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Translation direction and word type effects in Greek-English unbalanced bilinguals' translation

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Declaration

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Abstract

Introduction: Translation direction has been identified as influencing the translation of words in individuals who speak two languages, their native and a second language acquired later in life, known as unbalanced bilinguals. The *Revised Hierarchical Model* (RHM) developed by Kroll and Stewart (1994) assumes that there are asymmetries in translation. These asymmetries depend on whether the translation has the direction from the first language (L1) to the second (L2), forward translation direction, or from L2 to L1, backward translation direction which influence the speed of translation. One more factor which influences the process of translation to a significant degree in unbalanced bilinguals is the concreteness status of lexical items indicating that concrete and abstract words are processed differently. The present study attempted to cover the gap in the already existing literature by revisiting the effect of translation direction and concreteness status of the lexical stimuli in translation since to our knowledge there are no recent studies which have investigated these two variables together in a translation recognition task.

Methodology: One experiment took place with a translation recognition task which included trials in both forward translation (L1-L2) and backward translation (L2-L1). In both conditions the stimuli consisted of both concrete and abstract words. The participants of the experiment were Greek-English unbalanced bilinguals with a B2 proficiency level in the L2. In the responses of the participants reaction time and

accuracy was measured. The predictions of the study were that participants would need more time to translate the words in forward than in backward translation and the words which were abstract than concrete. The reason behind these two hypotheses is that backward translation and concrete words are processed faster. Additionally, it was hypothesized that abstract words in forward translation would be more difficult to translate than abstract words in backward translation.

Results: The results of the experiment revealed that the concreteness status of the lexical stimuli had a significant effect in the speed of translation recognition while the translation direction did not have a significant effect.

Conclusion: The results of the study do not confirm the hypotheses of the RHM and the findings of Kroll and Stewart (1994). Nonetheless, the concreteness effect in translation appeared to be stable confirming the vast majority of the studies that have manipulated this variable in translation experiments. Therefore, according to the present study bilinguals are not affected by the direction of translation in translation recognition but they need more time to recognize translation pairs which consist of abstract words rather than concrete ones.

Περίληψη :

Εισαγωγή: Η κατεύθυνση της μετάφρασης έχει βρεθεί ότι επηρεάζει τη μετάφραση των λέξεων από άτομα που μιλούν δύο γλώσσες, την μητρική τους και μία δεύτερη γλώσσα που μαθαίνουν αργότερα στη ζωή. Το μοντέλο *Revised Hierarchical Model* (RHM) το οποίο αναπτύχθηκε από τους Kroll and Stewart (1994) ισχυρίζεται ότι υπάρχουν ασυμμετρίες στη μετάφραση οι οποίες εξαρτώνται από το αν η μετάφραση έχει κατεύθυνση από την μητρική γλώσσα (L1) στη δεύτερη γλώσσα (L2) γνωστή ως κατεύθυνση μετάφραση προς τα μπρος ή από τη δεύτερη γλώσσα (L2) προς τη μητρική (L1) γνωστή ως κατεύθυνση μετάφρασης προς τα πίσω, οι οποίες επηρεάζουν την ταχύτητα της μετάφρασης. Ένας ακόμη παράγοντας που επηρεάζει τη διαδικασία της μετάφρασης σε σημαντικό βαθμό σε δίγλωσσους ομιλητές που έμαθαν τη δεύτερη γλώσσα αργότερα στη ζωή τους είναι η ακρίβεια στο νόημα των λέξεων, γεγονός που δείχνει ότι οι δίγλωσσοι ομιλητές επεξεργάζονται διαφορετικά τις λέξεις με ακριβές νόημα σε σχέση με τις λέξεις με αόριστο νόημα. Η παρούσα μελέτη προσπάθησε να καλύψει το κενό στην ήδη υπάρχουσα βιβλιογραφία με την επανεξέταση του αποτελέσματος της κατεύθυνσης της μετάφρασης και της ακρίβειας στο νόημα των λέξεων στη μετάφραση εφόσον σε ότι μας είναι γνωστό δεν υπάρχουν πρόσφατες έρευνες που να έχουν εξετάσει τις δύο μεταβλητές μαζί χρησιμοποιώντας πείραμα αναγνώρισης μετάφρασης.

Μεθοδολογία: Στην παρούσα μελέτη, ένα πείραμα αναγνώρισης μετάφρασης έλαβε χώρα το οποίο περιλάμβανε δοκιμασίες στην κατεύθυνση μετάφρασης προς τα μπρος (L1-L2) και στην κατεύθυνση μετάφρασης προς τα πίσω (L2-L1). Και στις δύο περιπτώσεις τα ερεθίσματα αποτελούνταν τόσο από λέξεις με ακριβές νόημα όσο και

από λέξεις με αόριστο νόημα. Οι συμμετέχοντες του πειράματος αποτελούνταν από δίγλωσσους ομιλητές (Ελληνικά- Αγγλικά) οι οποίοι κατέκτησαν τη δεύτερη γλώσσα αργότερα στη ζωή, με επίπεδο γλωσσομάθειας Β2 στη δεύτερη γλώσσα. Στις απαντήσεις των συμμετεχόντων, η ταχύτητα αντίδρασης και η ακρίβεια των απαντήσεων μετρήθηκαν. Οι προβλέψεις της έρευνας ήταν ότι οι συμμετέχοντες θα χρειάζονταν περισσότερο χρόνο για να μεταφράσουν τις λέξεις στην κατεύθυνση μετάφραση προς τα μπρος από ότι στην κατεύθυνση μετάφρασης προς τα πίσω όπως και τις λέξεις με αόριστο νόημα σε σχέση με τις λέξεις με ακριβές νόημα. Ο λόγος πίσω από τις παραπάνω δύο προβλέψεις είναι ότι η κατεύθυνση μετάφρασης προς τα μπρος και οι λέξεις με ακριβές νόημα μπορούν να γίνουν αντικείμενο επεξεργασίας γρηγορότερα. Ακόμη, προβλέπεται ότι οι λέξεις με αόριστο νόημα στην κατεύθυνση μετάφρασης προς τα μπρος θα είναι πιο δύσκολο να μεταφραστούν από ότι οι αόριστες λέξεις στην κατεύθυνση μετάφρασης προς τα πίσω.

Αποτελέσματα: Τα αποτελέσματα του πειράματος έδειξαν ότι η ακρίβεια της σημασίας των λέξεων επηρέασε σε σημαντικό βαθμό την ταχύτητα αναγνώρισης των λέξεων ενώ η κατεύθυνση της μετάφρασης δεν είχε στατιστικά σημαντικό αποτέλεσμα.

Συμπεράσματα: Τα αποτελέσματα της παρούσας μελέτης δεν επιβεβαιώνουν τις υποθέσεις του RHM και τα ευρήματα των Kroll and Stewart (1994). Παρόλο αυτά, η ακρίβεια της σημασίας των λέξεων έδειξε να είναι σταθερή μεταβλητή που επηρεάζει την μετάφραση των λέξεων, γεγονός που επιβεβαιώνεται από την πλειοψηφία των ερευνών με πειράματα μετάφρασης. Συνεπώς, σύμφωνα με την παρούσα μελέτη, οι δίγλωσσοι ομιλητές δεν επηρεάζονται από την κατεύθυνση της μετάφρασης στην αναγνώριση μετάφρασης αλλά χρειάζονται περισσότερο χρόνο για να αναγνωρίσουν ζεύγη μετάφρασης που αποτελούνται από αόριστες λέξεις σε σύγκριση με ακριβής σημασίας λέξεις.

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Introduction

In the last thirty years, there has been a significant number of psycholinguistic studies investigating the processes involved in language processing and translation. After the study conducted by Kroll and Stewart (1994), the Revised Hierarchical Model (RHM) was formed in order to explain the asymmetries that were found in translation and were associated with translation direction. The term asymmetries is used to explain the differences in the performance of the speakers in translation while the term translation direction is used to refer to whether the translation takes place from L1 to L2 (forward translation) or from L2 to L1 (backward translation). Since then many studies have followed whose findings have either replicated those of Kroll and Stewart (1994) or have not. In 2010, Brysbaert and Duyck (2010) expressed their criticism regarding the ability of the model to represent adequately the processes involved in translation, suggesting an alternative model known as BIA+ model (reference). After the criticism expressed, there was an immediate response by Kroll, Van Hell, Tokowich, and Green (2010) who gave their explanations.

