

L2 Idiom Processing: A Study Investigating Cognate Effects in English Idiomatic Expressions.



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Abstract

Research on L2 idiom processing does not agree on how idioms are processed in the L2 because different methods have yielded different and often opposing results. Where some studies claim L2 idiom processing is identical or similar to L1 idiom processing, meaning that idioms are stored as one lexical entry in the bilingual's mental lexicon, other studies claim L2 idiom processing is different from L1 idiom processing. To investigate L2 idiom processing in a new, original manner, focus needs to be on particular words that typically show deviating reading times in sentences: cognates. Cognates are usually processed faster in the L2 than words without orthographic and/or phonological overlap with the L1. This is called the Cognate Facilitation Effect. Therefore, the present experiment examined how idiomatic expressions are processed in the L2 by investigating cognate effects in English idiomatic expressions and regular control sentences using a Self-Paced Reading Task. The role of L2 proficiency in potential cognate effects and L2 idiom processing was examined as well. Results showed cognate effects to be present for the cognates in the regular control sentences, but not in the sentences containing an idiom. This pointed towards deviant processing and storage of idioms in the L2 when compared to regular sentences. No correlation between proficiency scores and cognate effects were found in the present experiment.

Keywords: Idiomatic expressions, idioms, processing, figurative, literal, cognates, cognate facilitation effect, proficiency, English, Dutch.

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1. Introduction

Idiomatic expressions might be considered a dime a dozen in languages throughout the world, but, for some speakers, they truly turn out to be a blessing in disguise in terms of language processing. Idiomatic expressions, here referred to as idioms, are special in that the sequence of words always have two meanings or interpretations: one interpretation is referred to as a 'literal' interpretation, and the other is referred to as the 'figurative' interpretation. While a literal interpretation exists, typically, the figurative meaning is meant when an idiomatic expression is used. An example of a typical English idiom would be 'to let the cat out of the bag', which has both a literal meaning, to let an actual cat out of a bag it was trapped in, and a figurative one, which would be 'to accidentally tell a secret'. Typically, an idiomatic expression is characterised as "... a string of words whose semantic interpretation cannot be derived compositionally from the interpretation of its parts" (Cacciari & Tabossi, 1988, p. 668). This means that when a meaning is derived from the interpretation of an idiomatic expression's parts, its separate words, a literal meaning is only possible. When the meaning is derived from the combination of words that form the idiomatic expression, a figurative meaning is possible alongside the literal meaning, and typically, a figurative meaning is meant when an idiomatic expression is used.

Studies on the processing of idiomatic expressions in the mind of both L1 and L2 speakers of a language investigated the processing of idioms by looking at reading times of individual words within the idiom to see if the literal meaning of the idiom is processed or the figurative meaning. Reading times can tell something about idiom storage, with faster reading times for idiomatic expressions compared to control sentences pointing towards idioms being stored as one lexical entry in a bilingual's mental lexicon. Unfortunately, although these studies focused on the same construct, they have mixed results and sometimes their results oppose each other. Where some results show that L2 idiom processing is similar to L1 idiom processing which typically assumes idioms are processed faster than novel phrases, some studies claim that L2 idiom processing works differently. In order to maximise the validity of the results that come from examining individual word processing within idioms, focus might need to be on particular words that typically show deviance in processing (i.e. faster or slower reading times) to see whether those deviances also occur within idiom reading.

Cognates are examples of such words; they are words in different languages that have a common etymological origin. Often, cognates are inherited from a shared parent language, but

they may also involve borrowings from a different language than a shared parent language. Therefore, cognates share semantics, orthography and often phonology across languages. An example of an English-Dutch cognate is the English word 'ball', which is 'bal' in Dutch and both share the same meaning. Previous literature has found that cognates are generally recognised and read faster in sentences than translation equivalents without semantic and orthographic overlap. When this happens, the effect that occurs is referred to as the 'cognate facilitation effect'. Cognate effects could aid the study on L2 idiom processing, because they can only occur if cognates are read and retrieved from the mental lexicon as one entry, which happens for words in regular sentences. Studies on L1 idiom processing and some studies on L2 idiom processing claim that idioms are retrieved from the mental lexicon as one entry, meaning that cognate effects within idioms should not be able to occur.

The present study sets out to combine the field of cognates and the field of idiom research in order to say something about the processing of idiomatic expressions in the L2 by looking at idiomatic expressions that contain a cognate. The present study wants to see whether Dutch native speakers process the literal meaning of English idiomatic expressions or a figurative meaning by looking at potential cognate effects within English idioms. Moreover, the role of L2 proficiency in this effect is examined.

2. Theoretical Background

The present experiment looks at idiom processing in the L2, a much-debated topic in the field of idiom processing. Results from such studies do not always support each other, and often oppose each other. Since L2 idiom processing is still a topic of debate, it is important to first give an overview of L1 idiom processing, a topic on which there is more consensus. In order to interpret L2 idiom storage and processing of bilinguals, a good understanding of idiom storage and processing in the native language is necessary. Before a background of L2 idiom processing is given, an overview of literature on idiom processing in the L1 is given.

2.1 Idiom processing in L1

Research on the processing of idioms in the mind has generally found that figurative language is processed faster by native speakers than literal language. This effect was called the Idiom

Superiority Effect (e.g., Ortony et al., 1978; Swinney & Cutler, 1979; Cacciari & Tabossi, 1988). Studies have shown that for native speakers, idioms have several processing advantages, such as faster reading times for idioms in texts as compared to non-idiomatic language (Ortony, Schallert, Reynolds, & Antos, 1978; Swinney & Cutler, 1979; Siyanova-Chanturia, Conklin, & Schmitt, 2011; Underwood, Schmitt, & Galpin, 2004; Carrol, Conklin, & Gyllstad, 2016). The Idiom Superiority Effect can be explained by the Lexical Representation Hypothesis (Foss & Jenkins, 1973; Lackner & Garrett, 1972), which holds that idioms are stored in and retrieved from the mental lexicon in the same way and manner as any other word, which means that idioms are stored and retrieved as one lexical entry, like separate words in regular sentences are as well. This hypothesis assumes that computation of both literal and idiomatic meanings is simultaneously initiated upon occurrence of the word of the idiom. Individual words are accessed from the lexicon and structural analysis on these words is undertaken at the same time that the lexical access of the string of words is taking place.

2.1.1 Lexical Representation Hypothesis in L1

A study which results supported the Lexical Representation Hypothesis is a study by Swinney and Cutler (1979). Swinney and Cutler presented grammatical idiomatic word strings together with matched grammatical control word strings to twenty native speakers of English in a Grammatical Decision Task (GDT). Participants had to decide whether the presented string of words formed a meaningful phrase in English by pressing one of the two buttons. Response latencies were measured. Results showed that grammatical idioms were judged to be acceptable English phrases considerably more quickly than the matched control word strings, which provided support for the Lexical Representation Hypothesis. Swinney and Cutler (1979) assume that the access of single lexical items is undoubtedly quicker than the access of the relationship among several words in a phrase, so the results support a model in which idioms are stored as lexical items in the bilingual's mental lexicon. The lexicalised meaning is assumed to be accessed simultaneously with the access of the literal meaning. If the meaning of an idiom were accessed from the individual words in the phrase, then idioms would not have been recognised faster than the control phrases.

The Idiom Superiority Effect was found in a wide range of experimental procedures.

However, not all results provide support for the Lexical Representation Hypothesis proposed

by Swinney and Cutler (1979). Cacciari and Tabossi (1988) did find support for the Idiom Superiority Effect using a Lexical Decision Task (LDT), but they concluded that their results were not in line with the Lexical Representation Hypothesis. Cacciari and Tabossi investigated the Idiom Superiority Hypothesis by presenting idioms with corresponding target words in a LDT. They presented native English speakers with nine idioms within non biasing context sentences together with three target words that were semantically associated with the meaning of the idiom, associated with the meaning of the last word of the string (literal interpretation) and with an unrelated word used as a control. An example from the experiment is the sentence '*after the excellent performance, the tennis player was in seventh heaven*'. The words on which a lexical decision task had to be performed for this sentence were '*saint*', which is semantically related to '*heaven*', '*happy*', which is semantically related to the meaning of the idiom, and '*umbrella*', a control word unrelated to both the final word of the idiom and the idiom's meaning. The experiment consisted of three sets. In every set, one of the target words were presented alongside the last word of the idiom. Reaction times to lexical decisions were recorded. Results show that idiom targets were responded to faster than literal target words. Literal target words' response times did not differ significantly from control target words' response times. Results suggest that the meaning of an idiomatic expression is immediately available upon presentation for native speakers. There was no evidence that access to the meaning of the last word of the presented string occurred.

In their second experiment, similar idioms were tested, but this time they were pretested and selected so that people were not likely to complete the words preceding the last word of the idioms idiomatically. To make sure of this, the selected idioms were placed in sentences as informatively poor as possible. Responses to literal target words were significantly faster than responses to idiomatic target words. Responses to idiomatic target words were not significantly faster than responses to control targets. Results from the second experiment show that only the literal meaning of the last word was available.

Experiment three was nearly identical to experiment two, other than that the presentation of the target word was delayed by 300ms. Experiment three showed that both idiomatic and literal meanings were activated. These findings are inconsistent with the Lexical Representation Hypothesis. The Lexical Representation Hypothesis proposed that the figurative meaning of the idiom that runs parallel to the literal meaning could be available at the end of the idiom because no structural analysis is required, but only the retrieval of the idiom from the mental lexicon. Cacciari and Tabossi's second experiment failed to show

initial activation of the figurative meaning of the idiom, and the third experiment showed late activation of both figurative as well as literal meaning of its last word. Also, the Lexical Representation Hypothesis cannot explain the presence of the literal interpretation of the last word of the idiom 300 ms after the end of the idiom in this experiment.

2.1.2 Individual Words in Idiom Processing

Both Swinney and Cutler (1979) and Cacciari and Tabossi (1988) compared idiomatic expressions to literal language to say something about the processing advantages that idiomatic expressions have over literal language. Where these studies give a good overview of the processing advantages that idioms have, they do not concentrate on investigating the processing of idiomatic expressions as such. Because the present study sets out to look at individual word processing within idioms in the L2 by looking at potential cognate effects, it is important to give an overview of individual word processing in idioms in the native language. Rommers, Dijkstra and Bastiaansen's study (2013) and Hubers' study (Chapter 5, 2020) are two closely connected studies concerning individual word processing within idioms in the L1.

Rommers et al. (2013) looked at individual word processing by investigating whether the activation of the literal meaning of a word is less engaged during the comprehension of idioms, where such activations are theoretically unnecessary, than during the comprehension of literal sentences. They investigated this by employing both behavioural and electrophysiological methods. Their study differs from the abovementioned studies in that they look at the issue of semantic unification in idioms, as opposed to the activation of literal word meanings only. Semantic unification is the process of integrating word meanings by combining them into larger units (Hagoort, 2005). In the first experiment, participants read sentences in either idiomatic context or literal context and performed a LDT on critical words, similar to Cacciari and Tabossi's (1988) experiment. However, in the Rommers et al. (2013) experiment, the critical words were never at the end of the sentence, but were in second to last position. Critical words were either related (REL) to the correct word in the idiom, unrelated (UNREL) or correct (COR). An example idiom from the experiment is the Dutch expression 'tegen de lamp lopen', which literally means 'walking against the lamp'. Its idiomatic meaning is 'to get caught'. Critical words for this idiom were 'lamp' (COR), 'kaars' (candle) (REL) and 'vis' (fish) (UNREL). In the second experiment, other participants read the same

sentences while brain activity was monitored using electroencephalography (EEG) recordings, but no task was performed.

