT

| /prism/ | DEP-IO | MAX-IO | INDENT-IO | COMPLEX |
|---|---|---|---|---|
| ⇒ a. prism | | | | * |
| b. prisem | *! | | | |
| c. prisme | *! | | | |
| d. pris | | *! | | |
| e. prizm | | | *! | * |
| f. prizem | *! | | * | |
| g. prizme | *! | | * | |

Table 16. Analyses of /galɔʃ/as an illustration of the participants' performance in the /-ʃt / context in PT

| /galɔʃ/ | DEP-IO | MAX-IO | INDENT-IO | COMPLEX |
|---|---|---|---|---|
| ⇒ a. galɔʃ | | | | |
| b. galɔʃet | **! | | | |
| c. galɔʃt | *! | | | * |
| d. galɔ | | *! | | |
| e. galɔʒ | | | *! | |
| f. galɔʒet | *! | | * | |
| g. galɔʒt | | | *! | * |

This tableau shows that candidate (b), (c) and (f) are immediately rejected because of their violation of high-ranking DEP-IO. Additionally, candidates (d) and (e) are later rejected because of their violation of high ranking constraints, MAX-IO and INDENT-IO. Finally, out of the two remaining candidates (a) and (g), candidate (a) is regarded as the optimal output due to the fact that the former violates no constraints, while the latter violates high ranking INDENT-IO and low-ranking COMPLEX.

Table 17. Analyses of /'ɑ̃p / as an illustration of the participants' performance in the /-mp / context in PT

| /'ɑ̃p / | DEP-IO | MAX-IO | INDENT-IO | COMPLEX |
|---|---|---|---|---|
| ⇒ a.'ɑ̃p | | | | |
| b.'ɑ̃pe | *! | | | |
| c. ɑ̃ | | *! | | |
| d.'ɑp | | | *! | * |
| e.'ɑmp | *! | | * | |

As is obvious from the above table, epenthesis and -substitution and epenthesis- were not considered in case of /-mp/ because their production seems impossible and learners produce neither one for the words with /-mp/ coda clusters used in the production task. Regarding table 17, the following is worth noting: (1) in candidate (b) an /-e/ vowel is added after /-p/ and so it violate DEP-IO (2) in candidate (c) /p/ is deleted (3) in candidate (d) /-ɑ̃/ that is called nasal vowel (voyelle nasales in French) is substituted with oral vowel /-a/ (4) in candidate (e) /-ɑ̃/ is substituted with /-a/ and /-m/ is added. Candidates (b) and (e) are immediately rejected because of their violation of high-ranking DEP-IO. Further, candidate (c) and (d) are rejected because of their violation of rather high-ranking constraints MAX-IO and INDENT-IO respectively. Therefore, candidate (a) that violates no constraints is considered as the optimal output.

## 6. Discussion

This part centers on interpreting and discussing the results of the two main conducted tests, namely OJT and PT. In fact, the outcome will be firstly compared with the theoretical models proposed earlier namely, (1) the FT/ FA (Schwartz & Sprouse, 1994, 1996), (2) the L2 Status Factor Hypothesis (Bardel & Falk, 2007, 2011), and (3) the Cumulative Enhancement Model (Flynn et al., 2004). Furthermore, OT is used to clarify if learners' previously known ranking still has an effect in comprehending or producing French syllable and to see whether OT supports what is obtained through transfer effects or not. In the following, discussion is presented for each test, the OJT and PT, separately.

*The OJT:* As the analyses of the participants' correct answer in each context demonstrate, the participants of this study portrayed little inability in perception of /-lp/ (M= .7800), /-kt/ (M= .6867) and /-ts/ (M= .6133) contexts. Notwithstanding, the perception of /-sm/ (M= .1867), /-mp/ (M= .3067) and /-ʃt/ (M= .4222) was difficult for these subjects. Thus, the main findings were as follows: /-lp/ was the easiest context for these learners to comprehend, /-kt/ and /-ts/ were the next easiest contexts, then /-ʃt/ and /-mp/ respectively and finally /-sm/.

