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Semantic and Phonological Effects on L2 to L1 Translation: The Case of Cognates, False Cognates, and Non-Cognate Translation Equivalents

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Abstract

Previous research on cognates, false cognates (FCs), and non-cognate translation equivalents (NCTEs) has largely centered on proficient bilinguals, emphasizing orthographic similarities between the first language (L1) and second language (L2) while often neglecting phonological factors. In contrast, the current study investigated intermediate learners' recognition of the correct L1 meanings of L2 cognates, FCs, and NCTEs in two genetically related languages with distinct orthographies. A test-retest design was implemented with 23 Arabic-speaking high school students learning Hebrew (L2). Participants were presented with 32 bolded words embedded in Hebrew sentences and asked to choose the correct Arabic translation from four options, with linguistic features influencing responses carefully controlled. The task was first administered in the 11th grade (2019) and then again in the 12th grade (2020). The words selected for the translation task were tailored to match the learners' proficiency level, guided by insights from a pilot study involving a larger pool of words and participants. The results indicated that accuracy in recognizing the correct translations of cognates was significantly higher than for FCs and NCTEs at both time points. In the 11th grade, students' recognition of FCs was significantly lower than that of NCTEs. However, as students progressed in their L2 learning, they became less confused by misleading phonological similarities, and no significant difference in performance was found between FCs and NCTEs, suggesting that with increased L2 learning, the misleading effect of FCs (i.e., interlingual homophone inhibition) decreased. In addition, significant correlations between cognates, FCs, and NCTEs emerged only in the 12th grade.

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1 Introduction

To assess vocabulary learning and development among second language (L2) speakers, much research has focused on words that are semantically, phonologically, or orthographically similar across languages. The similarities in these three linguistic features have led to terms that describe single-aspect similarities (e.g., meaning) or multi-aspect similarities (e.g., meaning and phonology). This study examines three categories: cognates, false cognates (FCs), and non-cognate translation equivalents (NCTEs). The goal is to investigate how these word groups influence L2 learners' ability to recognize the correct first language (L1) meanings in two languages with different orthographic systems: Hebrew and Arabic.

2 Literature review

2.1 Cognates

From a purely linguistic point of view and according to a narrow definition accepted in historical/diachronic linguistics, interlingual cognates are words in different languages that share the same single origin (Lijewska, 2020), whether the meaning has been preserved over time, such as *apple* in English and *Apfel* in German, or it has changed to some extent over time, like *hound* in English which means a hunting dog and *Hund* in German which means a dog. However, in a broader definition, interlingual cognates include a wider group of words in the various fields of linguistics. For example, according to Hoshino and Kroll (2008), cognates are defined as phonologically and potentially orthographically similar translations in languages that use the same writing system. Similarly, Rabinovich et al. (2018) define cognates as words in two languages that have a similar meaning as well as a similar pronunciation and sometimes a similar orthography. For example, *uma* in Hebrew and *ummah* in Arabic are identical in terms of meaning (nation), similar phonologically, but different orthographically; on the other hand, *palace* in English and *palacio* in Spanish are similar both phonologically and orthographically. In the last two definitions, there is no checking whether the origin of the two words is common or not since these definitions rely on the awareness of the speakers, and it cannot be assumed that the average speaker knows the common origin of the word.

The phenomenon most associated with cognates is called the cognate facilitation effect, according to which bilinguals (individuals who are able to use two languages) process cognates faster and more accurately than words that have no cognates in their L2, except for semantic equivalents that are not phonologically similar (Dijkstra et al., 2010; Poort & Rodd, 2017). Researchers have found that identical or nearly identical cognates are translated faster and more correctly than other words (Jacobs et al., 2016). Furthermore, when cognates are identical between two languages, participants make a correct and faster lexical decision than when there is a slight difference between them (Van Assche et al., 2011; Comesaña et al., 2015).

Semantic relatedness is the main distinction for cognates, which helps bilinguals decide whether a word that is orthographically – and/or phonologically – similar between two languages can be used in another language or not, with the help of cross-linguistic transfer (Lubliner & Hiebert, 2011). If a learner knows the meaning of related words in one language but not in the other language and is aware of a cognate relationship between the words, he/she can use their cognate knowledge to access the meanings of the words in the other language (Nagy et al., 1993).

Phonological relatedness plays an important role in cognate identification and cross/interlingual transfer (Lubliner & Hiebert, 2011). Some researchers claim that identifying a cognate connection between two languages is based mainly on phonological representations in memory. When hearing a word in L2, acoustically similar words in the L1 are automatically activated (Carroll, 1992). This phonological awareness is critical as it enables the identification of cognate relationships and contributes to reading comprehension independent of the L2 vocabulary (Lubliner & Hiebert, 2011). These phonological factors are also available to people who are illiterate in one or both languages and allow them to make a cross-lingual transfer (August et al., 2005).