In the studies that have investigated the processes involved in translation, the most common variable explored is that of the concreteness status of lexical items. The concreteness status of the words refers to whether the words refer to concrete objects or abstract entities. As there is a need for more recent studies that explore both variables of translation direction and concreteness status of lexical units, the present study will

attempt to test these two variables with a sample of Greek native speakers whose second language (L2) is English (Greek-English unbalanced bilinguals). We will begin with a discussion of the existing literature regarding the impact of the above-mentioned variables on language processing as well as translation. In the first chapter, the direction of translation and the Revised Hierarchical Model will be presented, then the criticism of the RHM, the contributions of the RHM and the studies which have explored translation using a *translation recognition* task as it will be the task that will be employed in the present study. In the second chapter, the concreteness status of lexical items will be presented and in the following subsections there will be a discussion of the most dominant theories which explain why concrete words are processed differently from abstract ones. These theories are the *Context-Availability Theory, the Dual-Code Theory, the Perceptual Symbol Systems Theory and the Different Organizational Frameworks Theory*. Next, there will be a reference to neuropsychological studies which shed light on the different kind of processing of concrete and abstract words by the brain, studies which may explain why word type has an effect on translation as well. Then, in the final part of the second chapter, there will be a presentation of the studies which have tested the concreteness status of lexical items involved in translation. The third chapter will examine the role of bilingual memory in language processing as memory is one of the most significant factors involved in all forms of language processing and translation in particular. After the presentation of the existing literature, the fourth chapter will explain the purpose and hypotheses of the present study, and the fifth chapter will present the Method of the study. The sixth chapter will present the Results, and the seventh chapter the Discussion, Limitations and Implications for Future Research. The last section of the dissertation will be the Conclusions drawn from this research.

1. Direction of translation

1.1.   The Revised Hierarchical Model

The *direction of translation* was investigated by Kroll and Stewart (1994) according to whom there are asymmetries in the accuracy and speed of translation which depend on translation direction. The study that was conducted aimed at examining the performance of the participants in categorized (category interference effect) and randomized conditions in both picture naming and translation tasks as well as to investigate the function of bilingual memory. The sample of the study comprised of Dutch-English unbalanced bilinguals who had learnt the second language (L2) in the first school years and for whom the native language (L1) was still the dominant one. The study included three experiments, one with picture naming tasks, one with picture naming tasks and words in alteration and one in translation. The lists of stimuli that were used were semantically categorized or randomized. The initial two experiments showed that participants confirmed the category interference effect but only in picture naming tasks and not when there was alternation of picture naming with word naming. These findings indicate that the category interference effect is not stable. Furthermore, in the third experiment, it was found that there were asymmetries in the translation performance of the participants who needed consistently less time to translate from L2 to L1 than from the L1 to L2.

Kroll and Stewart (1994) proposed the Revised Hierarchical Model (RHM) in order to accommodate the asymmetries in translation which were found in their

experiment and explain the translation direction effect. One significant contribution of the model is that it combined the *Word Association Model* which indicated that L2 words can be identified by direct word association with their translations in the L2 with the *Concept Mediation Model* which suggested that both L2 and L1 lexical units have direct links to the conceptual store. The RHM successfully fused the two models described by Potter, So, Von Eckardt and Feldman (1984) into a single one which encompassed developmental elements which influence translation performance (Kroll and Stewart, 1994; Kroll et al., 2010).

According to the RHM, a hierarchical division exists between lexical and conceptual representations. Lexical representations include information about the morphology of the lexical units whereas conceptual representations encompass material concerning the meaning of the words. The RHM suggested that the slower translation performance in forward translation compared to backward translation occured due to an asymmetry in the power of the connections between words and concepts in the two languages. The L1 was assumed to have advantaged access to meaning, while the L2 was assumed to be more probable to need mediation through the L1 translation. On this account, translation from L2 to L1 could be accomplished lexically, without semantic access, if the L2 word enabled lexically mediated retrieval of the translation. In contrast, L1 to L2 translation would necessarily be semantically mediated because of the strong L1 link to meaning. The fact that L1 has direct access to meaning and L2 needs to mediate through the L1 suggests that forward translation (L1 to L2) is more likely to engage semantics than backward translation (L2 to L1) (Kroll & Stewart, 1994; Libben, Jarema, Wetsbury, 2012).

Translation asymmetry may originate partly from the distinctive dependence of L2 on L1, and similarly as an effect of the distinctive nature of mapping of a limited L2

lexicon to a significant more extensive L1 lexicon. As L2 users may have acquired many L1 words for which they do not possess an L2 translation correspondent, the resulting word mapping from L1 to L2 may not be consistent and reliable. Hence, at the conceptual level, the RHM proposes that there are strong links for L1 lexical stimuli and comparatively less strong links for L2 lexical stimuli. Therefore, an L1 word is more likely to involve conceptual processing than its L2 translation (Tokowich, & Kroll, 2001).

Moreover, the language proficiency of the speaker in terms of the acquisition of L2 plays a significant role in translation asymmetries. Critically, most of the studies concerning translation mediated by words' meaning rely on the performance of bilinguals with high language proficiency level and support the predictions of the RHM. In particular, the initial reliance on L1 which facilitates access to L2 words' meaning produces an asymmetry in a type of "interlinguistic association". At the lexical level, the links from L2 to L1 are expected to be stronger than the links in the opposite direction. In addition, the translation direction asymmetry suggested by Kroll and Stewart (1994) proposes that the lexical-level links found during primary stages of language learning may persist even when bilinguals become fluent in the L2 and therefore influence their translation performance (Tokowich, & Kroll, 2001).

Furthermore, in terms of the role of bilingual memory, the RHM assumes that memory is involved in different ways depending on the direction of translation, resulting in different ways of language processing: semantic in L1-L2 and lexical in L2-L1. In other words, L1-L2 should be influenced more by semantic manipulations and L2-L1 by lexical ones (Kroll & Stewart, 1994; Kroll, Van Hell, Tokowich, & Green 2010).

One study which supports the above argument and investigated the role of translation direction in bilingual memory was conducted by Sholl, Sankaranarayanan, and Kroll, (1995) where they attempted to examine the connection between picture naming and translation with a sample of English-Spanish bilinguals. Participants initially named pictures and then translated the lexical units in their LI and L2. In the translation task, there were words which were displayed in written form which had been presented previously in the picture naming task. The results of the study showed that even if the picture naming triggered correct transfer of information related to the objects displayed in forward translation (L1-L2), it did not trigger any transfer in backward translation (L2-L1). These findings indicate that connections in bilingual memory are not symmetric and that the speakers have to mediate conceptually in translation from L1 to L2 and lexically in translation from L2 to L1.

In summary, a number of early studies provided evidence in support of the RHM, showing that reaction time and accuracy in forward translation was slower compared to that of backward translation (Sholl, Sankaranarayanan, and Kroll,, 1995; Kroll and Stewart, 1994)

1.2. Criticism of the RHM

In terms of the criticism expressed against the particular model mainly by Brysbaert and Duyck (2010), it was suggested that there is not clear evidence that there are separate lexicons for each language and that access to linguistic units takes place

selectively. Furthermore, the inclusion of "lexical links" between translation equivalents may block word recognition.

More specifically, there is a broader view reported by the scientific community which proposes that the process of translation ought to be described using a connectionist model with lexical and semantic routes, with the emphasis relying on how much each direction influences the overall linguistic processing. In particular, in such a model, the connection weights between a word and its meaning in L1 and L2 may be different according to the word's features. It is supposed that these connections are stronger for words that are similar at a morphological level (cognates) (Duyck & Brysbaert, 2004). Furthermore, Duyck and Brysbaert (2010) suggested a revised RHM which preserves the overall structure of the former model but allows the occurrence of semantic effects on the processing of L2. Regarding translation direction, there is no distinction among the two routes in terms of which of the two is faster than the other. However, it is suggested that one of two directions may have stronger links which in turn affect the levels of memory involvement. In the process of translation, there is a semantic association between the two translations which affects the activation and importance provided to the words' meaning.

The element that has been identified as being the most challenging regarding the RHM derives from studies in translation that demonstrate that translation in both directions seems to be mediated by the meaning of words. According to the RHM, the L1 has access to semantics more directly than the L2 and consequently forward translation's mediation through the words' meaning is more reliable than backward translation' mediation. Nonetheless, in translation studies, it has been found that under certain conditions there are consistent effects of semantic variables on backward

translation, findings which are not in accordance with the suggestions of the RHM (Kroll & De Groot, 1997; Kroll & Tokowicz, 2001; Kroll & Tokowicz, 2005).

Additionally, one more criticism regarding the RHM is that the comprehension of the meaning of words in the L2 does not essentially necessitate mediation through the L1. There is a study by La Heij, Kerling, and Van der Velden (1996) with opposing findings to the RHM's suggestions using a group of Dutch-English bilinguals similar to that of Kroll and Stewart (1994), where there was no evidence that there was a difference across the two directions of translation when the word to be translated was preceded by a visual stimulus such as a picture. The necessity to semantically mediate backward translation should be at its highest when the bilingual is not very skillful in the L2. As bilinguals become more proficient in the L2, the RHM predicts that the two directions of translation become more analogous. Consequently, would not be unexpected to find that both translation directions are influenced by semantics in bilinguals with high proficiency levels (Kroll et al., 2002). Also, In a study by Segalowitz and Hulstijn, (2005) which was conducted after the publication of the RHM, it was found that in a categorization task it was likely for even less skillful L2 students to comprehend the connotations of L2 words without needing to mediate through the L1 (Kroll, Van Hell, Tokowich & Green, 2010).

Additionally, in the study by De Groot, Dannenburg, and Van Hell, (1994), the participants who were Dutch-English unbalanced bilinguals had to translate a list of words in both translation directions. In the study, the researchers included the predictor variables of familiarity, availability of context and accuracy. The results of the study showed that meaning played a more important role in forward than in backward translation. Nonetheless, the findings of the first experiment of the study displayed an asymmetry effect related to the direction of translation only when the stimuli were

abstract and non-cognates. In the second experiment, the asymmetry was present with the performance of the participants in forward translation to be faster, a finding which opposed to that of the RHM. However, it should be noted the differences between the two translation directions in the second experiment were small.

