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# TRANSLATION PRIMING IN MALAY-ARABIC BILINGUALS

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## Abstract

It is argued that in the bilingual's the first (L1) and second (L2) language, even proficient individuals rely on the information stored in the L1 lexicon. Thus, translation priming effects are found from L1-L2 but not necessarily from L2-L1. The valence of the word however could be encoded at an early stage of L2 acquisition and thus could have an effect onword activation and thus translation priming. The aim of this study is therefore to investigate translation priming in Malay-Arabic bilinguals and to investigate the effects of valence on these translations. A total of 68 participants with Malay as L1 and Arabic as L2, ranging from 19–24 years of age (M= 20.79 ± 1.51 years) were recruited. The priming paradigm was used in four language conditions L1–L1, L2–L2, L2–L1, and L1–L2.For each of the four language conditions, these reflect the factors, prime exposure (masked/overt), prime type (control, repetition and translation), and target valence (neutral, positive, negative). In L1-L2 conditions translation priming was found at a preconscious and conscious level when the target was neutral, positive or negative in valence. In the L2-L1 condition translation priming was only evident in positive and negative targets. In positive targets masked and overt priming effects were found, however for negative targets effects were only found when overt priming was used. This opens the door for further research in these phenomena.

**Keywords:**

Bilingual; Malay language; Arabic language; Priming; Translation; Visual Recognition; Valence Evaluation

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**Introduction:**

When dealing with bilinguals, the question of how the first language (L1) and the second language (L2) interact with each other is fundamental. Word recognition and how words are mapped in terms of L1 and L2 are integral in understanding bilinguals (De Groot and Kroll, 2014). One way to examine this issue is to use the translation priming paradigm.

A typical priming experiment is where two words are presented successively. The first word is referred to as the prime and the second as the target. This is typically done with the prime displayed in lowercase letters and the target presented in uppercase letters to ensure that they are processed as two individual items and not simply as the target being an extension of the prime. This is however a challenge in Arabic as there are no upper- and lower-case letters albeit priming effects have been achieved in previous research (Tahir, 2018). The presentation of the prime facilitates, inhibits, or has no effect on the reaction to the target. These reactions are generally measured in terms of response times (RTs), accuracy of the task or both.

The standard visual priming display involves a series of meaningless characters (e.g., #####) for a period of 500ms, immediately followed by the prime, which in turn is immediately followed by the target. A standard duration for the target is about 500ms, whereas the presentation of the prime word can vary. At more than 60ms most people will be aware that a prime word has preceded the target (overt priming). But at durations of less than 50ms the meaningless characters and target will act as forward and backward visual masks, respectively, and most individuals will be unaware of the prime word (masked priming). Albeit the prime can still have an impact on the response to the target, depending on what features it shares with the target. When there is masked priming, this demonstrates that the shared features are processed independently of the conscious attention processes or what is termed subliminal priming (Elgendi et al., 2018; Forster & Davis, 1984; Castle et al, 2003; Kouider&Dehaene, 2007).

Priming has been used to carry out investigations in word recognition and processing in many types of relationships that result in positive priming effects. These include form priming, where prime-target share common letters/sounds (e.g., cat – COT); repetition priming the same word repeated (e.g., cat – CAT) associative priming, where the prime-target have a strong associative connection (e.g., table – CHAIR); emotion (affect) priming, where the prime - target share the same emotional valence (e.g., good - HAPPY), and translation priming, where the prime - target are translation equivalents across languages (e.g., good - BON). This present study is interested in the effects of both covert (preconscious/subliminal) and overt cross-language translation priming in Malay-Arabic bilinguals.

Numerous research has shown that priming effects are obtained in the direction of L1 to L2 (forward priming), in which an L2 target word is responded to faster when preceded by its translation (e.g., chair—kursi) than by an unrelated L1 word e.g., chair – garfu (fork) (Basnight-Brown and Altarriba, 2007; Lupker et al., 2015). This effect has been robust and found not only between similar script pairs (e.g., Dutch-English, Spanish-English, and Spanish-Catalan), but also between different script pairs (e.g., Chinese-English, Japanese-English, and Korean-English), suggesting that the L1-L2 translation priming effect should occur irrespective of orthographic similarities between two languages (see Wen and van Heuven, 2017). Moreover, the forward priming effect is observed in conditions using masked priming (Wen and van Heuven, 2017). This result suggests that the forward priming effect is a product of automatic language processing and is not a strategic effect.