Results from the first experiment show that idiomatic conditions were responded to faster than literal conditions. This is in accordance with Swinney and Cutler's (1979) Lexical Representation Hypothesis which theorises that idioms are stored as one lexical entry in the mental lexicon and can therefore be accessed quickly. Also, in the literal condition COR critical words were responded to faster than REL words, and REL words were responded to faster than UNREL words. In the idiomatic condition, participants responded faster in the COR than the REL and UNREL condition. However, in the idiomatic condition, the REL and UNREL conditions did not differ significantly, suggesting that, in the idiomatic context, literal words meanings were not activated. In the second experiment, a significant reduction in N400 amplitude for the REL condition relative to the UNREL condition was observed in literal sentence context, but not in idiomatic sentences. This suggests that either literal word meaning activation or semantic unification (or both) are less engaged in idiom comprehension than in literal sentence comprehension. When reading idioms, for which literal word meanings are irrelevant, the processing of literal word meanings in idioms can be switched off to some extent.

Hubers' (Chapter 5, 2020) study on idiom processing by native speakers is closely connected to the Rommers et al. (2013) study. Hubers (2020) also looked at the role of individual words in idiom processing, but also looked at the orthographic level of representation by having used a word naming task in stead of a LDT which relies more on orthography as opposed to a LTD, which taps into semantic information as well (Hubers, 2020). The rest of the design was inspired by the study of Rommers et al. (2013). A sentence used in the idiomatic condition is the sentence 'de getrainde dief liep uiteindelijk toch tegen de...' (the trained thief eventually walked against the...). The COR target word was 'lamp', which completes the idiom in Dutch, the REL target word was 'warmte' (warmth) and the UNREL target word was 'helm' (helmet). The equivalent sentence in the literal condition was 'het kind kan niet slapen zonder licht van een kleine ...' (the child cannot sleep without light of a little ...). Participants had to read the sentences word by word and pronounce the last word of the sentence (presented in red) aloud as quickly as possible. According to Hubers, idiom final nouns are expected to be activated to some extent, because the form of the word needs to be identified in order to complete the idiom. Although Rommers et al. (2013) may not have observed activation of

semantics of the idioms' final nouns, effects of lexical properties of the idiom final nouns related to the orthography may still be present.

In the idiomatic context, Hubers (2020) found faster naming latencies for the correct target word as opposed to the semantically unrelated target words. According to Hubers, this shows that idioms are recognised as such and that idiomatic expressions have a separate representation in the mental lexicon (p. 138). In the literal context, a similar facilitation effect was found. Both of these effects were in line with findings of Rommers et al. (2013). Also, Hubers (2020) observed no difference in terms of naming latencies between semantically related and unrelated target words in idiomatic context. Activation did not spread from the idiom final noun to a target word that was literally related, which suggests that the meanings of the individual words were not activated. This finding is also in line with the findings of Rommers et al. (2013). However, these findings could not be interpreted in a reliable way, because in literal context, Hubers (2020) did not observe faster naming latencies to the semantically related target words when compared to the unrelated target words. This finding was surprising, because several studies have shown facilitation of semantically related target words in literal context using similar methods (see Rommers et al., 2013).

In order to interpret the results of the idiomatic context, a second experiment was conducted in which the presentation of the target word was delayed in order to see if there can be a facilitation effect of the semantically related target word in literal context. Results from the second experiment show faster naming latencies for semantically related words as compared to the unrelated words in literal context. A delay in the target word presentation was enough to increase the activation of the correct target word to an extent that it was able to spread to words that were semantically similar. Although the idiom final noun was suppressed at the semantic level, there was activation on the orthographic level, indicated by an effect of target word frequency. To sum up, Hubers (2020) showed that at the semantic level, activation of individual words is suppressed, because it interferes with the meaning of the idiom as a whole. However, at orthographic level, the individual words are activated indicated by an effect of word frequency.

It can be concluded that in the native language, there is strong evidence that shows that idiomatic expressions show faster processing than sentences with only a literal interpretation. Rommers et al. (2013) even show that literal interpretation of individual words, which slows down the processing, can be switched off during idiom reading. While the abovementioned studies have investigated the role of individual words in idiom processing for native speakers,

fewer studies have investigated this for L2 speakers. Since the present study is concerned with L2 idiom processing, it is important to give a theoretical background of existing research into the processing of idiomatic expressions in the L2.

2.2 Idiom Processing in L2

Research on the processing of idioms in the mind has generally found that figurative language is processed faster by native speakers than literal language, with idioms showing faster reading times in text as compared to non-idiomatic language (Ortony, Schallert, Reynolds, & Antos, 1978; Swinney & Cutler, 1979; Siyanova-Chanturia, Conklin, & Schmitt, 2011; Underwood, Schmitt, & Galpin, 2004; Carrol, Conklin, & Gyllstad, 2016). This effect was usually referred to as the Idiom Superiority Effect. While the processing of idiomatic expressions in native speakers is still a debated topic, the debate of the processing of idioms by second language learners is even more so. Studies have shown that for second language learners there is no facilitation of figurative meaning for idioms as compared to literal interpretations (e.g., Cieslicka, 2006; Siyanova-Chanturia et al., 2011), while other studies suggest that idioms that also exist in a similar form in the native language show faster processing than idioms that are exclusive to the target language, and non-idiomatic language (Carrol & Conklin, 2014; Carrol, Conklin, & Gyllstad, 2016). An example of such idiom would be the English idiom ‘back to the drawing board’, which also has an equivalent idiom in Dutch. Finally, a different study suggests that native speakers and second language learners behave similarly when it comes to processing figurative language, claiming they both process figurative language faster than literal language (Beck & Weber, 2016). Below, various studies with varying results on L2 idiom processing are explained.

2.2.1 Literal Salience Model & Graded Salience Framework

Cieślicka (2006) investigated idiom processing for L2 learners in a priming experiment for advanced Polish learners of English. In Cieślicka’s study, participants were presented with English sentences containing idioms via audio, and they had to decide whether an upcoming target word was an existing English word or not. The target word was presented on the screen 100ms after the end of the audio. In this way, the experiment tested individual word processing in idioms for L2 learners. An idiom used in the experiment was ‘George wanted to

bury the hatched soon after Susan left.’ The idiomatic target word which appeared after this sentence was auditorily presented was ‘forgive’, and the control word was ‘gesture’, which was matched for frequency with the idiomatic target. The literal target word was ‘axe’, and the control word ‘ace’.

More advanced L2 learners of English responded faster if the target word was related to the idiom’s literal meaning rather than its figurative meaning. This processing advantage for literal words over figurative target words was then taken as evidence for a previously hypothesised Literal Salience Model which is based on the Graded Salience Framework by Giora (1997). The latter model hypothesises that salient meanings are accessed first and are also more strongly activated than non-salient meanings. The Literal Salience Model adds to this that for L2 speakers, in contrast to native speakers, the meaning of the idiom’s words separately is more salient than the figurative interpretation of the idiom. So according to the Graded Salience Framework, because the individual words are more salient, they are accessed first and are more strongly activated.

With these findings, Cieślicka (2006) added to the Graded Salience Framework that a learner’s proficiency or the amount of exposure to the L2 or to the idioms specifically does not affect the order of access.

While these results do give an indication of the difference between L1 and L2 processing of idioms, the study completely based its assumed difference between L1 processing and L2 processing of idioms on an experiment which tested only L2 processing. A study by Beck and Weber (2016) followed up on this study by looking at L1 processing as well.

Beck and Weber (2016) investigated L2 processing of idioms as well, but with both L1 and L2 speakers using a similar priming experiment as Cieślicka (2006). Again, participants, who were American native speakers of English and highly proficient German learners of English, were auditorily presented with idioms in non-biasing prime sentences. After the sentence was administered, a target word appeared on the screen, and participants had to do an English lexical decision task, similar to Cieślicka’s (2006) experiment. The target word was either literally related to the idiom, figuratively related, or not related at all. For the idiom ‘to pull someone’s leg’, the literally related target word was ‘walk’, and the figuratively related word was ‘joke’. Both the native speakers and L2 learners showed priming effects for figuratively and literally related target words in comparison to non-related target words. The words that were semantically related to the idiom yielded the quickest response times. The findings

supported Cieslicka's (2006) claim that individual word meanings are more salient than the figurative interpretation of the idiom as a whole. These results indicate storage of L2 idioms in the mental lexicon to be different from storage of L1 idioms, and are not in line with the Lexical Representation Hypothesis. However, Beck and Weber (2016) did also find this effect for L1 processing, suggesting that L2 idiom processing was very similar to L1 idiom processing in their experiment specifically.

While the abovementioned studies failed to show the Idiom Superiority Effect in the L2, Siyanova-Chanturia, Conklin and Schmitt (2011), who investigated online processing of idioms in a biasing story context by native and non-native speakers of English, showed even more controversial findings on L2 idiom processing. In their experiment, idioms and novel phrases were presented within story context, in which different idioms were used figuratively and literally. Results from eye-tracking indicate that native speakers show processing advantages for idioms over novel phrases, evidenced by fewer and shorter fixations on the idioms. However, for L2 speakers, different results were found. Siyanova-Chanturia et al. (2011) found that non-native speakers process idioms at a similar speed to novel phrases. Moreover, they found that for non-native speakers, figurative uses of the idioms were processed more slowly than literal uses of the idioms. Since novel phrases are processed word by word, this indicates that, according to Siyanova-Chanturia et al (2011), idioms are not located in the bilingual's lexicon as one single entry because they were processed at a similar speed to novel phrases. Had this been the case, idioms would have been read faster than novel phrases by bilinguals. These results are in accordance with Cieślicka's (2006) and Beck and Weber's (2016) findings.

Results from the abovementioned studies all point towards a storage of L2 idioms in the mental lexicon that is different from L1 idiom storage. Cieślicka's (2006), Beck and Weber (2016) and Siyanova-Chanturia et al (2011) all show that idioms in the L2 are not stored as one lexical entry in the bilinguals' mental lexicon, but that idiomatic expressions are processed in the same manner as literal sentences. These findings are not in accordance with the Lexical Representation Hypothesis which holds for L1 idiom storage. However, as mentioned before, research on L2 idiom processing and storage is not always in agreement, and multiple studies have shown L1 and L2 idiom processing and storage to be similar.

2.2.2 Lexical Representation Hypothesis in L2

A study that showed that L1 and L2 idiom processing are very similar is a study by Van Ginkel and Dijkstra (2019). However, Van Ginkel and Dijkstra (2019) did find differences between native speakers and L2 speakers in terms of sensitivity to idiom properties. Van Ginkel and Dijkstra used a similar procedure to Beck and Weber's (2016) procedure which involves priming of the idioms. In their experiment, a lexical decision task, both Dutch native speakers and highly proficient German learners of Dutch showed quicker response times to figuratively and literally related target words than to unrelated target words. Besides this similarity, they also reported differences between native speakers and L2 learners: unlike L2 learners, native speakers were sensitive to both idiom transparency and literal plausibility. If the idiom was more transparent, native speakers were more likely to show faster response times to target words that were figuratively similar to the idiom. If the idiom had a literally highly plausible interpretation, native speakers showed slower response times to figuratively related target words than they did if the idiom had a literally less plausible interpretation. Moreover, a high frequency of the idiom-final word yielded slower response times for literally related target words for native speakers, but faster response times for L2 learners. With this, they showed that although L1 and L2 idiom processing are similar, native speakers are more sensitive to more aspects of an idiom. Van Ginkel and Dijkstra (2019) argue that this higher sensitivity is affected by exposure. L2 learners are less exposed to the L2 language than native speakers are to that language, meaning that they have weaker representations of the idiom as well as the individual words that constitute the idiom. This makes L2 learners less sensitive to idiom properties and also to aspects of the individual words.