Duyck and Brysbaert (2004, 2008) reported that number magnitude effects, supposed to mirror semantic processing, are detected in number translation regardless of the direction even when bilinguals learn number words in the L2. However, in the study by the Kroll and Stewart (1994) comparatively proficient Dutch–English bilinguals displayed differential semantic effects in both directions of translation. Although, these findings appear to be contradictory, there is an explanation according to which the stimuli in the Kroll and Stewart's (1994) study were of lower frequency than the stimuli in the study conducted by Duyck and Brysbaert (2004, 2008). Other studies have likewise revealed that even very skillful bilinguals have the tendency to need longer time to translate the words in forward than in backward direction once the stimuli to be translated are difficult like abstract words which are not cognates (Van Hell & De Groot, 2008). According to Kroll and Tokowicz (2005), the processing of a stimulus may be influenced by the effects of language proficiency so that bilingual speakers regardless of their proficiency level may meet different challenges in the processing of stimuli which in turn depend on the characteristics of the stimuli and the framework of the trial. Indicating that semantic processing is likely for the L2 does not mean that the RHM is disproved. The model does not claim that L2 has not the ability to access meaning in general, but that the links are less strong for L2 than for L1 and that the asymmetry that is produced influences language processing.

1.3. *The contributions of the RHM*

Even the opponents of the RHM such as Brysbaert & Duyck (2010) have recognized that the RHM has significant contributions to the understanding of translation processes in bilingual speakers. In terms of the first contribution of the model, it is considered that the RHM has divided lexical and conceptual representations into different levels. In particular, the model projected that whenever a task includes the morphological aspect of the words, it would offer evidence associated with the distinct representations of them at a lexical level. On the contrary, if a task employes the meaning of words, the RHM reveals that words share a link at a structural level. The RHM was the first to suggest that there are implications associated with the fact that there are common as well as different representations concerning language processing by individuals who are bilingual.

In the RHM, the two kinds of connections are active, but with dissimilar intensities for the two languages. In particularl, according to the RHM, the links between the lexicon of the first language and the conceptual store are stronger than the connections of the lexicon of the second language to the conceptual store. On the contrary, the word to word link from the L2 to L1 is stronger than that of the opposite direction. The reason why this occurs is that L2 vocabulary is typically acquired by the link of the words with their translations (Brysbaert & Duyck, 2010).

In terms of the second contribution of the RHM, Krollet al. (2010) have opposed to the claim that access to language is selective as Brysbaert and Duyck (2010)

have claimed about the model's structure. On the contrary, they suggest that there is evidence which reveals that word access is not selective according to the RHM. The evidence behind this claim has been drawn from visual and spoken word recognition experiments as well as from spoken word production ones which confirm the parallel activity of the two languages. According to Kroll et al. (2010), selective access cannot take place even if contextual cues ease selective access and this principle is particularly significant in the formulation of models concerning language processing.

In terms of the asymmetries associated with the processing of the two languages by bilingual speakers, according to the RHM, the L1 is more likely to involve the semantic element in a more direct manner than the L2 and consequently translation procedures from the L1 to L2 may be "conceptually mediated" more consistently than translation in the opposite direction. This implies that the two translation directions are processed differently by unbalanced bilinguals with forward translation to need more time and effort to be accomplished. However, there is a series of studies using a translation production task which have revealed that under certain conditions there are consistent effects related to the semantic variables regarding translating procedures from L2 to L1 that may show that the principles of the RHM are not met (Van Hell & De Groot, 1998; De Groot, Dannenburg, & Van Hell, 1994).

Hence, both translation directions can be influenced by semantics in bilinguals with high proficiency levels. The contribution of proficiency level is vastly associated with the next contribution of the RHM related to the impact of the developmental stage of the bilingual in the L2 in the way language is used. The developmental stage is used in the sense of the improvement of the proficiency level of the bilinguals, a process which has a significant contribution to the way language is used. As translation involves language processing, proficiency levels influence translation as well. According to the

Multilink, a connectionist model developed by Dijkstra and Rekké (2010), it seems that it is important to take into consideration the developmental part of the RHM in translation focusing on the level of proficiency that the speakers have in the two languages as a determining variable in translation investigation (Basnight-Brown, 2014). However, the translation asymmetry as it was suggested earlier may be present even when bilinguals have high levels of L2 proficiency but not to the same extent as when bilinguals have basic to intermediate levels of L2 proficiency. This suggestion was confirmed in the translation experiment conducted by Tokowich andKroll (2001) which indicated that their participants even if they had high language proficiency levels in L2, they displayed the translation asymmetry. A reason why language proficiency plays a role in translation asymmetries between backward and forward translation is the fact that the bilingual has direct access to meaning in the L1 but in L2 the meaning of the word is found through mediation of the L1 until the bilingual reaches a level of L2 proficiency which helps them to have direct access to the word's meaning (Kroll, Van Hell, Tokowich & Green, 2010).

However, even if differences in proficiency level play a role in translation asymmetries, the word type effect appears to be more influential in bilinguals with different levels of language proficiency. In a study conducted by De Groot and Poot (1995), twenty participants who were separated into three groups with different levels of language proficiency in L2 translated from L1 (Dutch) to L2 (English) one set of words and another one from L2 (English) to L1 (Dutch). The word type variables which were examined were word imageability, frequency and the cognate status of the lexical stimuli. The findings of the study showed that all three variables affected translation, indicating that the language proficiency differences among the three groups did not involve conceptual memory. Furthermore, the results of the study showed that

conceptual memory was found to be involved in both translation directions in the same way. Additionally, the findings suggested that after the primary states of acquiring the L2 and becoming fluent in it, concept mediation processes are universal in translation tasks.

1.4.   *The translation recognition task in the investigation of translation*

Kroll & Steward and De Groot, Dannenburg, & Van Hell (1994) investigated the effect of translation direction using a translation production task. Nonetheless, there are studies which have examined the impact of translation direction using a translation recognition task (De Groot, 1992; De Groot & Comjis, 1995; De Groot & Hoeks, 1995).

In the study conducted by De Groot (1992), three experiments took place with the aim to find any factors which could affect the performance of the participants in three different types of a translation task. In the first experiment there was the typical translation task and a cued-translation one where participants were displayed a cue of a potential translation like the initial letter of the word to be translated. In the second one, participants took part in a translation-recognition task. In the first two experiments, word frequency as well as imageability were manipulated and according to the results of the experiment it was found that both variables had an impact on the performance of the participants in all three tasks. In the last experiment, there was a translation production task where word frequency, imageability, context availability, cognate status, accuracy, word length of both words involved in each pair and word familiarity

were examined. The findings of the experiment showed that only word frequency, cognate status, and context availability had a significant effect on the performance of the participants.

In the study conducted by De Groot and Comjis (1995), a translation-recognition task was used with each trial displaying a word pair, a lexical stimulus in L1 and after the first stimulus disappeared, a lexical stimulus in L2. The participants had to judge if the words within each pair were translation equivalents. The results of the task were compared with those of the translation production task where participants had to articulate the translation of the stimulus displayed on a screen. The participants in the two experiments were Dutch-English bilingual students whose age was above 18 years. The findings of the two experiments suggested that both tasks have the potential to respond to similar manipulations regarding the investigation of the translation process in unbalanced bilinguals. Accordingly, Kroll, Van Hell, Tokowich and Green (2010) have suggested that although the RHM was formed to explain translation production processes, it can also be used in the investigation of translation recognition processes because of the parallel activation of the two languages during both tasks which involve normal translation and translation recognition. More specifically, studies concerning lexical access in speakers of two languages which do not have similar scripts or ways of articulation indicate that the parallel activation of the two languages is a universal characteristic of lexical access in normal translation and recognition as well (Kim & Davis, 2003; Thierry & Wu, 2007).

In the experiment conducted by De Groot and Hoeks (1995), the link between language proficiency in L2 as well as lexical and semantic organization was examined. They tested a group of unbalanced trilingual speakers of Dutch, English and French. Dutch was the mother tongue of the participants (L1) and English (L2) a more dominant

language than French (L3). The aim of the study was to examine the developmental hypothesis which supports that in the L1 there is a word association structure which weakens in the L2 that becomes weaker in the L3 like French in this case. Similarly, the concept-mediation structure for the L1 and the L2 is more dominant. The L2 is English in this case. In this study, participants had to perform a translation production task and a translation recognition task. The participants translated from L1 (Dutch), to L2 (English) and from L1 (Dutch) to L3 (French). The concreteness status of the stimuli was the main variable which was tested. The hypothesis of the study was that the existence of a concreteness effect would indicate that conceptual memory is involved in the translation process supporting the concept-mediation hypothesis while the absence of the concreteness effect suggests the word association one. The findings of the study showed that there was a concreteness effect in the translation production task from L1 to L2 but not from L1 to L3, confirming the developmental hypothesis according to which language proficiency influences the way lexical and semantic organization takes place in translation by unbalanced multilingual speakers. Therefore, the translation recognition task can show the differences in the performance of the participants which are associated with *the concreteness status* of the lexical units, a variable which will be manipulated in the present study as well using the above task.

