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EMOTION PRIMING IN MALAY-ARABIC BILINGUALS

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Abstract

Intro: It is argued that even though emotion is experienced differently in the bilingual's the first (L1) and second (L2) language as a survival mechanism emotion has to be processed at the onset of word presentation.

Aim: The aim of this study was to investigate emotion evaluation and processing in visual recognition of words across the languages of Malay-Arabic bilinguals.

Method: 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, emotion), and target valence (neutral, positive, negative)

Results: In L1–L1, there is no evidence of emotion priming and emotion priming effects. Moreover, L1–L1 and L2–L2 were near equivalent in a lack of any emotion priming, except for L2–L2 neutral targets under overt conditions, when there was evidence of emotion priming. In L2–L1, the main effect for prime exposure was not significant, except possibly in emotion primes following a negative target. Finally, negative emotion priming was found when targets were

neutral in both the masked and the overt conditions. No emotion priming was found for positive and negative targets.

Conclusion: This study was interested in the valence processing in Malay-Arabic bilinguals. It found that emotions were processed when word were incongruent in L2. Positive emotion processing was also observed at the subliminal level in L1. While L1 emotional primes inhibited processing of neutral targets, L2 emotion primes facilitated L2 neutral targets. Surprisingly no emotional priming was evident for negative valence items. Further study is warranted in these effects with a larger sample.
Keywords: Bilingual; Malay language; Arabic language; Priming; Emotion; Visual Recognition; Valence Evaluation

Introduction:

Emotion and language are related from the very onset of language acquisition. Language is used to express the emotions and feelings which are internal to the external world. Language also gives us information about others intent to benefit and/or harm us. Evaluating the emotion in language is therefore deeply rooted to the human's survival as a species and is a priority. Emotions in a second language (L2) are felt and experienced different than in a first language (L1) (Dylman & Bjärtå, 2019; Altarriba & Canary 2004). However, since the L2 also conveys others' intent, even though emotion is not consciously experienced the same it should be evaluated like the L1 as the species depends on it. This research will therefore investigate emotion evaluation and processing in visual recognition of words across the languages of Malay-Arabic bilinguals using the 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 is referred to 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 prime. 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 people will be unaware of the prime word (masked priming). Yet 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 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 into 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 prime-target have a strong associative connection (e.g., table – CHAIR); emotion (affect) priming, where prime - target share the same emotional valence (e.g., good - HAPPY), and translation priming, where prime - target are translation equivalents across languages (e.g., good - BON). This present study is interested in the effects of both covert (subliminal) and overt cross-language emotion priming between Malay-Arabic bilinguals.

Fazio et al., (1986) conceptualized and conducted the first overt emotional priming experiments across three experiments. The participants had to judge whether a word was good or bad after being presented with a prime (emotional evaluation task). They found that when a prime is negative it yields quick negative judgements for subsequent negative words and when the prime was positive it yielded quicker response for positive words (congruent). When primes were the opposite valence of their targets (incongruent) they found longer response times. Masked emotional priming has also been carried out and has yielded replicable masked priming effects (Wentura et al., 2017, Greenwald et al., 1996; Otten & Wentura, 1999). These experiments have however all been conducted with monolinguals, albeit it indicates that masked emotional priming is possible. (Wentura et al., 2017). The studies on cross-language emotion priming are also limited. There have been many picture-word priming with varied responses between L1 and L2 RT's (Wu et al., 2022; Ma et al., 2019). In terms of words some evidence points to overall processing facilitation effects; that is, faster and more efficient processing, for emotion words for bilinguals in both L1 (Ponari et al., 2015) and L2 (Altarriba & Basnight-Brown, 2011). Further evidence exists, that the processing of positively valanced emotion-laden words is facilitated in whichever language the bilingual is dominant in (Altarriba & Basnight-Brown, 2011). Moreover, at least one study points to positive emotion words' processing advantage in the dominant language, and disadvantage in the non-dominant language. The same study indicates that positively valanced emotion-laden words are processed more efficiently in the non-dominant language, and the negatively valences ones are processed less efficiently in the dominant language (Kazanas & Altarriba, 2015). These studies have however focused on Spanish-English bilinguals in the United States of America (Bromberek-Dyzman et al., 2021). This study will therefore be novel in exploring Malay-Arabic bilingual.

