Emotionality in a second language: It's a matter of time

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ABSTRACT

The present study investigated the well acknowledged phenomenon of a different sense of emotionality in a person's first (L1) and second language (L2). Event-related potentials were recorded during the reading of pleasant, unpleasant and neutral words in L1 and L2. Enhanced processing of both emotional compared to neutral words was reflected in an amplified early posterior negativity (EPN) about 280–430 ms after word onset. While the EPN did not differ in amplitude between L1 and L2, it was delayed for L2. Interestingly, a better task performance in L2 but not L1 predicted longer delays of the EPN. These results might indicate that the affective valence of L2 words is processed in a less immediate way due to delayed lexical access. This is interpreted in terms of interference in a highly integrated L1/L2 mental lexicon.

1. Introduction

Being bilingual is typically seen as a big advantage in today's rapidly diversifying world. Knowing a second language gives the opportunity to understand and converse with people of different countries or cultures with whom efficient communication would otherwise be very difficult. However, having learned a second language (L2) later than one's first language (L1) is often related to the persistent subjective impression that the second language does not reach the same quality as one's native language, even with highest levels of proficiency. For example, sequential bilinguals, i.e., individuals that acquired their L2 after their L1, frequently report that they experience their second language to be less emotional as compared to their native language and that – although they perfectly *know* the emotional meaning of words in L2 – they do not *sense* it as with words in L1 (e.g., Pavlenko, 2005). If you are a native speaker of German hearing your child or partner say "Ich liebe Dich." would arouse a higher degree of happiness than its translation equivalent "I love you.", even if you are fluent in English. Similarly, swear words or taboo words leave you relatively untouched—even if you perfectly understand their meaning. Findings in linguistic research using introspection, interviews, or literary analysis corroborate these subjective impressions. For example, bilinguals rate the emotional force of swear words and taboo words as weaker in L2 than L1 (Dewaele, 2004) or feel less inhibited talking about embarrassing topics when using L2 as compared to L1 (Bond & Lai, 1986). Note that such

experiences are frequently reported even by highly proficient bilinguals, not just beginning learners or poor speakers of a second language (see Pavlenko, 2005). Thus although being potentially able to fluently converse in a second language, bilinguals' ability to grasp the emotional connotations of words and phrases might be seriously impaired, and thus hinder efficient and smooth communication—especially in emotional contexts.

In addition to subjective measures previous research also investigated the physiological arousal mostly by means of skin conductance responses (SCR, see Harris, Gleason, & Ayçiçegi, 2006 for review). These studies demonstrated consistently that for late sequential bilinguals the SCR is weaker for taboo words, insults (e.g., "You suck!"), or reprimands (e.g., "Shut up!") in L2 as compared to L1 (Harris, 2004; Harris, Ayçiçegi, & Gleason, 2003). Such psychophysiological data substantiate the subjective experience of a different sense of emotionality in L1 and L2. Moreover, they allow to identify various factors of the language-learning process that might have consistent effects across many individuals. For example, age of L2 acquisition seems to influence the response of the autonomic nervous system to affective words. In this line, Harris (2004) demonstrated comparable SCR for L1 and L2 taboo words and reprimands for early and, therefore, near native bilinguals corroborating the participants' equal subjective ratings of unpleasantness.

The origin of these differences between L1 and L2 has been attributed to the special features of emotional words, i.e., valence and arousal, that differentiates them from nonemotional words in the mental lexicon. The access of this additional information represented in the mental lexicon is assumed to be reflected in slower processing times for emotional as compared to none-motional words (Pavlenko, 2008). It has been further argued that

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"emotion concepts vary across languages and that bilinguals' concepts may, in some cases, be distinct from those of monolingual speakers" (Pavlenko, 2008, p. 147). Thus, it is conceivable that emotional words are processed more slowly in L2 as compared to L1. Support for this view is provided by studies demonstrating slower reaction times for instance in an affective priming paradigm (Altarriba & Canary, 2004; Degner, Doycheva, & Wentura, 2012). For instance in the study by Altarriba and Canary (2004) English monolingual and Spanish–English bilingual participants performed lexical decisions to English words in emotionally related or unrelated conditions. Positive priming effects in related conditions were found for both groups of participants with longer latencies for bilinguals than for monolinguals.

The difference in mental representations of emotional words in L1 and L2 is best explained through differences in the timing and/or context of language acquisition, assuming that the later and more formal acquisition of a second language (e.g., in school settings) does not allow for the establishment of emotionally relevant autobiographical and other diverse sets of associations in relation to emotional interpersonal interactions (e.g., Altarriba, 2003; Harris et al., 2006) as the natural and early acquisition of L1. This so-called 'emotional contexts of learning' theory holds that a word's distinctive emotional feel is learned across multiple exposures of a word in distinctive emotional contexts (Harris et al., 2006). Consequently, the reduced emotionality of L2 as compared to L1 could then be attributed to weaker associations between a word and its emotional context. Such weak associations have two possible sources of origin: too few encounters of the word per se, as it might be the case for low proficient bilinguals, and/or an insufficient emotionality of the context independent of the learner's proficiency. Although these accounts contain sufficient explanations of the possible origins of reduced emotionality of L2 as compared to L1, they do not offer any insights into the possible difference in native and second language processing underlying this phenomenon. The current research aimed at filling this gap using neurophysiological measures.