In contrast to these findings, a backward translation priming effect (L2 prime-L1 target, backward priming) tends to be very weak or even absent especially for the different-script non-cognate translation equivalents. Non-cognates are word translations with different word forms and phonological properties in the two languages (for example the English word fork and the Malay word garfu). Cognates on the other hand are similar in orthographic form and phonological properties in the two languages (example, book in English and buku in Malay). Cognates could be explained through form priming since they share form properties (Davis, et. al., 2003). Therefore, studies using cognates have found translation priming both ways L1-L2 and L2-L1. It has however only been found in L1-L2 for non cognates (Davis, et. al., 2003). Priming between languages in terms of non cognates is asymmetrical (Duñabeitia et al., 2010). The present study will use cognates in the same language and noncognatesin cross-language word pairs as items.

Gollan et al., (1997) were of the first researchers to test asymmetry between two different script languages in the masked priming paradigm. This study was conducted with Hebrew–English bilinguals using a lexical decision task,using both cognates and non cognates. With regards to noncognates, strong translation priming effects from L1 to L2 were found, but no significant effects from L2 to L1. They also demonstrated preconscious processing of non-Romanized characters using masked repetition priming with Hebrew. The results of Hebrew repetition priming are significant for the present study in that Hebrew and Arabic are both Semitic languages. In the case of Hebrew whether it was L1 or L2 it had a smaller priming effect in the masked repeated condition. It was concluded by the author that this could be due to it being a Semitic language and therefore processed differently in the masked paradigm. With regards to Arabic specifically masked repetition priming effects are only obtained under certain conditions which require the root word to be uncompromised and the participants to ne highly familiar with the script (Perea et al., 2011). It will therefore be essential to look at Arabic in terms of overt priming to overcome this limitation which may not yield repetition effects in the masked paradigm.The findings of non-cognate translation pairs, which refer to words that share the same meanings but do not share orthographical or phonological similarity (Finkbeiner et al., 2004; Wang and Forster, 2015) will be interesting. The asymmetry in the priming effects between forward and backward directions provides useful insight for the development of bilingual word recognition models. It is also noteworthy that asymmetry occurs robustly in unbalanced bilinguals (Finkbeiner et al., 2004). For balanced bilinguals who are fluent in both languages, the asymmetry has been found to decrease or even to disappear completely (Perea et al., 2011; Duñabeitia et al., 2010). In a recent review paper, Wen and van Heuven (2017) conducted a meta-analysis of 64 masked priming lexical decision experiments to evaluate effect sizes of the forward and backward translation priming effects in bilinguals. They found that effect size was significantly larger for forward than for backward priming.

Contradictory to the L1- L2 priming asymmetry Basnight-Brown and Altarriba (2007) reported findings with no asymmetry in a study conducted with highly proficient Spanish- English bilinguals. They found equal translation in both the L1-L2 as well as the L2-L1 direction. One model that could explain these symmetry and asymmetry effects is the revised hierarchical model

The revised hierarchical model (RHM) proposed by Kroll and Stewart, (1994) (Figure 1) proposes, a separate lexical representation for each language with a common concept store. The lexical store for L1 which is the dominant language is bigger than the lexical store for L2. It proposed that there are links between the two lexicons which vary in strength and the links between the two lexicons and the concept store which also vary in strength. The link from the L2 lexicon to the L1 lexicon is stronger (depicted by a solid line in the diagram) than the link from L1 to L2 (depicted by a dashed line in the diagram). The link from the L1 lexicon to the concept store is also stronger (also depicted by a solid line in the diagram) than the link between the L2 representations to the concept store (also depicted by a dashed line in the diagram). These weak links become stronger as L2 proficiency increases.