As a matter of fact, for /-lp/, /-kt/ and /-ts/ contexts that are all possible coda clusters in English and French, but not in Persian, learners were expected to comprehend them properly as a result of positive transfer from their L2 English that provide support to L2 status factor hypothesis. As seen above, results showed that this was the case and subjects had little inability in perception of /-lp/, /-kt/ and /-ts/ supporting the L2 status factor hypothesis.

Furthermore, with respect to /-sm/coda cluster that is existent in Persian and French, but not in English, learners were expected to show little disability in its comprehension as a result of positive transfer from their L1,confirming FT/FA hypothesis. However, contrary to this prediction, the result showed that /-sm/ was the most difficult context for the subjects and they mostly comprehended it as /-zm/. In fact, as stated in chapter 1, coda cluster /-sm/is written as "-sm" in English, but it is pronounced as /-zəm/ and thus learners' comprehension of /-sm/ as /-zm/ provide additional support for the negative transfer from their L2 English.

Finally, regarding /-mp/ and /-ʃt/ that are both possible coda clusters in Persian and English, but not in French, learners were predicted to have a good performance as a result of getting no effect from their previously known languages (i.e., Persian and French), supporting CEM. Nonetheless, the obtained results showed a contrary effect and learners' performance was rather low in both cases. In fact, learners' major error category for /-mp/ and /-ʃt/ were substitution and addition respectively indicating a possible negative influence from their previously known languages that was in contrary with the CEM.

Furthermore, the results of OJT were casted into OT and the following results were obtained. As stated earlier, the following constraint hierarchy was obtained for two groups: MAX-IO>> DEP-IO>> COMPLEX>> INDENT-IO. Contrast this hierarchy with the dominance hierarchy obtained for two consonant codas in Persian, English and French introduced in introduction, repeated here:

Persian: DEP-IO, INDENT-IO>>COMPLEX>> MAX-IO

English: DEP-IO>> MAX-IO>> INDENT-IO>> COMPLEX

French: FAITH>> COMPLEX

Obviously, the above mentioned obtained constraint hierarchy cannot uphold either Persian or English constraint hierarchy within two-consonant codas completely. In fact, it seems to be somehow between the two intended hierarchies and it might be interpreted as follows. According to the obtained constraint hierarchy within two-consonant codas, INDENT-IO is placed in the lowest-ranking position, and this is in accordance with the English constraint hierarchy in some way. Nonetheless, in the obtained hierarchy, COMPLEX is placed before the last constraint i.e., INDENT-IO in contrast to the English constraint hierarchy that has COMPLEX in the lowest-ranking position. It is also worth noting that while COMPLEX is placed below the faithfulness constraints (FAITH) in both the English and French constraint hierarchy, it is placed above the last faithfulness

constraint in the obtained and Persian constraint hierarchy. Having COMPLEX in a low-ranking position before the last constraint in both the obtained and Persian constraint hierarchy implies the fact that learners are still to some extent under the effect of the Persian constraint hierarchy within two-consonant codas. Furthermore, MAX-IO is in a high-ranking position in both the English and obtained constraint hierarchy. Finally, it should be said that while DEP-IO is placed in the highest-ranking position in the Persian and English constraint hierarchy, in case of the obtained constraint hierarchy it is placed lower than MAX-IO indicating that learners were more intended to epenthesize than delete the two-consonant codas. These suggest that in the acquisition of French two-consonant codas, subjects were relying on both of their previously known languages i.e., English and to a less extent Persian. In fact, subjects were not merely relying on one of their previously known languages and their performance was a dynamic interplay between the Persian, English constraint ranking and the target one i.e., French.

*The PT:* As two groups' accurate productions demonstrate, they portrayed little inability in the production of /-lp/ (M= .9333), /-kt/ (M= .8833), /-ts/ (M= .7067) and /-ʃt/ (M= .6750) contexts. On the other hand, production of the two other remaining contexts i.e., /-mp/ (M= .1867) and /-sm/ (M=.4952) were difficult for the subjects. Along these lines, the main findings might be presented as follows: /-lp/ was the easiest context for these learners to produce, /-kt/ and /-ts/ were the next easiest contexts, then /-ʃt/ and /-sm/ respectively and finally /-mp/.

