The Effect of L1 Persian on the Acquisition of English L2 Orthographic System on the Shared Grounds

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Abstract

This paper elaborates on Persian and English orthographic shared aspects to study the effects of L1 Persian on learning English as a foreign language. While there are some examples of letter/sound mismatches in the orthographic system of both languages, those of English are more complex than Persian. In order to see the effect of the mismatch between orthography and transcription, 40 Persian EFL learners were divided into two proficiency groups i.e., advanced and elementary, and their performance was examined on comprehension and production tasks. The learners' production skills were checked via a list of 76 pseudo words requiring the learners to read them while their voices were recorded. After a week time interval, a comprehension test consisting of 34 items was administered, requiring the learners to listen and choose among the orthographic forms presented to them. It was hypothesized that being educated in L1 Persian, comprising semi-opaque orthography system, the learners would tackle the English opaque graphemes better on the mismatches. However, it was observed that both elementary and advanced groups had difficulty learning English orthography system, showing almost no positive effect from L1. Only in rare cases did more proficient learners perform better due to more schooling education in English.

Keywords: Orthographic System, Transcription, Orthographic Depth Hypothesis, Deep Orthography, Shallow Orthography, Alphabetic Writing System

Received: March 2013; Accepted: December 2013

1. Introduction

The unconscious language knowledge provides a blueprint to guide the learners to determine the constraints of the orthographic system of the language they are dealing with. Orthographic Depth Hypothesis (Frost, 1994; Katz & Frost, 1992) is based on the letter-phoneme relation in an alphabetic orthography system, in which the deeper an orthographic system, the harder it is to predict the pronunciation of a word from its spelling. Deep orthographies, such as that of English, have a more complex or opaque relation between letters and sounds while shallow ones, such as Spanish and Italian, have a relatively simple one to one correspondence between a letter and a sound.

Many experiments have been conducted to study how many of the disabilities in various languages are related to orthographic characteristics (Cossu, Shankweiler, Liberman, Tola, & Katz, 1988; Goswami, Gombert, & Barrera, 1998). Cossu, et al. (1988) showed that learners with shallower L1 orthography demonstrated an advantage in phonological awareness over learners with a deeper orthographical background. Wimmer, Mayringer, and Landerl (2000) conducted a contrastive analysis between children learning to read German as a shallow orthography, and English as a deep orthography. They emphasized a more prominent role for rapid naming in explaining and predicting individual differences.

It was argued by Goswami, et al. (1998) that larger orthographic units such as rimes are processed with greater ease in children learning less transparent orthographies than in children who learn to read in a highly transparent orthography because opaque languages such as Chinese and Japanese teach

their learners to process words as a whole. Thus, Wang and Geva (2003) concluded that in logographic or more accurately morphosyllabic orthographic systems such as Chinese, monosyllabic morphemes are the basic units of processing. Indicating that speakers of these languages attend to graphemic forms as a whole visuals or morpholinguistic units rather than mapping graphemes onto phonemes. Then the learners need to amplify their graphic information and visual processing skills. In this study, Chinese children learning English as their L2, outperformed native English children in their spelling of orthographically legitimate and illegitimate letter strings because they could memorize the whole word as a unit better than English native speakers who process each alphabet in order to read and write.

As it was mentioned, the learners' background language has a great effect on processing the second language when Chinese first language is deeper and systematically different from English as a second language. But what happens in the presence of two alphabetic languages, such as Persian and English, where Persian orthography system is neither as deep as English nor as shallow as Italian or Spanish. One can assume a continuum, over which different languages are placed according to their orthographic depth; deep orthographies, such as English are placed at one end and shallow orthographies such as Spanish and Italian at the other end. In this regard, Persian occupies somewhere in the middle towards the shallow end of the continuum (Haghshenas, 1356; Samareh, 1366; Jabbari, 2005)

This study investigates the comprehension and production of some sounds and their graphemes within shared features of English and Persian orthographic system by Iranian EFL learners. Since various graphemic forms are possible in both languages one could hypothesize that not only advanced learners, but also elementary learners of English are able to handle the

mismatches of the target language properly because of the L1 support. Furthermore, English is multi dimensionally various in its orthographic system and Persian only shares some limited aspects of these dimensions (Yarmohammadi, 1985). This study tries to categorize these characteristics in the following theorems (See section 3). The aforementioned introduction paves the way for the following research questions.