As mentioned before, studies concerning L2 idiom processing are not always in agreement with each other. Where Cieślicka's (2006) results point towards differences in L1 and L2 idiom processing, both Beck and Weber as well as van Ginkel and Dijkstra (2019) argue that they are very similar, but that the subtle differences observed between the groups are most likely due to limited exposure to the L2. Exposure to L2 idioms is important for the present experiment as well, since in order for English idioms to be processed as idiomatic expressions by the Dutch native speakers, idioms have to at least be recognised as such. Exposure to L2 idioms most likely aids recognition and also most likely correlated with L2 proficiency. To study the effect of idiom exposure on idiom processing, Hubers (Chapter 4, 2020) investigated the effects of individual word activation in idioms for German L2 speakers of

Dutch in a Computer Assisted Language Learning (CALL) experiment with varying exposure to the idioms.

In his experiment, participants participated in a word naming task (post-test) after having taken part in the CALL-based learning study (training sessions) in which German native speakers learned Dutch (L2) idioms. Before the weekly training sessions, a pre-test was conducted in which participants reported on their language background. During this CALL study, Intensity of Practice was manipulated in a way so that half of the included idioms received limited practice and half of the idioms received intensive practice. The word naming task was used to study the activation of the individual words during idiom processing. Various idioms with varying translatability to German were selected. For each idiom, three context sentences were created so that participants would not associate an idiom to a particular context sentence. All context sentences were biased towards the idiomatic interpretation. Hubers' experiment is different from the abovementioned studies, in that the activation of the idiom and the activation of the individual words are measured at different points in time. They hypothesised that L2 learners do activate the individual words' semantics because they are more salient based on the model by Cieślicka (2006). However, increased exposure to the L2 idioms may result in L2 idiom processing becoming more similar to L1 idiom processing.

Results showed that participants performed significantly better in the idiom meaning recognition exercises (more correct answers) after having learned the idioms intensively than after having learned them in a less intensive manner. Performance on the idioms that were practiced non-intensively did not improve. Also, effects of idiom overlap between languages were found. L2 learners performed better on the meaning recognition exercise for words related to idioms that had an equivalent in the native language than for words corresponding to idioms that did not. This effect only arose in the post test, meaning that initially, participants did not make use of their L1 knowledge.

When it comes to processing, idiomatically biasing context in which the idioms were placed led to faster response times for the target words. Such context is a sentence surrounding the idiom that is biased towards the figurative meaning of the idiom. An example of such context sentence would be '*they failed again, so it is back to the drawing board for them*', in which a figurative interpretation of the idiom '*back to the drawing board*' is steered towards, instead of the literal interpretation. A similar effect was found for literal context. It implies that L2 learners recognise idioms as a whole (their idiomatic meaning), which supports a theory which predicts separate idiom representations in the mental lexicon. Furthermore, Hubers

found that semantically related and unrelated words did not differ in reaction times in idiomatic context. This suggests that L2 learners did not activate semantics of the idiom final word during idiom processing. This is in contrast with Cieślicka's (2006) Literal Salience Model which assumes faster recognition for the literal word meaning over the figurative meaning.

Hubers' results suggest that L2 learners and native speakers are fairly similar in terms of idiom processing. However, the L2 learners do differ from the native speakers in some areas. Where L2 learners showed facilitation for idiom-final noun frequency, native speakers showed an inhibitory effect. The results also show that intense practice with the idioms beforehand did not influence the processing of the idioms for L2 speakers. It did, however, influence the results of the offline idiom recognition test. Also, the degree of cross-language overlap concerning idioms did not have an influence on L2 processing of the idiom. All-in all, Huber's results show that L2 learners are in fact able to access the figurative interpretation of an idiom during processing, and that the speed of this is may be influenced by exposure to or practice with L2 idioms.

2.2.3 L1 Effect and Supportive Context

The abovementioned studies were all concerned with idiom processing for L2 learners, and were mainly concerned with the way idioms are stored in the bilingual's lexicon. While this gives a good insight into the processing of idioms by bilinguals, these studies do not particularly investigate certain idiom properties that might influence L2 idiom processing. An L2 idiom's similarity with the L1 in terms of meaning and form might influence idiom processing, and this in turn might also be affected by the richness of the context in which idioms in the L2 are presented. Türker (2019) investigated L1 effects on three different L2 skills (production, interpretation and comprehension) in an idiom-learning process supported by rich context. Türker's theory was that context aids idiom learning, which in turn would mean that L2 learners rely less on their L1 when a richer context is available. 36 English native speakers that were students in intermediate-level Korean courses participated in an experiment that consisted of a pre-test, a computer-assisted instructional treatment session and a post-test. Three idiom types (Korean) that differed in terms of similarities between the L1 and L2 were used for this experiment: idioms that had identical linguistic form and figurative meaning in the L1 and L2 (same linguistic and semantic setup of the idiom in their respective

language), idioms that had identical linguistic form but different figurative meaning, and L2 idioms that only occurred in the L2. Participants completed a production test, interpretation test and meaning test before and after the treatment session. Participants were randomly assigned to receive explicit or implicit feedback during the treatment sessions. Analysis on pre-test and post-test scores showed that the highest pre-tests scores were on the first category of idioms (same in both linguistics and semantics). The highest post-test scores, however, were on L2 only idioms and idioms that differed in terms of meaning. This indicates that supportive context in the L2 can override the L1 effect. when L2 idioms are taught in rich context, learners are less likely to rely on their L1 knowledge. The implication is that context improves the L2 learners' ability to infer meaning from the L2, rather through the L1. This effect is less strong for idioms with L1 equivalents.

This study shows that L1-L2 similarity of idioms are important when L2 learners have not explicitly or implicitly learned idioms through a task. Participants scored better on production, interpretation and comprehension for idioms that had an equivalent in the L1. This shows that, without prior learning, L1-L2 similarities of idioms is important for all facets of idiom learning.

The fact that L1-L2 similarity between idioms is important was also confirmed by a study by Carrol and Conklin (2014) who used initial words of English idioms and translated Chinese idioms as priming words for final words in a Lexical Decision Task with English monolinguals and highly proficient Chinese-English bilinguals. In this study, Chinese-English bilinguals responded significantly faster to target words when they completed a true Chinese idiom than when participants were presented with a control word which did not complete a Chinese idiom. This is remarkable, since the Chinese idioms were presented in an entirely unfamiliar form (English). Targets that completed an English idiom were not reliably faster than control words. Also, native speakers show priming for idiomatic sentences relative to matched control sentences, which confirms the Idiom Superiority Effect previously mentioned by multiple studies. Carrol and Conklin's (2014) study shows that L1-L2 semantic and grammatical similarity between idioms is very important. Chinese-English bilinguals responded faster to Chinese idioms presented in English, even when they were not presented in Chinese, but in an entirely unfamiliar form. Familiarity with the setup of the sentence and the combination of particular words which forms an idiomatic meaning in Chinese was enough for the Chinese participants to recognise Chinese idioms in English.

Results from both Türker (2019) and Carrol and Conklin (2014) are, in turn, in contrast with Hubers' (2020) results that indicated that L2 learners did not make use of their L1 knowledge before having learned idioms. This, again, shows that results from studies on L2 idiom processing are often not compatible and often contradict each other. Some studies found that idiomatic expressions are processed in a similar fashion to regular sentences in the L2, where some studies propose they are processed quicker than regular sentences in the L2. Siyanova-Chanturia et al (2011) even found that while figurative uses of idioms were read slower than literal uses, which are very surprising results when compared to results from different studies, idioms were not read faster or slower when compared to novel phrases in the L2. In one single study, one result points towards a single lexical entry representation in the bilingual's mental lexicon, whereas a different result rejects this theory.

In order to investigate L2 idiom processing in a different and original way, a focus might need to be on particular words within idioms that usually show deviances in terms of processing in regular non-idiomatic sentences. If a particular word that usually shows deviation in terms of processing, having either slower reading times or quicker reading times than 'typical' words, is placed within an idiom, a presence of such facilitatory or inhibitory effect would suggest processing of every individual word which constitute the idiom (and not the idiom as one single lexical entry in the bilingual's mental lexicon), suggesting a literal interpretation of the idiom as opposed to a figurative interpretation. Such words are cognates, which typically in the L2 show a facilitation effect in terms of processing over words that are not cognates with the native language. Cognates are usually recognised and read faster than other words in a sentence because of semantic, orthographic, and/or phonological overlap. Below, various studies on the cognate facilitation effect are given to show the robustness of this effect throughout various experiments.

2.3 Cognate Facilitation Effect

Cognates are words in several languages that have a common etymological origin. Usually, cognates between languages are very similar in terms of orthography, phonology and semantics. An example of an English-Dutch cognate is 'hand', which is spelled the same in both languages and has the same meaning. In this example, the words only differ in pronunciation. However, cognates do not need to be orthographically identical. Dutch 'huis' and English 'house' can also be categorised as cognates, since they are orthographically

similar and share the same meaning. Such words that are not orthographically identical in both languages are cognates as long as they share the same etymological origin. Often cognates are inherited from a shared parent language, but they may involve borrowings from some other language as well.

Cognates have been the subject of several studies in recent years. In these studies, cognate facilitation effects were found in a large variety of experimental conditions, such as in Lexical Decision Tasks (Dijkstra et al., 1999), progressive demasking (Lemhöfer et al., 2008) and various other tasks (Dufour & Kroll, 1995; Costa et al., 2000; Poarch & Van Hell, 2012). The cognate facilitation effect was also seen in Event Related Potentials (ERPs) studies, showing a reduced N400 effect for cognates (Midgley, Holcomb, & Grainger, 2011; Yudes, Macizo, & Bajo, 2010). The cognate facilitation effect is usually taken as evidence for language coactivation (Bultena, Dijkstra & van Hell, 2014). This means that when a person is presented with a cognate, the words in both languages are activated in the mental lexicon. This then causes faster processing of a cognate when compared to a word that is not orthographically or semantically similar to the corresponding word in the native language. Below, several studies are given to give a background of the cognate effects in individual word processing, sentence context and ERP measures.

2.3.1 Cognates in Isolation

A study worth mentioning is a study by Dijkstra, Grainger and van Heuven (1999), who looked into the access and organisation of the lexicon of bilinguals, and looked specifically at the Dutch-English bilinguals' recognition of English-Dutch cognates and false friends. False friends are words that are orthographically and/or phonologically similar across two or more languages, but that do not share the same meaning in those languages. It is an interesting study to look at, since the present study also focuses on Dutch-English bilinguals' processing of cognates. They tried to see whether information stored in the bilingual's lexicon was accessed selectively (selecting from only one language) or non-selectively (selecting from both languages) by looking at reaction times of English-Dutch cognates and false friends. In language-selective access, exclusive activation of information in only the contextually appropriate language occurs. If a cognate were processed language-selectively, no deviance in reading time would be measured when compared to control words. In language-nonselective access, automatic co-activation of information in both linguistic systems, so not only the

contextually appropriate language, occurs. This would result in faster reaction times as compared to words that are accessed language-selectively.

In their first experiment, they used a progressive demasking task to test the reaction times for 90 target words. In a demasking task, the presentation of the target word is altered with the presentation of a mask. The presentation of the target word increases, while the presentation of the mask decreases. In this experiment, the mask appeared for 300ms and was followed by the target word which was presented for 15ms. This then changed into 285ms and 30ms respectively, until the mask presentation was zero. Participants had to push a button as soon as the target word is recognised. The first experiment showed significant reaction time differences between particular types of cognates and false friends and their matching control words. The results showed that orthographic and semantic overlap of the cognates led to faster reaction times, while, on the contrary, phonological overlap, led to slower RTs. These results supported a language-nonspecific access view, but they do not assume a facilitatory effect (quicker reaction times) whenever overlap between cognates increased.