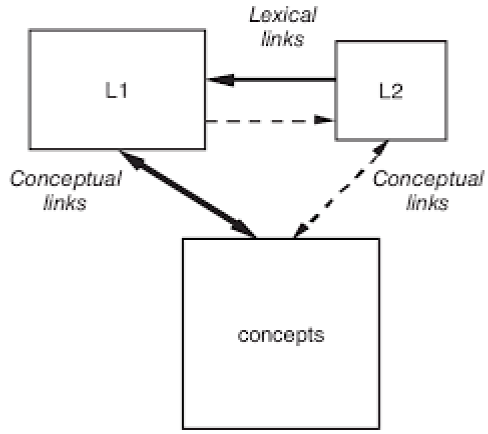


Figure 1 The revised hierarchical model (RHM) adapted from Kroll and Stewart, (1994)

Therefore, based on this model when a less proficient bilingual is presented with a word in L2, to get to the meaning of the word, its equivalent in L1 will be activated which will then provide the concept. As the bilingual becomes more proficient the words in L2 start to automatically retrieve concepts without the facilitation of L1. Furthermore, there is the possibility since both lexicons becomes strongly connected the L1 could also retrieve certain concepts via L2 (Kroll &Tokowicz, 2005). Even though it is thought that once L2 becomes highly proficient then it will not rely on L1 any longer to get to concept representation. Recent findings have suggested that even when L2 usage is very proficient it still relies on the link via L1 at times to facilitate concept retrieval (Kroll et al., 2010).

It can be speculated that since valence information is integral to survival the link between L2 and concepts for valence information will be established quite early in acquisition. As proficiency increases other concept information will be retrieved via L2. As the individual becomes highly proficient both the emotional concept as well as the other concepts of the word will be retrieved equally. It can also be speculated that since bilinguals recall emotion words better than neutral words (Anooshen& Hertel, 1994) and there is a preference for positive stimuli (Baumeister, et. Al., 2007), positive valence concepts will be strongly linked with the L2 lexical store. Since this research is interested in translation priming, the initial onset of the word which is has emotional value may assist translation.

Wentura and Rothermund, (2003) explain that the emotional evaluation process is handled by the affective vigilance system. The lexical retrieval aspect of word processing takes place in the object field. The response system is where the response task (word naming) is carried out according to a schema. The properties (pronunciation, phonological information) required by the task is handled by the supervisory system. The target filed is where the instructions of naming the target only and not the prime is given (in overt priming)or the uppercase letters in masked priming. If the prime and the target are highly congruent in valence, then a simple evaluation of positive or negative would be forwarded to the response system.

A prime can be viewed as a facilitator to the target when they are related and matched in terms of congruency. Thus, seeing the prime facilitates the response to the target. The prime could also be seen as a distracter, which is the stance Wentura and Rothermund (2003) take on valence words in the word naming task. The prime whether is it presented masked or overt must be processed. The target also must be processed. If both words are congruent in valence and related in the lexical store, then the valence system will evaluate both as the same. The lexical system will also evaluate the word as being related or a close match and both will be assessed as matching the response requirement. The prime and the target will therefore both be plausible response items. These evaluation systems need a form of asymmetry to inhibit the response to the prime in favor of the target. This asymmetry can be either in the valance system or the object field so that when the match/mismatch field compares the two it can inhibit the prime and attend to the target only.

To investigate the connection between the two lexicons, repetition priming (L1 – L1, L2 – L2) and well as translation priming (L1 –L2, L2 – L1) will be carried out. These repetition and translation prime target pairs will also be based on neutral, positive and negative valence words. It is therefore expected that repetition priming will be observed in both the masked and the overt conditions of L1 but only in the overt condition for L2(considering the limitations for Arabic). Translation priming will occur in the L1 – L2 condition but due to asymmetry at the lexical level it might not be observed in the L2 – L1 condition.

## Methodology

### *Participants Recruitment*

A total of 68 participants (i.e., 58 females and 10 males), ranging from 19–24 years of age (M = 20.79 ± 1.51 years) were recruited from the AHAS Kulliyah (Faculty) of Islamic Revealed Knowledge and Human Sciences at the International Islamic University of Malaysia (IIUM). They were all born and raised in Malaysia, their native language ( L1) was Malay and none of them resided for any period in an Arab country. They all started learning Arabic as second language (L2) between the ages of 9 and 11 ($M_{\text{age of acquisition}}$: 10.21 ± 0.48 years) and have been studying it for 8 to 14 years ($M_{\text{years of exposure}}$: 10.59 ± 1.54 years). The faculty they were recruited from used Arabic as the medium of instruction. Proficiency for Arabic was therefore based on the scores of their entrance test to get into the faculty which required a minimum score of 8 overall which is equivalent to the scoring system of the international English language testing system (IELTS) in English.