1. Do Persian EFL learners transfer their knowledge of grapheme-phoneme mismatches from L1 positively?
2. What is the role of English proficiency in the judgment and production of Pseudo words?
3. Does Persian orthography hinder or facilitate the acquisition of English orthography?

2. Methodology

2.1. Participants

The present study focused on some Persian EFL learners studying at a private language institute consisting of both males and females. None of the subjects had any residence in an English speaking country. The participants' bio data is presented in Table 1.

Table 1. *Participants' bio data*

	N.	Age range	OQPT range
Elementary	20	15-25	17-27
Advanced	20	15-25	48-59

The Oxford Quick Placement Test (OQPT) (2001) was administered to tap the participants' proficiency level. The test, consisting of 60 items, should be completed in 30 minutes. The participants who scored between 17 up to 27 were placed at the elementary proficiency level and those whose scores fell between 48 up to 54 were put in the advanced proficiency level. Each group consisted of 20 members and all participants shared their L1 as Persian.

2.2. Tasks

2.2.1. Production Task

In order to check learners' production skills of each grapheme they were given a list of words consisting of 76 pseudo words planned for this specific study. Participants were given the instruction in English and Persian concerning the tasks procedure especially with the elementary learners. They were supposed to read through the words numbered from 1 to 76 while their voices were recorded in a quiet room in the institute by the Marantz PMD661 Professional Solid State Recorder and Audio-head worn microphones were placed near the speaker's mouth to guarantee the quality of the recording. To prevent possible stress and to warm up their voices, students were given 5 minutes to read the words on their own. They were also told that the tests results would be kept confidential before the actual recording. It was explained that words were nonsense and there could be more than one possible pronunciation for each word. So, learners were supposed to articulate any possible pronunciation for each word that came to their minds.

2.2.2. Comprehension Task

Having recorded the participants' voice with two weeks' time interval; the researcher gave them the comprehension test. This period was required

because each participant was tested individually and it took some time to record 40 learners' voices; this time also was good to minimize fatigue and subsequent effects on their performance. The comprehension test consisted of 34 items; the learners were supposed to listen to the recorded voice on the CD player and choose among the orthographic forms presented to them. They could choose as many of the choices as they liked. For example, participants heard the word /pægz/ while they were required to choose the graphemic form [PAGS] or [PAGZ] or both of them if they believed both graphemes were appropriate. In some cases, there were more choices, for instance, after listening to the pseudo word /kl^ŝ/, participants had three forms of graphemes to choose one, two, or all of them: [CLOSH], [CLOOSH], and [CLUSH].

2.2.3. Procedure

To ensure the accuracy of results, the researchers gave the production test before the comprehension test to avoid any possible wash back. The test papers were then checked for each group separately; the graphemes chosen in the comprehension test were recorded in the SPSS software. The production recorded materials were also transcribed and entered the spreadsheet of SPSS for further analysis. A mixed between-within analysis of variance was conducted to assess the impact of proficiency i.e., elementary and advanced, on the participants' performance in the comprehension and production tests.

3. Data Analysis and Results

To investigate the effect of Persian L1 orthographic system on the comprehension and production of English L2 pseudo words by thetwo groups of learners, the researcher analyzed the data via a mixed between-within analysis of variance.

3.1. Theorem A: Different Graphemes Derived from the Same Sound Transcription in SLP & TLE

In the production test (1a), the learners were required to read through the pseudo words with grapheme [c] as in [pec, cibar, feace, etc.]. This task aimed to check the frequency of the produced sounds (i.e., /s/, /k/, or both) regarding the grapheme [c]. Furthermore, the same words using the grapheme [s] such as [pes, sibar, fease, etc.] were also examined to make the comparison more clear. In the comprehension task (1b), while listening to the sound /s/ as in /pɘs/, the learners were required to choose among the graphemic forms represented to them such as [pes], [pec], or both. Samples of this task are presented in the pair words below (See table 16 for further examples):

(1) [pes, pec], [sibar, cibar], [fease, feace], [selerate, celerate], [tise, tice]

Task 1: Production test — Task 2: Comprehension test

a. [c] →/s/, /k/ or both — b. /s/→[s], [c] or both

A mixed between-within ANOVA was conducted to assess the impact of two proficiency levels on participants' knowledge of grapheme [c] across the three possible pronunciations.