A model that has been put forward to explain the processes that take place during word recognition but can be applied in translation recognition as well is the *Bilingual Interactive Activation+ Model* (BIA+) This model has been proposed by Brysbaert and Duyck (2010) as a more suitable one for the exploration of translation processes instead of the RHM. More specifically, the model, like the RHM, supports that the lexical access in translation recognition by unbalanced bilinguals is non-selective but examines the bilinguals' word recognition in sentences where contextual

information is present. The BIA+ model consists of a localist-connectionist model which represents the word recognition process in unbalanced bilinguals with high proficiency levels in the L2 and in monolingual speakers as well. In the BIA+ model's theoretical structure, phonological and conceptual representations are included but its main application is associated with word recognition that is the reason why it is confined in the investigation of translation recognition and not translation production (Dijkstra & van Heuven, 2002).

For this reason, a third model has been formed which combines the RHM and the BIA+ model. This is the *Multilink Model* suggested by Rekké and Dijkstra (year). The model is a localist-connectionist model which has the potential to implement the translation processes which are shown both in early and highly skilled bilinguals. However, as word translation involves elements of word recognition, meaning extraction, and lexical production, the Multilink model is a more authentic model of simpler and elementary cognitive processes. Multilink's basic theoretical structure involves both features of RHM and BIA+. In particular, from BIA+ it borrows basic assumptions regarding Interactive Activation, the ability to distinguish among representations associated with the orthography, phonology, semantics, and language membership as well as the existence of a task / decision system. From the RHM, the model borrows the premises that the L1 and L2 lexicons may be different in magnitude and that the associations between word morphology and semantic representations may not be similar for the two languages. More specifically, the Multilink model suggests that the activation spreading along these associations depends on how frequent a word is and on how skillful the bilingual is in the L2. Additionally, Multilink allows an assessment of the existence of word association links between the L1 and the L2 which facilitate word processing, an element suggested by the RHM model, as well as of links

between lexical units with different morphology but the same modality which may inhibit the processing of words, an element suggested by the BIA+ model (Dijkstra & Rekké, 2010).

2. Concreteness status of the lexical items

There is a general distinction between word types according to their concreteness status. The phenomenon according to which concrete units are more easily acknowledged and remembered is known as the *concreteness effect* of words (De Groot, 1992; Caramelli,

Setti, & Maurizzi, 2004; Danguecan & Buchanan, 2016). By definition, concreteness consists of a quality which measures the potential of the word's meaning to become tangible (Kroll & Merves, 1986; Dove, 2015). Therefore, words are distinguished in two types according to their concreteness status, in concrete and abstract. Concrete units normally refer to thoughts that are spatially defined and materially perceptible (e.g., *bed, dog, sandwich*), while abstract units (e.g., *courage, serenity, hope*) normally are associated with notions involving social, event-related, and thoughtful material (Barsalou & Wiemer-Hastings, 2005; Borghi & Cimatti, 2009). A significant body of empirical studies shows considerable cognitive differences in the processing of abstract and concrete words. Moreover, it has been found that concrete concepts need less time to be processed than abstract ones (Caramelli, Setti, & Maurizzi, 2004), they are more easily recalled, and language referring to concrete versus abstract concepts is more easily processed (De Groot, 1992). Also, individuals respond more rapidly to concrete as opposed to abstract judgments in meaning and honesty judgment tasks (Singh, Frings & Moeller, 2017).

Moreover, there are various theories and models describing the above effect. For instance, it has been suggested that the meaning of concrete compared to abstract units differs according to the form of sensory experience they represent, the sort of meaning relationships with other words with which the target word co-occurs as the *Qualitatively Different Representational Hypothesis* describes (Crutch and Warrington, 2005), or amount of embodied as opposed to verbal information included, as the theory of *Embodied Abstract Semantics* suggests (Vigliocco et al., 2014). More specifically, in the Different Representational Hypothesis, concrete words are mainly structured according to their similar meaning and characteristics with words which belong to the same category, whereas abstract units are mostly structured according to their meaning

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connections to 'real life' situations. In particular, according to this theory, when abstract units are processed, links which are based on the association of words' meaning with situations are recognized more rapidly than the links which are based on the similarity of their meaning with other entities (Crutch et al., 2009). In terms of the theory of Embodied Abstract Semantics, concrete and abstract units consist of embodied and sensorimotor language elements. Furthermore, the theory assumes that concrete units consist of predominantly sensorimotor material whereas abstract units consist mainly of affective and linguistic evidence (Kousta et al., 2011).

One more distinction associated with the concreteness status of the words is the categorization of words according to *Object- and Language-Based Models*. In the former case, object-based representations categorize associated words according to the material relationship between their referents, and therefore, they are frequently used in studies encompassing concrete words. In the latter case, language-based representations, indicate that the meaning of a word can be identified according to the amount of contexts in which the word appears (Adelman et al., 2006), the amount of human-generated links, or the amount of ambiguity triggered by the words' meanings (Rodd et al., 2002). The above theories explain why concrete and abstract words are processed differently by the speakers, a condition which has the potential to influence translation as well.

In a study by Hill Korhonen and Bentz (2013), it was tested whether abstract notions are structured according to association, whereas concrete notions according to semantic closeness. It was found that abstract and concrete concepts have different forms of association with other concepts suggesting that concrete concepts are more intensely influenced by the presence of real objects than abstract ones and that the degree of feature-based structure can basically determine the concreteness of the

concepts given. More specifically, the processing of concrete words compared to abstract ones appears to rely on feature knowledge and the presence or not of tangible objects that can be visually observed (Bonner & Price, 2013).

A possible reason why conceptual representations of abstract words are different from those of concrete ones is that the meaning of an abstract word and its translation has the tendency to have less similar semantic characteristics than those of concrete words and their translations. More specifically in the study conducted by Van Hell and De Groot (1998), a word association task was employed with Dutch-English bilinguals who were asked to associate twice nouns and verbs that consisted of concrete, abstract, cognates and non-cognate words once in the language where the word was initially displayed and then in the other language the bilingual spoke. In both situations, the retrieval of an associate was faster in the case of concrete than in that of abstract words and in the case of cognates than in the case of non-cognates, and in nouns than in verbs. These results indicate that the concreteness status influences to a significant extent the way bilingual memory represents the words conceptually. Other factors which influence the conceptual representation in bilingual memory according to the findings of the study are grammatical category and cognate status.

The word-type effect identified in the process of translation has been confirmed by Jin (1990) whose findings showed that there is a consistent priming effect for concrete words which is not found in abstract lexical items. The study included an experiment with Korean-English bilinguals who were shown a prime word in one language for 150 ms, followed by a word or non-word in the other language, a task which required a lexical decision. The findings of the study showed that the priming effect was greater for concrete than for abstract words.

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In a memory experiment with a free recall test, Paivio, Clark and Lambert (1988) showed their participants a number of concrete and abstract lexical items, first in the language that the bilinguals were more familiar with and then in the additional language they knew and asked them CONTINUE. The findings revealed that concrete lexical items had an advantage from cross-language repetition compared to the abstract lexical items. Taking into consideration that free recall consists of word- retrieval where conceptual material is selected, it is suggested that bilingual memory representations may be different for the two word-types (Taha, 2017).

These findings associated with the effect of concreteness status of words are elaborated and justified by two main approaches, the theory of *Dual-Coding* and *Context Availability* (Altarriba, Bauer & Benvenuto, 1999). Nonetheless there are many more theories which explain these phenomena as well, such as theP*perceptual Symbols Systems Theory* and the *Differential Organizational Frameworks Theory*. All these theories provide different explanations regarding the different ways of processing of abstract and concrete words by the speakers.

2.1.   Context-Availability Theory

One theory which recognizes the contribution of contextual information in the exploration of words' meaning is the *Context-Availability Theory* according to which the meaning of a lexical unit relies on the linguistic context where it is found (Turney & Pantel, 2010). The Context-Availability Theory is one of the most significant theories explaining why abstract words are interpreted and processed differently by the

speakers. This finding is associated with the fact that abstract words have the potential to occur in numerous different contexts where they may have different meanings. In this case the knowledge of the context is critical in the correct interpretation of the lexical meaning (Hoffman, Biney & Ralph, 2015).

One more theory which recognizes the role of contextual information in word processing is the *Different representational framework hypothesis* (Crutch & Warrington, 2005) which assumes that the common linguistic context is more significant for abstract notions, while concrete notions are primarily structured by semantic closeness, a condition which suggests that the items share physical characteristics or belong to the same category. The above theories are important to consider for the present study as there was no contextual information available when participants were shown the lexical stimuli on screen, a situation which according to the above theory influences the processing of the two words types and especially abstract words.