In the second experiment, the same participants and stimuli words were used, but this time for a standard LDT. Experiment two yielded the same results as experiment one did. Dijkstra, Grainer and van Heuven (1999) concluded that the results from both experiments support a language-nonspecific access model. In both experiments, the reaction times of Dutch-English bilinguals were affected by the similarity of the English target words to the Dutch control words in all three dimensions: orthographic, phonological and semantic overlap. Thus, results show clear cognate facilitation effects for L2 bilinguals.

While the cognate facilitation effect has been found in an abundance of studies which made use of behavioural measures (Dijkstra et al., 1999; Dufour & Kroll, 1995; Costa et al., 2000; Lemhöfer et al., 2008; Poarch & Van Hell, 2012), it is also interesting to see whether cognate facilitation effects are also actually visible in a bilingual's brain. Evidence from such neural measures as an addition to behavioural measures would indicate the robustness of these effects. A study that investigated cognate facilitation effects using neural measures is a study by Midgley et al. (2011). Midgley et al. (2011) sought electrophysiological evidence for the cognate facilitation effect for L2 speakers. English-French bilinguals (English dominant language) were recruited for the experiment, and Event Related Potentials recordings (ERP) were made. Stimuli included 160 English French cognates and 160 (80 English, 80 French) noncognates. Two lists were formed, each list composed of two blocks: an English and a French block. Each list contained 80 English cognates and 80 English noncognates for the

English blocks, and for the French block 80 French cognates and 80 French noncognates as well as 80 fillers. In each list, a second group of 40 probe items were included, all referring to animal names. Participants performed a go/no-go semantic categorization task in which the participants were told to read all words for meaning and to press a button whenever they saw a word referring to an animal name. ERP recordings were made during the experiment. ERP results show ERP negativities in the region of N400 component were sensitive to cognate status in both language blocks. Typically, the N400 component is larger when a word is more difficult to process, and smaller when it is easier to process. These results are somewhat in line with previous behavioural studies (Lemhöfer & Dijkstra, 2004; Lemhöfer et al., 2004; Dijkstra et al., 1999; De Groot, 1992; Sanchez-Casas et al., 1992) who also found robust effects of cognate status when participants processed words in the L2. The results deviate from the previously mentioned studies in that they also show cognate facilitation in the L1. However, timing of cognate effects different in the L1 in comparison to the L2. In the L1, effects emerged at 200msec, where in the L2 effects started at 400msec.

2.3.2 Cognates within Sentences

Results from the abovementioned studies show that in individual word processing, cognate effects are robust. They are visible through both behavioural and neural measures. Since the present study focusses on the processing of cognates within sentences, it is worth looking at a study that found cognate effects in a task that presented cognates within sentences. Libben and Titone (2009) did exactly this, by investigated whether nonselective access occurs for words embedded in biased sentence contexts. Libben and Titone tracked eye movements as French-English bilinguals read English sentences containing cognates, false friends or matched control words that were neither cognates nor false friends. Sentences were either high-constraint sentences or low-constraint sentences. An example of a low-constraint sentence in the experiment is: ‘Because they owned a lot of property around the world, the expensive divorce was a disaster.’ (Libben and Titone, 2009, p. 384). In this sentence, the word ‘divorce’ is the cognate, since it shares orthography and phonology between the two languages. The matched control word was ‘wedding’. The corresponding high-constraint sentence was ‘Because of the bitter custody battle over the kids, the expensive divorce was a disaster.’ (Libben and Titone, 2009, p. 384).

Results show that for early-stage comprehension measures (fixating up to 350ms later), which includes first fixation duration, gaze duration and skipping, lexical access to words was nonselective and was not affected by sentence constraints. Cognate effects and false friend inhibitory effects were found here in both low and high-constraint sentences. However, later comprehension measures (350-600 ms), which includes go-past time and total reading time, showed cognate effects and interlingual homograph inhibition for low-constraint sentences only. No cognate effects were found in high-constraint sentences at this later point in time, suggesting that language nonselective access at early stages of comprehension is very quickly resolved in biased contexts in later stages of comprehension.

These cognate facilitation effects were also found within sentence context with Dutch-English bilinguals, the same target group as the present study uses, by Bultena et al. (2014) and Van Assche et al. (2009). Van Assche et al. (2009) used eye-tracking to see whether cognate effects occur in sentence context for Dutch-English bilinguals. Results showed faster reading times for cognates than for control words. Bultena et al. (2014) investigated cognate effects within sentence context by using both eye-tracking and a self-paced reading task. For both experiments, cognate effects were found.

Cognate effects tell us that often, bilingual sentence or word processing is language non-selective, meaning that bilinguals draw from lexical representations in both the native and second language. It is therefore interesting to see if surrounding sentence context can influence the strength of the cognate facilitation effects in the L2, making L2 sentence reading perhaps language selective. A study by Duyck, Van Assche, Drieghe and Hartsuiker (2007) investigated language-independent lexical access in bilinguals reading sentences in the L2, which constitutes a language-specific context.

In their first experiment, Dutch-English bilinguals performed a L2 (English) LTD. Results from the first experiment show that Dutch-English bilinguals were faster to recognise identical and non-identical cognates presented in sentence context than control words which exclusively existed in the L2.

The second experiment presented the same identical and near-identical cognates at the end of low-constraint sentences. Results from the first experiment were replicated in the second experiment. Facilitation was stronger for identical cognates than for non-identical cognates.

A third experiment used Eye Tracking to see if the obtained cognate effects in the first two experiments were visible in early reading time measures. Results from the third experiment

showed clear cognate facilitation effects for the reading times of identical cognates, but not for the reading times of non-identical cognates. Here, Duyck et al. (2007) show that sentence context may be able to nullify the cognate effects obtained in isolation when cross-lingual activation is weaker (as it is in non-identical cognates), but not when cross-lingual activation is at a maximum (which it is for identical cognates). This shows that cognate effects can be nullified by providing sentence context, but only when cognates are not identical to the words in the first language.

2.3.3 Task Dependencies

While, according to Duyck et al. (2007), sentence context influences the strength of cognate effects in the L2, this may also be influenced by the sort of task that is used to detect cognate effects. Bultena et al. (2014) looked at task dependency. The experiment consisted of a task which made use of Eye Movement Tracking, and a task which made use of a Self-Paced Reading Task, similar to the present experiment. Bultena et al. (2014) showed that the extent of the cognate effect was sensitive to task demands. This was shown by the different findings regarding cognate effects for verbs in the Eye Movement Tracking experiment and the Self-Paced Reading Task. A larger time window due to slower processing seemed to give more room for cognate facilitation effects to occur. Moreover, task demands also determine the precision of the measurement of reading times, reflected by different influences of L2 proficiency measures between the two tasks used in the experiment. Self-ratings of reading proficiency were shown to be a better predictor for reading times measured by Eye Movement tracking. Reading speed was a better predictor for reading times measured in the Self-Paced Reading task, which is a task sensitive to pace or responding. Bultena et al. (2014) propose self-ratings of reading proficiency give an indication of the ease of lexical access in natural reading, while reading times in a Self-Paced Reading Task are highly sensitive to reading speed.

2.3.4 Effects of L2 Proficiency

The abovementioned studies make claims about cognate processing for bilinguals as a group. However, differing degrees of L2 proficiency between bilinguals might also have an effect on

the strength of cognate effects in bilinguals. The Bilingual Interactive Activation model (BIA+) (Dijkstra & van heuven, 2002) explains this effect by coactivation of the L1 and L2. When seeing an L2 cognate, the representation of that word in the L1 speeds up the activation of the L2 cognate, which presumably share the same semantic representation in the brain. This causes cognates to be read faster than noncognate words. The activation of the L1 and L2 representations is dependent on L2 proficiency: less proficient L2 speakers benefit more from cross-linguistic overlap, which suggests that the activation of the L1 activation for less proficient L2 speakers is stronger (Bultena et al., 2014). The effect of L1 activation for a cognate is larger when the activation of the L2 representation is small, which is the case for less proficient L2 speakers. When speakers become more proficient in the L2, activation of L2 word forms speeds up due to increased exposure to L2 vocabulary. When a bilingual's proficiency in the L1 and L2 changes, the contribution of the activation of the L1 forms might be reduced, which in turn might explain the reduced cognate effects in high proficiency L2 speakers.

This reduced cognate effect for high proficient L2 speakers was shown by the abovementioned study by Libben and Titone (2009), who found that cognate effects are dependent on L2 proficiency, and found that participants who are more proficient in their L2 showed a decreased cognate facilitation effect in both early and late reading times, which means that for high proficient L2 speakers, the gap between reaction times of control words and cognates is smaller than it is for low proficient L2 learners, because highly proficient L2 speakers take less time to process the control words due to their high proficiency and greater experience in the language. The same was found by Bultena et al. (2014), who reported that noun cognate facilitation is reduced when reading proficiency in the L2 is higher. Similar to results from Libben and Titone (2009), Bultena et al. (2014) found L2 reading speed to be correlated with self-rated reading proficiency in the L2, indicating that faster readers rated themselves as being more proficient.

4 Present Study

Cognate facilitation effects have been found in numerous tasks investigating sentence processing. Moreover, the effects are visible in a bilingual's brain through ERP recordings. This robust evidence for the cognate facilitation effect in both behavioural and neural

measures, and especially in experiments investigating the effects in sentence context, makes cognates ideal words for placement in idioms to test the processing of idioms in the L2. Therefore, the present study wants to see how idioms in the L2 are processed, using cognates and noncognates as target words within idioms, and wants to see whether L2 proficiency plays a role in this. More specifically, the main question the present study asks is *whether Dutch-English bilinguals process the literal interpretation of English idioms (retrieved from the lexicon word by word), or the figurative (idiomatic) interpretation (retrieved as one single lexical entry), and whether L2 proficiency plays a role in this*. It looks at the processing of idioms in the L2 (English) by examining the reading times of cognates within those idioms and comparing them to the reading times of matching noncognate target words in idioms, and to reading times of cognates and noncognate target words in non-idiomatic sentences.

In the present experiment, only idioms with a translation equivalent in Dutch are used because Türker (2019) showed that similarity of idioms between the L1 and L2 is important for production, interpretation and comprehension of idioms in the L2 when idioms are not learned explicitly before an experiment. Carrol and Conklin (2014) showed that idiomatic expressions that also exist in the L1 were even read more quickly when those expressions were presented in the L2. However, Hubers (2020) found the opposite: in his experiment, L2 learners did not make use of their L1 knowledge of idioms before having learned L2 idioms. Despite contrasting theories, only idioms with a translation equivalent in Dutch were chosen to at least maximise chances of familiarity with the idiom. For the present experiment, it is important that all participants of all proficiency levels recognise the idiom sentences as idioms, and not as regular literal sentences. If idioms are not recognised as idioms by some participants, comparison between the idiomatic sentences and regular control sentences would not be valid. By using idiom with Dutch translation equivalents, chances of idiom recognition are maximised.

By using Dutch-English idioms that contain Dutch-English cognates, cognate effects can be examined in order to say something about the processing of L2 idioms. Presence of cognate facilitation effects in the reading of the idioms would indicate literal processing of the idioms, because this would mean that the idioms are not lexicalised in the reader's brain, but instead, idioms are read and retrieved from the mental lexicon in the same fashion as regular sentences. If the idioms are lexicalised as a whole, meaning that the combination of words forming the idiom are taken as a lexical entity on its own, a cognate facilitation effect should not be found. Thus, if cognate facilitation effects are present, that would mean that L2

speakers processed the idioms not as a lexical entity, meaning that they processed the literal interpretation of the idiom.

