



HEBREW LANGUAGE EDUCATION LITERATURE REVIEWS

Learning Hebrew as a Second or Foreign Language: Issues of Directionality, Orthography, and Metalinguistic Awareness

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Preface

CASJE (Consortium for Applied Studies in Jewish Education) is an evolving community of researchers, practitioners, and philanthropic leaders dedicated to improving the quality of knowledge that can be used to guide the work of Jewish Education. CASJE was launched with lead funding from the Jim Joseph, AVI CHAI, and Mandell and Madeleine Berman Foundations.

Early on, CASJE stakeholders and partners identified the potential for research to contribute to the improvement of Hebrew language education. To date, CASJE's activity in this field has included an effort to gain a better understanding of core issues that might benefit from a systematic applied research program, and on formulating a series of questions that might guide such a program over time.

To that end, this literature review is the third and final in a series commissioned by the CASJE Board. These reviews explore the implications and applications to the teaching and learning of Hebrew of recent research in heritage, second and foreign language learning.

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Hebrew is currently spoken worldwide by over nine million people, with more than half of this population living in Israel, where it is an official language.¹ Yet despite the high concentration of Hebrew speakers, the percentage of Israelis for whom Hebrew is a native language is reported to be only 49%, or less than half of the population.² We may thus observe that the majority of Hebrew speakers in the world today have acquired it as a second or foreign language. Accordingly, **this paper approaches the learning of Hebrew through the lens of second language acquisition, regardless of whether it is learned as a second or foreign language, or even as a heritage language.** Such an approach allows for consideration of the characteristics that make Hebrew a unique language to learn vis-à-vis one's native language(s), and also of the possible influences of language transfer, metalinguistic awareness, or other cross-linguistic factors in the acquisition of Hebrew. In particular, the characteristics of written Hebrew present unique challenges to the learner of Hebrew as a second or foreign language.

This review introduces and analyzes recent research related to learning to read and write Hebrew as a second language (L2) or foreign language (FL), with an aim to identify the specific challenges posed by the unique characteristics of written Hebrew, such as its right-to-left (RTL) directionality, consonant-based *abjad* script,³ and unique orthography. The paper also explores ways in which other RTL writing systems can inform the study of Hebrew, and how one's native language (L1) and the metalinguistic knowledge it provides can influence the successful acquisition of Hebrew as a second language. Through a focus on Hebrew from the perspective of second language acquisition, this review identifies directions for future research while emphasizing the value of studying Hebrew not in isolation, but rather in relation to the other language(s) that learners bring to the table.

¹ "Hebrew language." Wikipedia.org. Retrieved 10 January 2017.

² "CBS: 27% of Israelis struggle with Hebrew" - Israel News, Ynetnews. Ynetnews.com. 21 January 2013. Retrieved 10 January 2017.

³ An *abjad* is a writing system in which each letter or symbol represents a consonant, while vowels are only represented secondarily, or not at all.

Definitions

Second Language (L2) vs. Foreign Language (FL). While the terms second language and foreign language both refer to a language that is not a learner's native language, they differ with respect to the environments in which they are learned. A second language refers to a language widely spoken in the location where it is being learned, while a foreign language is a language not spoken in the location of learning.⁴ In the case of learning in the United States, Hebrew would therefore be considered a foreign language for most learners, with the exception of some heritage learners for whom Hebrew is considered a familiar language through daily exposure in the local Jewish community, which often includes synagogues, schools, prayer, and even local stores in addition to the home.

Right-to-Left (RTL or R-L) Language. The term right-to-left language refers to a language where the written script flows from the right to the left rather than left-to-right as in English and most other modern world languages. Hebrew and Arabic represent the two most widely used RTL languages, with the Hebrew alphabet also used to write other Jewish languages such as Yiddish.

Morphology. In linguistics, morphology refers to the study of the structure and parts of words in a language. A "morpheme" is the smallest grammatical unit that carries meaning.⁵ Hebrew has a relatively unique morphology in which a word is created by attaching a "word-pattern" of vowels and consonants onto a "root," or skeleton, of consonants.⁶ The roots only contain general semantic information, which is then transformed into a specific meaning by the addition of word-patterns, which attach one or more vowels to roots. New words can be formed by attaching different word-patterns onto roots, while the basic meaning of new words can usually be deduced by identifying their underlying roots.

Orthography. Orthography refers to the "correct writing," or conventional spelling, of a language, including the shape of its letters. The Hebrew script is often referred to as a square alphabet because its letter architecture is block-like, with more horizontal and vertical strokes and fewer curves and diagonals when compared to other scripts, such as the Latin alphabet.⁷ The Hebrew script is also noteworthy for having some letters which change form depending on where they appear in the word; for example, there are five consonants that change form when used as the final letter of a word. This means that some phonemes are represented by at least two different letters.⁸

⁴ Johnson, K., & Johnson, H. (eds.) (1999). *Encyclopedic Dictionary of Applied Linguistics: A Handbook for Language Teaching*. Blackwell Publishing Ltd.

⁵ Ibid.

⁶ Ben-Dror, I., Frost, R., & Bentin, S. (1995). Orthographic representation and phonemic segmentation in skilled readers. *Psychological Science*, 6(3), 176–81.

⁷ Share, D., & Levin, I. (1999). DAVID - Learning to read-write Hebrew. In M. Harris & G. Hatano (eds.), *Learning to read and write: A cross-linguistic perspective*. Cambridge: Cambridge University Press.

⁸ Feitelson, D. (1988). *Facts and Fads in Beginning Reading: A Cross-Language Perspective*. Norwood, New Jersey: Ablex Publishing Corporation.

Orthographic Depth. Orthographic depth refers to the degree to which individual graphemes (letters) and phonemes (sounds) match in the writing system of a language. It is also described by the terms letter-sound correspondence or grapheme-to-phoneme correspondence (GPC), or the opposite, letter-sound correspondence or phoneme-to-grapheme correspondence (PGC). Compared to many other alphabetic languages, such as Finnish and Italian, and even English, the ‘unvowelized’ Hebrew alphabet used in most modern print media aimed at adult readers is considered a very orthographically deep (or opaque) alphabet because of its relatively low correspondence of individual letters to single sounds and lack of explicit vowel notation. The ‘vowelized’ version of the Hebrew alphabet, on the other hand, which is used by children and other beginning readers as well as in more traditional printed texts such as the Bible, liturgical texts, and some rabbinic texts, is very orthographically shallow.^{9 10 11} Thus, the Hebrew alphabet is quite unique in being either very orthographically deep or very shallow, depending on whether the unvowelized or vowelized version is being used.

⁹ Frost, R., Katz, L., & Bentin, S. (1987). Strategies for visual word recognition and orthographical depth: a multilingual comparison. *Journal of Experimental Psychology. Human Perception and Performance*, 13(1), 104–115. <https://doi.org/10.1037/0096-1523.13.1.104>

¹⁰ Joshi, R. M., & Aaron, P. G. (2006). *Handbook of Orthography and Literacy*. Mahwah, NJ: L. Erlbaum Associates.

¹¹ Cossu, G. (1999). The acquisition of Italian orthography. In M. Harris & G. Hatano (eds.), *Learning to Read and Write - A Cross-Linguistic Perspective* (pp. 10–33). Cambridge: Cambridge University Press.

