



L2 to L1 Transfer: Arabic Top-Down Reading Processes Applied to English

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People who are proficient in foreign languages are often thought of as smart, intelligent, rational, and a whole slew of other praiseful adjectives. In truth, it can be very difficult to shed the structures of one's first language (L₁) and internalize the forms of a second (L₂); however, it is not impossible. Those who do learn L₂ in immersion programs also find that their newly acquired proficiency can at times interfere with the production of their L₁. While usually not a debilitating problem, a question can be raised: Does any transfer occur backwards between L₂ and L₁?

Plenty of work has been done exploring the cases of positive and negative transfer from L₁ to L₂. There are many aspects to study in this field, such as the compatibility of languages to L₁ on a graded scale like the language difficulty rankings used by government and intelligence agencies around the globe. There are also many studies that have attempted to determine the extent to which English is difficult to learn compared to a person's native language. These objectives serve a valuable purpose in helping the global community gain access to the *lingua franca* of the world today—English. But what could be the benefit to a native-English speaker learning a language and script that does not conform to his or her native language structure? Does this make him or her smarter or quicker at reading and comprehending L₁?

Linguists have conducted experiments that scrutinized the orthography of a language, concluding that the orthographic style of any given language determines how much contextually imposed information is necessary for a person to understand the script (Abu-Rabia 1997). They have also tried to identify how much transfer from non-voweled scripts affects an English learner's ability to read proficiently in English. (Hayes-Harb 2006). The main issue here is to find out whether or not a language learner becomes more proficient in reading his or her native English as a result of learning a second language with a deep orthographic script. This experiment could demonstrate that learning a second language has no effect on the first language reading

processes, or it could show evidence of backward to L1 transfer in a language learner.

Backward Transfer of Arabic Orthographic Language Processing to Native-English Speakers

The body of work that has been done regarding positive and negative transfer from L1 to L2 has been extensive. The general consensus on this topic is that language performers who are proficient in their L1 reading comprehension will also demonstrate proficiency in L2 reading comprehension given sufficient exposure to it (Abu-Rabia 2003); however, there has been relatively little work on the effects of L2 orthography influence on L1 reading comprehension. The question of whether that influence is positive or negative has yet to be determined between the orthographic systems of Arabic and English.

As opposed to English, Arabic utilizes tri-consonantal roots to form much of its vocabulary, and when written in forms, the vowels are often left out because the consonants connect to one another via a connected cursive-like system. Reading this system requires heavy top-down processing where the reader must understand the context and recognize the word shape in order to glean the correct meaning of each word. It has been shown that native-Arabic speakers process their own orthography slower than their L2 orthography because of the complexity of the Arabic writing system (Ibrahim 2002). This faster reading comprehension of a simpler L2 orthography for native-Arabic speakers could be extrapolated to posit that non-native-Arabic speakers with sufficient exposure to Arabic orthography will actually process their own more simple orthography faster.

Evidence of positive backward transfer like this has been shown in Chinese children who became more aware of phonological processes in their native language after studying English (Chen 2010). Evidence of this phenomenon being possible between Hebrew and English came in 2006, when an experiment showed that native Hebrew-speaking children learning English in first grade immersion programs demonstrated a greater proficiency in remembering words in English and in Hebrew than their peers (who had only casual exposure to English) (Fogor 2006). It now remains to be seen if adult English speakers will also become more proficient in their native language with the study of a Semitic orthography.

No Backward Transfer of Arabic Orthographic Language Processing to Native-English Speakers

A popular passage that is being passed around social media sites claims that a study at Cambridge University has shown that native-English speakers can read a text with the central vowels and letters jumbled. While this principle is true, the cost of having these central letters mixed up is the increased time it takes to comprehend the passage (Rayner 2006). This shows that, in general, any altered part of English orthography has an effect on reading, and this slowing effect on comprehension can be accentuated by study of and proficiency in a foreign language. Dr. Merel Kiejzer of Utrecht University in the Netherlands showed that language loss in L₁ can occur in a mirror image of acquisition in a foreign language and that people have a limited ability to efficiently process their native language because of their L₂ (Keijzer 2010).