### *Materials*

A demographic questionnaire was formulated requesting gender, age, languages used, and which order they were acquired, age of acquisition, location of acquisition and percentage of daily usage and their score on their entrance proficiency test. Stimulus items were originally based on a third language, English, and included 96 emotionally neutral, 96 positive affect, and 96 negative affect words, which were selected based on the valence rating from affective norms for English words (ANEW) (Bradley & Lang, 1999) and were matched for frequency ($M$: 420.83), concreteness (M: 293.3), number of syllables (M:2), and familiarity (M: 529) (Kucera & Francis, 1967; Brown, 1984) using the MRC Psycholinguistic Database (Coltheart, 1981).

The English words were then translated to Malay and Arabic through native speakers of each language. An affect word in English will translate into an affect word in the other two languages, and similarly for non- affect words, however the four item variables (frequency, concreteness, number of syllables, and familiarity) might not show the same correspondence from language to language since a low frequency word in English might have a translation equivalent in Malay with a higher relative frequency.

### *Experimental Design*

Priming experiments were constructed, each consisting of prime/target pairs which were presented in the masked and overt conditions respectively. All the words in Malay were prepared in Arial (font size: 10). Priming experiments usually have the prime in lowercase and the target in uppercase, however with regards to the Arabic script there is no distinction between upper and lower case. Therefore, all Arabic primes were prepared in Traditional Arabic (font size: 18), the most familiar to facilitate priming and the target was prepared in Times New Roman (font size: 18). The prime in the masked condition was displayed for 45 milliseconds to ensure that participants were not consciously aware of it. However, in the overt condition the prime was displayed for 500 milliseconds to enable conscious processing of it.

These experiments were varied by alternating the language used for both prime/target in the following order: $Malay_{L1}$/ $Malay_{L1}$ ($M_{L1}/M_{L1}$), $Arabic_{L2}$ ($A_{L2}/M_{L1}$), $M_{L1}/A_{L2}$, and $A_{L2}/A_{L2}$. Within each of these four language conditions a Latin-square design was used to allow each item to appear in all conditions without each participant seeing a specific target more than once. This resulted in six participant groups, with each group exposed to all four language conditions. They were also grouped across language conditions so that the participants viewing version one of $M_{L1}/M_{L1}$ viewed version two of $A_{L2}/M_{L1}$, version three of $M_{L1}/A_{L2}$ version four of $A_{L2}/A_{L2}$. Eight prime-target items were created for each of the conditions.

Eight items in each of the conditions described in the Table 1 below were presented. For each of the four language conditions, these reflect the factors, prime exposure (masked/overt), prime type (repetition/translation, control), and target valence (neutral, positive, negative) (see Table 1). In the different-emotional priming condition, the words even though different, were matched for valence (congruent). The primes/targets displayed in the masked condition were also not repeated in the overt condition while repetition of items was controlled for by use of Latin-square design.

**Table 1:** Examples for the prime target relationship and target valence (neutral, positive, and negative) in the masked and overt conditions

| **Prime** | | **Target Valence** | | |
|---|---|---|---|---|
| **Exposure** | **Prime Type** | **Neutral** | **Positive** | **Negative** |
| Masked | | | | |
| | Different-Neutral(Control) | tree-CAR | goat-BLISS | tree-HATE |
| | Same(Repetition/TranslationPriming) | car-CAR | bliss-BLISS | hate-HATE |
| Overt | | | | |
| | Different-Neutral (Control) | tree-BED | nail-JOY | tree-HATE |
| | Same (Repetition/Translation Priming) | bed-BED | joy-JOY | hate-HATE |

*2.4. Procedure*

The experiments were presented electronically using the E-Prime 3.0 software (Psychology Software Tools, Pittsburgh, PA), Each participant was placed in an individual cubical in front of a respective computer. Participants were then presented with an information sheet describing the experiment in English. They were then given the option of asking for clarification in Malay if needed. Informed consent was taken. As the informed consent form was presented in English, each question was once again explained in Malay if clarification was required.