Part 1: The Unique Features of the Hebrew Writing System

Perhaps the most defining characteristic of the Hebrew language is its 'root-plus-pattern' system of derivational morphology, in which most words are formed using a consonantal 'root' combined with a vocalic 'pattern.'^{12 13} As its name implies, a root provides the core meaning, or essence, of a word, while a pattern provides a specific derivation based on the root. Indeed, the entire Hebrew lexicon (50,000 to 100,000 words) is based on only about 2,000 such roots.¹⁴ Thus, specific words are formed from the many possible combinations of roots and vocalic patterns, which usually appear as consonant-vowel (CV) pairs, forming the primary phonemic units in Hebrew. To give an example, the root KLT (i.e., the three consonants K-L-T), which carries a core meaning of 'to absorb' or 'take in,' derives into not only the verb forms KALAT ('he grasped'), NIKLAT ('was grasped/absorbed'), HIKLAT ('he recorded'), but also the noun forms KLITA ('absorption'), MIKLAT ('shelter'), HAKLATA ('recording'), and MAKLET ('receiver'), all of which not only include, but are also semantically related to, the root KLT.¹⁵ Because of this semantic primacy of consonants forming the roots of most words in the language, Hebrew orthographies tend to be consonantal in nature, with vowels either remaining unwritten or presented in a manner secondary to the root consonants. Such a written script that features primarily consonants is known as an *abjad*. **For learners of Hebrew, however, this tendency has unfortunately resulted in an abundance of homographic words, or groups of words deriving from the same consonantal root.** For example, when written with only the consonantal root and no vowels, KTV can indicate 'journalist,' 'orthography,' or even the verb form 'he wrote,' depending on the context. In fact, up to 25% of the words in a typical Hebrew text are homographic when isolated from their surrounding contexts.¹⁶ Moreover, vowel writing in Hebrew is inconsistent across individual spellers because it often requires either formal linguistic or historical Hebrew knowledge that goes beyond what most Hebrew readers and writers have learned.¹⁷

¹² Berman, R. (1985). The acquisition of Hebrew. In D. I. Slobin (ed.), *The Crosslinguistic Study of Language Acquisition* (pp. 255–372). Hillsdale, NJ: Lawrence Erlbaum.

¹³ Sampson, G. (1985). *Writing Systems: A Linguistic Introduction*. Stanford University Press.

¹⁴ D. Share & Levin, 1999

¹⁵ Ibid. (p.89)

¹⁶ Shimron, J., & Sivan, T. (1994). Reading Proficiency and Orthography Evidence from Hebrew and English. *Language Learning*, 44(1), 5–27. <https://doi.org/10.1111/j.1467-1770.1994.tb01447.x>

¹⁷ Ravid, D. (2006). Hebrew orthography and literacy. In R. M. Joshi & P. G. Aaron (eds.), *Handbook of Orthography and Literacy* (pp. 339–364). Lawrence Erlbaum Associates: Mahwah, New Jersey.

To solve the problem of ambiguity caused by a high percentage of homographic words in written Hebrew, two unique methods of visually representing the addition of vocalic patterns to roots have been developed: the so-called 'mothers of reading' (Latin: *mater lectionis*) method, which uses pre-existing consonant letters to represent vowel sounds, and the 'pointed' method, which uses small diacritical marks resembling dots to do so.

The 'mothers of reading' method is the first and oldest of the two methods. It involves the use of four specific consonant letters (א *aleph*; ה *he*; ו *waw* or *vav*; and י *yod* or *yud*) to represent vowels. These four letters, depending on their position in a word, may signify either their respective consonants or vowels. However, this system can be problematic for two reasons. First and most obviously, the use of the same letters to represent both consonants and vowels can result in ambiguous situations when reading. Second, in actual use this system is both inconsistent and incomplete;¹⁸ the standard printed Hebrew that we see today in newspapers, books, signage, and other media is only partly and inconsistently vowelled by this 'mothers of reading' system.^{19 20}

The second and more recent method of vowelizing the consonantal roots of Hebrew uses a system of diacritical marks, or points (called *nikkud* or *niqqud*). This 'pointed' system has the virtues of being complete and able to provide virtually unambiguous representations of the vowels in Hebrew words through the use of tiny dots and dashes placed under, over, or between the letters. For example, in pointed Hebrew, the word for 'dog' is כלב (KeLeV [CvCvC]), while in unpointed Hebrew the diacritic points are removed from under and within the consonant letters: כלב (K-L-V [C-C-C]).²¹ Thus, compared to unpointed text, pointed Hebrew is considered a more orthographically shallow system that offers very high grapheme-to-phoneme correspondence (GPC), meaning that both consonants and vowels (via diacritics) have, in general, a single, unambiguous pronunciation. There are exceptions, though, based on various rules of pronunciation, such as some letters being pronounced differently depending on where they appear in the word (e.g., word-initial vs. word-medial); moreover, some letters are written differently depending on their word position, resulting in letters that have different forms but are pronounced the same. For this reason, children in Israel typically first learn to read pointed Hebrew, with the 'mothers of reading' method not being introduced until the second grade, and even then only gradually.²² As for adult speakers of Hebrew, including many in the U.S. who may be learning it as a second or foreign language, exposure to the pointed system remains high at all levels of reading and age groups through the reading of sacred texts, prayer books, dictionaries, children's books, and poetry.

¹⁸ Levin, I., Ravid, D., & Rapaport, S. (2001). Morphology and spelling among Hebrew-speaking children: from kindergarten to first grade. *Journal of Child Language*, 28(3), 741–772. <https://doi.org/10.1017/S0305000901004834>

¹⁹ D. Share & Levin, 1999

²⁰ Benuck, M. B., & Peverly, S. T. (2004). The effect of orthographic depth on reliance upon semantic context for oral reading in English and Hebrew. *Journal of Research in Reading*, 27(3), 281–299. <https://doi.org/10.1111/j.1467-9817.2004.00232.x>

²¹ Miller, P., Kargin, T., & Guldenoglu, B. (2014). Differences in the reading of shallow and deep orthography: developmental evidence from Hebrew and Turkish readers. *Journal of Research in Reading*, 37(4), 409–432. <https://doi.org/10.1111/j.1467-9817.2012.01540.x>

²² Shimron, J. (1999). The role of vowel signs in Hebrew: beyond word recognition. *Reading*, 301–319.

While having very strong GPC with pointed Hebrew means that most words have a single, unambiguous pronunciation, the reverse situation of phoneme-to-grapheme correspondence is not so straightforward. Over time, a number of pairs of graphemes that used to be phonemically distinct have assimilated, or merged phonetically, and now can be spelled with multiple letters, resulting in the duplication of some sounds across different morphemes. An interesting example of such a case is how the vowel /i/ may be signified by either a dot below the vocalized consonant (pointed system), by the consonant letter *yod*, or by both.²³ For these reasons, consonants tend to be mastered earlier and are spelled more correctly than vowels in the writing of young children.^{24 25} But consonants are not immune to this issue of phonetic merging of individual sounds onto multiple graphic representations, or *polygraphy*. **Modern Hebrew contains 18 consonant phonemes, but only 12 are always mapped onto the same letters in one-to-one correspondence; the other 6 consonants can each be represented by two different letters, creating one-to-two correspondence.**²⁶ Thus, while every Hebrew word typically has a single pronunciation, certain parts of words can be spelled with different letters and methods without affecting the underlying pronunciation. This poses a potential problem for the Hebrew learner in which knowledge of spelling alone can, with some exceptions based on the locations and combinations of some letters, accurately predict pronunciation, while knowledge of pronunciation alone cannot accurately predict spelling.