When there is little phonological correspondence between the cognates in the two languages, cognate recognition is more complicated (Lubliner & Hiebert, 2011). That is, more complex phonological relationships may make it challenging to identify the cognate relationship between the words in the two languages (Nagy et al., 2006). In a study by Bosma et al. (2019), bilinguals speaking Frisian and Dutch were tested on four groups of cognates that differ in their level of phonological overlap between the two languages. It was found that the more overlap there was between the words in the two languages, the more performance improved in terms of both time and the number of correct answers in a multiple-choice test of matching a picture to the word heard from the examiner. They note that over time (three years), performance improved mainly in orthographically dissimilar cognates with phonological regularity between Dutch and Frisian.

In addition to semantic and phonological relatedness, there is also orthographic relatedness. Researchers have argued that cognates in orthographically similar languages share the same orthographic representation in the bilingual lexicon (Gollan et al., 1997). In general, the greater the similarity in the form of the cognates between the two languages, the greater the cognate facilitation effect (Dijkstra et al., 2010). For example, the word *fruit* is easy to recognize and process by Dutch speakers learning English and English speakers learning Dutch because it has the same orthographic form and the same meaning in both English and Dutch, more so than the word *melon* in English and *meloen* in Dutch which are both identical in meaning but not orthographically identical.

2.2 False cognates

Phonologically similar words (and orthographically similar ones in orthographically similar languages) that are different in meaning are called false cognates (FCs) (Prior et al., 2017), such as *leḥem* (bread) in Hebrew and *laḥm* in Arabic, which means meat. The pronunciation is similar, but their meanings are different. So is *decepción* in Spanish, which is similar in pronunciation and form to *deception* in English but means disappointment and not fraud.

These words are not only referred to as FCs (Chen et al., 2012; Otwinowska & Szewczyk, 2017; Otwinowska et al., 2020) but also false friends (FFs) (Brenders et al., 2011; Otwinowska et al., 2020) and interlingual homophones (ILHPs) (Dijkstra et al., 1999; Van Hell & Tanner, 2013). In orthographically similar languages, they are termed interlingual homographs (ILHGs) (Dijkstra et al., 1999; Van Hell & Tanner, 2013; Otwinowska & Szewczyk, 2017; Otwinowska et al., 2020).

Even highly proficient learners make errors in FCs (Janke & Kolokonte, 2015). One explanation for the fact that FCs are more challenging to learn or recognize than other words is that these words lead to the activation of L1 meaning, which is incorrect in L2 (Dijkstra & Van Heuven, 2002). The two different meanings in the two languages compete with each other and slow the response (Van Hell & Tanner, 2013). In this case, in order to acquire FCs, learners must delay the transfer of the word's semantic representation (meaning) from L1 to L2 (Otwinowska, & Szewczyk, 2017). A second explanation stems from the deceptive similarity in the form of FCs between L1 and L2 (in orthographically similar languages) but not in meaning (Janke & Kolokonte, 2015), which leads learners to associate form in L2 with the wrong meaning (De Groot, 2011). In FCs, a process occurs – the opposite of the cognate facilitation effect – in which learners recognize the similarity between the two words (in pronunciation or form) and then infer the incorrect meaning (Otwinowska, & Szewczyk, 2017). The inhibitory effect of these words is called the interlingual homograph inhibition effect (Smits et al., 2006) or interlingual homophone inhibition (Carrasco-Ortiz et al., 2012).

2.3 Non-cognate translation equivalents

Words that solely have a common meaning between the different languages are called non-cognate translation equivalents (NCTEs) (Grainger et al., 2010) or, for short, non-cognates (NCs) (Pérez et al., 2010), such as *sefer* in Hebrew, *kitāb* in Arabic, and *book* in English. These words actually constitute the "normal" relationship between pairs of words of identical meaning between different languages. These words are also referred to as translation equivalents (De Bot et al., 1995) and are used as control words (CWs) (Poort & Rodd, 2017) and non-cognate control words (Van Hell & Tanner, 2013).

2.4 Studies on cognates, FCs, and NCTEs

Studies have shown that participants use their L1 to identify cognates in the target language, whereas they cannot do this with NCTEs (Costa et al., 2000; Pérez et al., 2010). Learners recognize cognates faster and with fewer errors than NCTEs (Brenders et al., 2011), and their performance in cognate and NCTEs recognition tasks is affected by the degree of L2 exposure (Pérez et al., 2010). In a study by Yudes et al. (2010), cognates and other words were examined in advanced Spanish-

and English-speaking bilinguals. The participants answered a translation recognition task in which two words, one in Spanish and the other in English, were presented one after the other. The speaker had to decide if they are correct translations of each other or if they are unrelated words, that is, if they are cognate pairs or not. It was found that their answers in pairs of cognates were more accurate than the other words.

Another study examined differences between cognates, FCs, and NCTEs encountered by 150 Polish English learners who were asked to translate 105 words from English into Polish (Otwinowska & Szewczyk, 2017). It was found that relative to NCTEs, cognates had a significantly greater chance of being translated correctly, while FCs had a significantly smaller chance. Moreover, in the study by Prior et al. (2017), the percentage of correct FCs answers was lower compared to NCTEs, and the reaction time of answers related to FCs was slower. Similar findings have been reported in many studies (Dijkstra et al., 1999; Van Heuven et al., 2008; Poort & Rodd, 2017). This suggests that cognates may be the easiest to learn, while FCs are the most difficult, since the advantage of the cognate facilitation effect does not apply to the processing of FCs.