While loss of L1 may not be absolutely assured, it can be assumed that a proficiency in Arabic L2 orthography might not have any effect at all on L1. When focused solely on their native language, Arabic speakers, both poorly and highly skilled readers, were equally slowed in their orthographic processing when compared against each other reading vowelized, unvowelized, and wrongly vowelized texts (Abu-Rabia 1998). If skilled readers, who should have more extensive top-down processing abilities, perform the same as poor readers in unvowelized Arabic, it is probable that non-native readers will be equally slowed in their processing of English should the vowels be omitted. This would show that proficiency in Arabic orthography does not positively influence native-English readers' ability to decode English without vowelizing despite high or low reading ability.

Methodology

In order to determine the extent to which native-English speakers retain and transfer the top-down processing characteristics of reading Arabic orthography, participants were invited to take part in this study. The types of participants required were native-English speakers, only some of whom were proficient in reading Arabic. Brigham Young University runs a highly competent Arabic language program that requires students to achieve an advanced level of proficiency. These students were invited to participate in the study via the BYU Arabic Facebook page. Other native English-speaking students were invited via the MESA Club Facebook page and other various networks, as long as they had not achieved a high level of proficiency in Arabic. Participation included the completion of a short, timed reading task that accounted for both speed and comprehension in unvowelized English.

Groupings

Group N was the control group and consisted of native-English speakers who were not proficient in reading Arabic. Members of this group were asked about their background with L2 Arabic to determine whether they had any such experience or not. The test questions did not change depending on the answer of the participants and simply grouped them with Group N.

In contrast, Group A consists of native-English speakers who had gained an advanced level of proficiency in Arabic. The level of proficiency was based on two measures: (1) whether or not students attended the Brigham Young University Arabic Study Abroad, which requires four months of daily reading and translation of unvowelled Arabic news articles, and (2) if the students have attained an advanced level proficiency certificate from the American Council on the Teaching of Foreign Languages (ACTFL). The majority of subjects for this group came from Brigham Young University Arabic Study Abroad participants.

Reading Task

The reading task that was given to both groups consisted of a series of textual passages that were timed and presented on a computer survey. The first screen asked the participants about their level of proficiency in Arabic. If a subject answered that he or she was proficient, he or she was then directed to a control text in Arabic that confirmed the proficiency level of the Arabic-speaking respondents. If the subject answered the comprehension question for the passage incorrectly, he or she was then directed out of the survey and not counted. If the subject answered correctly, he or she was directed to the first of the survey's seven main textual passages. Non-Arabic speakers advanced directly to the first of seven increasingly longer and more complex passages that had the vowels removed. The orthography of passages one through five used an underscore in place of a removed vowel and included spaces

between the underscores representing diphthongs (demonstrated in Example 1). This distinction indicated the presence of two missing vowels to orient the readers.

(1) Th_ l_ttl_ b_y cr__d

Passages six and seven gave no indication of where vowels were removed in order to more closely match the consonant-clustered words found in Arabic. This is shown in Example 2.

(2)Fr scr nd svn yrs g r fr fthrs brght frth n ths cntnt, a nw ntn, cncvd n lbrty...

The length of the stimulus passages increased as participants advanced through the passages; however, a native-English speaker's familiarity with the content would have decreased (i.e., the content moved from common stories and phrases to texts with new information that required analysis to understand).

(3)Q1 - Th_ l_ttl_ b_y cr__d w_lf!

(4) Q5 - A st_dy _t C_mbr_dg__n_v_rs_ty s_pp_s_dly cl__m_d th_t th_ h_m_n m_nd c_n r__d w_rds w_th j_mbl_d l_tt_rs w_th__t __pr_bl_m.

(5) Q7 - Thr ws nvr ny stdy dn t Cmbrdg nvrsty hwvr rsrchrs t th nvrsty f msschsts prfrmd xprmnts dmnstrng tht whn yu rd wrds wth jmbld lttrs yu rllly rd slwr.

Procedure

The participants viewed unvoiced textual stimuli on computers via a Qualtrics survey that measured the amount of time they spent viewing the text. The participants were instructed to click their mouse button the instant they finished reading and comprehending the meaning of each text. The time of this first click was used in the data set as a reaction time. After this, participants clicked on a tab directing them to answer reading comprehension questions that followed each text. This process repeated until the participants completed all seven sentences and concluded the test.