The question of whether the two vowel systems of written Hebrew have different effects on reading performance has been investigated using a variety of approaches. In the field of neuropsychology, Bar-Kochva compared whether the brain processed the shallow (pointed) and deep (unpointed) orthographic systems of Hebrew differently. Results showed that distinct event-related-potentials (ERPs) were elicited by the pointed and unpointed scripts, indicating a difference in how they are processed by the brain.²⁷ Such differences have been further examined by psychological studies of reading attempting to clarify the contribution of vowel signs (points) to the reading of Hebrew. Navon and Shimron have noted that because most vowel signs are written below the letters (though some appear inside or between letters), the reading of pointed text involves the simultaneous extraction of visual information from multiple horizontal planes.^{28 29} However, the researchers also found that both children and adults were able to read vowelized words faster than unvowelized ones; this advantage occurred despite the possibility that the presence of vowel signs required

²³ Navon, D., & Shimron, J. (1984). Reading Hebrew: how necessary is the graphemic representation of vowels? In L. Henderson (ed.), *Orthographies and Reading* (pp. 91–102). London: Lawrence Erlbaum Associates.

²⁴ D. Share & Levin, 1999

²⁵ Levin et al., 2001

²⁶ Berent, I., & Frost, R. (1997). The inhibition of polygraphic consonants in spelling Hebrew: Evidence for recurrent assembly of spelling and phonology in visual word recognition. In C. A. Perfetti, L. Rieben, & M. Fayol (eds.), *Learning to Spell: Research, Theory, and Practice Across Languages* (pp. 195–220). Lawrence Erlbaum Associates.

²⁷ Bar-Kochva, I. (2011). Does processing a shallow and a deep orthography produce different brain activity patterns? An ERP study conducted in Hebrew. *Developmental Neuropsychology*, 36(7), 933–938. <https://doi.org/10.1080/87565641.2011.606417>

²⁸ D. Navon & Shimron, 1984

²⁹ Yael, W., Tami, K., & Bitan, T. (2015). Many ways to read your vowels-Neural processing of diacritics and vowel letters in Hebrew. *NeuroImage*, 121, 10–19. <https://doi.org/10.1016/j.neuroimage.2015.07.029>

more visual processing. Thus it seems that such additional, or redundant, processing may serve as a way to confirm rather than hinder one's reading of words. Indeed, in subsequent research Shimron found that vowel signs sped up the recognition of words among third grade readers and improved the recall of words in the context of lists among sixth graders; moreover, vowelization was found to improve the memory and comprehension of prose texts.³⁰ Another study, which compared the deep (unpointed) orthography of Hebrew with Turkish, a language having a very shallow orthography that reliably reproduces all phonological forms of spoken words, found no significant word-processing disadvantage caused by unpointed Hebrew text in the processing of written words.³¹ This surprising finding was explained by noting that unpointed Hebrew is different from other deep orthographies such as English and French in that the orthographic depth of the former is rooted in phonological under-specification at the grapheme level, which is not present when the language is first acquired. That is, there exists precise phonological specification when the language is first learned via the pointed system, and also through subsequent exposure to texts that are typically written in pointed Hebrew, as noted previously, while that of the latter two languages is based on an irregularity in grapheme-to-phoneme correspondence that exists at all stages of language acquisition.^{32 33}

In addition to having two distinct systems for representing vowels in words, the Hebrew alphabet is also unique in that the shape of its letters is largely square. Compared to the Latin alphabet, which features a number of curves and diagonals, Hebrew letters tend to be more uniformly block-like and primarily composed of horizontal and vertical strokes, not unlike other block-like orthographies such as Chinese and Korean. Moreover, this uniformity is not limited to individual letters; as noted above, most Hebrew words are based on three-letter consonant roots, and therefore word length, even when vowels are added, also tends to be rather uniform. For these reasons, some scholars have noted that Hebrew letters may have slower recognition times when reading compared to alphabets with more distinct letters, such as English.³⁴

Finally, one other important characteristic of Hebrew words warrants mention: their morphological density, or how much semantic information is included in each word. In less morphologically dense languages such as English, function words such as prepositions (e.g., *to*, *from*, *at*) and possessives (e.g., *my*, *our*, *your*) are treated as separate words. In Hebrew, however, these are often affixed to both nouns and pronouns, which can result in some very dense sentences comprised of only two or three words, requiring substantial 'unpacking' by the

³⁰ Shimron, 1999; Shimron, J. (2006). Reading Hebrew: the language and the psychology of reading it. *Choice: Current Reviews for Academic Libraries* (Vol. 43). <https://doi.org/10.4324/9781410617187>

³¹ Miller et al., 2014

³² Frost, R. (2009). Reading in Hebrew versus reading in English: Is there a qualitative difference? In *How Children Learn to Read: Current Issues and New Directions in the Integration of Cognition, Neurobiology and Genetics of Reading and Dyslexia Research and Practice* (pp. 235–254). Taylor & Francis. <https://doi.org/10.4324/9780203838006>

³³ Vaknin-Nusbaum, V., & Miller, P. (2011). The importance of vowel diacritics for the temporary retention of high and low frequency Hebrew words of varying syllabic length. *Memory & Cognition*, 39(3), 516–526. <https://doi.org/10.3758/s13421-010-0026-3>

³⁴ For example, see: Navon, D., & Shimron, J. (1981). Does word naming involve grapheme-to-phoneme translation? Evidence from Hebrew. *Journal of Verbal Learning and Verbal Behavior*, 20(1), 97–109. [https://doi.org/10.1016/S0022-5371\(81\)90334-0](https://doi.org/10.1016/S0022-5371(81)90334-0)

reader to be interpreted correctly. For example, the two-word Hebrew sentence 'AKHALNU BABOKER' can be translated into the five-word English sentence 'We ate in the morning.'³⁵ In this sense, longer words in Hebrew can pose substantial problems when reading due to the need to simultaneously 'decode' all of the semantic information while determining the correct pronunciation. This has been empirically substantiated by recent longitudinal results using the MaDYK, a standardized dynamic Hebrew literacy assessment tool, which showed that the rate of words read correctly per minute decreases among third grade students compared to second grade benchmarks, resulting in fewer words being read per minute as the complexity (morphological density) of texts increases.³⁶

Thus, in addition to its right-to-left directionality, Hebrew's 'root-plus-pattern' of word formation, the primacy of the ambiguous 'mothers of reading' system in everyday reading situations over the unambiguous 'pointed' system of vowelings, square letter architecture, and morphologically dense sentence structure all contribute to the unique qualities of written Hebrew. In the following sections, some of these qualities will be revisited through comparisons with other RTL languages such as Arabic and LTR languages such as English, and also through an examination of how these qualities may be approached by learners of Hebrew as a second or foreign language through the lens of metalinguistic awareness afforded them by their native language(s).