In a study by Kroll and Merves (1986), it was found that when concrete lexical units were displayed in isolation, they were processed faster than abstract ones. Similarly according to Paivio (1991) concrete paired associates are more easily recalled than abstract ones. Furthermore, abstract lexical units need more time to be named and remembered with the absence of relevant context while phrases which include lexical units which are abstract are read more slowly (De Groot, 1998). For instance, the processing of concrete words presented in isolation is faster (Schwanenflugel & Shoben, 1983) and concrete words are usually remembered better than abstract paired associates. Moreover, abstract word naming is slower, and recall is impaired when words are presented without a supportive context (Schwanenflugel & Stowe, 1989; Wattenmaker & Shoben, 1987). Likewise, it takes longer to read sentences constructed

by abstract words (De Groot, 1989). Therefore, the absence of a supportive context has the potential to affect the translation recognition of the lexical stimuli that were given in the experiment of the present study and provide explanations regarding the differences in the processing of the two word types.

Furthermore, the difficulties in employing the context of abstract lexical units are assumed to come from the fact that these lexical units have the tendency to emerge in a broader variety of contexts and retain multiple meaning interpretations (Schwanenflugel, 1991). Therefore, it is expected that this factor may lead to slower reaction times in the translation of abstract words. According to the model of semantic memory by Collins and Loftus (1975), the employment of a word's meaning is more difficult if there are different pieces of information associated with that concept (Schwanenflugel, 1991). A supportive context enables to concentrate on precise information when abstract words are employed. Therefore, concrete words do not take advantage of the contextual cues due to the fact that they possess robust and steady central meanings. Therefore, this provides an additional explanation regarding the potential of concrete words to be processed faster than abstract ones (Schwanenflugel & Stowe, 1989). Furthermore, as in the present study there will be no context available when participants will have to recognize the translation pairs involved in the trials, it is expected that this condition will add some further difficulty to the recognition of word pairs which consist of abstract words as opposed to the ones which consist of concrete words.

One more study which shows the importance of context in word processing is that of Breedin, Saffran and Coslett, (1994) according to which the meaning of abstract words is less steady and more reliant on the linguistic context where they emerge than

the meaning of concrete words. Due to this increased reliance on the linguistic context, abstract lexical word meaning may be further language-specific than concrete word (Van Hell, 1998). However, according to Van Hell and De Groot's study (1998), the concreteness status vanished in lexical decision tasks when concrete and abstract lexical units had the same amount of context available indicating that the presence or not of a linguistic context is a critical factor in the processing of the two word types.

2.2.   *Dual-Code Theory*

One more theory which explains why the two word types are processed differently and may affect the reaction times in translation recognition as well is the *Dual-code theory*. According to Paivio's (2006) *Dual coding theory*, there are qualitative differences in the way abstract and concrete words are processed. He proposes that the representations of concrete units as opposed to abstract ones have properties which ease their processing. The researcher assumes that the difficulty to process abstract units comes from an absence of straightforward "sensory referents" that are characteristic for concrete lexical units (Paivio, 1991). The theory accepts two cognitive systems: one focuses on the illustration and processing of non-verbal entities such as fantasy, and the other focuses on verbal material. According to this theory, the differences in the processing of concrete and abstract words originate from object representations which exist only for concrete lexical items. From this perspective, concrete and abstract lexical units have qualitative differences. For instance verbal

semantic material and imagistic material is deposited for concrete words whereas abstract words are related predominately to material deposited in the verbal structure. The processing of concrete lexical units stimulates linguistic semantic material and imagistic material, leading to faster processing. In other words, abstract units' memory representations use 'verbal material' as opposed to concrete units which employ material which is associated with both visual and verbal information (Faust, 2012)

Paivio suggested that verbal, physical as well as perceptual material is represented in distinct stores and that concrete lexical units take advantage from "dual-coding" in both stores, when abstract lexical units are represented exclusively in the verbal one (ibid). However, according to Vigliocco et al., (2014), abstract words are more intensely related to responses associated with valence and feelings, for instance, some abstract lexical units are more closely connected to spatial and progressive relationships (Troche, Crutch, & Reilly, 2014). Therefore, it is indicated that abstract lexical units have the tendency to retain less elaborate semantic representations than concrete ones and the representations of concrete and abstract lexical units are related to distinct connection to perceptual, motor, verbal and emotional neural structures. Hence, this may lead to different reaction times in the processing of the two word types (Kousta et al., 2011). Furthermore, there is early evidence from neuropsychological studies which supports the dual-code interpretation concerning the processing of concrete vs. abstract lexical units. For instance, some patients with brain damage seem to display selective deficits concerning the use of certain classes of words (Coltheart, 1987).

2.3. *Perceptual symbol systems theory*

One more theory which supports the contribution of the sensory experience in the processing of the two word types is the *Perceptual symbol systems theory*. In particular, the sensory experience has been proposed by Basalou (1999) as influencing to a significant extent the meaning of concrete and abstract words as well as the processing of the two word types. According to the *Perceptual symbol systems theory* concrete words are more intensely associated with sensory experience than abstract ones and as Misse and Funte (2014) argue, concrete words and notions have the potential to be effortlessly inferred from sensory stimuli. For instance, the meaning of the word *cake* is related to diverse sensory experiences such as its taste and shape. On the contrary, the connotation of an abstract word such as *truth* is not linked to any sensory qualities, and consequently it is challenging to envisage. Hence, with the aim to define an abstract lexical unit, it is needed to employ additional abstract concepts, and the contexts and conditions that are related to that lexical item.

Additionally, it is supported that concrete notions are closely associated with the sensory-motor system, while abstract ones are based on concrete concepts which are found in the same linguistic context with them. Therefore, the efficient

interpretation of abstract units is based on the concrete units which are found in the same phrase or sentence (Hill, Korhonen, & Bentz, 2014).

2.4. Different organizational frameworks theory

One more theory related to word types which provides explanations why abstract and concrete are processed differently is the *Different Organizational Frameworks* (DOF) theory which suggests that there is a qualitative inconsistency between the illustration of concrete and abstract units within memory. Concrete notions are mainly structured according to semantic similarity with tangible entities while abstract notions are predominantly structured by their link to other notions. Findings which support this suggestion have been commonly received from populations with neuropsychological disorders and, to a lesser extent, from healthy populations. In a study by Ferré, Guasch, García-Chico, & Sánchez-Casas (2015), the different organizational frameworks theory was examined by employing, a semantic priming paradigm either within the same language or across two different languages. The findings of the study showed that there was priming for concrete words in every trial of the study. Nonetheless, with abstract words, priming was detected when sets and targets were related suggesting that there are differences in the way the two word types were processed by the participants.

However, later studies conducted with healthy populations have called into question the DOF theory. Zhang, Han and Bi (2013) employed a paradigm where

Chinese–English bilinguals were asked to translate pairs of words with associated meaning as well as words with unrelated meaning from Chinese to English. Researchers found what Kroll and Stewart (1994) did, that is, words in the associated sets were translated more slowly than words that were not related. Furthermore, the interference in concrete pairs was limited to those which had similar meaning when the two sorts of relations (similar meaning and association) triggered the same amount of interference in the pairs of words which were abstract. These findings suggest that there are various factors which have the potential to influence the processing of the two word types but still, even when language processing is influenced by other factors, the processing of the two word types differs (Zhang et al., 2013).

2.5.   *Neuropsychological studies*

Further evidence regarding the differences in the processing of concrete and abstract words comes from neuropsychological studies. More specifically, there are instances of brain damage where either abstract or concrete concepts appear to be weaker than their opposites and therefore, it is revealed a sort of asymmetry concerning the processing of concrete vs. abstract units (Tyler, Moss, & Jennings, 1995). Additionally, trials encompassing Functional Magnetic Resonance Imaging (fMRI) associate overlapping but partially separate neural structures with the processing of the two word types confirming that they are processed differently (Wilson et al.,, 2013).

Moreover, structural variations between abstract and concrete notions in Event Related Pontential studies have been described indicating that the two word types activate different cerebral regions (Adorni & Proverbio, 2012).

According to Kounios and Holcomb (1994) patients with damage in the left hemisphere display a differential availability of concrete lexical units as opposed to abstract ones. Furthermore, there are instances of brain damage where either abstract or concrete words appear to be more difficult to process, a finding which shows that the processing of the two word types is directly related to brain function (Tyler, Moss, & Jennings, 1995).

In a Positron Emission Tomography (PET) study, Damasio et al. (1996) showed that concrete words are processed mainly by left hemisphere areas which are associated with language use indicating that the left posterior inferior temporal area and adjacent fusiform gyrus are stimulated when spelling nouns with concrete meaning (Bookheimer et al., 1995). Another PET study by Beauregard et al. (1997)found that there was a clear section of stimulation in the right inferior frontal gyrus when the participants had to read abstract words. In the same study the right hemisphere stimulation was found only for the reading of abstract words and not for concrete ones. The above findings depict that the processing of the two word types requires the activation of different brain areas.

In an fMRI study by Kielh et al. (1999), it was revealed that the cortical brain units in the right hemisphere display greater stimulation in the processing of abstract lexical stimuli compared to concrete ones during lexical decision tasks. More specifically, the findings of the study suggested that the frontal portion of the right superior temporal gyrus is more stimulated during the acknowledgement of abstract lexical stimuli as opposed to concrete ones indicating that the processing of abstract

words is not as fast and accurate as that of concrete ones because it needs more widespread semantic processing. Therefore, the findings of the study suggest that the activation of the right superior temporal gyrus is required for the recognition of abstract words.