The participants who answered any of the comprehension questions incorrectly were excluded from the final data set of reaction times to eliminate the variability of participants speedily reading the texts without comprehending the meaning. The average response times of Groups A and N were compared to determine which group, if any, was significantly quicker or more adept at decoding the stimulus texts. If Group N (non-Arabic readers) were to take longer on average to comprehend the unvoiced text than Group A, it would be understood that Group A (Arabic readers) had read the English passages using the top-down processing skills necessary for reading and comprehending Arabic texts. This would enable them to more quickly read and understand an English orthography as it was written to mimic Arabic's common vowel deficient form.

Analysis

Forty-three participants were tested. Those who did not complete the survey, took longer than ten minutes to complete the survey, or answered any comprehension question incorrectly were excluded from the data set. This yielded eleven participants in Group A and twenty-four participants in Group N for a total of thirty-five participants that met all of the conditions necessary to be included in the analysis. The reaction times for each passage were gathered from the two groups and analyzed to discover the average reaction times divided by passage and group in Table 1.

Speaker	P1	P2	P3	P4	P5	P6	P7
Arabic	3.06	2.66	2.81	3.22	13.36	7.01	18.91
Non-Arabic	3.04	2.76	4.94	4.8	16.22	7.65	21.81

Table 1. Reaction times (in seconds) of Arabic/Non-Arabic Speakers

These reaction times demonstrate the increased time Group N took on average to read and comprehend English passages presented in a deep orthographic rendering. Group A appears to be more adept at processing the deep English orthography as it more closely mirrors Arabic. P1 and P2 are by themselves not significant because of their brevity, being limited to only a couple of words; however, Table 1 does show increasing reaction times of Group N as the test progresses into longer and less familiar texts. Figure 1 visually demonstrates the increasing trend in reaction times of Group N.

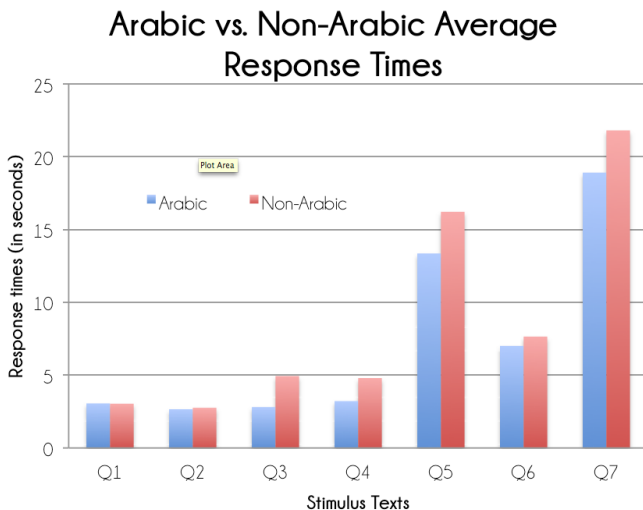


Figure 1. Arabic vs. Non-Arabic Average Response Times

Shorter passages with high familiarity were included mainly as priming devices, so the time it took participants to process these passages was naturally shorter. More accurate timing devices would be required to determine whether these reaction times have any significance. Groups A and N differed only by hundredths of seconds in these first responses, but as the length of the passages increased, the time

differences can be seen compounding and increasing. The significant decrease in reaction time for passage six is likely due to the change in the stimulus formatting, where the voweled underscores that signified missing vowels were removed. Passage six was also much shorter in length than the other passages in the continuum; however, passage seven appears to follow the trend of increasing response time with increased passage length for both groups.

In further analysis on the overall significance of these reaction times, statistics were run using a mixed effects model with either Group A or N as the fixed variable that allowed each passage and subject to have random intercepts. The mean for Group A is 6.9 and for Group N it is 8.7. The effect of group is significant $F(1, 207.749) = 7.549, p = 0.007$. This shows that Group A was not only quicker in their reactions than N, but that the difference is statistically significant.