³⁵ Share & Levin, 1999: 91

³⁶ Scott J. Goldberg, author of the MaDYK (*Mivchan Dinami Shel Y'cholot Kriah*) Dynamic Hebrew Reading Measure, personal communication, July 23, 2017

Part 2: Comparing Hebrew with Other RTL and LTR Languages

One way to categorize writing systems is by the direction in which they are written and read. The Greek alphabet and most Latin scripts are written from left to right (LTR), those that incorporate Chinese characters (including Japanese and Korean and a number of Chinese dialects) have traditionally been written vertically (from top to bottom), with each line moving from right to left (RTL), but are now also written horizontally and LTR because of Western influences, while some non-Latin scripts such as Hebrew and Arabic have always been written in a RTL direction.³⁷ While writing direction has not been shown to play as large a role in literacy development compared to the other factors discussed in Part 1, this section explores how the directionality and other visual aspects of one's native language may also influence not just reading and writing ability but other, nonlinguistic aspects of cognition as well.

The importance of visual memory for using the Japanese writing system (a morphemic system that includes Chinese characters) has been shown to result in better memory for geometrical patterns in Japanese children than in English children.^{38 39} Differences have also been found in how writers of different writing systems draw geometric patterns; when Chinese children were asked to draw patterns comprised of horizontal and vertical lines, they tended to start with a horizontal line, whereas English children tended to start with a vertical line. This result is in accordance with the basic writing principles for graphemes in their respective writing systems.⁴⁰ The directionality of the writing system also has been shown to affect how movement is perceived. When shown drawings that appear to rotate, Japanese adults perceived them to be rotating from left-to-right, while English adults perceived the rotation as right-to-left.⁴¹

Multiple studies have shown that individuals whose native language is LTR will develop spatial biases toward the left side of space and thus generally follow a left-to-right direction in perception and production, while native readers of a RTL language will have a stronger ten-

³⁷ Coulmas, F. (1989). *The Writing Systems of the World*. Oxford: Blackwell Publishers.

³⁸ Sampson, 1985

³⁹ Mann, V. A. (1986). Temporary memory for linguistic and nonlinguistic material in relation to the acquisition of Japanese kanji and kana. In H. S. R. Kao & R. Hoosain (eds.), *Linguistics, Psychology, and the Chinese Language* (pp. 155–67). Hong Kong: University of Hong Kong Press.

⁴⁰ Wong, T. H., & Kao, H. S. R. (1991). The development of drawing principles in Chinese. In *Development of Graphic Skills: Research Perspectives and Educational Implications* (pp. 93–112). London: Academic Press.

⁴¹ Morikawa, K., & McBeath, M. K. (1992). Lateral motion bias associated with reading direction. *Vision Research*, 32(6), 1137–1141. [https://doi.org/10.1016/0042-6989\(92\)90014-A](https://doi.org/10.1016/0042-6989(92)90014-A)

dency to scan and process information in a right-to-left direction.⁴² One recent study comparing Italian and Arabic speakers found that the Italian participants were faster than the Arabic speakers at verifying whether the action conveyed in a sentence matched the action shown in a drawing when the agent (sentence subject) was on the left side of the drawing and the action progressed from left to right, whereas the Arabic speaking participants were faster at verifying actions initiated by an agent on the right side of the drawing and proceeding leftward.⁴³ Similarly, a study of native English speakers, mainland Chinese speakers, and Taiwanese Chinese speakers in Taiwan (where traditional top-to-bottom, RTL Chinese writing remains more common) revealed that the English and mainland Chinese readers were better at remembering stimuli presented in the upper left-hand side of a screen, while the Taiwanese readers showed better memory for stimuli presented in the upper right-hand side.⁴⁴ Differences have even been found with respect to the production of spatial relationships. Vaid *et al.* found that the direction of reading and writing can influence how one graphically represents depth. Specifically, nearness was found to be strongly associated with the left side of space in LTR readers, regardless of handedness. When instructed to draw two houses on a canvas, one 'near' and one 'far,' LTR readers first drew the 'near' house on the left and then the 'far' house on the right, whereas RTL readers did not show this preference for left before right.⁴⁵

In addition to the above examples of language directionality being related to spatial and graphical cognition, similar results have been found with respect to how individuals engage in numeric thinking. In general, English speakers tend to have a mental number line oriented from left to right, with smaller numbers associated with the left side of space and larger ones associated with the right side. This type of association between numbers and space directionality has been termed the Spatial Numeric Association Response Code (SNARC) effect.⁴⁶ Zebian investigated this SNARC effect among four groups: English (LTR) mono-literates, Arabic mono-literates (RTL), Arabic-English bi-literates, and illiterate Arabic speakers (who could only read numerals).⁴⁷ The results showed a Reverse SNARC effect for the Arabic mono-literates in which the mental number line had RTL directionality. The Arabic-English bi-literates were found to have a weakened Reverse SNARC effect, while no effect was observed for the illiterate Arabic speakers. These results indicate that cultural artifacts such as the directionality of one's primary writing system can even influence the cognition of numbers.

⁴² Abed, F. (1991). Cultural influences on visual scanning patterns. *Journal of Cross-Cultural Psychology*, 22(4), 525–534. <https://doi.org/10.1177/0022022191224006>

⁴³ Maass, A., & Russo, A. (2003). Directional bias in the mental representation of spatial events: nature or culture? *Psychological Science*, 14(4), 296–301. <https://doi.org/10.1111/1467-9280.14421>

⁴⁴ Bergen, B. K., & Chan Lau, T. T. (2012). Writing direction affects how people map space onto time. *Frontiers in Psychology*, 3(APR), 1–5. <https://doi.org/10.3389/fpsyg.2012.00109>

⁴⁵ Vaid, J., Rhodes, R., Tosun, S., & Eslami, Z. (2011). Script directionality affects depiction of depth in representational drawings. *Social Psychology*, 42(3), 241–248. <https://doi.org/10.1027/1864-9335/a000068>

⁴⁶ Dehaene, S., Bossini, S., & Giraux, P. (1993). The mental representation of parity and number magnitude. *Journal of Experimental Psychology: General*, 122(3), 371–396. <https://doi.org/10.1037/0096-3445.122.3.371>

⁴⁷ Zebian, S. (2005). Linkages between number concepts, spatial thinking, and directionality of writing: The SNARC Effect and the REVERSE SNARC Effect in English and Arabic monoliterates, biliterates, and illiterate Arabic speakers. *Journal of Cognition and Culture*, 5(1), 165–190.