Methodology

Participants Recruitment

A total of 68 participants (58 females and 10 males), ranging from 19–24 years of age (M = 20.79 ± 1.51 years) were recruited from the (Faculty) AHAS Kulliyah of Islamic Revealed Knowledge and Heritage at the International Islamic University of Malaysia (IIUM). They were all born and raised in Malaysia, their native language (first 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 ($M_{age\ of\ acquisition}$: 10.21 ± 0.48 years) and have been studying it for 8 to 14 years ($M_{years\ of\ exposure}$: 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. Participation was on voluntary bases prior to inform consent and without any form of reward given.

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 the services of the Malay language laboratory and the Arabic language laboratory at IIUM. These laboratories use native speakers of each language for their translation service. 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

Four 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 four 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 (control, emotion), and target valence (neutral, positive, negative) (see Table 1). In the various emotional priming conditions, 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 the 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
	Different-Emotional (Emotion Priming)	hate-CAR	thrill-BLISS	pain-HATE
Overt				
	Different-Neutral (Control)	tree-BED	nail-JOY	tree-HATE
	Different-Emotional (Emotion Priming)	hate-BED	fun-JOY	pain-HATE

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 then had 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.

Succeeding 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.

3. Results

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

$Malay_{L1}$-$Malay_{L1}$ (M_{L1}-M_{L1})

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

For M_{L1}-M_{L1} neutral target, the control/emotion contrast showed no interaction with prime exposure ($F<1$), and no evidence for an emotion priming effect ($F<1$). The main effect for prime exposure was significant, where targets preceded by overt primes (546 milliseconds) were consistently responded to faster than when preceded by masked primes (579 milliseconds), where $F(1, 58) = 55.5$, $p < 0.001$, $\eta^2 = 0.49$.

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	**Emotion**
Neutral			
	Masked	586	586 (0)
	Overt	561	559 (+2)
Positive			
	Masked	586	578 (+7)
	Overt	548	544 (+4)
Negative			
	Masked	578	585 (-7)
	Overt	557	556 (+1)

The response times (RTs) is in milliseconds

As for M_{L1}-M_{L1} positive targets, based on Table 2, the control/emotion contrast revealed no evidence for an emotion priming effect ($F < 1$), which appeared to be consistent for both levels of prime exposure ($F [1, 58] = 2.11$, $p = 0.15$, $\eta^2 = 0.35$). The main effect for Prime Exposure was significant, where targets preceded by overt primes (539 milliseconds) were responded to faster than when preceded by masked primes (576 milliseconds), where $F (1, 58) = 62.4$, $p < 0.001$, $\eta^2 = 0.52$.

Finally, regarding M_{L1}-M_{L1} negative targets, based on Table 2 the control/emotion contrast showed no interaction with prime exposure ($F<1$), and no evidence for an emotion priming effect ($F<1$). The main effect for prime exposure was significant, indicating that targets preceded by overt primes (539 milliseconds) were consistently responded to faster than when preceded by masked primes (575 milliseconds), where $F (1, 58) = 50.0$, $p < 0.001$, $\eta^2 = 0.47$.

In summary, there was a larger priming effect in cases of overt exposure for neutral and negative targets. Interestingly, there is no evidence for any emotion priming effects.

$Arabic_{L2}$-$Arabic_{L2}$ (A_{L2}-A_{L2})
Referring to Table 3, rmANOVA was used to analyse the data with simple orthogonal contrasts then used to identify the status of repetition and emotion priming, respectively.