Regarding the three aforementioned hypotheses, namely the FT/FA, the L2 status factor hypothesis and the CEM, the main findings were as follows. Firstly, in line with FT/FA hypothesis, the participants were expected to show little disability in producing French words with /-sm/ coda cluster as a result of positive transfer from their L1that is due to the fact that /-sm/ may exist as a coda cluster in Persian and French, but not in English. However, the results showed that the production of /-sm/ was rather difficult for the subjects and they pronounced it in different forms of /-zm/, /-zəm/ and to a lesser extent /-zme/. As stated previously, coda cluster /-sm/is written as "-sm" in English, but it is pronounced as /-zəm/ and so subjects' production of /-sm/ as /-zm/, /-zem/ and /-zme/ is an indication of negative transfer from their L2 English, supporting the L2 status factor hypothesis. Comparing subjects' performance in OJT and PT, it should be noted that learners showed not too much inability in the production of /-sm/ contrary to its comprehension. Although this suggests a possible effect for L1 positive influence in the L3 acquisition process, it should not be regarded as an evidence for FT/FA due to having the same amount of negative transfer of /-sm/ from L2 in the PT and having no effects of positive transfer of this context in OJT.

Furthermore, in keeping with the L2 status factor hypothesis, the participants were expected to produce French words with /-lp/, /-kt/ and /-ts/ coda clusters accurately as a result of positive transfer from their L2 English that is due to the fact that /-lp/, /-kt/ and /-ts/ are all considered as coda clusters in English and French, but not in Persian. The obtained results showed that this was the case and subjects portrayed little inability in the production of /-lp/, /-kt/ and /-ts/ contexts that provide additional support for the L2 status factor hypothesis.

Finally, concerning the CEM, subjects were supposed to show little disability in producing the two coda clusters of /-mp/ and /-ʃt/ that were possible in Persian and English, but not in French as a matter of getting no effect from their previously known languages i.e., Persian and French. With respect to /-mp/, results showed that subjects had too much difficulty with this context that indicates a negative transfer from their previously known languages in contrast with the CEM. On the other hand, subject's performance was relatively good in case of /-ʃt/ context, somehow supporting CEM.

Casting the results of PT into OT, the following results were obtained. As mentioned before, the following dominance hierarchy was obtained for two groups' general performance: DEP-IO>> MAX-IO>> INDENT-IO>> COMPLEX. Contrast this hierarchy with the dominance hierarchy obtained for two consonant codas in Persian, English and French introduced in introduction, repeated here:

Persian: DEP-IO, INDENT-IO>>COMPLEX>> MAX-IO

English: DEP-IO>> MAX-IO>> INDENT-IO>> COMPLEX

French: FAITH>> COMPLEX

Obviously, the obtained constraint hierarchy totally upholds the English constraint hierarchy within two-consonant codas. In fact, according to the English constraint hierarchy, substitution should be the most preferred strategy in encountering English two-consonant codas, then deletion, and finally epenthesis and we see that this is what our obtained constraint hierarchy also suggests. What this suggests is that our learners have transferred their L2's constraint hierarchy (i.e., English constraint hierarchy) within two-consonant codas to their acquisition of French as a third language.

## 7. General Discussion

With respect to the FT/FA hypothesis, the results showed no evidence in support of this hypothesis. In fact, even in the case of /-sm/ that learners were expected to comprehend and produce it correctly due to the positive transfer from their L1, the results were in contrary and learners were intended to produce it incorrectly as a result of negative transfer from their L2. As mentioned before, learners portrayed not too much inability in the production of /-sm/, but this should not be regarded as an evidence for FT/FA due to having the same amount of negative transfer of /-sm/ from L2 in the PT and having a small effect of positive transfer of this context in OJT. Therefore, the results are in contrast to Hammarberg & Hammarberg (1993), Llisterri & Poch-Olivé (as cited in Wang 2013), and Schwartz & Sprouse (as cited in Özçelik, 2009) studies in phonology that proposed a main role for L1 influence in the L3 acquisition process.