Apart from these spatial differences in cognition observed between LTR and RTL readers, there also seem to be differences with respect to the conceptualization of time as running from left-to-right or right-to-left. One study examined how Spanish (LTR) and Hebrew (RTL) speakers responded to temporal references (e.g., past or future) through the auditory presentation of verbs and adverbs. The Spanish-speaking participants were faster responding to past-related words with the left hand and to future-related words with the right hand. The Hebrew-speaking participants, on the other hand, showed the opposite pattern: they were faster responding to past-related words with the right hand and to future-related words with the left.⁴⁸ Another study of writing direction and temporal cognition asked English, Hebrew, and Arabic speakers to place stickers that corresponded to temporally ordered events (e.g., breakfast, lunch, and dinner) on a surface. The English speakers showed a strong tendency to align them from left to right, the Arabic speakers tended to align them from right to left, while the Hebrew speakers showed mixed response patterns. The mixed responses among the Hebrew speakers were likely due to the fact that Hebrew-speaking Israeli children are more likely to have greater exposure to European LTR languages than Arabic-speaking Israelis, and that Hebrew-speaking children are generally taught to write numbers and perform arithmetic from left-to-right, while young Arabic-speaking children are taught to do all writing, including both language and arithmetic, from right-to-left.⁴⁹

Together, the studies reviewed in this section indicate that the reading and writing direction of a language can indeed exert observable effects on a variety of cognitive modalities, including how space, time, and even numbers are conceptualized and reproduced. As noted by Olsen, one's consciousness of language is structured by the writing system being used, and as such, writing provides the dominant models for thinking about nature and the mind, as it shows how our understanding of the world is shaped by our methods of creating and interpreting written texts. He further notes that writing "provides a model for speech; we introspect language in terms laid down by our scripts."⁵⁰ Thus, it is possible that the cognitive characteristics and tendencies acquired through the learning of the L1 writing system, including directionality, could influence learners of Hebrew as a second language; native speakers of LTR languages such as English, for example, may approach the reading of Hebrew differently than would native speakers of other RTL languages such as Arabic. Various possible influences of a Hebrew learner's L1 are explored in more detail in the next section.

⁴⁸ Ouellet, M., Santiago, J., Israeli, Z., & Gabay, S. (2010). Is the future the right time? *Experimental Psychology*, 57(4), 308–314. <https://doi.org/10.1027/1618-3169/a000036>

⁴⁹ Tversky, B., Kugelmass, S., & Winter, A. (1991). Cross-cultural and developmental trends in graphic productions. *Cognitive Psychology*, 23(4), 515–557. [https://doi.org/10.1016/0010-0285\(91\)90005-9](https://doi.org/10.1016/0010-0285(91)90005-9)

⁵⁰ Olson, D. R. (1994). *The World on Paper: The Conceptual and Cognitive Implications of Writing and Reading*. Cambridge University Press, Cambridge, New York.

Part 3: L1 Writing System Influences in Hebrew L2 Acquisition: Orthographic Distance, Language Transfer, and Metalinguistic Awareness

When considering the acquisition of Hebrew as a foreign or second language (L2), it is important to remember not only the unique characteristics of written Hebrew outlined in this paper, but also any contrasting or complementing first language (L1) writing system factors that could influence Hebrew acquisition by non-native speakers. This section summarizes three such factors: orthographic distance between the L1 and L2, language transfer between the L1 and L2, and metalinguistic awareness of writing systems.

Orthographic Distance

The orthographic distance between the two languages — that is, the extent to which the L1 writing system differs from that of Hebrew — can influence how quickly and successfully learners are able to acquire Hebrew as an L2. The ability to read is considered a dynamic process embedded within the two inter-related systems of a language and its writing system.⁵¹ ⁵² When learning to read, speakers must first learn how to map the spoken language onto the graphic symbols used to encode it. In this sense, reading ability requires prior linguistic knowledge. But what happens when the learner already has substantial linguistic knowledge of one or more other languages? Research has consistently shown that L2 learning is influenced by previously acquired language competencies, a phenomenon known as 'language transfer.'⁵³

Specifically, one may compare factors such as the directionality, morphological density, and orthographical depth of the L1 writing system with Hebrew as a way to measure the orthographic distance between them. With respect to directionality, there are two primary aspects to consider. In addition to the basic direction of reading and writing as one moves from word to word through a text, it is also important to consider directionality at the individual word level. Native speakers of English and other languages that use the Roman

⁵¹ Perfetti, C. A. (2003). The Universal Grammar of reading. *Scientific Studies of Reading*, 7(1), 3–24. https://doi.org/10.1207/S1532799XSSR0701_02

⁵² Perfetti, C. A., & Dunlap, S. (2008). Learning to read: general principles and writing system variations. In K. Koda & A. Zehler (eds.), *Learning to read across languages* (pp. 13–38). Mahwah, NJ: Erlbaum.

⁵³ Koda, K. (2012). Development of second language reading skills: cross-linguistic perspectives. In S. M. Gass & A. Mackey (eds.), *The Routledge Handbook of Second Language Acquisition* (pp. 303–318). New York, NY: Routledge.

alphabet, for example, generally write the individual Roman letters in a left-to-right fashion. However, native speakers of syllable-based logographic writing systems, such as those found in Chinese, Japanese, and Korean, are taught to write individual characters (syllables) in clockwise fashion (top-to-bottom and/or left-to-right, or some combination of both). Even among RTL languages, differences in directionality can be found at the word level. For example, despite being a RTL language, the Hebrew letters themselves are generally written in a left-to-right fashion, and owing to their block-shape nature they are normally not connected in print nor in written script. In contrast, in Arabic both letters and words are written from right to left, and they are always connected.⁵⁴ However, it is also worth noting here that both Hebrew and Arabic words share the practice of morphologically combining prefixes and suffixes to nouns to form semantically dense compound words (see earlier discussion), which may also require reading in a non-linear direction to successfully decode all of the semantic information.

As we have seen, the distance between L1 and L2 writing systems can vary considerably. Indeed, while many languages share the same or very similar writing systems, the Hebrew writing system is used only among the Jewish languages, and therefore the orthographic distance of Hebrew, regardless of the vowelization system being used, from the first language(s) of most learners of Hebrew as a second or foreign language is relatively large. English L1 learners of Spanish, for example, would encounter considerably less orthographic distance compared to English L1 learners of pointed or unpointed Hebrew. In cases of orthographic similarity (i.e., less distance), it is easier for L2 learners to access and use their prior understanding, or metalinguistic sensitivity, of their L1 when learning to read and write the L2. Thus, the degree of orthographic distance between the L1 and L2 can help explain why learners with different L1 backgrounds may acquire L2 competencies at different rates; the closer the orthographic distance between the L1 and L2 writing systems, the more rapidly learners should be able to learn to read and write the L2 writing system.

Language Transfer

The concept of orthographical distance is directly related to another aspect of L1 influence on the learning of a second language: *language transfer*. Language transfer can be defined as the superposition of native language (L1) patterns (including both form and function) onto L2 patterns.⁵⁵ Understanding language transfer is important, because it helps to clarify the influence of pre-existing L1 knowledge on the process of L2 acquisition by learners, and in particular how learners go about learning to read and write the L2 writing system. It also helps us determine what types of L2 input would represent what Krashen termed “comprehensible input” to the learner.⁵⁶ For example, if most learners of Hebrew as a second language use English as their first language, then an analysis of the writing system properties of English would allow us to identify the metalinguistic capabilities that may be directly related to learning to read and write Hebrew, and whether those capabilities can help or hinder

⁵⁴ Tversky et al., 1991

⁵⁵ Gass, S. M., & Selinker, L. (eds.) (1992). *Language Transfer in Language Learning: revised edition*. Amsterdam: John Benjamins Publishing. <https://doi.org/10.1075/lald.5>

⁵⁶ Krashen, S. (1982). *Principles and Practice in Second Language Acquisition*. London: Pergamon.