For A_{L2}-A_{L2} neutral targets, there was a significant contrast when control/emotion were used, $F (1, 53) = 12.25$, $p = 0.001$, $\eta^2 = 0.19$. HSD = 26. The main effect for prime exposure was significant, where targets preceded by overt primes (615ms) were responded to faster than when preceded by masked primes (685 milliseconds), where $F (1, 53) = 41.95$, $p < 0.001$, $\eta^2 = 0.44$.

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	Emotion
Neutral			
	Masked	676	693 (-17)
	Overt	644	618 (+26)
Positive			
	Masked	656	652 (+4)
	Overt	613	601 (+12)
Negative			
	Masked	691	695 (-4)
	Overt	648	642 (+6)

The response times (RTs) is in milliseconds

As for A_{L2}-A_{L2} positive targets, based on Table 3, the control/emotion contrast showed no significant interaction with prime exposure F (1, 59) = 1.51, $p = 0.22$, $\eta^2 = 0.03$, and no evidence for an emotion priming effect (F<1). The main effect for Prime Exposure was significant, where targets preceded by overt primes (589 milliseconds) are responded to faster than when preceded by masked primes (655 milliseconds), where F (1, 59) = 22.77, $p < .001$, $\eta^2 = 0.28$.

Finally, regarding A_{L2}-A_{L2} negative targets, based on Table 3, the control/emotion contrast showed no interaction with prime exposure (F<1), and no evidence for an emotion priming effect (F<1). The main effect for prime exposure was significant, where targets preceded by overt primes (631 milliseconds) were responded to faster than when preceded by masked primes (686 milliseconds), where F (1, 57) = 21.09, $p < 0.001$, $\eta^2 = 0.27$.

In summary, when a neutral target was used there was positive priming for emotion primes. Both forms of priming then disappear when a positive target is used. Furthermore, when a negative target was used there was no emotion priming. L1-L1 and L2-L2 were near equivalent in a lack of any emotion priming, except for L2-L2 neutral targets under overt conditions, when there was evidence of emotion priming.

$Arabic_{L2}$-$Malay_{L1}$ (A_{L2}-M_{L1})

Referring to the data in Table 4, an rmANOVA was used to analyse the data to identify the status of translation and emotion priming, respectively.

For A_{L2}-M_{L1} neutral target, the control/emotion contrast showed no significant interaction with prime exposure, where F (1, 58) = 1.874 , $p = 0.18$, $\eta^2 = 0.03$, and no evidence for an emotion priming effect (F<1). The main effect for Prime Exposure was also not significant, where F (1, 57) = 2.83, $p = 0.098$, $\eta^2 = 0.05$.

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	Emotion
Neutral			
	Masked	548	554 (-6)
	Overt	546	540 (+6)
Positive			
	Masked	550	544 (+6)
	Overt	557	534 (23)
Negative			

Masked	544	522 (-8)
Overt	538	533 (+5)

The response times (RTs) is in milliseconds

Pertaining A_{L2}-A_{L2} positive targets, based on Table 4, the control/emotion had a significant interaction, where F (1, 58) = 8.31, p = 0.006, η^2 = 0.13. This reflects an emotion priming effect under overt conditions (23 milliseconds) only, whereas masked priming (6 milliseconds) was not significant. There was also no main effect for prime exposure (F<1).

Finally, regarding A_{L2}-M_{L1} negative targets, based on Table 4, the control/emotion contrast showed no interaction with prime exposure (F<1), and no evidence for an emotion priming effect, where F (1, 58) = 1.4, p = 0.241, η^2 = 0.02. The main effect for prime exposure was not significant, where F (1, 58) = 3.37, p = 0.07, η^2 = 0.06.

In summary, the only emotion priming effect was found for positive targets following an overt prime. Also of interest was that in no case was the main effect for prime exposure significant, except possibly in emotion primes followed by a negative target.