Table 2. *Production Test of Theorem A Task 1a: Multivariate Tests*

	Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
ortho_C	Pillai's Trace	.984	1108.445[a]	2.000	37.000	.000	.984
	Wilks' Lambda	.016	1108.445[a]	2.000	37.000	.000	.984
	Hotelling's Trace	59.916	1108.445[a]	2.000	37.000	.000	.984
	Roy's Largest Root	59.916	1108.445[a]	2.000	37.000	.000	.984
ortho_C * proficiency	Pillai's Trace	.095	1.936[a]	2.000	37.000	.159	.095
	Wilks' Lambda	.905	1.936[a]	2.000	37.000	.159	.095
	Hotelling's Trace	.105	1.936[a]	2.000	37.000	.159	.095
	Roy's Largest Root	.105	1.936[a]	2.000	37.000	.159	.095

Opposed to the production task (1a) in which there was no significant effect for proficiency, Wilk's Lambda= .90, $F_{(2, 37)}$=1.93, p=.16, η_{p2} =.09, there was a significant effect for proficiency in the comprehension task (1b), Wilk's Lambda=.83, $F_{(2, 37)}$=3.76, p=.03, η_{p2} =.16. However, within group effect shows that there was a significant effect of sound production in production task and grapheme perception in comprehension task (See tables 2 and 3).

Table 3. *Comprehension Test of Theorem A Task 1b: Multivariate Tests*

	Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Ortho	Pillai's Trace	.267	6.739[a]	2.000	37.000	.003	.267
	Wilks' Lambda	.733	6.739[a]	2.000	37.000	.003	.267
	Hotelling's Trace	.364	6.739[a]	2.000	37.000	.003	.267
	Roy's Largest Root	.364	6.739[a]	2.000	37.000	.003	.267
ortho * proficiency	Pillai's Trace	.169	3.765[a]	2.000	37.000	.032	.169
	Wilks' Lambda	.831	3.765[a]	2.000	37.000	.032	.169
	Hotelling's Trace	.204	3.765[a]	2.000	37.000	.032	.169
	Roy's Largest Root	.204	3.765[a]	2.000	37.000	.032	.169

Bonferroni pair wise comparisons indicated that there was a substantial main effect for the production of sound /s/ in the reading task and comprehension of grapheme [s] in the comprehension test, leading these two options to be selected significantly more frequently than the other choices.

In order to study how learners pronounce the grapheme [s] in comparison with [z] some paired pseudo words were designed as mentioned in (2) below. The participants could pronounce the grapheme [s] with /s/, /z/, or both, while the grapheme [z] was mostly pronounced as /z/ and /Iz/. In the comprehension task (i.e., 2b) learners listened to the sound /z/ in a pseudo word, for example /pægz/, and they saw [pags] and [pagz] as the graphemic forms which they could choose one or both of them as the correct form(s) (See table 17 for further examples).

(2) [pags, pagz], [pakers, pakerz], [bons, bonz], [banos, banoz], [catos, catoz]

Task1: Production test *Task2: Comprehension test*

a. [s] → /z/, /s/ or both b. /z/ → [z], [s] or both

The interaction between orthography/sound and proficiency in comprehension task (2b), turned out to be significant, Wilk's Lambda=.70, $F_{(2, 37)}=7.67$, $p=.002$, $\eta_{p2}=.29$, while it did not in the production task (2a) (see tables 4 and 5).

Table 4. *Production Test of Theorem A Task 2a: Multivariate Tests*

	Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
ortho_[s]	Pillai's Trace	.986	1334.408[a]	2.000	37.000	.000	.986
	Wilks' Lambda	.014	1334.408[a]	2.000	37.000	.000	.986
	Hotelling's Trace	72.130	1334.408[a]	2.000	37.000	.000	.986
	Roy's Largest Root	72.130	1334.408[a]	2.000	37.000	.000	.986
ortho_[s] * proficiency	Pillai's Trace	.034	.649[a]	2.000	37.000	.529	.034
	Wilks' Lambda	.966	.649[a]	2.000	37.000	.529	.034
	Hotelling's Trace	.035	.649[a]	2.000	37.000	.529	.034
	Roy's Largest Root	.035	.649[a]	2.000	37.000	.529	.034

Similar to tasks 1a and 1b, the within group effect variable orthography was significant in both production and comprehension tasks ($p<0.05$) (see tables 3 and 4).