The effect of FCs (and all similar word groups) is not always inhibitory. Some studies found that they have neither a facilitation nor an inhibiting effect; in others, they were found to have a facilitation effect only. For instance, no difference was found between the reaction time of bilingual speakers on interlingual homographs (ILHGs) and the NCTEs (Van Heuven et al., 2008) and no difference in FCs identification time in relation to other non-cognate words (Dijkstra & Van Heuven, 2002). It was also found that FFs are processed at the same speed as CWs (Dijkstra et al., 1999; García et al., 2020). However, some research indicates that FCs are learned more accurately and quickly than NCTEs (Haj Ali-Shker, 2024).

Most studies have found a facilitating effect of the cognates: they are easier to acquire, recognize, and process than other words (Yudes et al., 2010; Brenders et al., 2011; Otwinowska & Szewczyk, 2017; Poort & Rodd, 2017). The findings in the various studies that examined FCs present a more complex picture that includes an inhibiting effect in some and a facilitating effect in others (Otwinowska & Szewczyk, 2017; Haj Ali-Shker, 2024). The difference in the findings stems from many factors, such as the level of competence, the type of assignment, and the extent to which the learner can delay the transfer of meaning from L1 to L2.

2.5 Limitations of previous studies

Research in this area faces significant limitations. First, most studies have been conducted with proficient bilinguals (Otwinowska et al., 2020). Second, they primarily focus on orthographic similarity, often neglecting phonological similarity (Dijkstra et al., 1999). Additionally, most research involves bilinguals whose L1 and L2 share similar orthographic systems, with limited studies examining languages with different orthographic systems (Hoshino & Kroll, 2008). In this context, recognizing common meanings is influenced more by phonological similarity than by orthographic proximity.

2.6 Cognates and FCs in the research of Hebrew as L2 to Arabic

This study fills gaps in existing research by examining Hebrew and Arabic, which have similar vocabulary but distinct orthographic systems. Both languages share a root-based morphological structure, rich consonantal inventory, and similar phonological processes like consonant doubling and vowel lengthening (Saiegh-Haddad & Henkin-Roitfarb, 2014). Despite these similarities, their scripts differ: Hebrew uses a non-cursive alphabet where letters are written separately, while Arabic employs a cursive script with connected letters. Furthermore, Arabic exhibits diglossia, distinguishing between spoken dialects and Modern Standard Arabic, whereas Hebrew maintains a unified standard form for both speech and writing (Saiegh-Haddad & Henkin-Roitfarb, 2014). For more nuanced similarities and differences, see Kheir (2019), Segal and Kishon-Rabin (2019), Henkin (2020), and Abu-Rabiah et al. (2023).

Previous research on these two genetically related but orthographically distinct languages—Hebrew and Arabic—includes studies by Prior et al. (2017), Degani et al. (2018), and Haj Ali-Shker (2024). The first study tested the recognition of semantic relations between words using cognates, FCs, and CWs in hearing in 68 speakers of Hebrew as L2 to Arabic. The participating students heard Hebrew words belonging to each of the three groups and then a Hebrew word appeared on the screen, and they were asked to indicate if it was semantically related to the word they heard. For example, they heard the word *hand* and saw the word *knee*. The correct answer in all cases involving a word that is a cognate is yes, there is a connection. In FCs, the correct answer is always no, as in the appearance of the word *atliz* (butchery) after hearing the word *lehem* (bread). There is no connection between the words *bread* and *butchery* in Hebrew, but this connection exists in Arabic since *laḥm* in Arabic means *meat*. It was found that the lexical interference from L1 Arabic did not decrease with the increase in the level of proficiency in Hebrew.

In the study by Degani et al. (2018), the semantic and phonological similarity between L1 (Arabic) and L2 (Hebrew) was examined in a task entirely in L2. It was found that identifying cognates was faster and more accurate than FCs identification since the semantic and phonological similarity between the two languages makes their identification easier. In contrast, performance in FCs was slower and less accurate because participants were influenced by the deceptive phonological similarity between the words in the two languages even though the task did not involve explicit incorporation of the phonological audio, such as saying the words to the participants. They linked the words due to phonological similarity between the items in the two languages, even in the absence of a similarity of meaning. This study showed that even in closely related but orthographically dissimilar languages, there is a cross-linguistic phonological influence.

A third study, by Haj Ali-Shker (2019), investigated how individual differences modulate the learning of different types of novel words in a foreign language. Participants learned Arabic words that were either cognate, false cognate, or control words. It was found that FCs were learned more accurately and quickly than CWs, suggesting that phonological overlap can aid learning despite meaning competition.

2.7 Relevance of this study

The relevance of the current study lies in three key aspects. First, it incorporates a translation task that explicitly involves both Hebrew (L2) and Arabic (L1). Second, this study adopts a test-retest design to evaluate performance in Hebrew, which provides a more robust measure of learning. Third, the participants are intermediate-level Arabic-speaking students in grades 11 and 12, a demographic that has not been extensively studied in prior research on second-language acquisition.