$Malay_{L1}$-ArabicL2/ (M_{L1}-A_{L2})

Referring to the data in Table 5, a rmANOVA was used to analyse the data to identify the status of translation and emotion priming, respectively.

For M_{L1}-A_{L2} neutral targets, the control/emotion contrast revealed a significant emotion (negative) priming effect, where F (1, 53) = 4.77, p = 0.033, η^2 = 0.082. There is however no significant interaction with prime exposure where F (1, 53) = 3.15 , p = 0.08, η^2 = 0.06 indicating that emotion priming under the overt condition (-31) was significant (HSD = 28) whereas under the masked (-4) condition it is not.

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	**Emotion**
Neutral			
	Masked	714	718 (-4)
	Overt	673	704 (-31)
Positive			
	Masked	716	704 (+12)
	Overt	653	670 (-17)
Negative			
	Masked	746	740 (+6)

Overt	705	697 (+8)

The response times (RTs) is in milliseconds

As for positive targets, based on Table 5, the control/emotion contrast showed a significant interaction with prime exposure, where F (1, 52) = 4.5 , $p = 0.04$, $\eta^2 = 0.08$ due to the emotion priming under the masked condition leans toward the positive (12) and under the overt condition toward the negative (- 17) which equates to no significant priming in their respective conditions (HSD = 27). However, the RTs overall which were going in opposite directions was 29 milliseconds, which was significant. There was no evidence for an emotion priming effect under the individual conditions (F<1). The main effect for prime exposure was significant, where targets preceded by overt primes (596 milliseconds) are responded to faster than when preceded by masked primes (695 milliseconds), where F (1, 52) = 88.33, $p < 0.001$, $\eta^2 = 0.63$.

Whilst in term of negative targets, based on Table 5, the control/emotion contrast showed no interaction with prime exposure (F<1) and there was no evidence for emotion priming effects (F<1). The main effect for prime exposure is significant, where targets preceded by overt primes (633 milliseconds) were responded to faster than when preceded by masked primes (729 milliseconds), where F (1, 53) = 127.08, $p < 0.001$, $\eta^2 = 0.71$.

In summary, negative emotion priming was found when targets were neutral in both the masked and the overt conditions. No emotion priming was found for positive and negative targets.

4. Discussion

The aim of this study was to investigate emotion processing in visual recognition of words across the languages of Malay-Arabic bilinguals.

Emotion priming was not observed in any of the congruent language conditions (L1- L1, L2 – L2) except in the emotionally incongruent condition (emotion – neutral) in the overt condition of L2 – L2. Even though it is contrary to Fazio, et. al., (1986) it can be explained in terms of Wentura and Rothermund (2003) and Wentura et al., (2018) who attributed these to automatic valence processing and the meddling effect with attention. In L2 – L2 the language is congruent, but the valence is incongruent. Therefore, there was enough asymmetry in valence to inhibit the processing of the prime and therefore facilitate response to the target. Considering the different types of asymmetries found, future research on this model would have to investigate the degree and type of asymmetry required to make definitive predictions. Overt emotion priming in the L2 – L1 condition confirmed the possibility that emotion priming would be observed due to the asymmetry in terms of L2 - L1. This could be due to a strong lexical link from L2 – L1 (Kroll & Steward, 1994).

In the L1 – L2 condition emotion priming was observed in three conditions. In the masked priming positive valence condition, positive priming was obtained. What was surprising however was the negative priming effect in both the overt emotion and the positive valence condition. The masked and overt priming conditions for positive valence prime – target pairs were leaning in opposite directions. It can therefore be assumed that attending to L1 positive emotion primes has a significant distracter effect on processing the target (Wentura & Rothermund, 2003; Wentura et al., 2018).

It is however intriguing to note that the other condition that positive emotion priming was observed was the L2 – L2 language condition. L2 emotion primes facilitated L2 neutral targets however L1 emotional prime inhibited processing of the neutral target. This will also be an interesting point for future research as this corresponds to the L2 – L2 condition and can be viewed in terms of Wentura and Rothermund (2003) and the L1 – L2 condition can be viewed in terms of the Fazio, et. al.'s (1986) incongruent findings but with Glaser and Banaji's (1999) reverse priming effects.