Regarding the L2 transfer hypothesis, results showed that a strong role for L2 influence was apparent not only in the case of /-lp/, /-kt/ and /-ts/ contexts, but also in the case of /-sm/ that was supposed to validate FT/FA hypothesis. In fact, the obtained results provide support for L2 status factor hypothesis that is also advocated in the following L3 syntax studies: Bardel & Falk (2007), Falk & Bardel (2011), Leung (as cited in Jaensch, 2010), Rothman & Amaro (2010). Therefore, the results provided a strong role for L2 as a major source of transfer in the initial states of L3 acquisition process and this is mainly in accordance with the studies done in L3 phonology by Williams & Hammarberg (1998) and Wrembel (2010).

Furthermore, the fact that whether CEM developed by Flynn et al. (2004) can fully account for the results or not was investigated. In fact, proponents of CEM believe that all languages known can have either a facilitative role or remain neutral in the subsequent language acquisition and L2 takes precedence over L1 only in cases when the TL form is not present in the L1. As mentioned before, a positive L2 influence was observed in cases of /-kt/, /-ts/ and /- lp/; however, a negative L2 transfer effect was found in case of / -sm/ context. In fact, the precedence of L2 over L1 as a source of negative transfer in the case of /-sm/ that exist in the L1 and L3 but not L2, rejected the idea held by CEM that L2 takes precedence over L1 only in cases when the TL form is not present in the L1. It should be pointed that; however there was a possible effect of L1 positive transfer in the case of /-sm/ in PT, it cannot fully support CEM due to having the same amount of L2 negative transfer effect in the production of this context and having a small effect of positive transfer of this context in OJT. Furthermore, in light of the CEM, learners were supposed to have a good performance in /-mp/ and /-ʃt/ contexts as a result of getting no effect from their previously known languages. Results showed that this was not the case and subjects had too much difficulty with these contexts (except for the production of /-ʃt/) that suggests a negative influence of the subjects' previously known languages in contrast to what is held by the CEM. In accordance with the CEM, the participants' performance was relatively good for /-ʃt/ in the PT; however, this is too weak to be taken as a support for the CEM.

Concerning the effect of learners' previously known languages' phonological constraints ranking in the acquisition of L3 French, results are interpreted as follows. Results of the OJT demonstrated participants' convergence on a constraint ranking somewhere between the previously known languages and target language. In fact, the participants were more under the effect of their L2 than L1 constraint ranking in the OJT. Furthermore, the results of the PT suggested that subjects completely transferred their L2 English ranking in parsing French syllables. In conclusion, the results of both OJT and PT demonstrated that learners relied on their L2's constraint hierarchy within two-consonant codas in their acquisition of French as a third language. It is also noteworthy to point that the production task is more critical for answering the research questions and our results of the PT here suggested a critical role for L2 constraint hierarchy in L3 acquisition process.

All these suggest a major role for L2 in the L3 syllable acquisition process and provide an additional support for the L2 status factor hypothesis. In fact, the results obtained through OT were in accordance with the results of cross-linguistic effect in L3 acquisition process and both of them provided support for L2 status factor hypothesis.

## 8. Conclusion

The results of this study bear great consequences in supporting L2 status factor hypothesis in the initial states of L3 acquisition while rejecting FA/FT hypothesis. In fact, although some partial influence of L1 on L3 was observed, it was overlooked due to the precedence of L2 over L1 in all the observed cases. Regarding OT, the transfer of L2 constraint hierarchy into L3 that was apparent especially in the PT indicated a major role for L2 transfer effect, supporting L2 status factor hypothesis. However, the partial or lack of transfer of L1 constraint hierarchy into L3 indicated the less severe nature of FA/FT hypothesis. Nonetheless, it should be noted that psychotypology or even actual typology may be regarded as another possible explanation for the obtained

results.

With respect to the CEM, it is noteworthy to point that it disregards the possibility of negative transfer from the L2 in the case that L1 is the source of transfer due to its appropriateness to the L3 (Rothman & Amaro, 2010). In fact, Rothman & Amaro (2010) considered the L1 transfer hypothesis or the L2 status factor as a good explanation for the incorrect transfer of a given value when the value from the other language system is a more accurate choice. In line with this, our results showed a negative transfer from the L2 even in the case that there was some possible positive transfer from the L1, and thus it questioned the practicality of some aspects of the CEM. Furthermore, the negative transfer of the previously known languages supposing to remain neutral in the case that the intended value was present in both L1 and L2 but not L3 provided additional evidence in questioning what is held by the CEM. In a nutshell, it can be said that while the data may be explained by a modified version of the CEM, the presented data are more consistent with the "L2 status factor" and it can fully account for the obtained results. Additionally, results indicated that L2 proficiency had an impact on the L3 acquisition process.