3 Methodology

3.1 Research questions and hypotheses

The research questions are as follows:

RQ1- What are the differences in the degree of accurate recognition of the translation of cognates, FCs, and NCTEs to Arabic among Hebrew as L2 speakers?
RQ2- Is there an increase in the degree of the accurate identification of the translation of the different groups over time? If so, are there differences in the degree of increase between the different groups?
RQ3- Does the disparity in the degree of accurate recognition of the translation of the group considered easy (cognates) and the degree of the accurate recognition of the translation of the groups considered difficult (FCs and NCTEs) decrease with the increase in acquisition time?

The current study aims to test three hypotheses:

1. Cognates are the easiest (highest translation recognition level) of all word groups because of the similarity in sound and identity in meaning between the words in the two languages.
2. FCs are the most difficult word group because of the sound similarity between the words in the two languages which is not accompanied by similarity in meaning. This difficulty is expected mainly at the first time point. In contrast, in the second one, with the increase in acquisition time, it is expected that the performance in the FCs will be similar to NCTEs, in which there is no facilitating or hindering similarity.
3. There will be a general increase in recognizing the correct translation of the different groups over time. The rate of increase may be different. A large increase is not expected in cognates because they tend to be easier compared to the other groups. However, in FCs and NCTEs, which are expected to be more complex, it is expected that with the increase in acquisition time, there will be a more significant increase in recognizing their translation.

3.2 Participants

The participants in the current study were Arab high school students from the northern Negev, Israel, all of whom are Muslims belonging to the Bedouin minority (Abu-Rabiah, in press 1). They began learning Hebrew in the second grade and received three to five hours of Hebrew instruction per week as part of their formal education. Their exposure to Hebrew outside of school varied. The 23 participants were intermediate L2 Hebrew learners, enrolled in the same science class with similar academic achievements. Throughout the study, they were taught Hebrew by a native Arabic-speaking teacher. They completed the task at two time points: the beginning of 11th grade and the beginning of 12th grade.

3.3 Pilot

Before starting the research, it was necessary to make sure that the three word groups' sophistication level was very similar, and that no words were chosen in one group which were initially more difficult for students of the tested age compared to the words in another group. Therefore, success in their translation was not affected by their rarity when compared to the effect of the phonological and semantic similarity that underlies this test. The goal was not to bias the results of success in translating the different word groups in favor of a particular word group before the start of the study. Therefore, in a recall of word meaning task, 63 words were selected, which included cognates, FCs, and NCTEs in equal percentages (21 words in each group). This task was transferred to another science class in the same school whose students had the same level of linguistic competence. They were asked to translate all the words from L2 to L1. The results of the pilot made it possible to choose 32 words from the three groups whose percentage of success in translation was similar (or almost the same). Table 1 shows the characteristics of the three sets of words with examples: cognates (similar meaning and pronunciation), FCs (similar pronunciation only), and NCTEs (similar meaning only).

Table 1. Word groups features

	Similarity in sound	Similarity in meaning	Hebrew	Arabic
Cognates	+	+	ברד barad	برد barad
FCs	+	-	מדינה medina	مدينة madina
NCTEs	-	+	קופסה kufsa	ʕulba علبة

3.4 Task

The final test was a word-meaning recognition task. A paper-based worksheet with 32 Hebrew sentences was prepared, each containing an underlined word from one of the three word groups. Students had 30 minutes during class to choose the correct Arabic translation from four options (see Appendix 1). The task was administered twice: at the beginning of 11th grade and again at the beginning of 12th grade, a year later. The answer choices were carefully designed to control for factors other than phonology, ensuring each option was plausible in terms of semantics, grammar, and syntax. Students were not allowed to use any resources or receive assistance, and their teacher did not help during the test.

3.5 Data analysis

Data was analyzed using SPSS version 27. Means and standard deviations for all word groups over time were produced. To assess differences between time points and word groups according to hypotheses, repeated-measures ANOVA was conducted with both time points and word groups as within-subjects effects. To assess correlations between time points, Pearson correlations were conducted. A p value lower than 5% is considered significant.

4 Findings and discussion

The findings indicated a significant interaction effect between the word groups and the time points ($F(2,44) = 15.92$, $p < .001$). To probe this effect, post hoc tests were conducted comparing the three word groups. Specifically, at time point 1, a significant difference was found between word groups ($F(2,44) = 21.53$, $p < .001$). Here, it was found that cognates had the highest performance compared to FCs ($p < .001$) and NCTEs ($p < .001$). In addition, the FCs performance was lower than that of NCTEs ($p < .001$). Conversely, at time point 2, a significant difference was found between the different groups of words ($F(2,44) = 11.42$, $p < .001$). At time point 2, the performance of cognates was found to be the highest compared to that of FCs ($p < .001$) and NCTEs ($p < .001$). No difference in performance was found between FCs and NCTEs ($p = .670$).