The experiment was displayed on a white screen background with the stimuli displayed in black. Each experiment was presented in four phases with the items in phase two and four in scramble blocks across conditions. The first phase was a masked practice phase consisting of eight items which were not part of the actual experiment. At the beginning of this phase the participants were presented on the computer screen with the following instructions:

"*A series of hashes (#'s) will appear on the screen followed by a word in UPPERCASE, you have to name this word as quickly as possible. The following items are for practice. Please be as quick as you can but also try to be as accurate as you can*".

The instructions were varied for the $A_{L2}/A_{L2}$ condition by stating that after the hashes(#'s) there will be a word in Arabic (presented in Times New Roman, font size: 18). They thenhad to press the space bar to begin. The trial would start with a fixation cross ("+" sign) in the center of the screen immediately followed by the mask (#######) for 500 milliseconds thereafter the prime for 45 milliseconds then the target was displayed until a verbal response was given or until the latency for the display of the target which was set to 1500 milliseconds ran out. If the time ran out and a response was not triggered an error message would be displayed and pressing the space bar would proceed to the next item. This response was triggered via a microphone and response times (RTs) were recorded in milliseconds. After the eight practice items there was a pause requiring the participants to press the space bar to proceed to phase two which was the masked priming condition.

Concluding the masked priming condition, a new set of instructions were displayed on the screen which introduced block three, the eight practice items for the overt condition. The instructions were as follows:

"*A series of hashes (#'s) will appear on the screen, but this time they will be immediately followed by a word in lower-case letters which in turn is followed by a word in UPPER-CASE. Again, you have to name this UPPER-CASE word as quickly as possible. The following items are for practice. Please be as quick as you can, but also try to be as accurate as you can*".

The instructions were varied for the $A_{L2}/A_{L2}$ condition by stating that after the hashes (#'s) there will be a word in Arabic presented in Traditional Arabic (font size: 18) followed by a word presented in Times New Roman (font size: 18). Again, name the one in Times New Roman (font size: 18). Once again, the trial started with a fixation cross ("+" sign) in the centre of the screen immediately followed by the mask (#######) for 500 milliseconds thereafter the prime for 500 milliseconds then the target was displayed until a verbal response was given or until the word display time ran out. Thereafter it transitioned into phase four the actual overt experiment which was organised the same way as the masked experiment.

With regards to the language conditions the experiments were presented two at a time with the option for a break in between. It was therefore $M_{L1}/M_{L1}$, $A_{L2}/M_{L1}$, the option of a break and thereafter $M_{L1}/A_{L2}$, $A_{L2}/A_{L2}$ which were varied according to the group versions mentioned before. The participants took approximately 45 minutes to complete the entire set of experiments.

## Results

The four language conditions were each analysed separately. The first analyses focus on congruent prime-target language pairs, involving repetition priming. L1 (Malay) will be first, followed by L2 (Arabic). After which incongruent prime-target pairs will be analysed, involving translation priming. L1 (Malay) targets first, followed by L2 (Arabic) targets. Each set of analyses will focus on the prime exposure (masked and overt) by prime type (control, repetition/translation) factors, foreach level of target type (neutral, positive, and negative). These are all within-groups factors. The 6 versions of theexperiments (group factor) were used as between group factors for controlling individualdifferences. However, these results will not be reported. Tukey's honesty significantdifference (HSD) was used where required to interpret the interactions.

*Malay*$_{L1}$*/Malay*$_{L1}$*(M*$_{L1}$*/M*$_{L1}$*)*

Referring to the data in Table 2, repeated measures analysis of variance (rmANOVA) was used to analyse the data with simple orthogonal contrasts then used to identify the status of repetition priming.

For $M_{L1}/M_{L1}$ neutral target, the control/repetition contrast revealed that repetition primes result in faster RTs than control primes (31 milliseconds), where F (1,58) = 27.0, $p< 0.001$, $\eta^2 = 0.32$. Although both masked (19 milliseconds) and overt (43 milliseconds) priming effects are significant (HSD = 17), a significant interaction suggests that priming under overt conditions is larger than under masked conditions, where F (1, 58) = 8.66, $p = 0.005$, $\eta^2 = 0.13$.