To study language processing within the field of cognitive neuroscience, event-related potentials (ERPs) have proven to be an effective and frequently used method. The effects of emotional content on word processing have been extensively investigated in L1 (Herbert, Junghöfer, & Kissler, 2008; Kissler, Herbert, Peyk, & Junghöfer, 2007; Schacht & Sommer, 2009a; Scott, O'Donnell, Leuthold, & Sereno, 2009). Using well-controlled verbal stimulus material these studies consistently report an early (around 200–320 ms) enhanced negativity for positive and negative emotionally arousing words compared to neutral words that occurs predominantly at left temporo-occipital electrode sites. This so-called early posterior negativity effect (EPN) has been demonstrated to be independent of the word class, thus for nouns, verbs and adjectives that were matched for a number of other potentially relevant dimensions such as word length, word frequency or concreteness (Herbert et al., 2008; Kissler, Herbert, Winkler, & Junghöfer, 2009; Schacht & Sommer, 2009a). The EPN is elicited at various presentation rates (Herbert et al., 2008; Kissler et al., 2007) and seems independent of the actual task requirements, as it was found using silent reading and nonemotional grammatical decision tasks (e.g., Kissler et al., 2007, 2009) as well as lexical decision tasks (Schacht & Sommer, 2009a; Scott et al., 2009). Thus, the EPN effect provides a very robust and replicable phenomenon of the processing of emotional words.

It has been suggested that the EPN reflects the spontaneous activation of a word's emotional connotation immediately after the visual word-form representation has been accessed (Kissler et al., 2007, 2009). This view holds that bidirectional connections between the midfusiform gyrus in the extrastriate ventral stream and the amygdala activated directly after the lexical access may

enhance the brain's response to emotional words. Such an interaction between extrastriate areas and the amygdala has indeed been demonstrated in emotional face processing (Vuilleumier, Richardson, Armony, Driver, & Dolan, 2004) and it has been argued that this leads to a prioritized visual processing of emotionally significant stimuli due to a rapid capture of attention (Lang, Bradley, & Cuthbert, 1997). A comparable attentional modulation of the EPN has been previously demonstrated in studies showing that attended stimuli were associated with larger EPNs (e.g., Schupp et al., 2007a; Schupp et al., 2007b).

If the subjective reduction of emotionality in L2 is indeed based on differential processing of L2 as compared to L1, this framework offers two possible processing differences. On the one hand, the emotional content of a word may be activated to a lesser extent in L2 as compared to L1. As a consequence we would expect the EPN elicited by emotional valent words in L2 to be reduced in amplitude as compared to L1. On the other hand, as outlined above the lexical access may be delayed in L2, delaying the subsequent enhancement of the EPN by the word's emotional connotation. This should result in a delayed peak latency of the EPN rather than in a reduction of its amplitude. However, both effects could also occur together resulting in an attenuated and delayed EPN in L2.

2. Materials and methods

2.1. Participants

Thirty-three self-identified bilinguals were recruited at Saarland University to take part in the study. Thereof 17 were German–French bilinguals and 16 were French–German bilinguals. One German–French bilingual participant was excluded from all analyses because of excessive eye blink artifacts. The remaining 32 participants (eight male) were at the time of study between 18 and 28 years old. They all had normal or corrected-to-normal vision and were without history of neurological or psychiatric disorder. All participants signed informed consent before the experiment and were paid €7.5 per h for participation.

The mean age at which participants started learning their respective second language was 12 years (ranging between 7 and 16), and all had spent at least one stay longer than 6 months (M = 14.9 months, ranging from 6.5 to 60) in a country in which they actively spoke their L2. The mean self-rated frequency of daily L2 use in the last three months was 3.59 (ranging between 1.33 and 5 with a maximal score of 7, see Procedure section for details of the questionnaire used to asses the individual frequency of daily L2 use). The self-rated proficiency in their respective L2 of 68.9 on a 100-point scale was well above average (50 points, $t_{31} = 6.13$, $p < .001$). According to these self-reports all participants can be regarded as sequential and unbalanced bilinguals with proficient knowledge of L2.

2.2. Stimuli

Stimuli were frequently used nouns, likely to be known by moderate (non-native) speakers of either language (as confirmed by post-tests, see below) that were selected from a larger database according to valence and arousal ratings obtained from monolingual speakers of German and French (cf., Degner et al., 2012). These ratings were collected using a computerized version of the Self-Assessment Manikin (SAM: Bradley & Lang, 1994). From this pool, 300 French–German synonym pairs were selected such that they matched according to word length, valence, and frequency of use (based on the databases LEXIQUE, New, Pallier, Brysbaert, & Ferrand, 2004, and CELEX, Baayen, Piepenbrock, & Gulikers, 1995 for French and German words, respectively). Crucially, these synonyms did not include cognates and inter-lingual homographs, because such words have been shown to foster bilingual lexical processing (e.g., Costa, Caramazza, & Sebastian-Galles, 2000). These words varied in their emotional valence, with 100 words being negative (e.g., Cauchemar–Alptraum–nightmare), 100 neutral (e.g. Feuille–Blatt–leaf) and 100 positive (e.g. Blague–Witz–joke). All pleasant and unpleasant words were matched for perceived arousal but differed from neutral words. Furthermore, pleasant, neutral, and unpleasant words differed significantly in valence ratings (see Table 1 for further details). For each language 30 additional orthographically legal pseudo-words were created by exchanging two letters from existing words across all three valence groups. A complete list of the stimulus material is provided as supplemental material. The 330 German–French word pairs were divided into two lists of 165 words, including 15 pseudo-words contained in both lists.