4.1 Cognates

As mentioned, at both time points, it was found that the degree of the correct translation of cognates was statistically significantly higher than the other two groups (FCs and NCTEs). This is further concrete evidence of the presence of the cognate facilitation effect in the two languages, Hebrew and Arabic, which belong to the same language family but are written in different orthographic systems. This finding is consistent with the evidence of the cognate facilitation effect even in bilinguals of languages that are not orthographically similar (Miwa et al., 2014; Poarch & Van Hell, 2014; Degani et al., 2018).

The two similarities that help speakers of Hebrew as L2 to Arabic identify the cognates with relatively greater ease than the other groups of words are semantic and phonological relatedness. They identify two words that have a similarity in sound and must decide whether they also have a similarity in meaning (cognates) or whether they have no similarity in meaning (FCs), that is, whether they can perform interlingual transfer or not (Lubliner & Hiebert, 2011). If they do not know the meaning of the word in one of the two languages and they are aware of a cognate relationship between words in the two languages, they can transfer the meaning of a word from one language to another based on the phonological relationship (Nagy et al., 1993).

Table 2. Means and standard deviations of performance by word group and time

Time	Word group	M	SD
Time 1	Cognates	80.43	14.30
	FCs	56.52	16.13
	NCTEs	66.60	16.41
Time 2	Cognates	78.26	17.75
	FCs	61.74	19.46
	NCTEs	65.17	21.00

As expected, cognates are easier than other words because they are similar in meaning and sound (see Table 2). In the current study, the degree of translation recognition is very high and stands at about 80% of all cases. If Hebrew and Arabic had similar writing systems, the degree of recognition of the cognates would probably be even higher than 80% since it was found that cognates are more orthographically transparent than phonologically transparent (Lubliner & Hiebert, 2011). The high cognate facilitation effect is probably an embodiment of the finding that the simultaneous activation of both languages is strengthened in a context where both languages are required to perform the task (Yudes et al., 2010), as in the final task chosen in this research.

Unlike the findings of an inhibitory effect of the cognates in bilinguals with an intermediate level of competence (Brenders et al., 2011) and a moderate level of cognate facilitation effect in learners with an intermediate level of competence (Laufer & McLean, 2016), in this study, there was evidence of a high degree of facilitating effect of cognates in Hebrew speakers as L2 to Arabic at an intermediate level.

The high degree of recognition of the translation of the cognates actually further supports the finding of Schmid and Jarvis (2014) that cognates are more frequently used when L1 and L2 are closely related. This is because the more the two languages are similar in terms of the lexicon, the more a speaker assumes that cognates have a similar meaning and uses them more frequently (De Groot et al., 1994). This high degree of recognition is not obvious because the lack of orthographic similarity of the cognates between Hebrew and Arabic, which have different orthographic systems, deprives the learners of an essential source for identifying the cognate relationship between the words in the two languages (Helms-Park & Perhan, 2016). In the present case, the correct identification of the cognates is not automatic because the lack of orthographic similarity reduces the chances of correct phonological activation of the corresponding word in L2 (Helms-Park & Perhan, 2016).

To conclude, the first hypothesis that cognates would have the highest level of correct translation recognition among all word groups was confirmed. The cognate facilitation effect also exists in the two languages that are related but with different orthographic systems: Hebrew and Arabic. Furthermore, cognates facilitate the L2-to-L1 translation recognition task among bilinguals with an intermediate proficiency level.

4.2 False cognates

The second finding is that at the first time point, performance in FCs was lower compared to NCTEs. In a more general view, of the three groups of words, the FCs group was the most difficult group for the students at the first time point. The students were wrong in identifying the meaning of the FCs in Arabic significantly more than their percentage of errors in cognates and NCTEs. At the second time point, the performance of FCs and NCTEs was similar. This finding is consistent with the expectations that a phonetic similarity between the words in the two languages not accompanied by semantic identity is misleading.

Even highly skilled speakers have been found to commit errors in FCs more than in other words (Janke & Kolokonte, 2015). The chance that intermediate speakers, like in this study, make an FCs mistake is even greater. The explanation for this finding is that learners transfer the meaning of L1

to L2 where this meaning is not valid (Dijkstra & Van Heuven, 2002). This transfer in FCs increases the chance of making a mistake in the answer since the meaning in L1 is not valid in L2.

In addition to transferring an incorrect meaning from L1 to L2 in these words, it was found that even if the learner knows the different meanings of the FCs in both languages, the competition between them leads to a slowing down of the response (Van Hell & Tanner, 2013). The reason for this is that the processing of the FCs leads to the non-selective activation of two different semantic representations (Durlik et al., 2016). Without semantic identity, the similar or identical phonological or orthographic form does not speed up the recognition of the FCs or their translation. In a study by Dijkstra et al. (1999), it was found that ILHPs are processed more slowly than other words. Similarly, bilingual speakers' FCs recognition response was also slower than the other words (not including cognates) (Van Hell & Tanner, 2013).

