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A Comparison of Turkish-English Bilinguals' Processing of Emotion Words in Their Two Languages

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Abstract

There is a great deal of evidence showing that, in monolinguals, various emotional stimuli are processed by the brain in different ways. This view has found considerable support from studies conducted with verbal stimuli. In bilinguals, on the other hand, emotional processing is more complex, and is thought to be influenced mainly by two factors; age of language acquisition and proficiency. In this study, participants were forty-eight simultaneous / early bilinguals, who acquired both languages from birth, and have high proficiency in both. A lexical decision task, i.e., distinguishing real words from non-words, was used to gain insight into to how the participants processed visually presented emotion words in Turkish and English. Reaction times and accuracy were recorded via SuperLab software program and were statistically analyzed. Shorter response times and higher accuracy rates were found for real words compared to non-words in both languages. Also, shorter response times were found for positive compared to negative and neutral words in both languages. An analysis of the accuracy rates revealed no statistically significant differences among Turkish emotion words, whereas, for English, accuracy rates were higher for positive words when compared to negative and neutral words. These results have been interpreted in the light of psycholinguistic models of lexical processing

Keywords: Bilingualism, lexical processing, emotion words, lateralization

1. Introduction

It is well-established in the literature that emotional content of stimuli has a processing advantage, whether visual or auditory. Studies using verbal stimuli, mainly conducted with monolinguals, have provided supporting evidence (Kissler, Herbert, Winkler, & Junghofer, 2009). It is not clear, however, whether this applies to the bilingual population. This uncertainty is attributed to the diversity of bilinguals' language experience, as confirmed by a majority of studies.

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Bilingualism, characterized as being in a state of constant change depending on the frequency of use of each language, is a multi-faceted phenomenon. It is sufficiently common to be considered a norm, rather than an exception. In studies investigating bilingualism, the participants' age of acquisition, frequency of use and proficiency of languages are diverse. Particularly, the proportion of those acquiring their second language after their first is relatively high. Due to the diversity in participants' background, a variety of definitions of bilingualism has emerged. For example, based on the age of acquisition, bilinguals are labelled simultaneous, early or late bilinguals. They are categorized as proficient or non-proficient based on the proficiency level of both languages. Compound or Coordinate bilinguals are classifications according the cognitive structuring of the languages in the brain.

It is suggested that the diverse nature of bilingualism has implications for emotion word processing (Pavlenko, 2004). To start with, linguistic features of both languages should be considered, as well as structural and conceptual differences. There are some cases in which there is a complete overlap between concepts, while in others there may be striking differences (Pavlenko, 2008). Worldview of different cultures has a huge impact in the way emotion words are perceived. To be more specific, individualistic cultures and collectivist cultures differ in responses to the same emotions. For example, western cultures disapprove of dependence, while it is favored in collectivist cultures, such as Japan (Pavlenko, 2008).

Bilinguals have two languages at their disposal to express their emotions. A good deal of evidence has shown that different factors affect bilinguals' language preference in the expression and perception of emotional language, the most important being age of acquisition (Dewaele, 2004a; 2008; Harris, Ayçiçeği, & Gleason, 2003; Harris, 2004). The prevalent view in the literature is that separate systems mediate language and emotions, and that these develop simultaneously early in infancy, which explains the more emotional nature of the native language (Pavlenko, 2004, 2012). Another view is that emotion words are more easily retrieved from the memory and more frequently used due to their richer mental representations originating with childhood experiences (Altarriba, 2006). This suggests that emotion words have deeper emotional associations (Dewaele, 2004a). Correspondingly, in the case of late acquisition of a second language, emotionality is perceived to be less, particularly if learned in formal settings (Dewaele, 2004a, 2004b; Pavlenko, 2004). However, L2 can sometimes be more emotional than the native language and preferred as the language to express emotions (Pavlenko, 2004, 2012).

Few studies investigated bilinguals' production and perception of emotionality. One possible reason is uncertainty over the validity of the results in the literature, due to "the diversity in the language experiences of the participants" (Harris, Gleason, & Ayçiçeği, 2006, p. 258). This view is associated with the heterogeneous nature of bilingualism, revealed by conflicting results in the studies investigating emotionality in bilingual language production and perception.