To answer the question, 30 Dutch native speakers with varying proficiency in English (L2) performed a self-paced reading task to see whether sentences containing idioms in English that contain cognates with Dutch were processed literally or figuratively. L2 proficiency was measured through an online LexTALE proficiency task (Lemhöfer & Broersma, 2012).

5. Hypothesis

Because this research tries to say something about L2 processing of idioms and the effects of L2 proficiency, two hypotheses were formed. Firstly, cognate effects are expected to be present in the Self-Paced Reading Task in both the idiom condition and the non-idiom condition, because a large body of research has shown that bilinguals process idiomatic expressions in the L2 in the same manner as they process literal sentences, meaning the retrieval of every word separately from the lexicon (Cieślicka's , 2006; Beck and Webers, 2016; Siyanova-Chanturia et al., 2011.), and because an abundance of research has found cognates effects to be present in sentence context and other tasks (Dijkstra et al., 2009; Lemhöfer et al., 2008; Dufour & Kroll, 1995; Costa et al., 2000; Poarch & Van Hell, 2012; Midgley, Holcomb, & Grainger, 2011; Yudes, Macizo, & Bajo, 2010; Dijkstra et al., 1999; Libben & Titone, 2009). If the effects are present, that would mean that a literal interpretation of the sentences containing idioms that contain cognates with Dutch is processed by the bilinguals as opposed to the figurative interpretation. If a figurative interpretation is read, a cognate effect will have to be absent, because I propose that for a figurative interpretation of an idiom, the processing of the combination of words that constitute the idiom as a whole is important, since an idiom with its figurative meaning forms a lexical entry in the speaker's brain. For a literal interpretation, the processing of each word individually is important. Because of this, a cognate effect can only be found if an idiom is processed literally. A similar idea to this was also proposed by Van Ginkel (2019), who proposed that a word within an idiom can cause a semantic prediction, after which a semantic priming effect can occur. Van Ginkel proposed that this can only happen if the particular word is processed in isolation, because for the processing of the figurative interpretation, the word is taken together with the

other words of the idiom as one lexical entry, blocking the individual processing of the particular word in isolation.

Secondly, proficiency is expected to play a role in the extent and strength of the cognate effects. Libben and Titone (2009) showed that cognate effects are influenced by L2 proficiency and found that participants who are more proficient in their L2 showed a decreased cognate facilitation effect in both early and late reading times. Bultena et al. (2014) also showed L2 proficiency to have a role in the extent of cognate effects, with participants who were more proficient in reading in the second language showing decreased cognate effects. Therefore, for this experiment, highly proficient English speakers are expected to show a decreased cognate facilitation effect, if they show the effect at all.

6. Experiment

6.1 Method

Participants

30 Dutch-English bilinguals with varying levels of proficiency in English were recruited for this study, of which 13 were female. Participants were between 19 and 27 years old ($M = 21.8$, $SD = 1.99$). All participants were native speakers of Dutch and learned English at school as an L2.

To determine the participants' proficiency in English, all participants did a LexTALE proficiency test online at home before the experiment. The LexTALE proficiency test is a test designed by Lemhöfer and Broersma (2012) that tests language proficiency on the basis of vocabulary knowledge. The test presents participants with strings of words, for which participants have to decide whether such string is an existing English word or not. Participants scored between 45% and 100% ($M = 83.24$, $SD = 13.61$). A large number of participants received a score that was 80% or higher (15 participants). According to the proficiency data, two proficiency groups were made: a low proficiency group, group 1 ($M = 67.95$, $SD = 9.22$), and a high proficiency group, group 2 ($M = 92.09$, $SD = 5.45$). Group division and the corresponding scores are presented in Table 1 below.

Table 1. *Number of participants who received a particular score on the LexTALE proficiency test per proficiency group.*

LexTALE score	Group 1	Group 2
40% - 50%	1	0
50% - 60%	1	0
60% - 70%	3	0
70% - 80%	6	0
80% - 90%	0	5
90% - 100%	0	14
Total:	11	19
Total after data pre-processing:	8	16

Materials

A set of 80 English target sentences was created; 40 sentences contained an English idiom, and 40 sentences were regular English sentences that contained no idiom, here referred to as non-idiom sentences. Of each set of 40 sentences, 20 sentences contained an English-Dutch cognate (either within the idiom or within the regular sentence) and 20 sentences contained a noncognate target word that existed exclusively in English (either within the idiom or within the regular sentence). This made a two by two (2x2) design, with idiom status making one condition, idiom or no idiom in the sentence, and cognate status the second condition, with the target word being either a cognate or a non-cognate. All sentences including target words are presented In appendix I and appendix II.

Idioms were found on 7esl.com (2020), which contains a database of more than 1500 English idioms. For this experiment, only idioms that were translatable to Dutch were selected. This means that all idioms in the experiment also existed in Dutch in a similar form. An example of an idiom used in the experiment is the English expression ‘to get out of hand’. The Dutch equivalent of this idiom is ‘uit de hand lopen’ (‘to walk out of hand’) which has identical figurative meaning to the English idiom.

For the 40 sentences that contained an English idiom, the idioms were placed in context sentences biased towards a figurative meaning of the idiom. This means that the preceding sentence context strengthened a figurative interpretation of the idiom. Because it is assumed

that sentences are processed incrementally, and because in a Self-Paced Reading Task participants are forced to read sentences incrementally, idioms were placed towards the end of the sentences to make sure the biasing contexts preceded the idioms. An example of this is the experimental sentence ‘They finally decided to move on and draw a line under this whole situation.’ The idiom ‘draw a line under’, in which ‘line’ is the English-Dutch idiom, is placed towards the end of the sentence to make sure the biasing sentence context preceded the idiom.

The 40 non-idiomatic control sentences were also biased towards the target word, which was always presented near the end of the sentence. For example, the experimental sentence ‘I have light skin, so I have to sit in the shadow unfortunately.’ is biased towards the noncognate target word ‘shadow’. This way, chances of prediction of the cognate or noncognate target word in the non-idiom condition were maximised.

Target words were either English-Dutch cognates or words that existed exclusively in English. To maximise the possibility of finding cognate effects, all target words were nouns, since Bultena et al. (2014) found that nouns show stronger cognate effects than verbs do. The words in the different conditions were matched on a number of criteria. Between the idiom and non-idiom condition, cognate length in terms of the number of letters did not differ significantly, with $M = 5.6$ and $M = 5.5$, $t(18) = 0.261$, $p = 0.797$. Orthographic overlap with Dutch was determined with the Levenshtein Distance. The Levenshtein Distance between two words is the number of deletions, insertions or substitutions required to transform a source word into the target word. For this experiment, only English cognates with a maximum Levenshtein Distance of 2 to the Dutch counterpart were selected. An example of a cognate with Levenshtein Distance 2 is ‘kettle’, with ‘ketel’ being the Dutch counterpart. Only high overlap cognates were presented in order to maximise the finding potential cognate effects. Levenshtein Distance was matched across the idiom and non-idiom condition and did not differ significantly between the two conditions, with $M = 1.4$ and $M = 1.35$, $t(18) = 0.574$, $p = 0.591$.

All target words were matched for frequency in the English language. Frequency of the target words was determined through the Subtlex-UK database (Van Heuven et al., 2013), which contains word frequencies in subtitles for 160,022 English words. Descriptive analyses of the frequency of the target words gives $M = 4.5$, $SD = 0.0652$, $N = 39$ for the idiom condition, and $M = 4.6$, $SD = 0.719$, $N = 39$ for the non-idiom condition. A t-test between the frequencies of the target words in both conditions was performed. No significant difference was found between the frequencies of the target words, with $t(38) = -0.515$, $p = 0.610$.

Procedure

Due to the global pandemic of the Covid-19 virus, this experiment was conducted online. Participants carried out the experiment at home, using their own laptop/ PC / Mac. The experiment worked on html5, which means that it was compatible with all modern PC web browsers. By having done the experiment online, safety of the participants and myself was ensured.

A Self-Paced Reading Task was made using the online experiment software *Webexperimenten van de Radboud Universiteit*. This is a web browser-based programme for conducting language experiments online, created by the Radboud University in Nijmegen, the Netherlands.

Participants were recruited via Whatsapp Messenger. All participants were sent an email including instructions that explained what they should do on their own pc. Prior to the experiment, participants made a LexTALE proficiency test to test their proficiency in English. The proficiency score of this test was filled in in a small questionnaire which was presented before the experiment. Here, participants filled in their age, gender, and LexTALE proficiency score.

Experimental instructions were divided into two parts (screens), with two practice sentences in between which made it possible for the participants to become familiar with the Self-Paced Reading Task. Instructions are presented in appendix III. Instructions were presented in the middle of the screen in a black 27-point Courier font to a white background. First, through the instructions, participants were told the length of the experiment, and the number of sentences that would be presented (80). Instructions mentioned that all data gathered was anonymously. Instructions instructed the participants to sit in a quiet room in their house, avoiding any distraction. After the procedure of the experiment was explained, participants had to press a button to start a Self-Paced Reading Task on two practice sentences. After the trial run, the second instructions appeared on the screen. The second instructions made clear that participants should read the sentences at a natural pace, and that they should not read extra slowly or quickly. Participants were told that sometimes a comprehension question would be asked, as to ensure attention was paid to the sentences. Instructions mentioned that if the participant needed a short break, the participant should take a break during the comprehension questions, and not during the self-paced reading task.

Target sentences were presented in the middle of the screen in a black 25-point Courier font to a white background. 80 sentences were randomised using the randomisation function in Microsoft Excel (Microsoft Corporation, 2020), after which the 80 sentences in random order were divided into four blocks. Each block of 20 sentences was then randomised twice again, as to make two lists per block which contained the same sentences, but in a different order, except for the last sentence. The last sentence had to be the same sentence in both version of a list, since after the last sentence of a list, a comprehension question about the last sentence was asked. Since it was impossible to code the experiment differently, the last sentence had to remain the same for both versions of a list. For every block, participants were either presented the first list or the second list. The programme automatically ensured that if the first participant had been presented the first list for the first block, the second participant would be presented with the second list of the first block. This way, it was ensured that all lists were presented to the same number of participants.

During the Self-Paced Reading Task, sentences were initially masked, which means that every word in a sentence was replaced by a dash. The dash's length corresponded to the number of letters of the word. Once the participant pressed the space bar, the first word of the sentence would appear. Once the space bar was pressed a second time, the first word would disappear, and the second word would appear.

After every block of 20 sentences, a yes/no comprehension question was asked which corresponded to the last sentence of the block. Participants had to press the 'y' key for yes, and the 'n' key for no. An example of a comprehension question is "*was the tree located in the forest?*" This question was asked after the sentence "*In the field, there used to be a tall tree which is now removed.*"

After the experiment, a message appeared on the screen thanking the participants for participating in the experiment, under which a button appeared which contained the text 'End experiment'. In the e-mail instructions, participants were told to press this button, after which they would be taken to the website of the Radboud University.

Design and Analysis

The experiment had a 2x2 design with idiom status and cognate status being the independent variables. Reading times of the target words was the dependent variable. Reading times of

target words were recorded and two repeated measures ANOVAs for the F_1 and F_2 analysis were performed, after which several post-hoc analyses (t-tests) were performed to determine the cause of the presence or absence of cognate effects and to determine the role of L2 proficiency in this. Prior to these analyses, data pre-processing was carried out to clean up any data inconsistencies.