In conclusion, both "L2 status factor" and "typological proximity" are considered as the real possibilities for the outcome of the present study. The overall results of OT also provided an additional support for the L2 status factor. Furthermore, the obtained data provided no support for the FA/FT hypothesis, while casting doubt on the tenability of several aspects of the CEM.

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**Appendix A**

**Sampling in the Case of Two-Consonant Codas in Persian, English and French**

Persian

nabš, tabl, ǰobn, tabʔ, rabt, habs, sobh, tabx, ʔabd, sabz, sabr, lotf, notq, satl, hatm,

matn, qatʔ, qotb, fath, fetr, nesf, fesq, mesl, rasm, hosn, vosʔ, ʔasb, bast, masx, qasd,

ʔasr, fohš, sahl, vahm, zehn, mahv, boht, bahs, mahd, mahz, sehr, baxš, boxl, ʔaxm,

kerext, toxs, ʔaxz, faxr, sedq, ʔadl, badv, hads, madh, sadr, hazf, rezq, bazl, nazm,

vazn, ǰozv, ǰozʔ, hezb, yazd, bazr, farš, barf, barq, narm, qarn, barg, sarv, farʔ, zarb,

part, qors, tarh, nerx, sard, gorz, kašf, ʔešq, pašm, ǰašn, hašv, mošt,qešr, kafš, vefq,

qofl, dafn, ʔafv, nafʔ, seft, nafs, nafx, lafz, sefr, naqš, vaqf, noql, soqm, laqv, naqb,

seqt, naqs, feqh, ǰoqd, maqz, faqr, zolf, xalq, ʔelm, dalv, zelʔ, qalb, xelt, sols, solh,

talx,ǰeld, šemš, ʔomq, haml, yomn, šamʔ, samt, xoms, ʔamd, ramz,ʔomr, senf, xeng, manʔ, konh, senx, tanz, novʔ, xovf, tovq, hovl, qovm, kovn, vosʔ, zovb, sovt, qovs, lovh, ʔovd, hovz, ǰovr, ʔeyš, heyf, meyl, deym, deyn, beyʔ, qeyb, beyt, heys, ʔeyd, feyz, qeyr, naʔš, laʔl, taʔm, laʔn, saʔb, yaʔs, baʔd, baʔz, qaʔr

English

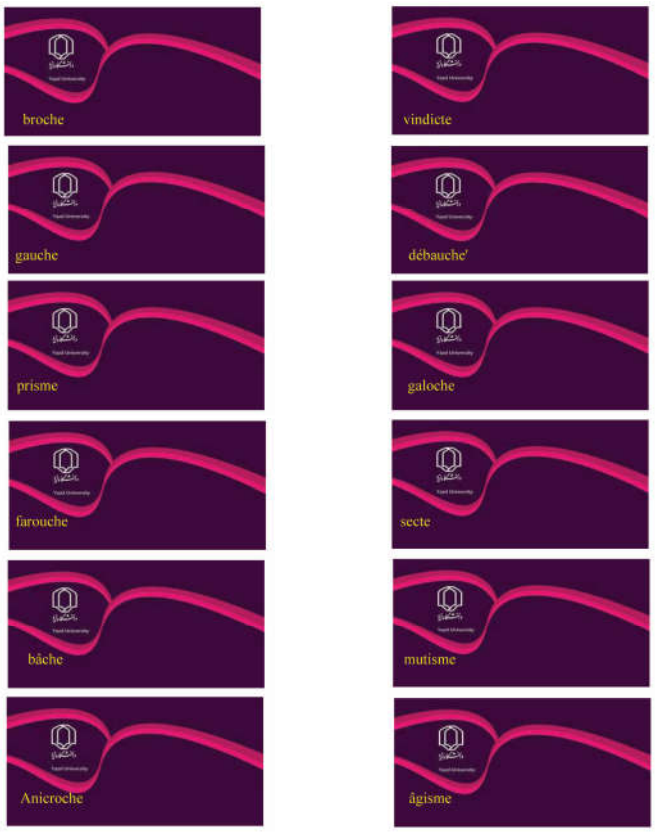
accept, depth, copse, robed, robes, width, adze, pact, tricks, ringed, sags, judged, soft, fifth, surfs, loved, loves, swathed, sixths, rasp, last, bask, gazed, washed, massaged, jump, dreamt, accent, blend, branch, month, adjoins, help, bulb, adult, cold, chalk, belch, gulf, wealth, meals, calm, warp, absorb, deport, accord, remark, church, surf, birth, alters, harsh, conform, adorn, snarl