**Table 2:** Mean response times (RTs) for each $M_{L1}/M_{L1}$level of targets type, as a function of prime type by prime exposure, with priming effects in parentheses

| Target Type | Prime Exposure | Control | Repetition |
|---|---|---|---|
| **Neutral** | | | |
| | Masked | 586 | 567 (+19) |
| | Overt | 561 | 518 (+43) |
| **Positive** | | | |
| | Masked | 586 | 565 (+20) |
| | Overt | 548 | 514 (+34) |
| **Negative** | | | |
| | Masked | 578 | 560 (+18) |
| | Overt | 557 | 504 (+53) |

The response times (RTs) is in milliseconds

As for$M_{L1}/M_{L1}$positive targets,based on Table 2, the control/repetition contrast again revealed a significant repetition priming effect (27 milliseconds), where F (1, 58) = 30.93, $p< 0.001$, $\eta^2 = 0.35$. Unlike the neutral targets, the magnitude of this effect appeared to be consistent across both levels of Prime Exposure, with no significant interaction, where F(1,58) = 2.1 ,$p = 0.16$, $\eta^2 = 0.34$.

Finally, regarding $M_{L1}/M_{L1}$negative targets, based on Table 2 the control/repetition contrast revealed that repetition primes result in faster RTs than control primes (36 milliseconds), where $F(1,58) = 75.0$, $p<0.001$, $\eta^2 = 0.56$. Although both masked (18 milliseconds) and overt (53 milliseconds) priming effects are significant (HSD = 11), a significant interaction suggests that priming under overt conditions is larger than under masked conditions, where $F(1,58) = 10.36$, $p = 0.002$, $\eta^2 = 0.15$.

In summary, there is a consistent positive repetition priming effect across all three target types, with a larger priming effect in cases of overt exposure for neutral and negative targets

*Arabic$_{L2}$/Arabic$_{L2}$($A_{L2}/A_{L2}$)*

Referring to Table 3, a rmANOVA was used to analyse the data with simple orthogonal contrasts then used to identify the status of repetition priming.

For $A_{L2}/A_{L2}$ neutral target, the control/repetition contrast revealed that repetition primes result in faster RTs than control primes (positive priming), where $F(1, 53) = 6.85$, $p = 0.01$, $\eta^2 = 0.11$. Priming under the masked condition was not significant whereas priming under the overt (63 milliseconds) condition was significant, where $F(1, 53) = 20.24$, $p< 0.001$, $\eta^2 = 0.28$. There was no significant interaction with prime exposure (F<1).

**Table 3:** Mean response times (RTs) for each $A_{L2}/A_{L2}$ level of targets type, as a function of prime type by prime exposure, with priming effects in parentheses

| Target Type | Prime Exposure | Control | Repetition |
|---|---|---|---|
| **Neutral** | | | |
| | Masked | 676 | 688 (-12) |
| | Overt | 644 | 581 (+63) |
| **Positive** | | | |
| | Masked | 656 | 657 (-1) |
| | Overt | 613 | 584 (+29) |
| **Negative** | | | |
| | Masked | 691 | 673 (+18) |
| | Overt | 648 | 605 (+43) |

The response times (RTs) is in milliseconds

As for $A_{L2}/A_{L2}$ positive targets, based on Table 3, the control/repetition contrast revealed that there are no significant repetition priming effects, where $F(1,59) = 2.34$, $p = 0.13$, $\eta^2 = 0.04$. There was also a close to significant interaction with Prime Exposure, where $F(1,59) = 3.40$ ,$p = 0.07$, $\eta^2 = 0.05$. Based on the (HSD=21) repetition priming in the overt condition is significant.

Finally, regarding $A_{L2}/A_{L2}$ negative targets, based on Table 3, the control/repetition contrast revealed that repetition primes result in faster RTs than control primes (positive priming), where $F(1,57) = 12.02$, $p = 0.001$, $\eta^2 = 0.17$. Masked effects (18 milliseconds) were not significant whereas overt (43 milliseconds) priming effects were significant. There is no significant interaction for prime exposure, where $F(1,57) = 1.94$ ,$p = 0.17$, $\eta^2 = 0.03$.

In summary, when a neutral target is used there is positive priming for repetition priming. This effect disappears when a positive target is used. But when a negative target is used there is both masked and overt repetition priming. Whereas L1/L1 showed repetition priming for both masked and overt primes across all three types of targets, for L2/L2 this was true for all overt primes, but only true for masked primes for negative targets.