The next explanation can be derived from the fact that deceptive similarity in the form of FCs between L1 and L2 in orthographically similar languages alongside a difference in meaning can be misleading. This misleading similarity causes the learner to associate the word form in L2 with the incorrect meaning of the similar form in L1 (De Groot, 2011; Janke & Kolokonte, 2015). In two languages that are not orthographically similar, this can be attributed to the misleading phonological similarity and not orthographic similarity. For example, in the current study, the learners who read the word *medina* in Hebrew associate it with the Arabic word *madiina* which means *city* and not *country*. Following, they transfer the meaning of *city* to the Hebrew word *medina*. It is transferring an incorrect meaning to L2 that leads to a mistake. This is an embodiment of the opposite process of the cognate facilitation effect. In this case, to succeed in FCs, learners must learn not to transfer the false meaning from L1 to L2 (Otwinowska, & Szewczyk, 2017).

In a task of translating words from English to Polish among Polish students who learn English (as a third language) which included the translation of 35 words from the three groups of words (cognates, FCs, and NCs), it was found that the chance of translating cognates relative to NCs is significantly higher than the chance of a correct translation of the FCs relative to the NCs. The intensity of the inhibitory effect of the FCs was similar to the intensity of the cognate facilitation effect (Otwinowska, & Szewczyk, 2017). Similar findings were also reported in a study by Prior et al. (2017): the percentage of correct responses to FCs was lower than CWs and the response time of FCs was also slower.

Brenders et al. (2011) examined in a longitudinal study (about 14 months) cognates, FCs (ILHGs and ILHPs), and NCs in Dutch- and English-speaking bilinguals in elementary and middle school. They were divided into three levels of competence: high, medium, and low. The researchers found that only the students with a high level of competence had evidence of the cognate facilitation effect. On the other hand, for students with medium and low competence levels, there was an inhibitory effect for cognates and FCs relative to NC. Also, in the current study, an inhibitory effect of FCs was observed among Hebrew speakers as L2 to Arabic at an intermediate level. However, unlike it, cognates had a facilitating effect among the same group.

To conclude, the second hypothesis that FCs would be the most difficult of all word groups was confirmed because the sound similarity between the words in the two languages is not accompanied by identity in meaning. This difficulty did stand out at the first time point, while at the second time point, with the increase in acquisition time, performance in FCs was similar to performance in NCTEs. Furthermore, the inhibitory effect of the FCs is also found in the two languages that are historically related but have different orthographic systems: Hebrew and Arabic.

4.3 Time effect

The examination of the improvement over time for each group of words separately was carried out using paired *t*-tests. No significant differences were found between time point 1 and time point 2 in the three groups of words: cognates ($t = 0.54$, $p = .59$), FCs ($t = 1.21$, $p = .59$), and NCTEs ($t = 0.44$, $p = .66$). However, it should be remembered that there is a clear gap between FCs and NCTEs at the first time point but not at the second. That is, there is some evidence that the gap between the

groups changes and that the most difficult group becomes less difficult with the increase in the time of acquisition. My expectation before the study was that there would be a general increase over time in the translation recognition of the different groups, but that the rate of increase might be different. A large increase is not expected in cognates because they are already seen as easy, while in FCs and NCTEs, which are more difficult, it is expected that with the increase in teaching time there will be a more significant increase in recognizing their translation.

Although it is reasonable to assume that students will improve their language proficiency over the research period, previous studies have shown that this is not always the case. Lexical development in L2 may remain stagnant in certain dimensions while progressing more rapidly in others (Zheng, 2016). For example, one year was insufficient to demonstrate significant improvement in several aspects of L2 Hebrew vocabulary in the writing of L1 Arabic speakers, such as lexical diversity and lexical density (Abu-Rabiah, 2020, 2023), and lexical sophistication (Abu-Rabiah, 2024). Therefore, the lack of a general improvement in accuracy is not unexpected.

A possible explanation of the lack of increase in the degree of recognition of the translation of the different groups of words could stem from the limited degree of exposure to the Hebrew language of the students beyond their formal teaching at school. Findings in the vocabulary studies showed that a significant enrichment of language acquirers' lexicon does not occur only in the formal settings of formal teaching at educational institutions. Peters et al. (2019) examined the vocabulary of French as L2 and English as L3 by Flemish high-school students and Flemish university students in their first year at university. The difference between the groups in the length of formal exposure to these languages is about two years. It was found that there was a modest and slight improvement in the vocabulary of the participants who were not exposed to these languages outside of the teaching setting. The improvement was more substantial for the participants who were exposed to French and English in other contexts, such as reading books, watching TV, and playing computer games. Peters et al. (2019) pointed out that in second and third language teaching, teachers must maintain realistic expectations regarding the size of the learners' vocabulary, especially if the formal exposure to the acquired languages is limited to two to four hours per week. According to Hebrew as a second language curriculum (2019), the minimum number of hours required of students to take the basic matriculation exam in Hebrew is 3 hours per week. During the research period, the students studied for three hours a week. However, this small number of hours is not enough for the learners to significantly expand their vocabulary.

The limited number of hours of formal instruction is not sufficient for students to achieve a noticeable increase in vocabulary, and the focus on specific word groups further complicates the documentation of clear progress. This challenge is particularly evident with L2 learners who, by the end of high school and before entering higher education, possess a productive vocabulary size of only around 1,000 lemmas (Abu-Rabiah, in press 2). According to the Hebrew as an L2 curriculum (2019), the vocabulary achievements expected of high school students do not include any reference to words that share similarities between L2 (Hebrew) and L1 (Arabic). The curriculum emphasizes knowledge of synonyms according to register and context, identifying the contextual meaning of words, phrases, or conjunctions using a monolingual dictionary, and expanding vocabulary through exposure to new texts and awareness of their textual and socio-cultural contexts.