As confirmed by the majority of studies conducted with monolingual participants, compared to neutral words, emotion words are processed faster and more accurately, and recalled better (Nagae & Moscovitch, 2002; Brierley et al., 2007). Bilingual literature has yielded similar results (Ferre, Garcia, Frage, Sanchez-Casas, & Molero, 2010). However, there is no consensus regarding the emotionality of each language of bilinguals. For example, Anooshian and Hertel (1994) reported better recall of L1 emotion words compared to L2. Ferre et al., (2010), on the other hand, reported no difference in the recall of L1 and L2 words regardless of age and manner of acquisition, proficiency level or dominance of languages. Another line of research based on bilinguals' self-reports on their language choice to express emotions has provided much insight into the relationship between emotionality and the languages spoken.

Psycholinguistic research has shown that, like monolinguals, bilinguals process emotion words faster than neutral words. However, due to the diversity in the language experience of the participants, the majority of whom are late learners of L2, there have been doubts about the validity of the results obtained in bilinguality literature. In Eilola, Havelka and Sharma's study (2007), for example, no significant difference was found between the participants' languages in their processing of emotion words, which was interpreted as revealing equal perception of emotionality in both languages of proficient bilinguals. In contrast, Jonczyk (2013), reported shorter latencies and higher accuracy rates for negative words. This result was supported by another study conducted with late bilinguals (Jonczyk, 2014). Better performance in processing negative words were reported for Chinese-English bilinguals by Chen (2015). Late learners of L2 in Conrad, Recio and Jacobs' study (2011) processed emotion words in their L1 (German) and L2 (Spanish) faster and more accurately than neutral words. However, these results are contradicted. Early bilinguals in Altarriba and Basnight-Brown's (2010) study performed better in processing the emotion words in their L2 (English) than their L1 (Spanish). This result was associated with the frequency of use of their L2. L2 emotion words were found less effective than their L1 (English) by the late learners in Harris (2004), whereas no difference in emotionality was found between languages for early bilinguals. Sutton, Altarriba, Gianico, & Basnight-Brown (2007) reported that L1 (Spanish) and L2 (English) were similar in terms of their emotionality for early bilinguals. In order to provide further support to bilinguality literature, this study aims to investigate perception of emotionality in simultaneous Turkish-English bilinguals.

2. Method

2.1. Participants

48 bilinguals who acquired Turkish and and English from birth participated in the study (15 Male, 33 Female, Mean Age= 29.75, *Std*= 9.64). A questionnaire was used to identify whether participants were eligible for the study. They were strongly right-handed (93.33 %, *Std*=10.49) as confirmed by the *Edinburgh Handedness Inventory*

(Oldfield, 1971). The participants self-assessed their proficiency in both languages, and a Friedman Test revealed no significant difference between four language skills, $\chi^2 = 5.21$, $sd = 3$, $p = .157 > .05$.

2.2. Experiment

Participants performed a lexical decision task in which they decided whether visually presented letter strings were real or non-words. They were instructed to perform the task as fast and accurately as possible. A trial session was conducted to familiarize the participants with the task.

The stimuli comprised of a total of 120 words and non-words. In the Turkish set, the real words were chosen from a pool of 300 words from *Yazılı Türkçe'nin Kelime Sıklığı Sözlüğü* (Göz, 2003), and rated by a hundred Turkish native speakers on a 5-point Likert Scale according to their valence, frequency of use and, the degree of arousal. After rating, 10 positive, 10 negative and 10 neutral words were selected from the pool. No significant differences were found in terms of frequency of use, ($F_{2,27} = 0.83$, $p > .05$, $\eta^2 = .058$). However, they differ significantly in terms of valence, ($F_{2,27} = 98.01$, $p < .001$, $\eta^2 = .879$). Non-words were created by exchanging the initial letters and final letters of real words, and they all complied with the phonotactic rules of Turkish. Similarly, the English set were formed from a pool of 300 words selected from *Affective Norms for English Words* (Bradley & Lang, *1999*). Based on the ratings collected from 30 English native speakers, 10 positive, 10 negative and 10 neutral words were selected for the English set. 30 non-words were formed by changing one letter of English real words.

The experiment took place in a quiet, dimly-lit room. The participants sat 40 cm away from a laptop computer using a chinrest. They were instructed to indicate whether the visually presented words were real words or non-words by pressing the designated keys on the keyboard (1 for yes, 2 for no), as required by the lexical decision task. Their response times and the accuracy of their answers were recorded via a software program, and SPSS was performed to analyze the data.

3. Results

Table 1 shows response times of the bilingual participants to emotion words in Turkish.