*Arabic$_{L2}$/Malay$_{L1}$($A_{L2}/M_{L1}$)*

Referring to the data in Table 4, armANOVA was once again used to analyse the data pertaining to translation priming.

For $A_{L2}/M_{L1}$ neutral target, the control/translation contrast revealed no significant translation priming, where $F(1, 57) = 2.59$, $p = 0.113$, $\eta^2 = 0.04$. There was also no significant interaction with prime exposure, where $F(1,57) = 2.44$ ,$p = 0.12$, $\eta^2 =0 .04$.

**Table 4:** Mean response times (RTs) for each $A_{L2}/M_{L1}$ level of targets type, as a function of prime type by prime exposure, with priming effects in parentheses

| Target Type | Prime Exposure | Control | Translation |
|---|---|---|---|
| **Neutral** | | | |
| | Masked | 548 | 547 (+1) |
| | Overt | 546 | 532 (+14) |
| **Positive** | | | |
| | Masked | 550 | 533 (+17) |
| | Overt | 557 | 527 (+30) |
| **Negative** | | | |
| | Masked | 544 | 551 (-7) |

| | | | |
|---|---|---|---|
| | Overt | 538 | 521 (+17) |

The response times (RTs) is in milliseconds

Pertaining $A_{L2}/A_{L2}$ positive targets, based on Table 4, the control/translation contrast revealed that translation primes result in faster RTs than control primes (positive priming), where $F(1,58) = 21.4$, $p<0.001$, $\eta^2 = 0.27$. There was no significant interaction with prime exposure, where $F(1,58) = 3.05$, $p = 0.09$, $\eta^2 = 0.05$.

Finally, regarding $A_{L2}/M_{L1}$ negative targets, based on Table 4, the control/translation contrast revealed no significant effect, where $F(1,58) = 1.2$, $p = 0.27$, $\eta^2 = 0.02$. However, based on HSD=17, translation priming under the overt condition (17 milliseconds) is significant and whereas under the masked condition it is not significant, where $F(1,58) = 9.02$, $p = 0.004$, $\eta^2 = 0.14$.

In summary, priming was only evident for positive and negative targets. For positive targets there weremasked and overt translation priming effects, while for negative targets this was only found in overt priming.

*Malay$_{L1}$/ArabicL2/(M$_{L1}$/A$_{L2}$)*

Referring to the data in Table 5, armANOVA was used to analyse the data pertaining to translation priming.

For $M_{L1}/A_{L2}$ neutral targets, the control/translation contrast revealed that translation primes result in faster RTs than control primes (positive priming), where $F(1,53) = 109.24$, $p<0.001$, $\eta^2 = 0.67$. Although both masked (51ms) and overt (171 milliseconds) priming effects were significant (HSD = 28), a significant interaction suggests that priming under the overt condition was larger than under the masked condition, where $F(1,53) = 28.2$ ,$p<0.001$, $\eta^2 = 0.35$.

**Table 5:** Mean response times (RTs) for each $M_{L1}/A_{L2}$ level of targets type, as a function of prime type by prime exposure, with priming effects in parentheses

| Target Type | Prime Exposure | Control | Repetition |
|---|---|---|---|
| **Neutral** | | | |
| | Masked | 714 | 663 (+51) |
| | Overt | 673 | 502 (+171) |
| **Positive** | | | |
| | Masked | 716 | 664 (+52) |
| | Overt | 653 | 465 (+188) |
| **Negative** | | | |

| | | |
|---|---|---|
| Masked | 746 | 702 (+44) |
| Overt | 705 | 497 (+208) |

The response times (RTs) is in milliseconds

As for positive targets, based on Table 5, the control/translation contrast revealed that translation primes result in faster RTs than control primes (positive priming), where F(1,52) = 195.3, $p$<0.001, $\eta^2$ = 0.8. Although both masked (52 milliseconds) and overt (188 milliseconds) priming effects were significant (HSD = 27), a significant prime exposure interaction suggests that priming under the overt condition is larger than under the masked condition, where F(1,52) = 45.7, $p$<0.001, $\eta^2$ = 0.47.

In term of negative targets, based on Table 5, The control/translation contrast revealed that translation primes result in faster RTs than control primes (positive priming), where F(1,53) = 190.98, $p$<0.001, $\eta^2$ = 0.78. Although both masked (44 milliseconds) and overt (208 milliseconds) priming effects were significant (HSD = 26), a significant interaction suggests that priming under the overt condition is larger than under the masked condition, where F(1,53) = 65.3 ,$p$<0.001, $\eta^2$ = 0.55.