7. Results

Reading times of the target words in all conditions were analysed. Prior to analysis, participants' performance on the four comprehension questions was analysed. Accuracy was high ($M = 81.7\%$, $SD = -21.3$). Although instructions explicitly mentioned to pay attention during the task, the data of six participants were excluded from analysis because they had an accuracy lower than 75% on the comprehension questions. Since four comprehension questions were asked throughout the experiment, this means that participants who gave the wrong answer to two or more questions were removed from analysis. The fact that the experiment had to be conducted at the participants' home without supervision due to the Covid-19 pandemic might have had an effect on the attention paid during the experiment. Moreover, the fact that every participant used a different laptop/computer with a different keyboard most likely has affected reaction times as well.

Reading times lower than 100ms and higher than 2000ms were removed from the analysis, because such reading times are unrealistically short or long. Exclusion of these reading times removed 0.83% of the data. Also, reading times that were more than 2.5 standard deviations from the item group's mean were excluded from analysis. Exclusion of these reading times amounted to the deletion of 2.21% of the data. Furthermore, two items (one non-cognate and one cognate) and their matching target/control words were excluded from analysis, because the mean reading times of these words were 2.5 standard deviations above the mean of the reading times of the target words in that condition. In the end, data of 24 participants for 76 sentences were analysed (1810 data points).

Two repeated measures ANOVAs were performed on the reading times of cognates and noncognate target words in the idiom condition and non-idiom condition as within subject factors for the participant analysis (F_1) (table 2), and as within-subject factors in the item analysis (F_2) (table 3). The F_1 analysis showed that idioms ($M = 358\text{ms}$, $SD = 100$) were read

significantly faster than non-idiom sentences ($M = 373\text{ms}$, $SD = 98$), $F(1,23) = 9.643$, $p = 0.005$, $\eta_p^2 = 0.295$. The analysis also showed a significant interaction between idiom status and cognate status, $F(1,23) = 11.220$, $p = 0.003$, $\eta_p^2 = 0.328$. No significant effect of cognate status was found: $F(1,23) = 0.732$, $p = 0.401$, $\eta_p^2 = 0.732$. For the F_2 analysis, no significant effect of idiom status nor cognate status was found, with $F(1,18) = 1.037$, $p = 0.322$, $\eta_p^2 = 0.054$, and $F(1,18) = 0.000$, $p = 0.966$, $\eta^2 = 0.000$. However, the F_2 analysis showed a marginal interaction between idiom status and cognate status, with $F(1,18) = 3.290$, $p = 0.086$, $\eta_p^2 = 0.155$.

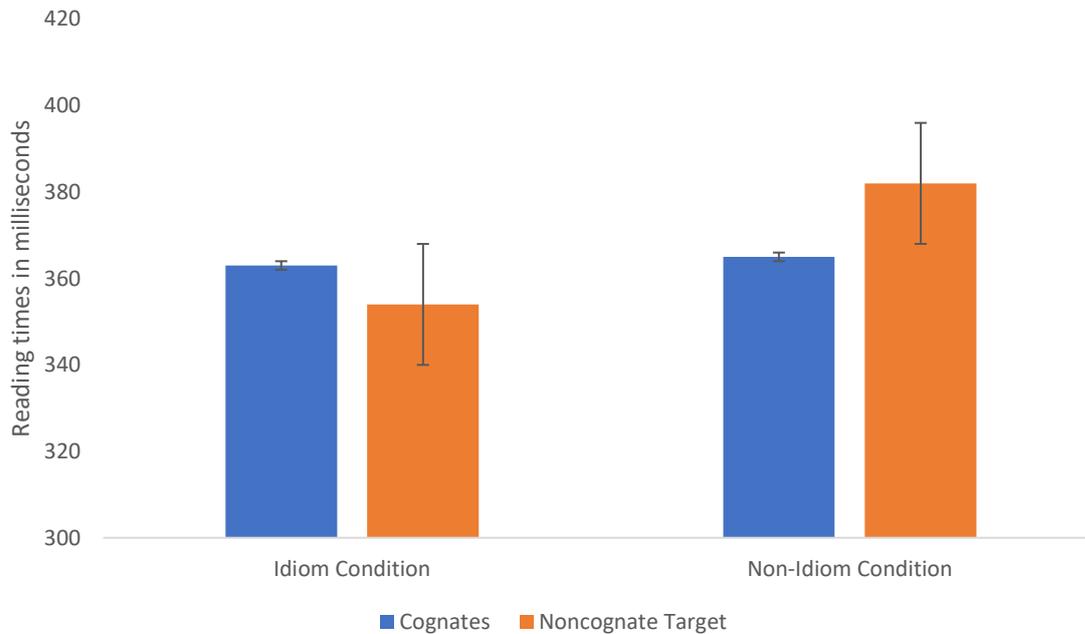
The first aim of the present study was to assess whether cognate effects would occur during the reading of English idiomatic expressions. Since a significant interaction between idiom status and cognate status was found, a post-hoc analysis was carried out to see where the cognate effects occurred. Firstly, the cognates within the non-idiom condition ($M = 365\text{ms}$, $SD = 97$) were compared to the noncognate target words ($M = 382\text{ms}$, $SD = 98$) in that condition to see whether cognate effects occurred in this experiment within nonidiomatic sentences. This comparison served as a baseline to establish proof for the cognate effects in general. Cognates were read significantly faster in the non-idiom condition than matched noncognate controls: $t(22) = -2.530$, $p = 0.019$, showing cognate effects in regular sentences, as expected. In the idiom condition, however, no such effect was found. Here, cognates were not read faster than noncognate words: $t(22) = -1.359$, $p = 0.188$. On the contrary, in the idiom condition, noncognate words were read slightly faster ($M = 354\text{ms}$, $SD = 105$) than cognates ($M = 363\text{ms}$, $SD = 94$), although this difference was not significant. This data is represented in Table 4 and Figure 1 below.

Table 4. Mean reading times in milliseconds per condition and per proficiency group and noncognate minus cognate difference scores.

Target word	Low proficiency	High proficiency	Total mean
Idiom – cognate	400 (345)	345 (83)	363 (94)
Idiom – noncognate	389 (120)	336 (91)	354 (105)
Difference score	-11	-8	-9
Idiom condition			
Non-idiom – cognate	413 (341)	341 (81)	365 (97)
Non-idiom - noncognate	431 (101)	357 (87)	382 (98)

Difference score	18	17	17
non-idiom condition			
Total mean	408 (106)	345 (84)	366 (97)

Figure 1. Bar chart of mean reading times for idiom and non-idiom condition.

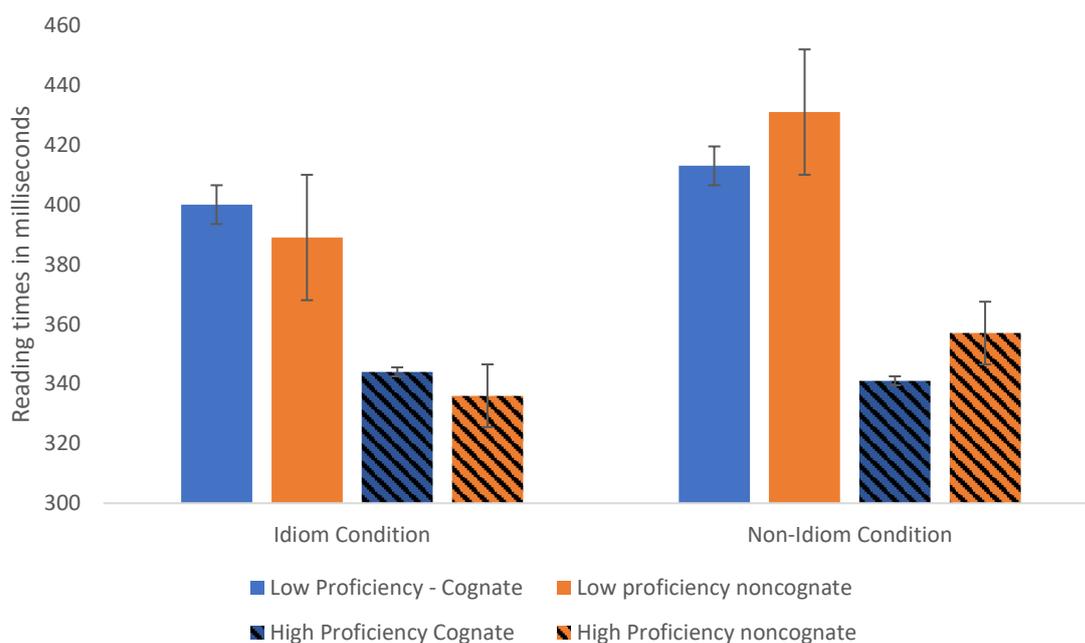


Since no cognate effects were found in the idiom condition, reading times of cognates in the idiom condition were compared with reading times of cognates in the non-idiom condition to see if the absence of cognate effects in the idiom condition is a result of deviance in reading times for the cognates between the two conditions, or a result of a deviance in reading time for the noncognates. The absence of cognate effects in the idiom condition was not a result of deviance in reading times for cognates between the conditions, since no significant difference between the two was found: $t(22) = -0.497, p = 0.624$. However, when noncognate words across conditions were compared, a significant difference was found in reading times between the two: $t(22) = -3.578, p = 0.002$. Noncognate target words within the idiom condition were read significantly faster ($M = 354\text{ms}, SD = 105$) than noncognate target words in the non-idiom condition ($M = 382\text{ms}, SD = 98$).

When comparing cognates and noncognates between and within conditions for all participants, there is a large variability in reading speeds between participants ($M = 366, SD = 96.8$), much less between items ($M = 376, SD = 58.3$). This is most likely due to the

participants' varying proficiency levels in English. Correlation between proficiency scores and a participants' total mean reading time of all target words was not significant, with $r(22) = -0.281, p = 0.194$. This was likely caused by the fact that highly proficient English speakers are somewhat overrepresented as compared to low proficient English speakers in the sample. A significant differences in reading times was, however, found when reading times of all target words of participants between proficiency groups were compared, with $t(6) = 2.757, p = 0.033$. Highly proficient English speakers read words significantly faster ($M = 345\text{ms}, SD = 84$) than less proficient English speakers ($M = 408\text{ms}, SD = 106$). One thing that should be noted is that sample sizes are not equal in this comparison. Such significant difference was also found when cognate reading times in the non-idiom condition were compared between groups: $t(6) = 2.658, p = 0.038$. In this condition, cognates were read significantly faster by highly proficient speakers ($M = 341\text{ms}, SD = 81$) than by lower proficient speakers ($M = 413\text{ms}, SD = 107$). This significant difference was also found in the idiom condition, with cognates having been read quicker by highly proficient speakers than by lower proficient speakers, with $t(6) = 2.482, p = 0.048$. For the noncognates in this condition, however, no significant difference was found between groups, with $t(6) = 2.249, p = 0.066$. A similar pattern unfolds in the non-idiom condition, with cognates having been read faster by highly proficient speakers ($t(6) = 2.658, p = 0.038$), but noncognate target words having been read at similar speeds between the two proficiency groups ($t(6) = 3.170, p = 0.019$).

Figure 2. Bar chart for mean reading times per proficiency group.



Finally, a handful of analyses were done to see whether cognate effects are influenced by L2 proficiency. Firstly, the difference in reading time between noncognate control words and cognates in both conditions was calculated for all participants. Reading times of cognates were subtracted from reading times of noncognate control words to form a difference score. Then, a correlation analysis was done to see whether these difference scores correlated with proficiency scores. LexTALE proficiency scores did not correlate with difference scores for cognates and noncognates in the idiom condition, nor in the non-idiom condition, $r(23) = -0.043$, $p = 0.841$, and $r(23) = -0.051$, $p = 0.811$. This shows that cognate effects were not dependent on or affected by L2 proficiency.