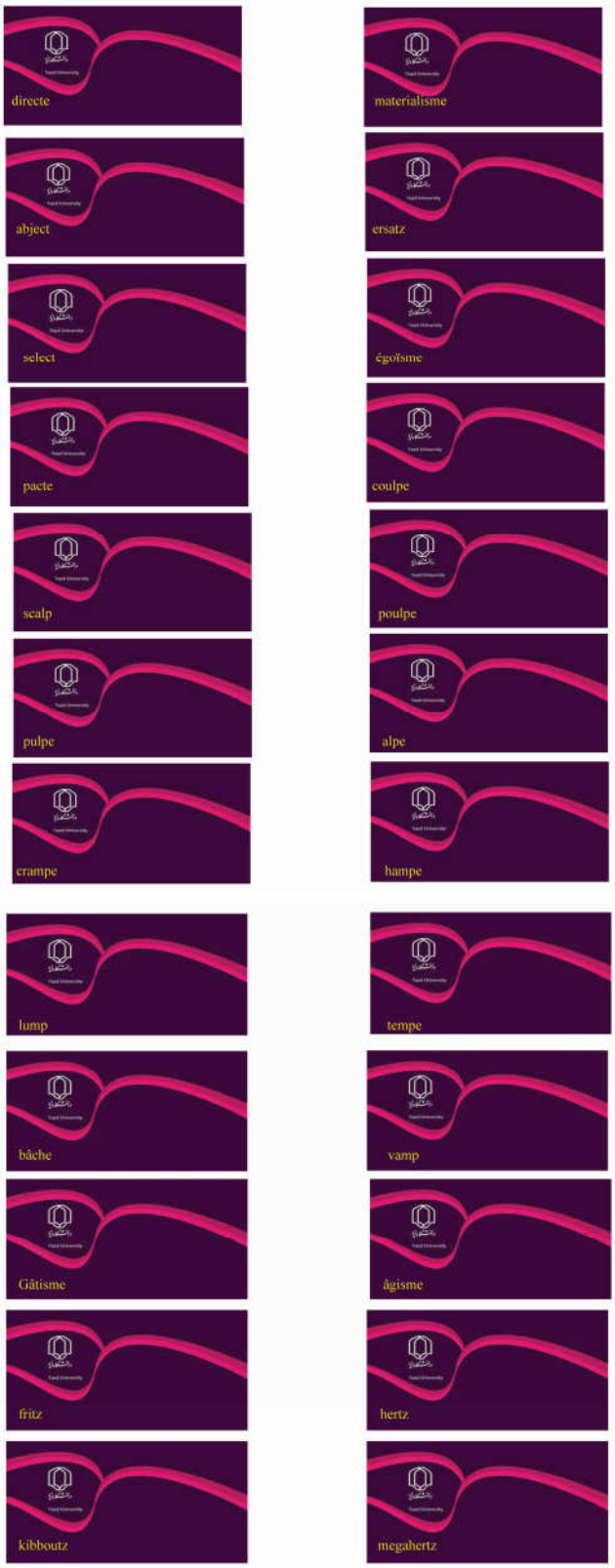
French

collecte, abject, directe, marque, barque, calme, film, mars, courte, morte, verte , cobalt, malt, tumulte, comble, capable, portable, omble, folk, ballast, mixte, mus, masque,fisc, basque, abrupt, adepte, adopté, lift, kraft, relaps, fixe, relaxe, ersatz, clamse, stagne, Indemne, âgisme, prisme, alpe, scalp, pul