CONCLUSION

The results of the experiment and analysis of this study support the hypothesis that backward transfer does in fact occur for native-English speakers learning Arabic as a second language. Since this study focuses on orthographic decoding, inferences can be made about how the brain adapts processing and decoding strategies between certain types of orthography. In this study, the two languages dealt with underlying deep or shallow orthographies. A deep orthography offers few visual cues that specify the exact meaning of the text. Shallow orthographies, on the other hand, encode all or most of the morphophonemic and phonetic information necessary to divine specific meanings from words, thereby reducing the burden on the reader to supply the missing information. Reading efficiently in Arabic requires the reader to come to the text with a deep understanding of the script, topic, history, prose, and writing styles found in Arabic culture.

The transfer of this reading strategy from Arabic to English only demonstrates that it occurs between Arabic and English, but the implications of positive versus negative transfer are subjects for sociolinguistic studies. It is still unknown whether or not this increased ability to decode written language with fewer phonetic cues is good or bad. While this transferred characteristic could assist language learners in decoding new or unfamiliar texts containing deficiencies, it may also encourage confirmation biases. When a reader is required to impose his or her own cultural view or acquired biases onto a text to glean meaning, there is an increased tendency to misinterpret ambiguous words and phrases both negatively and positively. This miscommunication is also referred to as a “confirmation bias,” or the way a reader will interpret an ambiguous text in a way that confirms his or her previously held biases. A case of confirmation bias like this occurred between Persian and Hebrew languages in 2005 when the President Mahmoud Ahmadinejad of Iran was purported to have said that Iran would “wipe Israel off the map.” This translation, however, was completely incorrect because of the idiom used by the Hebrew translator (Kessler 2011). The correct translation stated that the Israeli regime should “vanish from the arena of time.” The verb *vanish* used in the speech is an intransitive verb in Persian, and the connotation was that the regime would collapse and disappear like the government of the Soviet Union, not by force of another actor. Unfortunately, the translator unintentionally (or intentionally) read the line as a threat based on his own biases in the context of the existential threat mindset that is prevalent among Israelis.

In contrast, this experiment may add legitimacy to popular theories and claims that suggest increased intelligence from learning a second language. Some of these theories have resulted in experiments that use an array of cognitive tasks to study decreased reaction and processing times in subjects ranging from preschoolers to adults (Bhattacharjee 2012). While it may be difficult to determine actual

intelligence increases from language learning, this Arabic–English study shows that certain isolated externalities can influence the first language while a second language is being learned. The effects of these influences can be measured in the first language should the second language orthography require a change in cognitive participation from the learner in order to decode.

Future Work

With regard to the limitations of this study, the same experiment could be replicated using more precise equipment. Linguists involved in cognitive psychology, for example, often use eye-tracking equipment to determine the speed and reactions of their subjects as they read texts. This type of experimentation could, with increased accuracy, provide data on which to base new conclusions about how much backward transfer actually occurs, and whether or not there is a negligible difference between second language learners and normal readers.

A major limitation to this study was the amount of background information available on the participants. While it was determined that participants who had achieved foreign language proficiency certificates and had studied on the Arabic Study Abroad reacted quicker to the stimuli provided, it cannot be said whether this type of student read more efficiently because of the mere frequency of their reading sessions, the volume of reading material, or their proficiency in reading Arabic script. The effects of better natural reading ability could be accounted for by determining the reading proficiency levels of students in their native language before comparing Arabic-proficient subjects against non-proficient subjects. It is possible that persons who gravitate toward studying deep orthographies are already more highly proficient in their native shallow orthographic systems.

Another interesting approach to studying the extent of backward transfer between languages deals specifically with character-based writ-

ing systems. While this study only dealt with morphophonemic- and phonetic-based orthographies, it would be interesting to study the extent of top-down processing and context-related comprehension in Chinese, Korean, and Japanese scripts. In order to conduct studies for these languages, transference measures would have to be developed to fairly compare the mental processes through which each is decoded. As for the mental processes of Semitic languages and English, this study may serve as a rough guide for developing more detailed comparative measures.