However, when the two previously formed proficiency groups were compared with each other, different results were found. In the non-idiom condition, cognate reading times were compared with noncognate reading times for the low proficiency and high proficiency group separately. Analyses show that cognate effects in regular sentences in this experiment were only present for highly proficient English speakers ($t(14) = -2.144$, $p = 0.050$), and not for low proficient English speakers ($t(6) = -1.308$, $p = 0.239$). In the idiom condition, however, neither groups showed cognate effects, with $t(6) = 0.606$, $p = 0.567$ for the low proficient group, and $t(14) = 1.056$, $p = 0.309$ for the highly proficient group. Results of this analysis show that cognate effects are only present for highly proficient L2 speakers, and only in regular sentences. Lower proficient L2 speakers did not show cognate effects in regular sentences, nor in sentences containing idiomatic expressions.

8. Discussion

The present study aimed to investigate L2 idiom processing by looking at potential cognate effects within L2 idioms. It was hypothesised that cognate effects would occur within regular sentences as well as within the English idioms in the present experiment, because cognate effects seem to be strong and persistent in the L2 both in isolation and within sentence context. Presence of such cognate effects within the idiomatic expressions would point towards literal processing of the idiom, meaning that the idiom was not stored as one lexical entry in the bilingual's mental lexicon. Furthermore, it was hypothesised that more proficient English (L2) speakers would show decreased cognate effects when compared to lower proficient speakers, if they showed them at all. Results from the present experiment were not

in accordance with these hypotheses. While cognate effects were found in the regular control sentences as expected, no cognate effects were found in the idiomatic expressions. Furthermore, no correlation between proficiency and strength of cognate effects was found. Below, findings from the present studies are discussed.

8.1 Representation of Idioms

Results from the present experiment show that target words embedded in idiomatic expressions were read faster than target words embedded in regular sentences. These results do not confirm the hypothesis that was made about the occurrence of cognate effects within the idiom condition, which assumed idiomatic sentences to not have been stored as a single lexical entry, which does not speed up processing. However, the present results are not surprising, since numerous studies in both the L1 and the L2 have shown that generally, idiomatic expressions have a processing advantage over regular sentences.

The present findings are in contrast with Cieślicka's (2006) and Beck and Weber's (2016) findings, who both propose the Literal Salience Model which poses that salient meanings are processed more quickly, and that separate words within idioms are more salient than the idiom as a whole. Siyanova-Chanturia (2011) and Conklin and Schmitt (2011) also found there to be differences between L1 idiom processing and L2 idiom processing, with non-native speakers having read idiomatic expressions at a similar speed as regular sentences, indicating that idiomatic expressions are not stored as a single lexical entry in the L2 speaker's brain but that expressions in the L2 are stored in the mental lexicon similarly to regular sentences.

Results from the present study indicate otherwise. Individual target words within the idiom condition were read significantly faster than individual target words within the non-idiom condition, nullifying cognate effects in the idiom condition. The Literal Salience Model cannot explain this, since it argues that in both conditions, the words that constitute the sentence or idiom are stored separately in the lexicon.

The most plausible theory is a theory which theorises that idioms were stored as one lexical entry in the mental lexicon by the L2 speakers of English; A theory proposed by Hubers (2020) and Van Ginkel and Dijkstra (2019) as well. They also found that non-native speakers

read idiomatic expressions significantly quicker than regular sentences in the L2, which the present study replicated.

These results in turn then are able to explain the absence of cognate effects within the idiom condition of the experiment. If idioms were stored as one single lexical entry in the bilingual's brain, cognates effects could not have occurred within idioms, because idioms are then retrieved from the lexicon as a whole. Unlike initially hypothesised, no cognate effects were found in idiomatic expressions in the present experiment. Cognate effects were expected to be present in both conditions in the present experiment because previous literature has found the effect to be robust across conditions and tasks.

Probability of finding cognate effects in both conditions were maximised by having used high overlap and high frequency cognates only for both conditions. Only cognates with a maximum Levenshtein distance of 2 were used in the experiment, which made cognates between the two languages nearly identical in terms of orthography, phonology and, of course, semantics. The noncognate target words had a mean Levenshtein distance of 5.1, which made sure noncognate target words were not orthographically or phonologically similar to the Dutch counterpart. All this was done to increase probability of finding cognate effects.

However, such cognate effects were only found in non-idiom sentences. This cannot have been a result of differences for cognates between the conditions, since cognates between the idiom and non-idiom were matched for overlap with Dutch, length in letters, number of syllables and frequency in the English language. The same holds for the noncognate target words, which were also matched across conditions for overlap, length and frequency. Therefore, the presence of cognate effects in the non-idiom condition and the absence of the effects in the idiom condition was a result of a different cause than deviation in target word properties.

The absence of cognate effects in idiomatic sentences might also be explained by the fact that in the idiom condition, more non-identical cognates were used than in the non-idiom condition. Duyck et al. (2007) showed that sentence context is able to nullify cognate effects obtained in isolation when cross-lingual activation is weaker (as it is in non-identical cognates), but not when cross-lingual activation is at a maximum (which it is for identical cognates). This means that cognate effects can be nullified by providing sentence context, but only when cognates are not identical to the words in the first language. In the present experiment, A large majority of cognates that were used were non-identical cognates with

Dutch. Of the 38 cognates used in the experiment, 32 were non-identical cognates with Dutch. In the idiom condition, only 2 cognates were identical. In the non-idiom condition, 6 cognates were identical to the Dutch counterpart. Since Duyck et al. (2007) found that sentence context can only nullify the cognate effects when cognates are non-identical, and since, in the present experiment, the idiom condition contained more non-identical cognates than the non-idiom condition, sentence context might have nullified cognate effects in the idiom-condition.

However, despite the number of non-identical cognates being higher in the idiom condition, cognates in the present experiment were matched for overlap with Dutch, and no significant difference of cognate overlap (Levenshtein Distance) was found between the idiom and non-idiom condition. This means that, if sentence context were to have influenced cognate effects, context would also have influenced cognate effects in the non-idiom condition. This was not found in the present experiment.

Since Duyck et al. (2007) only tested for low-constrained sentences, nothing can be said about the influence of the extent of context provided by a sentence. In the present experiment, all sentence contexts were biased towards the target word, and in the idiom condition, were biased toward a figurative interpretation of the idiom. Therefore, a difference in the extent of sentence context cannot be analysed to see if this influenced reading times of target words. However, idiomatic expressions might provide a certain context which nullifies cognate effects. Unfortunately, since Duyck et al. (2007) did not test for differences in sentence context, this cannot be proven.

The most plausible theory remains the idea that idiomatic expressions are not stored in the same way as regular sentences are in the mental lexicon, for which there is a separate representation for every word constituting the idiom, but are stored as one lexical entry in the speakers' mental lexicon. This theory is in accordance with the Lexical Representation Hypothesis, which proposes idiomatic expressions are stored as one lexical entry in the lexicon. Swinney and Cutler (1979), who found support for such hypothesis, assume that the access of single lexical items is undoubtedly quicker than the access of the relationship among several words in a phrase, so the results support a model in which idioms are stored as lexical items. The lexicalised meaning is assumed to be accessed simultaneously with the access of the literal meaning. If the meaning of an idiom were accessed from the individual words in the phrase, then idioms would not have been recognised faster than the control phrases in their experiment, and cognates would have most likely been read quicker in the present experiment. The Lexical Representation Hypothesis was initially only found for idiom processing in the

L1, but Beck and Weber (2016), Van Ginkel and Dijkstra (2019) and Hubers (2020) all found support for this hypothesis for idiom processing in the L2 as well.

The clear presence of cognate effects in regular sentences strengthens the robustness of the cognate effects in L2 sentence reading. Absence of such robust effects in idiomatic sentences firmly point towards a different processing and reading of those sentences when compared to regular sentences. This, together with the fact that target words in idiomatic expressions were read faster than target words in regular sentences indicates that, in the present experiment, idiomatic expressions were stored in the bilingual's brain as one lexical entry. These results do not confirm the hypothesis that was made about cognate effects within idiomatic expressions. Prior to the experiment, it was hypothesised that cognate effects would occur within idiomatic expressions, since cognate effects had been found to be robust across various tasks and within various conditions, and since a large portion of the research conducted into L2 idiom processing proposed that idiomatic expressions are not processed more quickly in the L2, indicating idioms are retrieved word by word like regular sentences. However, results from the present experiment show that processing advantage of idiomatic expressions over literal language and its corresponding representation in the brain outweighs the robustness of cognate effects within sentences. Cognate effects still seem to be present in regular sentence processing, but idiomatic expressions seem to be special regarding processing, shown by the absence of cognate effects. If this theory holds true, this answers the main questions the present study asked about processing of L2 idiomatic expressions.

8.2 Effect of Translatability of Idioms

In hindsight, chances of finding the idiomatic expressions used in the experiment to have been stored as one entry in the mental lexicon was most likely maximised by exclusively having used idioms that had a translation equivalent in Dutch. Türker (2019) and Carrol and Conklin (2014) showed that L1-L2 similarity of idioms are important when L2 learners have not explicitly or implicitly learned idioms through a task. Carrol and Conklin (2014) showed that L1-L2 similarity of idioms is important in terms of processing for non-native speakers. In their study, bilinguals responded significantly faster to words that completed an idiom in the native language, even though the task and presented idiom was not in the native language, and the idiom was therefore presented in an entirely unfamiliar form. In the present experiment, participants were most likely familiar with the Dutch version of the idiom, together with the

English variant as well (especially the highly proficient participants). If lower proficient participants were not familiar with the English idiom, according to Carroll and Conklin's (2014) results, they most likely recognised the Dutch idiomatic expression which caused faster processing of the idioms when compared to regular control sentences. Faster processing of the idiomatic expressions, which did occur in the present experiment when control words were compared across conditions, then has nullified potential cognate effects within those idioms.

This theory is in contrast with Hubers' (2020) results that indicated that L2 learners did not make use of their L1 knowledge before having learned idioms. According to Hubers, cross-language overlap between idiomatic expressions does not influence processing of those idiomatic expressions in the L2. The present results do not exactly disprove of this theory, since only overlapping idioms were used in the experiment which prohibited a comparison between translatable and non-translatable idioms. However, it can be tacitly proposed that L1-L2 overlap between the idioms has most likely had an influence on reading times of the idioms in the present experiment.

This further strengthens a theory in which the idiomatic expressions were stored as one lexical entry in the speaker's brain, caused by the fact that participants were either so proficient in English they have reached near-native proficiency, or participants recognised the Dutch version of the idiom, which most likely is stored as one lexical entry in the mental lexicon of the bilingual.

8.3 Task Demands

This theory is strengthened if task dependencies are taken into consideration. Bultena et al. (2014) showed that the extent of the cognate facilitation effect is sensitive to task demands. Bultena et al. (2014) suggest that when reading times are prolonged by using a moving window paradigm, as is the case in a Self-Paced Reading Task, there is more room for cognate effects to occur (Bultena et al., 2014). Therefore, this would mean that in the present experiment, small or late cognate effects should have been observed if they were present in the idiom condition, because the present experiment used a Self-Paced Reading Task. However, no cognate effects were observed in the idiom condition in the present experiment, further strengthening the theory of idiom being processed differently than regular sentences.

8.4 Cognate Effects in Regular Sentences

An abundance of studies in recent years have shown cognate facilitation effect in sentence context. These studies showed the robustness of the cognate facilitation effect, with it occurring under a large variety of experimental conditions and methods, irrespectively of language. The present study strengthened the robustness of the cognate facilitation effect in sentence context, but also showed its limitations. In regular sentences, the present study found strong cognate facilitation effects. This shows that participants read cognates in the L2 faster than noncognate words. Since cognates share the same semantics and similar orthography and phonology with the L1, they are recognised and therefore read faster than words that exist exclusively in the L2. This is usually explained as language non-selective access, the automatic co-activation of information (semantics, orthography and phonology) in both linguistics systems (the L1 and target language). These results of the present study support the view of cognates being accessed language-nonselectively.