In one more study by Fliessbach, Weis, and Klaver (2006) using the fMRI technique, the processing of abstract and concrete words was investigated in terms of the notion that concrete units are in general more effortlessly remembered than abstract ones. The study relied on the two theories of context-availability and dual-coding which support this view. Twenty-one healthy individuals between the age of 19-43 took part in the study. Participants performed on a recognition memory task with the use of fMRI and their brain stimulation was recorded. The stimuli employed were abstract and concrete units, chosen and recognized as belonging to the most frequent German words. The findings showed that the activated areas in the brain were more when the participants had to process concrete stimuli as opposed to abstract ones, a finding which shows that the two word types are processed differently by the speakers' brain.

One more fMRI study by Pexman et al. (2007) investigated the levels of cortical stimulation between concrete and abstract units during a task which included semantic classification. In particular, participants had to decide whether the lexical stimuli represented a food or a drink. According to the study's findings abstract units triggered more widespread cortical stimulation than concrete units, and this was attributed to the potential of the specific task to fully stimulate abstract word representations. According to studies in embodied cognition by Barsalou and Wiemer-Hastings (2005), it has been acknowledged that abstract words are richer and more intricate than concrete ones.

According to Katja Wiemer-Hastings and Xu (2005), abstract concepts are linked to peripheral concepts rather than to internal properties. As these concepts differ extensively across different situations, their characteristics are not specific, they are associated with personal experiences, interpersonal interactions and circumstances. Conversely, concrete concepts embody distinct items with individual characteristics, utilities, portions, activities and associations with other items. These features of the two word types provide one more explanation regarding the fact that the speakers process differently the two word types (Barsalou & Wiemer-Hastings, 2005).

2.6. The concreteness effect in translation

In terms of the concreteness effect in translation, in the experiments described by De Groot, Dannenburg and Van Hell (1994) and Van Hell and De Groot (1998), it was found that translation regardless of its direction was influenced by the concreteness status of the words too. The element that is more challenging regarding the evaluation of the RHM derives from students who are not very skillful in the L2. According to De Groot and Poot (1997), L2 students may produce concreteness effects in backward translation, opposing to the predictions of the RHM. If concreteness is considered as being a variable associated with the words' meaning, then the discovery of concreteness effects in translation regardless of its direction appears to challenge the assertions of the RHM. According to De Groot, Dannenburg and Van Hell (1994) translation in the two directions can be affected by the concreteness status of the lexical units. Critically,

the vast majority of scientific evidence shows that translation which is conceptually mediated and relies on the performance of bilinguals with high proficiency levels in both languages is absolutely consistent with the estimates of the RHM. Nonetheless, there may be a necessity to mediate more in backward translation at lexical level when the L2 is comparatively weak. When bilinguals reach higher levels of proficiency in the L2, the RHM shows that bilingual speaker have more similar performance in forward and backward translations (Kroll et al., 2002).

Another study which examined the concreteness effect in translation was conducted by Laxen and Lavaur (2010). The initial aims of the study were not the assessment of the impact of the concreteness status of the lexical stimuli in translation but the investigation of the impact of multiple translations of a lexical unit in translation. of the participants were French-English bilingual speakers. The study employed three translation experiments with a translation recognition task where participants had to choose whether each word pair involved translation equivalents or not. In the first experiment, lexical stimuli with a single translation were recognized more quickly than words with more than one translation. Moreover, when lexical stimuli were displayed with their dominant translation, they were recognized faster than when the stimuli displayed a translation which was not dominant. In the second experiment, the same results were yielded for both forward translation (L1-L2) and backward translation (L2-L1) direction. In the third experiment, the manipulation focused on the number-of-translations and meaning relation between the translations of the stimuli. The results showed that when the translation of a lexical stimulus had a semantic relation, then the translation recognition was faster than in words which involved different translations which were not semantically related. In terms of the impact of the concreteness status

of the lexical stimuli, in the first experiment, it was found that there was a concreteness effect. In the second experiment it was found that there was a concreteness effect only in forward translation direction (L1– L2), a condition the RHM predicts as well. In particular, the RHM suggests that there should be a concreteness effect for forward translation (L1–L2) as this direction of translation is conceptually mediated. Moreover, the findings concerning forward translation (L1–L2) are confirmed by Tokowicz and Kroll (2007), regarding the fact that concrete and abstract words with a single translation are recognized with the same speed, but when words involve multiple translations, concrete words are recognized faster than abstract ones. Furthermore, it is worth mentioning that the findings of the study revealed that translation recognition was faster in forward translation direction (L1–L2) than in backward translation (L2–L1), a finding which is opposed to RHM predictions.

3. Language representation in bilingual memory

One significant mental function which contributes to the processing of words is memory. In particular, bilingual memory appears to function in a very complicated way while it is affected by the characteristics of the lexical units such as their concreteness status and in turn affects language processing such as translation as well.

The storage and processing of the meaning of words encompasses a significantly complex network of brain areas associated with memory function (Hoffman, Biney & Ralph, 2015). The way word meaning of the L1 and the L2 is stored in the memory of bilinguals is a subject of controversy. However, there are two theories which explain how this takes place. One of them is the *Language-independent theory* according to which words have common representations with their translations at a

semantic and conceptual level and the other theory is the Language dependent one, according to which there is a distinct lexicon for the languages a bilingual user speaks indicating that the L1 and the L2 have different lexicons. According to this view, every word has different conceptual representations from its translation equivalent. Furthermore, meaning is organized according to word type, which suggests that abstract and concrete words are stored in a different way (Van Hell & De Groot, 1998).

One study which shows the impact of the concreteness effect in memory function is that of Basnight-Brown and Altarriba (2015) who investigated the way bilingual memory operates in the translation of concrete, abstract and emotional stimuli. The aim of the study was to investigate how multiple translations can be incorporated into bilingual memory representation. The results of the study concerning the impact of concrete and abstract words in multiple translations regardless of their direction, showed that there is a concreteness effect in the translation of words in both words with a single translation and with more than one translation indicating that word type affects memory function in translation as well.

All different elements in the meaning of abstract and concrete lexical items across different languages may lead to different memory conceptual representations of individuals who speak more than one language. Abstract words may have less common semantic features than concrete ones and, therefore, retain less semantic elements which are common to their translations (De Groot, 1989). In particular, according to the Localist view, concrete words may have more common conceptual representations with their translations than abstract ones. On the other side, according to the *Distributed* view, concrete words may have in common more extensive parts of conceptual representations with their translations. This phenomenon depicts that abstract and

concrete words are processed and stored differently in the memory of bilingual speakers (Plaut & Shallice,1993).

In a study by Harad and Coch, (2009), it was examined whether the concreteness effect plays a role in the processing of words as well as in the ability to remember them. In the study, healthy adults participated in an experiment which included abstract and concrete words. It must be noted that half of the words for every type were old and the other half were new. The study used memory tasks which included press button responses. The findings revealed that concrete words were easier to recall than abstract ones. This occurs because concrete words possess more meaning-based features than abstract words, a fact that leads to the different amount of effort when processing the two word types.

4. Purpose and Research Hypothesis of the Present Study

The gap in the already existing bibliography is that to our knowledge there is no recent study which has investigated both the effect of translation direction and concreteness status of the stimuli using a translation recognition task. There is only one study using a translation production task with a sample of Greek-English unbalanced bilinguals but with no clear findings in terms of the effect of concreteness status of the lexical stimuli which was found to be minimal (Hatzidaki, 2002). Specifically, it was found that L2-L1 translation direction was faster than L1-L2 direction but the effect of the semantic variable of concreteness was not significant in either translation direction.

Therefore, the aim of the present study is to revisit early research in a pair of languages not used before in the context of the current research question.. Moreover, it would be informative to investigate the translation performance of Greek-English unbalanced bilinguals as Greek and English are two languages which are very different in terms of the transparency of the orthography of lexical units. Greek is

considered a more transparent language than English meaning that in Greek there is a correspondence between phonemes and graphemes whereas in English there is not, a condition which affects the articulation and spelling of words as well as the speed of reading (De Leon Rodriguez et al. 2016; Protopappas & Vlahou, 2009). Thus, the present study investigated whether the RHM applies to the translation recognition of abstract and concrete words in Greek- English unbalanced bilinguals and tested whether the criticism that calls into question the reliability and validity of the model is reasonable (Brysbaert & Duyck, 2010). The research questions of the study were the following:

1. What is the role of translation direction in translation recognition of Greek and English words?

2. What is the role of the concreteness effect in translation recognition from L1 to L2 and from L2 toL1?

3. How translation direction and concreteness together affect the process of translation recognition?

The hypotheses of the study are based on the RHM suggested by Kroll and Steward (1994) according to which there are translation asymmetries when bilinguals translate words from one language to another. According to the RHM, there is slower translation performance in forward translation (L1-L2) compared to backward translation (L2-L1) due to an asymmetry in the kind of memory involved in the two translation directions, a condition which suggests different effects because of the kind of processing taking place. That is, the processing is primarily conceptual in L1-L2 and lexical in L2-L1. The L1 is assumed to have an advantaged access to meaning, while

the L2 is assumed to be more likely mediated by L1 translation. Additionally, it has been suggested by Kroll et al. (2010) that although the RHM has been formed to describe translation production tasks, it can be used to investigate translation recognition tasks as well.