**Appendix B**

**Production Test**




directe
abject
select
pacte
scalp
pulpe
crampe
lump
bâche
Gâtisme
fritz
kibboutz
materialisme
ersatz
égoïsme
coulpe
poulpe
alpe
hampe
tempe
vamp
âgisme
hertz
megahertz

## Appendix C

### Oral Judgment Test

Listen to each word and identify what is correct by circling one word in appropriate set on this sheet. Please do not leave any numbers unanswered.

| | | | | |
|---|---|---|---|---|
| 1. | a. [dirɛket] | b. [dirɛk] | c. [dirɛgt] | d. [dirɛkt] |
| 2. | a. [materjalism] | b. [materjalizm] | c. [materjalisem] | d. [materjalis] |
| 3. | a. [abʒɛkt] | b. [abʒɛket] | c. [abʒɛgt] | d. [abʒɛk] |
| 4. | a. [ɛrzats] | b. [ɛrzas] | c. [ɛrzates] | d. [ɛrzatz] |
| 5. | a. [selɛkt] | b. [selɛket] | c. [selɛgt] | d. [selɛk] |
| 6. | a. [egɔizm] | b. [egɔism] | c. [egɔisem] | d. [egɔis] |
| 7. | a. [pakt]c | b. [paket] | c. [pagt] | d. [pat] |
| 8. | a. [galɔʒ] | b. [galɔʃt] | c. [galɔʃet] | d. [galɔʃ] |
| 9. | a. [gatism] | b. [gatizm] | c. [gatis] | d. [gatisem] |
| 10. | a. [brɔʃ] | b. [brɔʒ] | c. [brɔʃt] | d. [brɔʃet] |
| 11. | a. [megaɛrtes] | b. [megaɛrts] | c. [megaɛrtz] | d. [megaɛrs] |
| 12. | a. [lɶ̃pe] | b. [lɶ̃p] | c. [lɶ̃] | e. [lɶ̃b] |
| 13. | a. [deboʃt] | b. [deboʃ] | c. [deboʒ] | d. [deboʃet] |
| 14. | a. [alep] | b. [alp] | c. [alb] | d. [ap] |
| 15. | a. [kibuts] | b. [kibutz] | c. [kibutes] | d. [kibus] |
| 16. | a. [skalep] | b. [skalp] | c. [skalb] | d. [skap] |
| 17. | a. [pulb] | b. [pulp] | c. [pup] | d. [puleb] |
| 18. | a. [goʃt] | b. [goʒ] | c. [goʃet] | d. [goʃ] |
| 19. | a. [vɛ̃dikt] | b. [vɛ̃digt] | c. [vɛ̃diket] | d. [vɛ̃dit] |
| 20. | a. [prism] | b. [prizm] | c. [prisem] | d. [pris] |
| 21. | a. [frits] | b. [frites] | c. [fris] | d. [fritz] |
| 22. | a. [vɑ̃p] | b. [vɑ̃] | c. [vɑ̃b] | d. [vɑ̃pe] |
| 23. | a. [pylp] | b. [pylb] | c. [pylep] | d. [pyp] |
| 24. | a. [aʒism] | b. [aʒizm] | c. [aʒis] | d. [aʒisem] |
| 25. | a. [krɑ̃b] | b. [krɑ̃p] | c. [krɑ̃pe] | d. [krɑ̃] |
| 26. | a. [kulp] | b. [kulep] | c. [kulb] | d. [kup] |
| 27. | a. [’ɑ̃p] | b. [’ɑ̃pe] | c. [’ɑ̃b] | d. [’ɑ̃] |
| 28. | a. [tɑ̃pe] | b. [tɑ̃p] | c. [tɑ̃b] | d. [tɑ̃] |
| 29. | a. [’ɛrts] | b. [’ɛrtes] | c. [’ɛrtz] | d. [’ɛrs] |
| 30. | a. [baʃ] | b. [baʃt] | c. [baʒ] | d. [baʃet] |
| 31. | a. [anikrɔʒ] | b. [anikrɔʃt] | c. [anikrɔʃet] | d. [anikrɔʃ] |