Table 1: Bilinguals' Response Times to Emotion Words in Turkish

Turkish Words	Mean (ms)	N	Std	*t*	*p*
Positive Words	695.51	48	118.93	-2.977	.005*
Negative Words	746.61				
Positive Words	675.51	48	122.49	-2.321	.025
Neutral Words	736.55				

Positive Words	695.51	48	143.06	-9.019	.000*
Non-words	881.73				
Negative Words	746.61	48	112.55	.619	.539
Neutral Words	736.55				
Negative Words	746.61	48	129.89	-7.207	.000*
Non-words	881.73				
Neutral Words	736.55	48	142.12	-7.077	.000*
Non-words	881.73				

*p< .0083 (p value has been adjusted by dividing .05 by the number of pair-wise comparisons, 6 in this case)

A paired-samples t-test revealed no difference in the response times for positive vs. neutral words and negative vs. neutral words, suggesting that, in terms of required processing times, emotion words were similar to neutral words. All three word types (positive, negative and neutral) were processed faster than nonwords. Also, positive words were processed faster than negative words.

A Wilcoxon test was performed on the accuracy data. Table 2 shows the differences in the accuracy rates of the Turkish words.

Table 1: Accuracy Rates for Emotion Words in Turkish

Turkish Words	Mean (%)	Std	Z	p
Positive Words	83	.17	-1.779	.075
Negative Words	78	.16		
Positive Words	83	.17	-.369	.712
Neutral Words	82	.15		
Positive Words	83	.17	-5.820	.000*
Non-words	56	.09		
Negative Words	78	.16	-1.176	.240
Neutral Words	82	.15		
Negative Words	78	.16	-5.695	.000*
Non-words	56	.09		
Neutral Words	82	.15	-5.774	.000*
Non-words	56	.09		

*p< .0083 (p value has been adjusted by dividing .05 by the number of pair-wise comparisons, 6 in this case)

Table 2 shows that positive, negative and neutral words were processed significantly more accurately than non-words. No other pair-wise comparisons in Table 2 were found significant.

Table 3 shows bilingual participants' response time to English words.

Table 3: Bilinguals' Response Times to Emotion Words in English.

English words	Mean (ms)	N	Std	t	p

Positive Words	673.73	48	164.73	-3.491	.001*
Negative Words	756.75				
Positive Words	673.73	48	151.87	-1.257	.215
Neutral Words	701.28				
Positive Words	673.73	48	169.05	-7.645	.000*
Non-words	860.28				
Negative Words	756.75	48	134.46	2.858	.006*
Neutral Words	701.28				
Negative Words	756.75	48	155.67	-4.608	.000*
Non-words	860.28				
Neutral Words	701.28	48	137.27	-8.025	.000*
Non-words	860.28				

*p< .0083 (p value has been adjusted by dividing .05 by the number of pair-wise comparisons, 6 in this case)

As can be seen in Table 3, response times for positive words are significantly shorter than those for negative words and non-words. However, no significant difference was found between positive and neutral words. Neutral words are processed significantly faster than negative words. Non-words yielded the longest response times when compared to positive, negative and neutral words, and the differences were found significant.

A Wilcoxon test was performed on the accuracy data, and the results are given in Table 4.

Table 2: Accuracy Rates for Emotion Words in English

English Words	Mean (%)	Std	*Z*	*p*
Positive Words	83	.15	-3.729	.000*
Negative Words	73	.15		
Positive Words	83	.15	-3.598	.000*
Neutral Words	73	.15		
Positive Words	83	.15	-6.032	.000*
Non-words	58	.06		
Negative Words	73	.15	-.056	.955
Neutral Words	73	.15		
Negative Words	73	.15	-5.678	.000*
Non-words	58	.06		
Neutral Words	73	.15	-5.599	.000*
Non-words	58	.06		

*p< .0083 (p value has been adjusted by dividing .05 by the number of pair-wise comparisons, 6 in this case)

According to Table 4, all pair-wise comparisons, except that between negative and neutral words are significant. Positive words have the highest accuracy rate when compared to negative words, neutral words and non-words. However, no significant difference was found between the negative and neutral words.