For this reason, the predictions of the study are that the backward translation (L2-L1) condition where stimuli will be displayed with the English word preceding the Greek one will be performed faster than the forward translation (L1-L2) condition where the Greek word will precede the English one. Also, concrete word pairs are expected to be processed (recognized as translation equivalents) faster than abstract word pairs (the concreteness effect). Additionally, it is expected that there will be an interaction of the concreteness status of the words with translation direction. In other words, it is expected that word pairs with abstract words will need more time to be responded to in L1-L2 translation direction than the trials with word pairs which consist of concrete words. If the findings of the study confirm the predictions, then there will be one more argument in favor of the assumptions of the RHM according to which there are asymmetries in translation of unbalanced bilinguals which give a processing advantage to backward translation because of differential implication of lexical vs. semantic memory in that translation direction. Furthermore, it will be demonstrated that translation direction and concreteness status are two variables which interact and affect each other in the process of translation recognition by unbalanced bilinguals.

5. Method

In the present study, one experiment took place which included a *translation recognition task* where participants had to recognize if the word pairs displayed consisted of translation pairs or not. The variables that were manipulated in the experiment were the concreteness status of the lexical stimuli and translation direction. Prior to the experimental phase of the study, participants had to fill in and sign a consent form and then questionnaires were distributed. The questionnaires aimed at documenting the *demographic characteristics* of the participants as well as their language status, including questions about their age, the years of classes they had received in the L2, the age of their first exposure to the L2, the level of their language proficiency, certificates they had received in L2, and the amount of interaction in the L2 in their everyday life.

5.1. Participants

The participants were 9 Greek-English unbalanced bilingual speakers, all male students who were recruited from Euelpidon Military School in Athens with mean age 21 years (SD = .5). All participants at the time of the experiment were students of English and they were preparing for the C2 examination of Michigan State University (MSU). Furthermore, according to the questionnaire that was distributed to the participants to record their language status, the mean years of English classes they had received in their lifetime was 7 (SD = 1.3) while the mean age of first exposure was 9 years (SD = 1.3). All participants' level of proficiency was above B2 and they all had received a B2 certificate of language proficiency in English according to the *Common European Framework for Languages* (CEFR). More specifically, two of the nine participants had received the ESB B2 certificate, one of them had received the Cambridge University B2 certificate, two of the participants had received the Michigan University B2 certificate and four of them, the PTE-Edexcel B2 certificate. In terms of their everyday interaction with the English language except the classes they were attending once a week for two hours, two of the participants reported that they were interacting in the L2 through the internet, movies and music, one reported through the internet, movies and series, one through movies and music, two participants through movies, music, series, and TV, while one through TV, movies, PC, gaming. Finally, two of them reported that they were interacting in the L2 rarely in their everyday life. The selection criteria of the participants were their level of proficiency in English and the fact that they had to be around the same age. The exclusion criteria were any known neuropsychological disorder as well as vision problems that could affect the results of the experiment.

5.2.   *Materials*

Each stimulus list consisted of 48 word pairs. Overall, out of all the stimuli, 24 word pairs were concrete (Mean= 536, SD=26.6) and 24 were abstract (Mean= 326, SD=44.4). The stimuli were 24 translation pairs (positive test material) and 24 non-translation pairs (negative test material) with 12 abstract and 12 concrete word pairs in each group of translation and non-translation pairs. Of the 12 abstract word pairs in each group of translation, 6 were translation pairs and 6 were not translation pairs; the same occurred in the 12 concrete words involved in each translation group. Furthermore, the first 24 of the translation pairs were presented in forward translation (L1-L2) with the first word of each pair which appeared on the screen to be in Greek (L1) and the second word which appeared on the screen after an interval of 1000 ms to be in English (L2). Similarly, the next 24 word pairs were presented in backward translation (L2-L1) with the first word of each pair which appeared on the screen to be in English (L2) and the second word which appeared on the screen after an interval of 1000 ms to be in Greek (L1).

Therefore, there were 48 trials in total, with each participant completing all of the trials. The lexical stimuli were only nouns with the English word length to be of two syllables. The stimuli were of high familiarity (Mean= 576, SD=45.5) and not cognate words as cognates are expected to be translated faster due to their similarity with their translation equivalents (Coltheart, 1981) and therefore could affect the results of the experiment. The English words were taken from the MRC Psycholinguistic Database and were translated into Greek. It was assumed that the concreteness status of

the English words would be similar for their translation equivalents in Greek. Additionally, another reason why the Greek words were translated from the English ones is that there is available database with concreteness ratings in Greek. The lexical items in the negative pairs were all different from the words in the positive pairs of the experiment.

5.3. Procedure

The *Testable Minds* online platform was used (www.testable.org) for the stimulus presentation and the recording of the reaction times. Participants were presented with written instructions on a computer screen in English before the forward translation trials and Greek instructions before the backward translation trials together with oral instructions. Participants were told they would be shown word pairs, comprised of a Greek and an English word or an English and a Greek word, and that they had to decide as quickly as possible whether the words within a pair were translations of each other. If the trial represented a translation pair, participants had to press the key A and if the words within a pair were not translation equivalent they had to press L.

In the backward translation direction the Greek word constantly preceded the English one with an interval of 1000 ms. In forward translation direction the demonstration order was reversed. At the beginning of the experiment, there were two practice trials for the forward translation direction (L1-L2) and after the completion of the first 24 trials in this direction of translation, there were further instructions in Greek, two practice trials in backward translation (L2-L1) and then the 24 trials in backward

translation followed. Before every trial, a fixation was displayed. The order of display of the stimuli was the same for the first three participants and then it was changed for the other five participants in order to ensure that there is not any pattern of the display of the stimuli created. The duration between the appearance of the second stimulus of each word pair and the moment the response key was pressed was recorded as reaction time (RT). The experiment had aduration of approximately 15 minutes per session.

6. Results

6.1. General analysis

A type of pair (translation vs. non-translation) x word type (concrete vs. abstract) x translation direction (L1-L2 vs. L2-L1) analysis of variance (ANOVA) was conducted for errors and RTs. The design was within participants and between items. The results of the error analysis did not yield any significant main effect neither for participant nor for items, hence we report the means for participants. The mean error for translation vs. non-translation word pairs was 1.3 vs. .8, respectively; for concrete vs. abstract words was 1.1 vs. 1.0, respectively; and for L1-L2 vs. L2-L1 translation direction was 1.1 for both. No interaction was significant either.

The results of RT analysis yielded a significant main effect of type of pair, with translation pairs being recognized faster than non-translation pairs (M = 705 ms vs. M = 852 ms, respectively); and a significant main effect of word type, with concrete words being recognized faster than abstract words (M = 706 ms vs. M = 850 ms, respectively). The main effect of translation direction was not significant. No interaction was significant either.

6.2. *Main analysis*

A word type (concrete vs. abstract) x translation direction (L1-L2 vs. L2-L1) analysis of variance (ANOVA) was conducted for errors and RTs. The design was within participants and between items.

The results of the error analysis did not yield any significant main effect neither by participants nor by items, hence we report the means for participants. The mean error for concrete vs. abstract translation pairs was 1.3 for both, and for L1-L2 vs. L2-L1 translation direction was 1.4 vs. 1.3, respectively. The interaction was not significant either.

Due to an incorrect entry, one pair of items had to be excluded from the analyses. Also, out of 423 responses, there were 77 errors (22.2%). For the analysis of reaction time, responses shorter than 300 ms and longer than 1600 ms were excluded as outliers (28; 8.1%). This yielded 346 correct responses for analysis. Two kinds of analyses were conducted: a general one that also considered responses to non-translation pairs, and a more specific one (main analysis) that focused on translation pairs. RT results are reported only for correct responses.

The results of the analyses both by participants and by items were similar, hence we report the means for the participants. The mean RT in forward translation direction (L1-L2) was 732 ms while the mean RT in backward translation direction (L2-L1) was 677 ms. The difference of 193 ms between the mean RT for concrete vs. abstract word pairs was statistically significant: 608 ms vs. 801 ms, respectively, showing that translation pairs of concrete words were recognized faster than those of abstract words.

7. Discussion

The results of the experiment showed that the concreteness status of the words of the word pairs used in the experiment had a significant effect on the performance of the participants, whereas the translation direction did not, even though participants were slightly faster in backward translation direction (L2-L1) than in forward translation direction (L1-L2). These findings go against the claims of RHM according to which backward translation is translated faster than forward translation because greater implication of lexical memory in that translation direction. More specifically, the present findings challenge the findings of the third experiment of Kroll and Stewart (1994) according to which there were asymmetries in translation performance of the participants who needed consistently less time to translate from L2 to L1 than from the L1 to L2 semantically related or randomized lists of words.

Another aspect the present study's findings challenge is the claim of Tokowich and Kroll, (2001) that even if participants have a high language proficiency level in L2, they display a translation asymmetry as well. In the present study the language proficiency level was not high but intermediate, showing that even unbalanced bilinguals with intermediate levels of language proficiency may not display the asymmetry suggested by RHM.