In summary, translation priming was found in all the target conditions as well as in both masked and overt conditions.

**Discussion and conclusion**

The aim of this study was to investigate translation priming across the languages of Malay-Arabic bilinguals with a particular interest in valence words. The models used to investigate the relationship between the bilingual's lexical stores and its relation to a shared concept store was the Revised Hierarchical Model (RHM) (Kroll and Stewart, 1994) and Wentura and Rothermund's, (2003) affective vigilance system.

*Repetition Priming*

In the L1-L1 condition repetition priming occurred in the masked as well as in the overt conditions as expected. These results are in line with previous research that also found these effects (Forster & Davis, 1984). What was also interesting is that the priming effects in the overt condition was consistently greater than the masked priming effects.

When it came to L2-L2, repetition priming was observedin the only in the overt condition for most of the target valences which was predicted in line with the view that Semitic languages have little or no priming effects under the masked condition. Interestingly masked priming was evident for negative emotion prime-target pairs which is contrary to previous research (Perea, et. al., 2011). This indicates that Arabic could be processed at a preconscious lexical level under special circumstances (Tarik, 2018; Perea, et. al., 2011). There is no information to define the special circumstances for this priming and will be valuable future research however it could be speculated that the negative emotion was processed at the preconscious level and therefore aided the processing of the repeated target as the valence was congruent, but the lexical information was only processed for the target therefore causing the asymmetry needed to inhibit the prime. It could also be viewed that serial processing occurred in that valence processing was completed after being presented with the target,thus, the only processes that was still required was the lexical retrieval. Some researchers have argued that in terms of evaluation, at the initial level negative stimuli in the environment are processed more rapidly to avoid threats(Reisch et al., 2020; Dijksterhuis&Aart, 2003) and could therefore have aided the preconscious processing.

*Translation Priming*

In L2-L1 translation priming, due to the asymmetry, no priming was expected. Surprisingly priming effects were found in the positive and negative target conditions. Furthermore, taking into considerationthe special case of Arabic,effects were found in masked as well as overt priming in the positive condition, which was even more interesting.This could indicate that the valence, particularly positive in Arabic are processed at a preconscious level. In the L2 – L1 condition it was speculated that emotional evaluation had contributed to the Arabic prime being processed in the masked condition. There is therefore an underlying factor in both conditions where the Arabic prime was a valence word. These effects could also be explained in terms of Wentura and Rothermund (2003) where in the L2 – L2 condition the congruence was too high in valence and lexicalretrieval. Therefore, there was no opportunity to inhibit the prime thus there was no masked repetition priming. However, in this condition there was asymmetry between languages at the retrieval level but congruence at the emotion level therefore the prime could be inhibited, and the target could be responded to faster.

In the overt condition, both the positive and negative L2 words were processed and facilitated the reaction to the translation equivalent in L1. Asymmetry could have played a factor in terms of Wentura and Rothermund (2003). These observations could also however be explained in terms of the RHM prediction where translation from L2 – L1 is due to a strong direct link between the two lexical stores (Kroll & Steward, 1994). Another surprising aspect of the L2 – L1 condition is that there was no difference in the masked and overt priming conditions which is also the case for the repetition priming in the L1- L1 positive valence condition. Since the only masked priming effect for L2-L1 was positive valence translation priming, it could therefore be stated that emotional preconscious processing of positive words in L2 has the same priming effect as the overt processing of emotion and lexical stimuli (Chaouch-Orozco et al., 2022).

In terms of L1-L2, translation priming occurred in the masked as well as in the overt conditions which was expected and mimicked the effects of the L1-L1 condition. This corroborates previous research on asymmetry which found significant priming effects from L1-L2 (Chaouch-Orozco et al., 2022; Jiang & Forster, 2001). Overt priming effects were consistently greater than masked priming effects. This could also be due to the strong link between L1-L2 lexical stores as well.

In summary both L1-L2 and L2-L1 translations are possible. The valence of the prime also seems to have an effect on priming and may also contribute to whether a word is processed subliminally or not. Further investigation is warranted specifically in the Arabic language with a larger population size.

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