8.5 Cognate Effects and Proficiency

The correlation analysis indicated that the cognate effects in the non-idiom condition and the absence of cognate effects in the idiom condition were not affected by L2 proficiency. However, a post-hoc analysis which compared two proficiency groups indicated that the cognate facilitation effect was limited to highly proficient L2 speakers only. These are surprising results that oppose results from previously conducted experiments that found cognate facilitation effects to be weaker for highly proficient L2 speakers when compared to the extent of the cognate facilitation effect for lower proficient L2 speakers. Libben and Titone (2009) and Bultena et al. (2014) both found that cognate effects are dependent on L2 proficiency, and found that participants who are more proficient in their L2 showed a decreased cognate facilitation effect. This means that highly proficient L2 speakers are able to partially block out interference from the L1, and might access vocabulary in the L2 language-selectively, meaning that the L1 does not interfere with or aid the vocabulary access in the L2. The present post-hoc analysis provided exactly opposite results. In regular sentences, cognate facilitation effects were only present for highly proficient English speakers, and were not at all present for lower proficient English speakers. Since experimental conditions did not seem to deviate from other experiments that have found the opposing results, a different explanation for this has to be offered.

First of all, a small sample size of the low proficient group might have caused the statistical analysis to be insignificant. Total sample size was already majorly reduced by six to 24 participants due to low accuracy on the sentence comprehension questions. This reduction caused the two proficiency groups to be relatively small. The low proficiency group consisted of 8 participants, where the high proficiency group consisted of double the participants, 16 participants. This difference in sample size per group comes from the difficulty in finding low proficient English speakers in this particular demographic. Dutch people, especially younger people like the participants in the present study, are considered good English speakers when compared to people with different native languages. According to a study by Education First (2019) which compared 100 countries including Scandinavian countries whose residents are also known to be good English speakers, Dutch people have the highest proficiency in English when compared to those other 99 countries, with a proficiency score of 70.27 on the Education First English Proficiency Index (EF- EPI). This most likely caused the sample size of the high proficiency group to be significantly higher than the sample size of the low proficiency group, since participants were not recruited on the basis of proficiency, but proficiency groups were only made after the experiment. Lower sample size of the low proficiency group most likely was a factor that influenced the significance of the statistical analysis. This theory is relatively plausible, because mean difference in reading times between cognates and noncognates in the non-idiom condition was actually higher for the low proficiency group ($431 - 313 = 18$) than it was for the high proficiency group ($357 - 341 = 16$). A smaller sample size of the former can explain why the former difference was insignificant while being larger than the latter, which was significant.

Not only a small sample size might have influenced results, also a large difference between the groups in standard deviation from the mean might have had an impact. Overall, the low proficiency group had a higher standard deviation from the mean (106ms) than the high proficiency group (84ms). This is even more present for the cognates in the non-idiom condition, with standard deviation for the low proficiency group being 101ms, and for the high proficiency group being 87ms. This reflects the fact that the high proficiency group was more homogeneous in terms of proficiency scores than the low proficiency group was. Scores for the low proficiency group ranged from 40% to 80%. For the high proficiency group, the range was only from 80% to 100%. The fact that scores in the low proficiency group had a larger range most likely influenced the standard deviation from the mean for that group, which, in combination with a smaller sample size, might have influenced the validity of the statistical

analysis. One way to solve the latter problem is to make group sizes relatively equal, but this would mean that participants who scored higher than 80% on the LexTALE proficiency test would be classified as 'low proficiency' participants, which would then make the proficiency distinction less valid. Removing participants from the high proficiency groups to make sample sizes equal would require removing another 8 participants from the analysis, which would in turn severely impact statistical powers.

Since cognate facilitation effects were found when all participants were taken as one group, and since correlation analysis showed there to be no correlation between proficiency scores and the extent of occurring cognate effects, it is safe to say the disappearance of this effect in the post-hoc analysis for only the low proficiency group was caused by a small sample size and a large standard deviation from the mean for the group. Therefore, it can be concluded that the proficiency difference in terms of the cognate facilitation effect in this experiment is meaningless, because the difference in the post-hoc analysis was probably caused by a small sample size and a large standard deviation for the low proficiency group.

9. Conclusion

The present experiment investigated reading times of cognates in English idioms and regular sentences and compared these reading times with reading times of noncognate control words to see whether cognate effects occurred in idiomatic expressions in the L2. L2 proficiency effects were also examined. Results showed that idiomatic expressions were read significantly faster than regular control sentences. These results indicated that idioms were mostly likely stored as one lexical entry in the L2 speakers' mental lexicon, a theory previously proposed by multiple studies. This theory was further strengthened by the fact that the first hypothesis, which hypothesised that cognate effects would occur in idiom sentences because cognate effects have been shown to be enormously robust across conditions and tasks, was not confirmed. While cognate effects were found in regular sentences, as expected, they were not found in the idiom condition. Since type of cognate and sentence context most likely did not influence cognate effects, it can be concluded that idiomatic expressions were processed differently in the present experiment than regular English sentences. Idiomatic expressions were stored in the bilingual's mental lexicon as one lexical entry, meaning that they are retrieved from the lexicon as one unit, unlike regular sentences, for which words that

constitute the sentence are stored separately. Had this been the case, cognate effects would mostly likely have been found, like they were in the regular sentences in the experiment.

When proficiency scores were examined, there was no correlation between proficiency scores and reading times, nor between proficiency scores and strength of cognate effects in regular sentences. While the post-hoc analysis did show proficiency effects, unequal sample sizes of the two proficiency groups and differences in deviation of scores between the groups rendered this effect meaningless. Future research into L2 idiom processing could solve this problem by recruiting participants on the basis of proficiency, after which it is easier to make equal size proficiency groups. Furthermore, further research could look into the effect of translatability of idioms into the native language of bilinguals on idiom storage and processing in the L2. Perhaps, Eye-Tracking should be used in the future, since it represents natural reading more correctly.

All in all, results of the experiment answered the question the present study asked. Absence of cognate effects within idioms indicates that idioms are most likely stored differently in a bilingual's mental lexicon than regular sentences are, and are therefore also read and processed in a different manner. Because generally strongly occurring cognate effects within sentences were absent in the idiom condition in the present experiment, the present findings are evidence for the Lexical Representation Hypothesis and the Idiom Superiority Effect in the L2.

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Appendices

Appendix I

Idiomatic expressions containing a cognate or a noncognate target word used in the present experiment.

Idioms + Cognate Target.	Idioms + Noncognate Target.
The massive party got quite out of hand yesterday.	After a week in the hospital, it was time to go under the knife and recover.
It is time to get out of this and grab the bull by the horns and get on with it.	He should not be so stuck in his ways and think outside of the box for once.
Working that hard makes her a busy bee for sure.	He was so clueless, it was like he had been living under a rock for the past year.
The two participants are having a race against the clock together.	By calling her unsuitable, he was playing with fire and was in great danger.
They failed again so it is back to the drawing board for them.	When I moved there, I had to put down roots before I became comfortable.
Yesterday I went to the gym to blow off some steam after the meeting.	Nowadays, I am busy and I really have a lot on my plate concerning work.
The finally decided to move on and to draw a line under this whole situation.	Some criminals in society seem to feel above the law undeservedly.
The incompetent president buried his head in the sand when the news broke.	Waking up at 6 makes her an early bird for her age.
Do not be late and do not miss the boat this time when applying!	You should not raise your voice when you talk to me.
The words were on the tip of his tongue during the job interview.	After having neglected the project, he took a deep dive into the literature.
It is better to forget it and get it out of your system entirely.	My supervisor told me I was really cutting corners this time.
John told me I was comparing apples to oranges again.	In this economic situation, time is money for certain companies.
When she was insecure, she used to fish for compliments all the time.	The situation turned out to be a storm in a teacup for both of them.
Luckily there is always light at the end of the tunnel for every situation.	To avoid hurting his feelings, I swept the secret under the carpet for a long time.
Unfortunately, this was only the tip of the iceberg for him.	I had butterflies in my stomach when I saw him.
Him blaming her was really the pot calling the kettle black this time.	After they won the lottery, they went from rags to riches in an instant.
It is good to be honest, but you should not wash your dirty linen in public that often.	It took him quite some time to come out of the closet in front of his parents.
While helping us, he did not even lift a finger himself while moving the couch.	After having tried too many times, it was time to throw in the towel and leave.
The thief stole the jewellery in broad daylight yesterday.	The rich owner of this shop has deep pockets as many people say.

Note. Idioms are presented in bold. Target words are presented in red (monosyllabic) or blue (multisyllabic).

Appendix II

Non-idiomatic sentences containing a cognate or noncognate target word used in the experiment.

Non-idiom sentences + Cognate	Non-idiom sentences + Noncognate Target
If you look up, you can see the moon is really bright tonight.	He immediately crashed his car after buying it.
He said that she was the most beautiful girl in the world to him.	I love riding my bike to go to work.
We spotted a very beautiful fox in the forest.	In the field, there used to be a tall tree which is now removed.
Becoming a rapper was my biggest dream when I was young.	She had lost her key to get in.
I wanted to throw an office party, but my boss did not agree.	Cleaning my room is my least favourite chore by a long run.
Although he had been defeated, he still had some hope left.	To buy that, you need to go to the store at the shopping mall.
On the contract, I had to write my name and age.	They sent a message to my phone to confirm my order.
To look masculine, he is growing his beard out once again.	At the corner of the street, there is a small shop that sells cute things.
I like to drink a nice bottle of wine once a month.	She absolutely loved her new dress that she bought yesterday.
They picknicked in the park together for their first date.	Every Sunday he went to church with his wife.
In the desert, I saw a big dromedary looking for water.	The horrible contagious disease is spreading incredibly quickly.
He proposed a promising concept to his boss.	Online shopping is increasingly becoming a habit for people.
He spoke with a very silly accent that was untracable.	Pizza in combination with pineapple actually tastes lovely.
It is better to abstain from all contact until further notice.	During the night, I use more than one pillow to sleep well.
They had missed an important detail in the construction of the building.	He always wears baggy trousers which look ridiculous.
She wanted to see lions at the circus last week.	The boss addressed the employee about his behaviour.
I have light skin, so I have to sit in the shadow unfortunately.	The clothes were put on the counter and payed for.
The monkey was eating a banana in the tree.	They had arrived at a very small village inhabited by a few people.
He actually has two mothers who care for him.	On top of the mountain , there was a big statue.

Note. Target words are presented in red (monosyllabic) or blue (multisyllabic).

Appendix III*First experimental instructions.*

This experiment consists of 80 English sentences, and will take approximately 10 minutes of your time. Please sit down at a quiet place of your house which is not prone to distractions. Everything is anonymous, so I will not be able to see what data belongs to whom. You are going to perform a self-paced reading task. This means that sentences will be presented word by word, and you can decide when the next word has to be presented by pressing the space bar. Once you press the space bar, the next word will appear, and the previous word will disappear. Press the button below and try it!

Experimental instructions after practice sentences.

I hope you now understand the experiment! This experiment looks at reading times, so it is important that you read the sentences at your own natural pace. Do not try to read extra slowly or extra quickly. You should read the sentences so that you understand

them, at your own pace. No pressure! Sometimes a yes/no question will be asked after a sentence. You can press 'y' and 'n' for 'yes' and 'no' accordingly. This is also the time to take a little break if needed. Do not take a break during sentence reading. When a sentence is finished, press the space bar again to go to the next sentence. By pressing the space bar, the first word will appear. Press the button below to start the experiment and to go to the first sentence.