Hebrew acquisition. Naturally, learners of Hebrew as a second or foreign language will differ in a variety of skills, such as L1 reading and writing ability, L2 (Hebrew) linguistic knowledge, and the degree of similarity of the reading processes in the two languages — which is also related to the previous discussion of orthographic distance. Thus we should not assume that language transfer happens in the same manner across all skills and competencies or that it is uniform across all L2 learners. Rather, some L1 writing system characteristics should be directly transferable to Hebrew — such as the sound-based and phonemic nature of English, which native English speakers may believe are common (i.e., “language-neutral”) conventions across all writing systems — while others should be non-transferable — such as the LTR directionality and alphabetic nature of English in which both vowels and consonants are given equal status compared to the RTL directionality and consonantal nature of Hebrew in which vowels are optionally marked depending on the system (pointed or unpointed).⁵⁷ Finally, all of the above factors are influenced by the more overarching question of time of exposure — that is, where in the process of L1 language development does the learner encounter the L2, and, with respect to the L2, in what order are the various aspects of the L2 encountered by the learner? Timing, and specifically the age of exposure to the L1 and L2, therefore, is a major factor in cognitive development that has a direct effect on literacy. Moreover, timing can be an effective tool for L2 educators when used strategically to plan pedagogical interventions in terms of the order in which to introduce the various aspects of the target language.⁵⁸

With respect to reading skills, while multiple studies have noted that general literacy skills that have already been developed in one language (the L1) can be readily transferred to a second language,^{59 60 61} it is not yet clear which specific skills transfer and to what extent they are beneficial to L2 learners, especially when there is great orthographical distance between the L1 and L2 writing systems.⁶²

As for writing skills, L2 spelling accuracy is known to be affected by the type of L1 writing system. One study found that readers with an L1 writing system that used the Roman alphabet produced more spelling deviations than readers with other L1 writing systems (e.g., Arabic, Chinese, and Japanese), indicating that the L1 writing system influences spelling processes in the L2.⁶³ In addition, learners with different L1 writing systems may have different levels

⁵⁷ Gass, S. M., & Selinker, L. (2008). *Second Language Acquisition: An Introductory Course*, 593. Taylor & Francis. <https://doi.org/9780805854978>

⁵⁸ Ibid.

⁵⁹ Akamatsu, N. (1999). The effects of first language orthographic features on word recognition processing in English as a second language. *Reading and Writing*, 11(June), 381–403. <https://doi.org/10.1023/A:1008053520326>

⁶⁰ Koda, K. (1998). The role of phonemic awareness in second language reading. *Second Language Research*, 14(2), 194–215. <https://doi.org/10.1191/026765898676398460>

⁶¹ Koda, K. (1999). Development of L2 intraword orthographic sensitivity and decoding skills. *The Modern Language Journal*, 83(1), 51–64. <https://doi.org/10.1111/0026-7902.00005>

⁶² Koda, K. (2005). Learning to read across writing systems: transfer, metalinguistic awareness, and second-language reading development. In V. Cook & B. Bassetti (eds.), *Second Language Writing Systems* (pp. 311–334). Clevedon: Multilingual Matters.

⁶³ Oller, J. W., & Ziahosseiny, S. M. (1970). The contrastive analysis hypothesis and spelling errors. *Language Learning*, 20, 183–9.

of awareness of the phonological units represented by the L2 writing system. In one study involving English learners of Hebrew as a second language, the L1 English learners were found to actually be faster than L1 Hebrew (i.e., native Hebrew) readers in deleting the first phoneme from Hebrew words, and moreover they also were unaffected by whether the words were written with or without vowels. The authors concluded that this difference was likely due to the fact that in Hebrew syllables are generally thought to consist of biphonemic consonant-vowel (CV) units, while in English syllables are often based on single phonemes, which could explain the L1 English learners' ability to more quickly identify monophonemic units.^{64 65}

Another study examined the cross-linguistic transfer of phonemic awareness and word identification skills in early literacy across two orthographically distant languages, Russian and Hebrew. The results showed native Russian (L1) children benefited from their Russian literacy skills in the acquisition of Hebrew (L2); specifically, they were observed to have an enhanced ability to spell out Hebrew vowels and consonant clusters even compared to native Hebrew (L1) speaking children.⁶⁶ The authors noted that their results actually indicated support for two alternative hypotheses regarding the benefits of bi-literacy. The first, the Central Processing Hypothesis, states that the acquisition of reading skills does not depend on the nature of the orthography; in this case, the results showed that prior literacy development in even an orthographically different language such as Russian can still be beneficial to the L2 Hebrew learner. The second, the Script-Dependent Hypothesis, states that specific orthographic and linguistic features of the L1 may positively influence literacy development in the L2; here, the authors posited that literacy in Russian's *fully-fledged* alphabet (which gives all vowels and consonants their own, 'full,' letters) helped learners of L2 Hebrew by facilitating the ability to discern certain distinctive features of the Hebrew writing system.⁶⁷

These results can be further understood in light of the abovementioned findings of the bimorphemic CV unit being the primary building block of syllables for Hebrew speakers.⁶⁸ That is, the role of morphemes and their combinations to form syllables, and in particular the C-V combination, is an important aspect of literacy development for Hebrew speakers that should be considered when teaching Hebrew as a second language. In particular, when considering L2 Hebrew learning in the U.S., where the L1 is most likely English, the fact that the English alphabet is (like the Russian Cyrillic alphabet) also fully-fledged would indicate positive influences of prior L1 English literacy development (and specifically phonological awareness) on the learning of L2 Hebrew.

⁶⁴ Ben-Dror et al., 1995

⁶⁵ Share, D. L., & Blum, P. (2005). Syllable splitting in literate and pre-literate Hebrew speakers: Onsets and rimes or bodies and codas. *Journal of Experimental Child Psychology*, 92, 182–202.

⁶⁶ Leikin, M., Schwartz, M., & Share, D. L. (2010). General and specific benefits of bi-literate bilingualism: A Russian-Hebrew study of beginning literacy. *Reading and Writing*, 23(3), 269–292. <https://doi.org/10.1007/s11145-009-9210-x>

⁶⁷ Geva, E., & Siegel, L. S. (2000). Orthographic and cognitive factors in the concurrent development of basic reading skills in two languages. *Reading and Writing: An Interdisciplinary Journal*, 12, 1–30.

⁶⁸ D. L. Share & Blum, 2005

Other studies have indicated that text directionality of the L1 may also affect the acquisition of L2 reading ability. Recall that although Chinese has traditionally been written vertically — and still is — in many cases Chinese L1 learners of English as an L2 have been found to not be negatively affected in letter recognition tasks when English letters are presented vertically.⁶⁹ Additional evidence comes from Arabic, another RTL language like Hebrew. Arabic L1 readers tend to locate letters in English words faster when the letter is on the right-hand side of the word compared to the left-hand side, while English L1 readers show the opposite tendency: they are faster at locating letters on the left side of words.⁷⁰

As this brief summary has shown, **language transfer is an important aspect of learning Hebrew as a second or foreign language, because it helps clarify the ways in which prior exposure to other languages may help or hinder the acquisition of Hebrew.** To the extent that the Hebrew writing system is different from most other languages in terms of directionality, morphology, and alphabet representation (e.g., optional vowels vs. obligatory consonants), it would be worthwhile to explore in more detail the language-specific aspects of Hebrew learners' L1s to further clarify how language transfer may be operating among learners with diverse L1 backgrounds.