4. Discussion

The aim of this study was to investigate emotion word processing in simultaneous bilinguals. An analysis of the RT's showed that positive words were processed faster than negative words both in Turkish and English. This result is in line with the majority of studies investigating emotion word processing, which highlight *The Positivity Effect*, i.e. the faster processing of positive words. This idea has an evolutionary basis, suggesting that the human brain prioritises positive stimuli to exploit the resources that are potentially advantageous for the organism in order to ensure its survival. This result has previously been reported in studies which employed verbal (Briesemeister, Kuchinke & Jacobs, 2011; Kissler & Koessler, 2011; Palazova, Mantwill, Sommer, & Schacht 2011; Scott, O'Donnell, Leuthold, & Sereno, 2009) and nonverbal stimuli (Schacht & Sommer, 2009). This view has also been supported by electrophysiological (Kissler et al., 2009) and imaging studies (Kuchinke, Jacobs, Grubich, Vo, Conrad, & Herrmann, 2005).

When the response times for negative words were examined, it was seen that they were processed more slowly compared to positive and neutral words, another finding with considerable support in the literature. According to one view, negative stimulus may increase the amount of interference in lexical processing (Sutton & Altarriba, 2008), making it difficult to focus on the semantic analysis. Another view maintains that negative stimulus leads to an increased workload for cognitive processing (Estes & Adelman, 2008) by causing distraction. Also, Larsen, Mercer, Balota, and Strube (2008) argue that negative words are less frequent than positive words, and cause a novelty effect on participants, which, in turn, delays processing speed This view has a great deal of experimental support (Kissler & Koessler, 2011; Sutton & Altarriba, 2008). Evolutionary-based research also gives considerable support. For example, *Automatic Vigilance Hypothesis* predicts that negative stimuli engage attention to the extent that it slows processing speed (Estes & Adelman, 2008).

Also, the lower frequency with which negative words are used is considered to account for the difference in processing speed. For example, Larsen, Kimberley, Mercer, and Balota (2006) maintained that studies that employed a variety of tasks, such as Lexical Decision Task, Stroop Task or Naming Task, reported longer latencies for negative words, which was taken as evidence for a correlation between frequency of use and processing speed. In Larsen et al.'s study (2008), longer latencies for negative stimuli were attributed to the novelty effect created by negative words due to their less frequent use. According to this view, negative stimuli attract our attention more quickly, however, it is more difficult to disengage or divert from the stimuli, causing a delay in processing. Our results regarding the processing of positive and negative words can be interpreted as supporting this view.

No significant differences were yielded by pair-wise comparisons of response times between the positive and neutral words in Turkish and English, and those between the negative words and neutral words in Turkish. However, a significant difference was found between the response times for negative and neutral words in English.

These results can be explained by the tendency of neutral words to be rated higher on the concreteness scale, suggesting stronger associations in the memory (Altarriba, 2006: 234). This is assumed to account for the ease of lexical retrieval of neutral words (Sabsevitz, Medler, Seidenberg, & Binder, 2005). In our study, the English word set includes concrete words such as Ankle, Bottle, Chair, as opposed to abstract words such as Agony, Abuse, Insult in the negative word set. This accounts for neutral words in English being processed faster than negative words. Kanske and Kotz (2007) reported a similar result. Sutton et al. (2007), similarly, reported that Spanish-English bilinguals processed neutral words in both languages faster than negative words. In Eilola and Havelka's (2011) study, Greek-English bilinguals processed neutral words with shorter latencies than negative words, but no significant difference was found between those for positive and neutral words.

The analysis of the accuracy rates for words in Turkish showed no significant differences between positive, negative and neutral words suggesting that the emotional content of the words have no particular effect on the accuracy of participants' responses. When the accuracy of the English words was analyzed, it was seen that positive words had higher accuracy rates compared to other words, which adds support for the Positivity Effect, already observed in the analysis of response times. Unlike response times, no significant difference was found between negative and neutral words. This result can be interpreted as the so-called *Speed-Accuracy Trade-off,* which maintains that participants in experimental studies may sometimes choose between speed or accuracy in their responses favoring one over the other (Bogacz, Wagenmakers, Forstmann, & Nieuwenhuis 2010).

5. Conclusions

Response time data revealed superiority of positive words both in Turkish and English, in line with the literature. Accuracy rates of English words support this result. However, for Turkish words, there was no difference between the accuracy rates for positive words, and those for negative and neutral words. Also, we report faster reaction times for neutral words than negative words in English. However, this result wasn't replicated in Turkish, and similarly, there was no difference between the accuracy of neutral and negative words in either language. This study investigated processing of visually presented words in simultaneous bilinguals. Future studies may investigate whether these results are replicated when stimuli are auditorily presented, or whether the age of language acquisition and frequency of use exert influence in lexical processing.

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