Table 5. *Comprehension Test of Theorem A Task 2b: Multivariate Tests*

	Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
ORTHO_/Z/	Pillai's Trace	.245	6.012[a]	2.000	37.000	.005	.245
	Wilks' Lambda	.755	6.012[a]	2.000	37.000	.005	.245
	Hotelling's Trace	.325	6.012[a]	2.000	37.000	.005	.245
	Roy's Largest Root	.325	6.012[a]	2.000	37.000	.005	.245
ORTHO_/Z/ * proficiency	Pillai's Trace	.293	7.671[a]	2.000	37.000	.002	.293
	Wilks' Lambda	.707	7.671[a]	2.000	37.000	.002	.293
	Hotelling's Trace	.415	7.671[a]	2.000	37.000	.002	.293
	Roy's Largest Root	.415	7.671[a]	2.000	37.000	.002	.293

Furthermore, Bonferroni pair-wise comparisons indicated that there was a substantial main effect for all sounds in production, but in the comprehension test only grapheme [s] was significantly different from *both* options.

In English the sound /u/ is written with different graphemes in different contexts, so the pseudo words in (3) were designed to check which graphemic forms are chosen more frequently by the learners in the comprehension task (3b). For example, they listened to the word /pu/ and encountered three different graphemes such as [po], [poo], and [pwo] which they could choose one, two, or all options. In the production test (3a), words containing the grapheme [o], [oo], or [wo] were compared to see how differently they were pronounced. In pairs such as [po] and [poo], the main difference laid in the application of /u/ or /ʊ/ (See table 18 for further examples).

(3) [po, poo, pwo], [fo, foo, fwo], [ko, koo, kwo]

Task 1: Production test *Task 2: Comprehension test*

a. [o]→/u/, /ʊ/ or *both* b. /u/→ [oo], [wo], [o], [oo & wo], [oo & o], [wo & o], or *all*

As opposed to the production task (3a), Wilk's Lambda=.84, $F_{(2, 37)}$=3.34, p =.04, η_{p2}=.15, there was no significant effect for proficiency in the comprehension task (3b) Wilk's Lambda=.83, $F_{(6, 33)}$=1.60, p=.40, η_{p2}=.16. Bonferroni pair wise comparisons indicated that there was a substantial main effect for all sounds in the production task.

Table 6. *Production Test of Theorem A Task 3a: Multivariate Tests*

	Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
ortho_[o]	Pillai's Trace	.927	236.215[a]	2.000	37.000	.000	.927
	Wilks' Lambda	.073	236.215[a]	2.000	37.000	.000	.927
	Hotelling's Trace	12.768	236.215[a]	2.000	37.000	.000	.927
	Roy's Largest Root	12.768	236.215[a]	2.000	37.000	.000	.927
ortho_[o] * proficiency	Pillai's Trace	.153	3.341[a]	2.000	37.000	.046	.153
	Wilks' Lambda	.847	3.341[a]	2.000	37.000	.046	.153
	Hotelling's Trace	.181	3.341[a]	2.000	37.000	.046	.153
	Roy's Largest Root	.181	3.341[a]	2.000	37.000	.046	.153

Similar to the above tasks 1a and 1b, the within group effect variable orthography was significant in both production and comprehension tasks ($p<0.05$) (see tables 6 and 7).

Table 7. *Comprehension Test of Theorem a Task 3b: Multivariate Tests*

	Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
ORTHO_/u/	Pillai's Trace	.825	25.958[a]	6.000	33.000	.000	.825
	Wilks' Lambda	.175	25.958[a]	6.000	33.000	.000	.825
	Hotelling's Trace	4.720	25.958[a]	6.000	33.000	.000	.825
	Roy's Largest Root	4.720	25.958[a]	6.000	33.000	.000	.825
ORTHO_/u/-*proficiency	Pillai's Trace	.162	1.060[a]	6.000	33.000	.406	.162
	Wilks' Lambda	.838	1.060[a]	6.000	33.000	.406	.162
	Hotelling's Trace	.193	1.060[a]	6.000	33.000	.406	.162
	Roy's Largest Root	.193	1.060[a]	6.000	33.000	.406	.162

In the production of items consisting of the graphemic form [wo], as shown in (4) below, there were instances of another pronunciation other than /u/ and /ʊ/, in which the learners pronounced each letter separately /wʊ/, for example [pwo] was pronounced as /pu/, /pʊ/, or /pwʊ/. So the pseudo words in this category were studied separately according to their pronunciations.