Metalinguistic Awareness

While some aspects of writing systems are considered universal, all of the characteristics of writing systems discussed thus far point to important differences across systems in terms of directionality, orthographic density, phonological transparency, and alphabet type (alphabetic, consonantal, morphemic, etc.). Thus, learners of Hebrew as a foreign or second language invariably (but perhaps unconsciously) bring, based on their L1(s), various types of linguistic awareness to their learning in terms of how writing systems are used to encode different elements of language and how to deal with different degrees of phonological and orthographic transparency. This ability to identify, analyze, and manipulate language forms is called *metalinguistic awareness*.⁷¹

Metalinguistic awareness facilitates the learning of a second language in two primary ways. First, in the case of reading, the learner must understand that the graphic symbols of the written language correspond to speech units. This includes knowing what each symbol represents and also how they are combined to form words. In the case of morpheme-based writing systems, for example, one study found a strong association between children's morpho-syntactic awareness and the adoption of morphemes as spelling units.⁷² Without such insights into how sounds and symbols are linked, the written language would be

⁶⁹ Freeman, R. D. (1980). Visual acuity is better for letters in rows than in columns. *Nature*, 286, 62–64. <https://doi.org/10.1038/286062a0>

⁷⁰ Randall, M., & Meara, P. (1988). How Arabs read Roman letters. *Reading in a Foreign Language*, 4(2), 133–45.

⁷¹ Koda, K. 2005

⁷² Bryant, P., Nunes, T., & Aidinis, A. (1999). Different morphemes, same spelling problems: cross-linguistic developmental studies. In *Learning to Read and Write: A Cross-Linguistic Perspective* (pp. 112–132). Cambridge University Press.

completely indecipherable and useless. Second, metalinguistic awareness facilitates learning by allowing learners to analyze the spoken language into meaningful segments; such 'segmentation' ability helps the learner to analyze words to identify known elements within unfamiliar ones (i.e., strings of letters).⁷³

One type of metalinguistic awareness is phonological awareness. Reading studies have shown that a learner's sensitivity to the segmental structure of spoken language is directly related to their ability to read and spell words,^{74 75} and that reading progress can be significantly improved by explicit phonological awareness training.⁷⁶

Along with phonological awareness, the benefits of having morphological awareness in language acquisition have also been observed. The ability to analyze the morphological constituents of words has been shown to be related to overall reading ability, and fewer errors involving the omission of inflectional or derivational morphemes are found among skilled readers compared to less skilled ones.^{77 78 79} It is also worth noting for the discussion of Hebrew acquisition as a second language that the type of morphology used by a writing system can affect how morphological awareness develops. One study found that because the Chinese writing system is based on strong grapheme-morpheme connections through the use of Chinese characters, morphological awareness was a stronger predictor of literacy acquisition than phonological awareness.^{80 81 82}

⁷³ Koda, K. 2005

⁷⁴ Stahl, S. A., & Murray, B. A. (1994). Defining phonological awareness and its relationship to early reading. *Journal of Educational Psychology*, 86(2), 221–234. <https://doi.org/10.1037/0022-0663.86.2.221>

⁷⁵ Yopp, H. K. (1988). The validity and reliability of phonemic awareness tests. *Source: Reading Research Quarterly*, 23207146(2), 159–177. <https://doi.org/10.2307/747800>

⁷⁶ Bradley, L., & Bryant, P. (1991). Phonological skills before and after learning to read. *Phonological Processes in Literacy: A Tribute to Isabelle Y Liberman*, 37–45.

⁷⁷ Carlisle, J. F. (1995). Morphological awareness and early reading achievement. In *Morphological aspects of language processing* (pp. 189–209). <https://doi.org/10.2307/495689>

⁷⁸ Zhang, D., & Koda, K. (2012). Contribution of morphological awareness and lexical inferencing ability to L2 vocabulary knowledge and reading comprehension among advanced EFL learners: Testing direct and indirect effects. *Reading and Writing*, 25(5), 1195–1216. <https://doi.org/10.1007/s11145-011-9313-z>

⁷⁹ Rubin, H. (1988). Morphological knowledge and early writing ability. *Language and Speech*, 31, 337–355. <https://doi.org/10.1177/002383098803100403>

⁸⁰ Nagy, W. E., & Anderson, R. C. (1999). Metalinguistic awareness and literacy acquisition in different languages. In *Journal of Experimental Psychology: Learning, Memory, and Cognition* (Vol. 34, pp. 155–160).

⁸¹ Wu, X., Anderson, R. C., Li, W., Wu, et al. (2009). Morphological awareness and Chinese children's literacy development: An intervention study. *Scientific Studies of Reading*, 13(1), 26–52. <https://doi.org/10.1080/10888430802631734>

⁸² For some recent studies focusing on Hebrew, see: Ravid, D., & Malenky, A. (2001). Awareness of linear and nonlinear morphology in Hebrew: a developmental study. *First Language*, 21, 25–56; Schiff, R., & Calif, S. (2007). Role of phonological and morphological awareness in L2 oral word reading. *Language Learning*, (June), 271–298; Schwartz, M., Taha, H., Assad, H., Khamaisi, F., & Eviatar, Z. (2016). The role of emergent bilingualism in the development of morphological awareness in Arabic and Hebrew. *Journal of Speech, Language, and Hearing Research*, 59(August), 797–809. <https://doi.org/10.1044/2016>; Vaknin-Nusbaum, V., & Sarid, M. (2016). Morphological awareness and reading in second and fifth grade: evidence from Hebrew. *Reading and Writing*, 229–244. <https://doi.org/10.1007/s11145-015-9587-7>; Vaknin-Nusbaum, V., & Sarid, M. (2016). The contribution of morphological awareness to reading comprehension in early stages of reading. *Reading and Writing*, 29(9), 1915–1934. <https://doi.org/10.1007/s11145-016-9658-4>

In sum, research on both phonological and morphological awareness indicates that metalinguistic awareness can help facilitate language learning in a variety of ways, and that such awareness is directly related to the underlying writing systems of the languages being learned. In the case of second language acquisition, metalinguistic awareness can provide advantages to L2 learners by equipping them with the specific abilities they have already acquired through the process of acquiring their L1(s). This knowledge can then provide a base from which we can predict which specific abilities are 'transfer ready' for L2 learners. Moreover, because such metalinguistic awareness is based on the connections between the sounds of a language and its writing system, we can identify which metalinguistic competencies are likely to transfer over to the second language by analyzing and comparing the specific properties of the L1 and L2 writing systems.⁸³ For example, while phonological awareness has been found to be highly correlated with the ability to spell in English L1 speakers, this has not been found to be the case for Hebrew or Chinese L1 speakers, possibly because neither the Hebrew (pointed or unpointed) nor Chinese writing system has a fully-fledged alphabet that facilitates strong phonemic awareness equally across both consonants and vowels.⁸⁴ ⁸⁵ A similar result has been observed with respect to morphological awareness. While it correlates with spelling skills in Hebrew L1 speakers, this would not be the case with Italian L1 speakers, for example, because only a few aspects of the Italian writing system represent morphemes.⁸⁶ Nonetheless, the simple fact that second language learners have already acquired at least one L1, regardless of type, means that learners of Hebrew will be able to apply some degree of metalinguistic awareness — whether that be phonological with respect to consonants, vowels, and syllables; morphological with respect to the appearance or combinations of letters; or both — to facilitate their learning to read and write Hebrew.