Finally, it must be noted that no emotional priming was evident for negative valence items in any condition. There is therefore evidence that positive emotion evaluation and processing is preferred over negative processing (Shuman et al., 2013). It also gives indirect support that the L2 lexicon is directly linked to concepts in terms of emotional information and this information is positive. An account for processing emotion in the cross-language context could therefore be that the initial emotional evaluation takes place at the onset of the prime as well as the target, but the secondary process goes via both links from L1 to the semantic store and L2 to the semantic store as all, therefore concluding in a strong cross language relationship based on emotion.

Conclusion

This study was interested in the valence processing in Malay-Arabic bilinguals. It found that emotions were processed when word were incongruent in L2. Positive emotion processing was also observed at the subliminal level in L1. While L1 emotional primes inhibited processing of neutral targets, L2 emotion primes facilitated L2 neutral targets. Surprisingly no emotional priming was evident for negative valence items. Further study is warranted in these effects with a larger sample.

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References:

Altarriba, J., & Basnight-Brown, D. M. (2011). The representation of emotion vs. emotion-laden words in English and Spanish in the Affective Simon Task. *International Journal of Bilingualism*, *15*(3), 310-328.

Altarriba, J., & Canary, T. M. (2004). Affective priming: The automatic activation of arousal. Journal of Multilingual and Multicultural Development, 25, 248-265.

Basnight-Brown, D. M., & Altarriba, J. (2007). Differences in semantic and translation priming across languages: The role of language direction and language dominance. Memory & Cognition, 35, 953–965.

Bradley, M.M., & Lang, P.J. (1999). Affective norms for English words (ANEW): Stimuli, instruction manual and affective ratings. Technical report C-1, Gainesville, FL. The Center for Research in Psychophysiology, University of Florida.

Bromberek-Dyzman, K., Jończyk, R., Vasileanu, M., Niculescu-Gorpin, A.-G., & Bąk, H. (2021). Cross-linguistic differences affect emotion and emotion-laden word processing: Evidence from Polish-English and Romanian-English bilinguals. *International Journal of Bilingualism*, *25*(5), 1161-1182. https://doi.org/10.1177/1367006920987306

Brown, G. D. A., (1984). A frequency count of 190,000 words in the London-Lund Corpus of English Conversation. Behavioural Research Methods Instrumentation and Computers, 16, 6, 502-532.

Castles, A., Davis, C. & Forster, K.I. (2003). Word recognition development in children: Insights from masked priming. In Kinoshita. S. & Lupker, S. (Eds.), Masked priming: State of the Art (pp. 345-360). London, UK: Psychology Press.

Coltheart, M. (1981). The MRC psycholinguistic database. Quarterly Journal of Experimental Psychology, 33A, 497-505.

Dylman, A. S., & Bjärtå, A. (2019). When your heart is in your mouth: the effect of second language use on negative emotions. *Cognition and Emotion*, *33*(6), 1284-1290. https://doi.org/10.1080/02699931.2018.1540403

Elgendi, M., Kumar, P., Barbic, S., Howard, N., Abbott, D., & Cichocki, A. (2018). Subliminal Priming—State of the Art and Future Perspectives. *Behavioral Sciences*, *8*(6), 54. https://www.mdpi.com/2076-328X/8/6/54

Fazio, R. H., Sanbonmatsu, D. M., Powell, M. C., & Kardes, F. R. (1986). On the automatic activation of attitudes. Journal of Personality and Social Psychology, 50, 229-238.

Forster, K. I., & Davis, C. W. (1984). Repetition and frequency attenuation in lexical access. Journal of Experimental Psychology: Learning, Memory, and Cognition, 10, 680–698.