(4) [pwo, fwo, kwo]

[wo] →/u/, /wu/ or /ʊ/

Table 8. *Production Test of Theorem a Task 4: Multivariate Tests*

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
ortho_[wo]	Pillai's Trace	.257	6.395[a]	2.000	37.000	.004	.257
	Wilks' Lambda	.743	6.395[a]	2.000	37.000	.004	.257
	Hotelling's Trace	.346	6.395[a]	2.000	37.000	.004	.257
	Roy's Largest Root	.346	6.395[a]	2.000	37.000	.004	.257
ortho_[wo]* proficiency	Pillai's Trace	.180	4.071[a]	2.000	37.000	.025	.180
	Wilks' Lambda	.820	4.071[a]	2.000	37.000	.025	.180
	Hotelling's Trace	.220	4.071[a]	2.000	37.000	.025	.180
	Roy's Largest Root	.220	4.071[a]	2.000	37.000	.025	.180

Proficiency caused significant differences in the production of [wo], Wilk's Lambda=.82, $F_{(2,37)}=4.07$, $p=.04$, $\eta_{p2}=.18$. The pair-wise comparisons indicated that only the first and second options (i.e., /u/ and /wu/) were produced significantly differently from each other.

Table 9. *Comprehension Test of Theorem A Task 4: Multivariate Tests*

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
ORTHO_/u/	Pillai's Trace	.825	25.958[a]	6.000	33.000	.000	.825
	Wilks' Lambda	.175	25.958[a]	6.000	33.000	.000	.825
	Hotelling's Trace	4.720	25.958[a]	6.000	33.000	.000	.825
	Roy's Largest Root	4.720	25.958[a]	6.000	33.000	.000	.825
ORTHO_/u/-*proficiency	Pillai's Trace	.162	1.060[a]	6.000	33.000	.406	.162
	Wilks' Lambda	.838	1.060[a]	6.000	33.000	.406	.162
	Hotelling's Trace	.193	1.060[a]	6.000	33.000	.406	.162
	Roy's Largest Root	.193	1.060[a]	6.000	33.000	.406	.162

3.2. Theorem B. Same Sound Transcriptions Result in Different Grapheme(s) in SLP and TLE

There are some examples of sounds in English and Persian which can be transcribed with two different graphemes; a single-letter graphemic form and combinational graphemes made up of two letters; for instance, as the comprehension task shows the sound /h/ can be written as [h] or [wh] as in (5) or /t/ with [t] and [th] as in (6). Furthermore, combinational graphemes can also be pronounced in two ways; for example, [wh] can be pronounced as /h/ or /w/ forming the production test.

(5) [hoog, whoog], [horry, whorry], [hoke, whoke], [hote, whote], [whovex, hovex]

Task1: Production test — *Task 2: Comprehension test*

a. [wh] →/h/, /w/ or both — b. /h/ → [h], [wh], or both

There was neither significant effect for proficiency in the production task (5a), Wilk's Lambda=.90, $F_{(2, 37)}=1.92$, $p=.16$, $\eta_{p2}=.09$, nor in the comprehension task (5b), Wilk's Lambda=.93, $F_{(2, 37)}=1.20$, $p=.31$, partial eta squared=.06 (See tables 10 & 11).

Table 10. *Production Test of Theorem B Task 5a: Multivariate Tests*

	Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Wh	Pillai's Trace	.956	397.826[a]	2.000	37.000	.000	.956
	Wilks' Lambda	.044	397.826[a]	2.000	37.000	.000	.956
	Hotelling's Trace	21.504	397.826[a]	2.000	37.000	.000	.956
	Roy's Largest Root	21.504	397.826[a]	2.000	37.000	.000	.956
wh * proficiency	Pillai's Trace	.094	1.926[a]	2.000	37.000	.160	.094
	Wilks' Lambda	.906	1.926[a]	2.000	37.000	.160	.094
	Hotelling's Trace	.104	1.926[a]	2.000	37.000	.160	.094
	Roy's Largest Root	.104	1.926[a]	2.000	37.000	.160	.094

Within group effect variable Otho H was quite significant in both comprehension and production tasks (See tables 10 and 11).

Table 11. *Comprehension Test of Theorem B Task 5b: Multivariate Tests*

	Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Ortho H	Pillai's Trace	.463	15.948[a]	2.000	37.000	.000	.463
	Wilks' Lambda	.537	15.948[a]	2.000	37.000	.000	.463
	Hotelling's Trace	.862	15.948[a]	2.000	37.000	.000	.463
	Roy's Largest Root	.862	15.948[a]	2.000	37.000	.000	.463
Ortho H * proficiency	Pillai's Trace	.061	1.202[a]	2.000	37.000	.312	.061
	Wilks' Lambda	.939	1.202[a]	2.000	37.000	.312	.061
	Hotelling's Trace	.065	1.202[a]	2.000	37.000	.312	.061
	Roy's Largest Root	.065	1.202[a]	2.000	37.000	.312	.061

Both tasks had substantial main effects. for the sounds. The pair-wise comparisons of results using Bonferroni adjustment indicated that in the production test, only *both* options were significantly different, while in the comprehension task [h] was chosen significantly differently.