The teachers are not asked to draw students' attention to words that are similar between the two languages in various aspects, and there is no direct teaching of such words in the classroom. The lack of emphasizing the connections between words in the learner's L1 and L2 does not help them expand their vocabulary in these word groups. This is a second explanation for the lack of increase in recognizing the translations of these word groups even after a year of formal instruction. Only at an advanced level is it indicated in the curriculum that teachers could compare Hebrew and Arabic. As mentioned, the students in this study are not at an advanced level.

4.4 Correlations between word groups at each time point

The examination of improvement over time for each condition separately was conducted using paired *t*-tests. No differences were found between time 1 and time 2 for condition A ($t = 0.54$, $p = .59$), condition B ($t = 1.21$, $p = .59$), and condition D ($t = 0.44$, $p = .66$).

Table 3. Pearson correlations between groups and time

Time		Cognates	FCs
Time 1	**FCs**	.105	
	NCTEs	.388	.591**
Time 2	**FCs**	.509*	
	NCTEs	.575**	.699**

*$p < .05$, **$p < .01$

According to Table 3, at the first time point, a significant correlation was found only between the performance in FCs and the performance in NCTEs (r = .591, $p < .01$). No additional correlations were found at the first time point. When examining correlations at time point 2, stronger associations were found. Specifically, significant correlations were found between cognates and FCs (r = .509, $p < .05$) and NCTEs (r = .575, $p < .01$). In addition, another significant correlation was also identified between FCs and NCTEs (r = .699, $p < .01$).

The finding that at the first time point there is only one significant correlation between FCs and NCTEs is consistent with the first two findings: the degree of the correct response to the cognates is statistically significantly higher than the other two groups (FCs and NCTEs), and at the first time point, performance in FC was lower compared to NCTEs. On the one hand, FCs and NCTEs are significantly more difficult word sets for learners than cognates. On the other hand, only at the first time point are FCs even more difficult than NCTEs. This last finding adds an important layer according to which the performance trend of each of these two groups can be predicted with the help of the results of the other group. That is, at the first time point only with the help of an examination of one of the two groups (FCs and NCTEs), it is possible to estimate what the trend will be in the translation task of the other group. According to the fact that there is a correlation between FCs and NCTEs at the first time point, the students' performance on words such as *lehem* (bread) in Hebrew and *lahm* (meat) in Arabic that have a phonological but not semantic similarity is similar to their performance on words such as *kufsa* (box) in Hebrew and *ulba* (box) in Arabic that have no phonological similarity but share a semantic identity, at least in terms of trend and not in terms of the values of the results obtained.

Unlike the first time point, at the second time point, all word groups were correlated with each other. This finding shows that performance in one set of words is similar to performance in another set of words among the participants. According to this, the performance over time in the difficult word groups (FCs and NCTEs), which include only one similarity that is not misleading (semantic), and in FCs with a misleading phonological similarity becomes more similar to the easy word group (cognates) which includes both phonological similarity and semantic identity.

5 Conclusion

The empirical research presented in this study investigated three groups of words that exhibit semantic and/or phonological similarities between Hebrew and Arabic. This test-retest study, conducted with a one-year interval, involved 23 native Arabic-speaking high school students learning Hebrew as an L2. The participants were asked to select the Arabic translation of a highlighted Hebrew word within one of 32 sentences, each containing one word from one of the three groups: cognates, false cognates (FCs), and non-cognate translation equivalents (NCTEs). The goal was to examine the differences in the difficulty of translating words that are similar in one or both aspects

(semantic/phonological) between Hebrew and Arabic, and to assess the effect of teaching time on translation recognition.

The findings revealed a cognate facilitation effect between Hebrew and Arabic, two genetically related languages with distinct orthographic systems. As teaching progressed, students' performance on the more difficult word groups became more similar to their performance on the easier word groups. At both time points, the accuracy of translating cognates was significantly higher than that of the other two word groups, due to the semantic and phonological similarities between cognates in both languages. This result is consistent with previous studies on the Hebrew-Arabic language pair and aligns with broader findings on the advantages of cognates in various tasks, including L2-to-L1 translation.

The second key finding showed that, at the first time point, FCs were the most difficult word group, as they exhibited phonological similarity between the languages but differed in meaning. However, as students progressed in their L2 learning, they became less confused by the misleading phonological similarities, and no significant difference in performance was found between FCs and NCTEs. This suggests that with increased L2 learning time, the misleading effect of FCs (i.e., inter-lingual homophone inhibition) diminished.

No general increase in performance was observed over time across the different word groups, as lexical development in L2 may remain stagnant in some dimensions and require more than a year for significant progress in others. Furthermore, a correlation between word groups that were difficult at the first time point was found, while by the second time point, correlations were observed between all word groups. This indicates that with extended teaching time, the gaps between the difficult and easy word groups narrowed.