Glaser, J., & Banaji, M. R. (1999). When fair is foul, and foul is fair: Reverse priming in automatic evaluation. Journal of Personality and Social Psychology, 77, 669-687.

Greenwald, A. G., Draine, S. C., & Abrams, R. L. (1996). Three cognitive markers of unconscious semantic activation. Science, 273, 1699-1702.

Kazanas, S. A., & Altarriba, J. (2015). The Automatic Activation of Emotion and Emotion-Laden Words: Evidence from a Masked and Unmasked Priming Paradigm. *The American Journal of Psychology*, *128*(3), 323-336. https://doi.org/10.5406/amerjpsyc.128.3.0323

Kroll, J. F., & Stewart, E. (1994). Category interference in translation and picture naming: Evidence for asymmetric connections between bilingual memory representations. Journal of Memory and Language, 33, 149 –174.

Kouider, S., & Dehaene, S. (2007). Levels of processing during non-conscious perception: a critical review. Philosophical Transactions of the Royal Society of London B, 362, 857-875.

Kucera and Francis, W.N. (1967). Computational Analysis of Present-Day American English. Providence: Brown University Press.

Ma, X., Zhang, F. W., Ma, X., Xia, L., Tao, Y., & Liu, Y. (2019, 16-19 Aug. 2019). Emotional Information Processing by the Bilinguals under Cross- Channels. 2019 IEEE International Conference on Computer Science and Educational Informatization (CSEI),

Otten, S., & Wentura, D. (1999). About the impact of automaticity in the Minimal Group Paradigm: Evidence from affective priming tasks. European Journal of Social Psychology, 29, 1049-1071.

Pillaud, N., & Ric, F. (2020). The impact of automatic evaluation on mood: an awareness-dependent effect. *Cognition and Emotion*, *34*(7), 1457-1472. https://doi.org/10.1080/02699931.2020.1775555

Ponari, M., Rodríguez-Cuadrado, S., Vinson, D., Fox, N., Costa, A., & Vigliocco, G. (2015). Processing advantage for emotional words in bilingual speakers. *Emotion*, *15*(5), 644-652. https://doi.org/10.1037/emo0000061

Shuman, V., Sander, D., & Scherer, K. (2013). Levels of Valence [Hypothesis and Theory]. Frontiers in Psychology, 4. https://doi.org/10.3389/fpsyg.2013.00261

Spruyt, A., Hermans, D., De Houwer, J., & Eelen, P. (2001). Explaining the affective priming effect: Affective priming in a picture naming task. Unpublished manuscript.

Tsai, J. L. (2017). Ideal affect in daily life: implications for affective experience, health, and social behavior. *Curr Opin Psychol*, *17*, 118-128. https://doi.org/10.1016/j.copsyc.2017.07.004

Wentura, D. & Rothermund, K. (2003). The "meddling-in" of Affective Information: A general model of automatic evaluation. In J. Musch and K.C. Klauer (Eds.), The psychology of evaluation: Affective processes in cognition and emotion (pp. 51-86). Mahwah, NJ: Erlbaum.

Wentura, D., Rohr, M., & Degner, J. (2017). Masked emotional priming: A double dissociation between direct and indirect effects reveals non-conscious processing of emotional information beyond valence. Consciousness and Cognition, 49, 203-214. https://doi.org/https://doi.org/10.1016/j.concog.2017.01.016

Wentura, D., Müller, P., Rothermund, K., & Voss, A. (2018). Counter-regulation in affective attentional biases: Evidence in the additional singleton paradigm. *Quarterly Journal of Experimental Psychology*, *71*(5), 1209-1218. https://doi.org/10.1080/17470218.2017.1315147

Wu, C., Zhang, J., & Yuan, Z. (2022). An ERP investigation on the second language and emotion perception: the role of emotion word type. *International Journal of Bilingual Education and Bilingualism*, *25*(2), 539-551. https://doi.org/10.1080/13670050.2019.1703895