(6) [Thames, Tames], [Thailand, Tailand], [Thai, Tai], [Thomas, Tomas]

Task1: Production test *Task2: Comprehension test*

a. [Th] → /θ/, /t/ or both b. /t/ → [t], [th], or both

Unlike the comprehension test (6b) in which Wilk's Lambda=.93, $F_{(2, 37)}$= 1.30, p=.28, partial eta squared=.06, there was a significant interaction between proficiency and production of [Th] (6a), Wilk's Lambda=.67, $F_{(2, 37)}$= 8.89, p=.001, η_{p2} =.32. There was a substantial main effect for the sounds in both tasks (See tables 12 and13).

Table 12. ***Production Test of Theorem b Task 6a: Multivariate Tests***

	Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
[th]	Pillai's Trace	.708	44.780[a]	2.000	37.000	.000	.708
	Wilks' Lambda	.292	44.780[a]	2.000	37.000	.000	.708
	Hotelling's Trace	2.421	44.780[a]	2.000	37.000	.000	.708
	Roy's Largest Root	2.421	44.780[a]	2.000	37.000	.000	.708
[Th] * proficiency	Pillai's Trace	.325	8.899[a]	2.000	37.000	.001	.325
	Wilks' Lambda	.675	8.899[a]	2.000	37.000	.001	.325
	Hotelling's Trace	.481	8.899[a]	2.000	37.000	.001	.325
	Roy's Largest Root	.481	8.899[a]	2.000	37.000	.001	.325

The pair wise comparisons using Bonferroni adjustment indicated that only choice of *both* options was significantly different in two tests.

Table 13. *Comprehension Test of Theorem B Task 6b: Multivariate Tests*

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
ORTHO_/T/	Pillai's Trace	.357	10.265[a]	2.000	37.000	.000	.357
	Wilks' Lambda	.643	10.265[a]	2.000	37.000	.000	.357
	Hotelling's Trace	.555	10.265[a]	2.000	37.000	.000	.357
	Roy's Largest Root	.555	10.265[a]	2.000	37.000	.000	.357
ORTHO_/T/ * proficiency	Pillai's Trace	.066	1.305[a]	2.000	37.000	.283	.066
	Wilks' Lambda	.934	1.305[a]	2.000	37.000	.283	.066
	Hotelling's Trace	.071	1.305[a]	2.000	37.000	.283	.066
	Roy's Largest Root	.071	1.305[a]	2.000	37.000	.283	.066

3.3. Theorem C. Same Grapheme Result in Different Sound Transcriptions in SLP and TLE

As it was mentioned earlier, the sound /u/ can be written through three graphemic forms; [ou], [o], and [oo]. In the comprehension test (7b), for example, the learners listened to the pseudo-word /puld/ while they are required to choose any one, two, or three options among the graphemic forms [pould], [pold], and [poold]. In the production task (7a), the orthographic form [ou] was presented in several pseudo words as in (7) to be pronounced. Additionally, the production of [o] and [oo] are examined in sections (9a) and (10a), respectively. Also note that section (3a) as discussed above, dealt with the production of [o] too (See table 19 for further examples).

(7) [pould, pold, poold], [foulk, folk, foolk],[koush, kosh, koosh]

Task 1: Production test *Task 2: Comprehension test*

a. [ou] → /ʊ/, /a: / or /u/ b. /ʊ/→ [o], [ou], [oo], [o&ou], [o&oo], [ou&oo], or all

There was no significant interaction between proficiency and tests of production (7a), Wilk's Lambda=.88, $F_{(2,\ 37)}$=2.33, p=.11, η_{p2}=.11, and comprehension (7b), Wilk's Lambda=.81, $F_{(6,\ 33)}$=1.22, p=.31, partial eta squared=.18 (See tables 14 and 15).