Furthermore, in the study conducted by Van Hell and De Groot (2008), it was found that backward translation was performed faster than forward translation suggesting that even very skillful bilinguals need more time to translate words in forward than in backward direction if the stimuli to be translated are abstract, non-cognate words which suggests that the two variables of translation direction and concreteness status interact in the performance of unbalanced bilinguals in translation. This finding was not confirmed by the results of the present study.

A study the present study's findings partly agree with is that conducted by De Groot, Dannenburg andVan Hell (1994) according to which reaction time in forward translation was faster compared to backward translation only in some cases. More specifically, the findings showed that the differences in reaction time was not present in the first experiment but only when the stimuli were abstract ones and non-cognates. Nonetheless, in the second experiment, it was found that there was an asymmetry in translation with forward translation (L1-L2) being faster than the backward one (L2-L1). However, the differences in RT in the two translation directions were small. In the present study, the difference in reaction time were small and not statistically significant but in the same direction as that of Kroll and Stewart (1994). In terms of the results of the study regarding the effect of the concreteness status of the lexical units, it was found that there was a concreteness effect in both translation directions, a finding which agrees with the present study's findings regarding the effect of the concreteness status of the lexical stimuli in translation.

Furthermore, the study conducted by De Groot and Comjis (1995), where a translation-recognition task was employed together with a translation production task, found that both tasks responded to similar manipulations regarding word imageability, context availability, accuracy, familiarity but not translation direction. That is, the

results of that study showed that all the above variables, including imageability, had an impact on both tasks, a finding which agrees with the present study' finding in terms of the concreteness effect found.

In another study conducted by De Groot and Poot (1995), the findings of the study showed that word type variables such as word imageability affected translation, with the performance of the participants being faster on words that were easy to imagine like concrete ones than on those words that were difficult to imagine like abstract ones. This finding partly confirms the results of the present study regarding the concreteness effect. In this study the variable of translation direction was not examined.

The findings of the present study also partly agree with the results of the first two experiments conducted by De Groot (1992) where a normal-translation task, a cued-translation task, and a translation recognition task were used. In two experiments word imageability had an effect on translation, with words that were easy to imagine like concrete ones being translated faster than those that were not easy to imagine like abstract ones. However, in the last experiment which involved a translation production task, word imageability alone did not have an effect. In the above study translation direction was not tested.

The present study partly agrees with the findings of De Groot and Hoeks (1995) with a sample of unbalanced trilingual speakers of Dutch (L1), English (L2) and French (L3). As mentioned earlier, participants had to perform a translation production task and a translation recognition task. The concreteness status of the stimuli was the main variable which was manipulated. The findings of the study showed that there was a concreteness effect in the translation production tasks from L1 to L2 but not from L1 to L3, indicating that language proficiency influences the translation processes

performed by unbalanced multilingual speakers. The developmental hypothesis of the study cannot be confirmed by the findings of the present study as the participants had the same language proficiency level as the participants of the current study which was an intermediate level and were bilingual speakers and not trilingual. However, it is worth mentioning that in both trilingual and bilingual speakers, the concreteness status of the lexical stimuli had an effect with concrete words being recognized or translated faster than abstract ones.

Similarly, the findings of the present study regarding the concreteness effect go along those of Basnight-Brown and Altarriba (2015) who examined the way bilingual memory operates in the translation of concrete, abstract and emotional words. The findings of that study regarding the impact of concrete and abstract words on both single and multiple translations showed that there is a concreteness effect in the translation of words in both words with a single translation and with more than one translation. Also, in the study conducted by Van Hell and De Groot (1998), it was found that the concreteness status of the lexical units had an effect on the translation with concrete ones being translated faster than abstract ones, a finding which agrees with the results of the present study. In both the above studies, the variable of translation direction was not studied.

In the study conducted by Zhang, et al. (2013), researchers used Chinese–English bilinguals who were asked to translate pairs of words with associated meaning as well as words with unrelated meaning from Chinese to English. The researchers found that words in the associated sets were translated more slowly than words that were not related. Moreover, the interference in concrete pairs was limited to those which had similar meaning when the two kinds of relations (similar meaning and association) triggered the same amount of interference in the pairs of words which were

abstract. These findings are partly related to the present study's findings as the concreteness status appeared to influence only the condition where the words were related. In the present study, the word pairs which were not translation pairs were not semantically related in order to avoid confusing the participants with the semantic meaning of the words and consequently lead to false responses. In this study translation direction was not examined.

The results of the present study also replicate those of Laxen and Lavaur (2010) regarding the concreteness effect on translation . More specifically, in the first experiment of the study where participants had to recognize whether the word pairs were translation equivalents or not, the concreteness effect was present. In the second experiment it was found that there was a concreteness effect only in forward translation direction (L1– L2), a condition which indicates that the translation direction and the concreteness status interact but it was not confirmed by the present study.

7.1.   *Limitations of the Study and Implications for Future Research*

In terms of the limitations of the study, the participant sample that took part in the experiment was small and the lexical items that were used in the experiment were few, two conditions that may not allow the results of the present study to be generalized as well as draw safe conclusions about the impact of translation direction and concreteness status in the translation recognition of word pairs by unbalanced bilingual speakers. Furthermore, one more limitation is that the order of the stimuli was the same for the first three participants and then it was changed for the other six participants

when it should have been different for all the participants in order to ensure that there is not any pattern created that may ease translation recognition. Additionally, the experiment did not take place in a laboratory but during the English class of the participants.

However, a valid online platform for experiments was used called *Testable Minds* and developed by Dr Constantine Rezlescu the English lexical units were controlled for their familiarity using the online MRC Psycholinguistics database created for experimental purposes. In addition, it was ensured that there was a numerical balance in the lexical stimuli displayed with the number of concrete word pairs being equal with the number of abstract word pairs, the number of translation pairs being equal with the number of non-translation pairs, and the number of items involved in forward translation (L1-L2) being the same in number with those involved in backward translation (L2-L1). Moreover, in terms of the participants used, it was taken care that all participants would have the same age, language status and educational background, that is the Euelpidon Military School in Athens.

In terms of the implications of the present study for future research, the current findings can strengthen the arguments for the impact of the concreteness status of the lexical units on the performance of unbalanced bilinguals in translation but as far as the direction of translation is concerned, more studies are needed to confirm that the direction of translation, and hence conceptual and lexical memory, does not have a significant effect on the performance of unbalanced bilinguals in translation. Therefore, it is suggested that more studies take place with more stimuli, a larger sample of Greek-English bilinguals, which was part of the novelty of this study, so that the results of the present study can be more easily generalized in future studies.

8. Conclusion

The present study aimed at examining the effects of concreteness status and translation direction of the lexical stimuli in translation using a translation recognition task where word pairs where displayed to Greek-English unbalanced bilinguals who had to identify whether these pairs consisted of translation equivalents or not. The findings of the study showed that words pairs of concrete words were recognized faster than translation pairs of abstract words. These findings agree with the findings of the vast majority of the studies which examine the variable of concreteness status and imageability (De Groot, Dannenburg, & Van Hell, 1994; De Groot & Comjis, 1995; De Groot, 1992; De Groot & Hoeks, 1995; Basnight-Brown & Altarriba, 2015; Van Hell & De Groot, 1998). Hence the fact that the present study replicated a finding reported bya big number of studies that have used either a translation production task or a translation recognition task leads to a safe conclusion regarding the impact of concreteness on translation performed by unbalanced fluent bilinguals.

However, translation direction was not found to have an effect or be influenced by the type of words used, which clashes with several studies that have showed that backward translation (L2-L1) is performed faster (e.g., Kroll & Stewart, 1994; Tokowich, & Kroll, 2001) than forward translation (L1-L2). However, it should be noted that in the study conducted by De Groot, Dannenburg, and Van Hell (1994) the differences in RT between the two directions of translation were absent or opposite to

the findings of Kroll and Stewart (1994) and partly in accordance with the findings of the present study regarding the possible absence of differential implication of conceptual and lexical memory in translation.

Additionally, the above fact as well as the fact that in the present study, the findings showed that word pairs in backward translation (L2-L1) were recognized faster than in forward translation (L1-L2) but the difference in RT was not significant suggests that this variable should be investigated further in future studies in order to obtain more evidence regarding the effect of translation direction on the performance of unbalanced bilinguals and more specifically bilinguals who speak Greek and English.

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Appendix I

Questionnaire:

The questionnaire aims to record the language status of the participant

1. What is your age?

2. How many years of classes have you received in English so far?

3. What was the age of your first exposure to English?

4. What is the level of your language proficiency in English? Which certificates have you received in English?

5. How much do you interact in English in your everyday life?

Appendix II

Consent form

In this study, there will be presented 48 trials of translation pairs, you will be asked to judge whether the word pairs consist of a translation pair or not. All information you provide will remain confidential and will not be associated with your name. If for any reason during this study you do not feel comfortable, you may leave the experiment. Your participation in this study will require approximately 15 minutes. When this study is complete you will be provided with the results of the experiment if you request them, and you will be free to ask any questions. If you have any further questions concerning this study please feel free to contact us through phone or email: 6939880188 or el.irene@hotmail.com. Please indicate with your signature on the space below that you understand your rights and agree to participate in the experiment.

Your participation is solicited, yet strictly voluntary. All information will be kept confidential and your name will not be associated with any research findings.

_____   _____

_____

        Signature of Participant   Eleftheriou Eirini