6 Practical implications and limitations

When teaching vocabulary, it is beneficial to emphasize the similarities between words in the learners' L1 and L2. This focus can help learners expand their vocabulary more rapidly. Highlighting these similarities is crucial because it enables the teacher to guide students in recognizing when they can rely on cross-linguistic similarities to understand unfamiliar words (cognates) and when such similarities might be misleading (FCs).

While the number of words tested in this study was limited, it offered an initial exploration of the research questions. Future studies could expand the number of words in each of the three categories and examine them with learners at different proficiency levels or over periods longer than a year.

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Appendix

בחרו את הפירוש הנכון של המילים המודגשות במשפטים הבאים!
הערה: רק תשובה אחת נכונה.
(Choose the correct meaning of the underlined words in the following sentences!
Note: Only one answer is correct.)

1. בשנה שעברה החולה **שקל** יותר: شَكَلَ, تأثَّرَ, وَزَنَ, عانَى.
2. השכן **טען** כל הזמן דבר חדש: طَعَنَ, نَشَرَ, كتَبَ, إدَّعَى.
3. **מערכת** זו היא מערכת חדשנית: مَركَبة, جِهَاز, فِكْرَة, غَوَّاصَة.
4. הוא הנשיא הראשון של ה**ארגון**: شَرِكة, مُنَظَّمة, فِرقَة, دَولة.
5. החומר **נזל** מהדלי: نَزَلَ, ذابَ, سالَ, تَبَخَّر.
6. ה**ריצה** מורידה את הסיכון לחלות במחלת לב: رياضة, تأمُّل, راحة, جَرْي.
7. כשהתעוררתי בבוקר ראיתי **ברד** על החלון: غُبَار, أوساخ, مَطَر, بَرَد.
8. תקופת ה**הרשמה** תסתיים מחר: تَسجيل, تَدريب, تَعليم, إعداد.
9. הוא **שפט** במהירות: عَبَّر, شفَطَ, تَكَلَّمَ, حَكَم.
10. ה**ריח** אינו מפריע לי: خَسارة, رائِحة, ضجَّة, رِيح.
11. ה**חלב** משמש כתרופה לחלק מהמחלות: حَلِيب, عَصِير, مَاء, لَبَن.
12. הם **סעדו** ביחד ודיברו כל הזמן: صَعِدوا, أكَلوا, قرَأوا, مَكَثوا.
13. ה**חיה** יפה וטובה ולא צריך לפחד ממנה: حَيَوان, عَرْض, حَياة, دِراسة.
14. ה**גמל**, יש לו תכונות מיוחדות: جَمَل, جَسَد, ضَبْع, حَمَل.
15. החיות אוכלות **תבן**: زَرْع, تِبْن, جَزَر, قَمْح.
16. ה**ציפייה** שלי היא שתתמודד טוב עם המצב: تَخَيُّل, تَوَقُّع, أُمنية, رَغْبَة.
17. הוא **שלח** את זה עכשיו: غَسَلَ, شَلَحَ, تَلَقَّى, أرْسَلَ.
18. אין למסור את ה**נשק** האישי לאדם אחר: دَواء, بِطاقَة, سِلاح, كلِمة مُرُور.
19. בתוך ה**קופסה** יש מתנה: كِيس, كَأس, خِزَانَة, عُلْبَة.
20. ה**מכתב** מקושט בתמונות צבעוניות: مَقَرّ, مَكْتوب, مَرقَب, مَكتَب.
21. ה**תיש** ברח מהחווה: حِصان, تَيس, خنزير, ثَور.
22. ה**דמעה** חונקת אותה: مُفاجَأة, شَمْعَة, دَمْعة, جَفوة.
23. ה**אומה** צריכה להיות מאוחדת נגד פושעים: جَمَاعَة, فِئَة, مُنَظَّمة, أُمَّة.
24. ה**מדינה** הקטנה ביותר בעולם נמצאת ביבשת אירופה: مُؤسَّسة, مَدِينَة, قَرية, دَولة.
25. **לחם** זה טעים כי הוא חם: دَجاج, لَحْم, خُبْز, جُبْن.
26. הצבע של **גרב** התינוק הוא אדום: مَحْفَظَة, قَمِيص, غِطَاء, جَورَب.
27. הנאשם **זעם** כי לא נתנו לו הזדמנות להביע את דעתו: إشتَكَى, غَضِبَ, زَعَمَ, إنتَحَرَ.
28. ה**בריכה** מכילה 120 בני אדם: قَاعَة, بِرْكة, بَوتَقَة, مَلْحَمَة.
29. בחנות זו ניתן לרכוש **מדים** במחיר זול: دراجات, ثلاجات, مَلاَبِس, أَقْمِشة.
30. ה**רמז** הזה אינו עוזר לי לפתור את החידה: رَمْز, شَرْح, فِكْر, رَسْم.
31. ה**משימה** האחרונה תתפרסם בקרוב: مُهِمّة, بَيان, نشْرَة, قَرَار.
32. ה**עבירה** שלך מוזרה מאוד: مُخَالَفَة, تَصَرُّف, حَياة, عِبْرَة.