Table 14. ***Production Test of Theorem C Task 7a: Multivariate Tests***

	Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
ortho_[ou]	Pillai's Trace	.579	25.410[a]	2.000	37.000	.000	.579
	Wilks' Lambda	.421	25.410[a]	2.000	37.000	.000	.579
	Hotelling's Trace	1.374	25.410[a]	2.000	37.000	.000	.579
	Roy's Largest Root	1.374	25.410[a]	2.000	37.000	.000	.579
ortho_[ou] * proficiency	Pillai's Trace	.112	2.333[a]	2.000	37.000	.111	.112
	Wilks' Lambda	.888	2.333[a]	2.000	37.000	.111	.112
	Hotelling's Trace	.126	2.333[a]	2.000	37.000	.111	.112
	Roy's Largest Root	.126	2.333[a]	2.000	37.000	.111	.112

There was also a substantial main effect for the sounds in both tasks (P=.000). The pair-wise comparisons of results using Bonferroni adjustment indicated that learners did not pronounce sounds /ʊ/ and /u/ significantly differently from each other in the production test.

Table 15. *Comprehension Test of Theorem C Task 7b: Multivariate Tests*

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
ORTHO_/ʊ/	Pillai's Trace	.818	24.645[a]	6.000	33.000	.000	.818
	Wilks' Lambda	.182	24.645[a]	6.000	33.000	.000	.818
	Hotelling's Trace	4.481	24.645[a]	6.000	33.000	.000	.818
	Roy's Largest Root	4.481	24.645[a]	6.000	33.000	.000	.818
ORTHO_/ʊ/ * proficiency	Pillai's Trace	.183	1.229[a]	6.000	33.000	.317	.183
	Wilks' Lambda	.817	1.229[a]	6.000	33.000	.317	.183
	Hotelling's Trace	.224	1.229[a]	6.000	33.000	.317	.183
	Roy's Largest Root	.224	1.229[a]	6.000	33.000	.317	.183

4. Discussion and Conclusion

This study was conducted to investigate the role of proficiency in the acquisition of English graphemic features shared with Persian L1. In order to achieve this goal, advanced and elementary Persian EFL learners were examined through production and comprehension tasks by applying a set of pseudo words.

This study is based on three theorems; theorem **A** SLP and TLE Different Graphemes derived from the same sound transcription. In the first and second tasks designed to check the theorems, i.e., tasks (1) and (2), proficiency had a significant role in the comprehension while it did not for the production tasks, indicating that comprehension occurs before production in the acquisition process. Thus, the advanced learners were significantly better in relating a sound to its different graphemic forms which indicates more experience and better command of English. Consequently, it is argued that the participants' knowledge of L1 with letter-phoneme mismatches did not play a significant difference in the comprehension of these sounds since if it had, then less

proficient learners should also have performed equally well. Regarding the production tasks, i.e., the graphemes [c] and [s] in (1a) and (2a), despite the presence of the same feature in Persian, neither of the groups could successfully produce the required sounds i.e., /s/ and /z/, which is again a piece of evidence supporting the lack of L1 transfer.

To provide some evidence, one can juxtapose the English and Persian graphemic variations resulting in the same sound. In both English and Persian a group of graphemes correspond to the same sound. Tables 1 and 2 shows these sounds (Haghshenas, 1356; Samareh, 1366):

Table16. ***Sound /S/ in SLP and TLE***

	Persian: /s/→ [س – ص – ث]	English: /s/→ [s – c]
Examples	[س]: /s/→ سایه: /saje/ 'shadow'	[C] → Cide: /saId/ as in 'genocide'
	[ص]: /s/→ صابون: /sa:bu:n/ 'soap'	[S] → Side: /saId/ as in 'sidebar'
	[ث]: /s/→ ثروت: /særvæt/ 'wealth'	

Table17. ***Sound /Z/ in SLP and TLE***

	Persian: /Z/→ [ظ – ذ – ض – ز]	English: /Z/→ [s / z /es]
Examples	[ظ]: /z/ → ظهر: /zohr/ 'noon'	[Z] → zoo /zʊ:/
	[ذ]: /z/ → ذرع: /zær? / 'scantling'	[S] → nuns /nˆnz/
	[ز]: /z/ → زرع: /zær? / 'agronomy'	[Es] → mangoes /mæŋgəʊz/
	[ض]: /z/ →ضربان: /zæræba:n/ 'pitter-patter'	

The above tables show in both English and Persian a group of graphemes correspond to the same sound. Then there is no variation between Persian and English corresponding to these two tasks.

The third task described in (3), dealt with the production of /ʊ/ and /u/ across the two proficiency groups. The advanced group performed significantly

better in differentiating these two sounds in their productions while neither of groups' comprehension records was significant. This can conclude that L1 played no significant positive role at least in the production of learners.