References

- Abu-Rabia, Salim. "The need for cross-cultural considerations in reading theory: The effects of Arabic sentence context in skilled and poor readers." *Journal of Research in Reading* 20 (1997): 137-147. <http://search.proquest.com/docview/58349776?accountid=4488>.
- Abu-Rabia, Salim. "Reading Arabictexts: Effects of text type, reader type and vowelization." *Reading and Writing* 10 (1998): 105-119. <http://search.proquest.com/docview/58359624?accountid=4488>.
- Abu-Rabia, Salim and Linda S. Siegel. "Reading skills in three orthographies: The case of trilingual Arabic-Hebrew-English-speaking Arab children." *Reading and Writing* 16 (2003): 611-634. <http://search.proquest.com/docview/85577155?accountid=4488>.
- Abu-Rabia, Salim and Haitham Taha. "Reading and spelling error analysis of native Arabic dyslexic readers." *Reading and Writing* 17 (2004): 651-689. <http://search.proquest.com/docview/85636980?accountid=4488>.
- Bhattacharjee, Yudhijit. 2012. "Why bilinguals are smarter." *The New York Times* (2012) March 17. Accessed April 8, 2013. http://www.nytimes.com/2012/03/18/opinion/sunday/the-benefits-of-bilingualism.html?_r=0.
- Chen, Xi, Fen Xu, Thien-Kim Nguyen, Guanglei Hong, and Yun Wang. "Effects of cross-language transfer on first-language phonological awareness and literacy skills in Chinese children receiving English instruction." *Journal of Educational Psychology* 102 (2010): 712-728. <http://search.proquest.com/docview/772280574?accountid=4488>.
- Ehrich, John F. and Renata F. I. Meuter. 2009. "Acquiring an artificial logographic Orthography: The beneficial effects of a logographic L1 background and bilinguality." *Journal of Cross-Cultural Psychology* 40 (5): 711-745. <http://search.proquest.com/docview/85713851?accountid=4488>.
- Eviatar, Zohar, Raphiq Ibrahim, and Deia Ganayim. "Orthography and the hemispheres: Visual and linguistic aspects of letter processing." *Neuro-*

- psychology* 18 (2004): 174-184. <http://search.proquest.com/docview/85579351?accountid=4488>.
- Foger, Tani. "The effects of partial Hebrew language immersion in pre-school on English (L1) and Hebrew (L2) reading skills in first grade." <http://search.proquest.com/docview/85715952?accountid=4488>.
- Hayes-Harb, Rachel. "Native speakers of arabic and ESL texts: Evidence for the transfer of written word identification processes." *TESOL Quarterly* 40 (2006): 321-39. <http://www.jstor.org/stable/40264525>
- Ibrahim, Raphiq, Zohar Eviatar, and Judith Aharon-Peretz. "The characteristics of Arabic orthography slow its processing." *Neuropsychology* 16 (2002): 322-326. <http://search.proquest.com/docview/85555624?accountid=4488>.
- Keijzer, Merel. "The regression hypothesis as a framework for first language attrition." *Bilingualism: Language and Cognition* 13 (2010): 9-18. <http://search.proquest.com/docview/85707954?accountid=4488>.
- Kessler, Glen. 2011. "Did Ahmadinejad really say Israel should be 'wiped off the map'?" *The Washington Post, The fact Checker* (2011). Accessed April 8, 2013. http://www.washingtonpost.com/blogs/fact-checker/post/did-ahmadinejad-really-say-israel-should-be-wiped-off-the-map/2011/10/04/gIQABJIKML_blog.html.
- Ratcliffe, Robert R. "What do "phonemic" writing systems represent? Arabic *huruuf*, Japanese *kana*, and the moraic principle." *Written Language and Literacy* 4 (2001): 1-14. <http://search.proquest.com/docview/85539116?accountid=4488>.
- Rayner, Keith, Sarah J. White, Rebecca L. Johnson, and Simon P. Livsledge. "Raeding wrods with jubmled letters." *Psychological Science* 17 (2006): 192-193. <http://search.proquest.com/docview/85593006?accountid=4488>.
- Saigh, K., & Schmitt, N. "Difficulties with vocabulary word form: The case of Arabic ESL learners." *System*, 40(2012), 24-36. <http://search.proquest.com/docview/1038112630?accountid=4488>.