⁸³ Perfetti, C. A., Beck, I., Bell, L. C., & Hughes, C. (1987). Phonemic knowledge and learning to read are reciprocal: a longitudinal study of first grade children. *Merrill Palmer Quarterly*, 33(3), 283–319. <https://doi.org/10.4319/lq.2013.58.2.0489>

⁸⁴ Goswami, U. (1999). The relationship between phonological awareness and orthographic representation in different orthographies. In M. Harris & G. Hatano (eds.), *Learning to read and write: A cross-linguistic perspective* (pp. 134–56). Cambridge: Cambridge University Press.

⁸⁵ Hanley, J. R., Tzeng, O. J. L., & Huang, H.-S. (1999). Learning to read Chinese. In M. Harris & G. Hatano (eds.), *Learning to read and write: A cross-linguistic perspective* (pp. 173–95). Cambridge: Cambridge University Press.

⁸⁶ D. Share & Levin, 1999

Conclusion

Through a review of recent literature on the Hebrew writing system, other languages utilizing both RTL and LTR writing systems, and the influences of language transfer, metalinguistic awareness, and other cross-linguistic factors on the acquisition of Hebrew as a second or foreign language, **this paper has attempted to shed light on the unique complexities of acquiring Hebrew and its RTL writing system in a modern world filled mostly with orthographically distant LTR languages.**

Hebrew's status as a RTL language with unique orthographical characteristics poses a special challenge to individuals learning it as a foreign or second language, and especially to those whose first language is a LTR language like English. Even for those whose first language is also a RTL language such as Arabic, other characteristics of written Hebrew can present a number of challenges. This section highlights some points to consider when learning or teaching Hebrew as a second language.

First, the homographic nature of Hebrew words, which are largely based on three-letter consonantal roots, should be taken into consideration during assessments of Hebrew reading comprehension and writing. Particular attention should be given to whether adequate emphasis is given to the role of vowelization in the early stages of acquisition to facilitate the reading of isolated words and texts. As has been shown for learners of Arabic, clear (i.e., pointed) vowelization can be beneficial even for skilled readers.⁸⁷

Second, and related to the prominent semantic role of consonantal roots over vowels in Hebrew, is the issue of reading accuracy versus reading comprehension. With adequate contextual or historical knowledge of consonantal roots, a Hebrew reader may be able to comprehend a word or text and yet not know how to pronounce it correctly due to the possible ambiguity or lack of vowel representation. Or, in the opposite scenario, a very small percentage of readers — so-called “word callers” — may be able to read a written text quite fluently but not decode and understand it at a similar level.⁸⁸ Thus attention should be given to identifying areas where reading accuracy may not correlate well with reading comprehension.

⁸⁷ Abu-Rabia, S., & Taha, H. (2006). Reading in Arabic orthography: Characteristics, research findings, and assessment. In R. M. Joshi & P. G. Aaron (eds.), *Handbook of Orthography and Literacy* (pp. 339–364). Lawrence Erlbaum Associates: Mahwah, New Jersey.

⁸⁸ Meisinger, E. B., Bradley, B. A., Schwanenflugel, P. J., & Morris, R. D. (2010). *NIH Public Access*, 24(December 2004), 147–150. <https://doi.org/10.1037/a0017191>

Third, it is important to consider the relevant characteristics of the L1(s) of learners of Hebrew as a second or foreign language. As described in the previous section, knowledge of a first language provides one with an arsenal of L1 metalinguistic awareness competencies, including phonological and orthographical awareness. These metalinguistic competencies allow L2 learners of Hebrew to approach the language from a top-down perspective rather than the bottom-up perspective typical of native L1 learners. Such a perspective provides Hebrew learners with unique strategies for making connections between the spoken language elements and graphic symbols of the new and unfamiliar writing system.

In sum, the unique features of written Hebrew as an RTL language, insights from studies of other writing systems (both RTL and LTR), and the various metalinguistic awareness factors that a learner may bring from his or her L1(s) can all influence the acquisition of Hebrew as a second language. The next section posits some questions for future research.

Questions for Future Research

Because of Hebrew's unique status as a RTL language with a consonantal-based orthography and multiple systems of vowelizing words, learning the writing system as a second or foreign language can be a daunting task for any learner, regardless of background. However, fortunately there are a number of systematic ways of approaching the acquisition of Hebrew as a non-native language that can help learners use the skills they have already acquired through learning their native language (L1) to more effectively acquire Hebrew. Despite the wide ranging research and valuable insights gained from the various studies presented above, however, **many issues remain regarding our understanding of the acquisition of Hebrew as a second or foreign language.** Specifically, there is still much to be learned about the effects of the L1 writing system on the acquisition of L2 Hebrew, which, due to its unique writing system, will likely differ from the L1 in terms of its directionality, basic linguistic units (morphemes, phonemes, syllable formation, etc.), morphological transparency, and phonological transparency, among other factors. Thus, future research efforts should focus on the following issues and questions.

First are the overt physical properties of the L1 writing system. These include directionality and the ways in which the individual letters or characters, such as vowels and consonants or their combinations, are written.

- ▶ Are learners of Hebrew as a second language influenced by these properties of their native (L1) language?

Next are the orthographic rules of the L1 writing system.

- ▶ What rules have learners been exposed to and internalized regarding the use of spacing between words, vowelization, punctuation, and upper-case versus lower-case letters (or other letter variations) in their L1?

Third are the rates of development of different aspects of the L1 writing system. Recall that children learning Hebrew as a native language typically first learn the consonants together with the pointed system of vowelization, and thus they are exposed to a very orthographically transparent writing system.

- ▶ Is the exposure to consonants and vowels (if they are differentiated orthographically) different in the Hebrew learners' first language(s)?

- ▶ Should reading instruction for L2 Hebrew learners begin with a strictly vowelized (pointed) system and then gradually transition to the more common 'mothers of reading' system?
- ▶ Or should the pointed system be maintained throughout the learning curriculum since that is the system that most learners will likely encounter in their daily lives when reading prayer books and other religious texts?
- ▶ What advantages do learners gain through metalinguistic awareness of their L1 with respect to the representation of vowels, consonants, and syllables?

Finally, there is the issue of ultimate attainment in terms of bridging the distance between a learner's L1 and Hebrew.

- ▶ Can any differences in the levels of competence attained by Hebrew learners be attributed to different degrees of orthographic distance or other differences in the characteristics of their first language(s) when compared with Hebrew?
- ▶ If so, how can those differences best be addressed so that all learners of Hebrew are able to attain proficiency to the best of their ability?

Pursuing the answers to these questions will help Hebrew language researchers and educators to gain even more useful insights and develop even better strategies for language acquisition and instruction going forward.

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