The reason is due to the fact that in Persian one grapheme corresponds to /ʊ/ and /u/ sounds while in English several graphemes correspond to these sounds (Haghshenas, 1356; Samareh, 1366):

Table 18. ***Sound /a/ in SLP and TLE***

	Persian: [ا , و, ی] → /a/	English: [oo, u, a] → /a/
Examples	[ا] : /a/ بابا :/baba/ 'dad'	[oo]: /ˆ/ flood:/flˆd/
	[ی]: /a/ عیسی: /i: sa/ 'Jesus'	[u]: /ˆ/ bud:/bˆd/
	[و] :/a/ صلوه :/sælat/ 'prayer'	[a]: /ɒ:/ talk:/tɒ:k/
		[a]: /a:/ are: /a:/

Task 4 represented pseudo words such as [kwo] innovated based on real words such as [two]. As predicted by "orthographic depth hypothesis" (Frost, 1994; Katz & Frost, 1992), in the shallow languages with alphabetic orthography systems every morpheme gets a phonological representation. Thus, the elementary group in this task produced /wu/ as a simple one to one letter - phoneme pronunciation, 12 times more than the advanced learners. This behavior can be originated from shallower L1 (Persian) background with a more transparent orthography system within which most letters have vocalized forms, while English as a deep orthography has a more opaque relation between letters and sounds. It has caused problems for Persian learners of English. This is what Frost (1994), Katz & Frost (1992) called "orthographic depth hypothesis" positing that the deeper an orthographic system, the harder it is to predict pronunciation of a word from its spelling. The significant role of proficiency in these production tests again supports the role of education rather than L1 positive transfer.

Theorem B SLP and TLE the same sound transcription derived from different graphemes. This theorem results in simple/combinational grapheme(s). It is not only rare in Persian, but also it is an exception in English and that's probably why there was no significant effect for proficiency in task (5), where the English combinational graphemes (wh) were produced and comprehended to almost similar rates by the two proficiency groups . As it was mentioned, in task (6) participants were required to read the grapheme [Th] in words such as [Thames], /t/ was produced more frequently by elementary learners while the advanced learners pronounced /θ/ more which is due to the more instruction and practice of /θ/ pronunciation. The advanced group selected *both* options more frequently than elementary group in these tasks caused by lack of knowledge of these exceptions in English.

Theorem **C** SLP and TLE Same grapheme results in different sound transcriptions. Though /ʊ/ and /u/ were not comprehended significantly differently by advanced and elementary learners (see task 7 above), the correct sound /ʊ/ was produced by the advanced learners 1.5 times more than the incorrect sound.

While [o] and [ou] were not selected significantly differently by the learners, choosing more than one option for the orthographical form of /ʊ/ was much more frequent among proficient learners, proposing a wider command of English writing system. The tables below provide some evidence in both Persian and English (Haghshenas, 1356; Samareh, 1366).

Table 19. ***Same Grapheme, Different Sound in TLE***

English Grapheme	Examples
[ou] → /ʊ/, /aʊ/	Could: /kʊd/
	Cloud: /klaʊd/
[c] → /s/ , /k/	City: /sIti/
	Cat: /kæt/
[g] → /dʒ/, / g/	Ginger: /dʒIndʒə/
	Girl: /gʒ:l/
	Garage: /gəra:ʒ/
[ʊ] → / ^ /, / ju/	Cut:/k ^ t/
	Cute:/kjut/

Table 20. ***Same Grapheme Different Sound in SLP***

English Grapheme	Persian Examples
[و] → /u/ , /ʊ/, /ə/	دور: /dur/ 'far'
	دو: /d ʊ / 'two'
	دو: /də ʊ / 'running'

Answering the first and second research questions, proficiency in comprehension tasks the learners were more successful than the production one, though in cases it helped pronouncing non-existing sounds in Persian such as /θ/. As a general outcome, it was observed that more proficient learners chose *all* and *both* options more than less proficient ones, indicating their better command of English as a result of learning. The results achieved throughout this study supported the orthographic depth hypothesis (Frost, 1994; Katz &Frost, 1992). English as a less transparent language than Persian has a more opaque relation between grapheme and sound transcription leading Persian learners of English to have difficulties in relating sounds to graphemes, which could explain why in some cases proficiency did not play any role supporting Wang and Geva (2003). Dealing with the third question, L1 orthographic system did not help Persian participants learn English

orthography. Since all items above had the same features shared between both L1 and L2, the learners had problems dealing with them and only in rare cases did more proficient group perform better.

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