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Affective language processing in a native and non-native mind: A neuropragmatic perspective

Przetwarzanie języka afektywnego w języku ojczystym oraz obcym: Perspektywa neuropragmatyczna

Praca doktorska

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Uniwersytetu im. Adama Mickiewicza w Poznaniu

pod kierunkiem prof. Romana Kopytko oraz

Dr Katarzyny Bromberek-Dyzman

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As a final remark, please note that part of the present dissertation has been already submitted for publication (experiment 2; Jończyk et al. forthcoming).

Poznań, dnia .....

OŚWIADCZENIE

Ja, niżej podpisany **Rafał Jończyk** student Wydziału Anglistyki Uniwersytetu im. Adama Mickiewicza w Poznaniu oświadczam, że przedkładaną pracę dyplomową pt: **„Affective language processing in a native and non-native mind: A neuropragmatic perspecitve”** napisałem samodzielnie. Oznacza to, że przy pisaniu pracy, poza niezbędnymi konsultacjami, nie korzystałem z pomocy innych osób, a w szczególności nie zlecałem opracowania rozprawy lub jej części innym osobom, ani nie odpisywałem tej rozprawy lub jej części od innych osób. Oświadczam również, że egzemplarz pracy dyplomowej w formie wydruku komputerowego jest zgodny z egzemplarzem pracy dyplomowej w formie elektronicznej.

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Introduction

Communication is an arena of *expression, exchange,* and *sharing* of people's thoughts, opinions, beliefs, feelings, or attitudes. Two essential, interacting and integral expressive agents in communication are affect (e.g. emotions, feelings, attitudes, beliefs) and language (its verbal and non-verbal manifestation). The relationship between affect and language is highly reciprocal. Affect finds an outlet on all levels of non-verbal (e.g. gestures, body posture, facial expression) as well as verbal (e.g. syntax, semantics, pragmatics) language. In turn, language may have the capacity to modify people's affective states (e.g. by means of swear words, compliments, or poetry).

In today's world, individuals' communicative interactions are oftentimes constructed in and coloured by a multilingual context. Indeed, it has been estimated that more than half of the world population speaks more than one language (Grosjean 1984, 2010). Therefore, this multilingual ingredient should be taken into consideration when analysing communicative interactions, and thus constitute an important factor in the analysis of affective manifestations in communication. In fact, research on affective language in bilingualism has shown that bilingual individuals often report substantial differences in the way they perceive and express affective information in their first and second language, with the second language being more affectively detached than the first (see Dewaele 2010; Pavlenko 2005). In the search for behavioural and psychophysiological correlates of this phenomenon, however, psycholinguistic and neuroimaging paradigms reported essentially no measurable differences between affective word processing in the native and non-native language (see Pavlenko 2012). What seems to have been put in the

shade in these paradigms, however, is a pragmatic perspective that through the implementation of natural linguistic context might provide a more comprehensive and authentic picture of bilinguals' affective repertoires in communicative encounters. In the present dissertation I will therefore adopt a pragmatic approach to the investigation of affective language in bilingual speakers that might account for the inconsistencies reported in behavioural, psychophysiological and neuroimaging studies. Specifically, I set out to investigate how the build-up of contextual information might modulate behavioural and electrophysiological responses to affective words in the native and non-native language in two experiments on immersed Polish-English bilinguals. Hence, this study aims to explore the available psycho- and neuro-linguistic findings in the research on affective language processing in bilingualism and, owing to the "pragmatic twist" in the design, provide a more reliable picture of the phenomenon under investigation.

Chapter 1 will discuss the theoretical and empirical background of the relationship between affect and language. It will present a historical perspective on the concept of emotion, demonstrating how its understanding has been shaped over the past century. Here, the mainstream models of emotion will be discussed along with their critical evaluation. Particular attention will be devoted to the premises of the psychological construction model (Barrett and Russell 2015) and the concept of core affect that provide the theoretical foundation for the present investigation. Finally, the interaction between affect and language will be discussed from a psycholinguistic and pragmatic perspective. It will be brought to the fore that in order to better understand the mechanisms governing the manifestation of affective language in communication, there is a need for an introduction of linguistic context into an experimental design, likewise to experiments in the field of neuropragmatics.

Chapter 2 will build on the discussion on affect – language interface from Chapter 1, but – importantly – it will extend it to a bilingual context. It will provide a critical review of a wide array of studies investigating affective repertoires of bilingual speakers in such contexts as psychotherapy or psycholinguistic laboratory, and using such measures as self-reports or electroencephalography. As it will be shown, at present there is a marked discrepancy between the findings in the field. While clinical and introspective studies

suggest that the second language may be affectively more distant than the first language, cognitive, psychophysiological and neuroimaging evidence report essentially no measurable differences in affect processing in L1 and L2. As in Chapter 1, it will be argued that such inconsistency in bilingual research on affective language might stem from unnatural experimental designs and the absence of linguistic context in psycho- and neuro-linguistic paradigms.

Chapter 3 will describe two experiments whose aim is to directly address the aforementioned limitation of psycho- and neuro-linguistic studies on affective language in bilingual speakers, i.e. the absence of linguistic context in experimental design. The described experiments constitute the first attempt to directly investigate the impact of a build-up of contextual information on the processing of the same set of affective words in the first and second language of bilingual individuals. Also, both behavioural and electrophysiological data were collected in experiment 1 and 2 to obtain a holistic view on the phenomenon under investigation. As it will be reported and discussed, the collected data provides compelling evidence of the influence of natural sentence context on bilinguals' affective responses to stimuli. Specifically, the present study demonstrates a differential modulation of electrophysiological responses to affective sentences, but not single words, in L1 and L2. This finding offers the first neurocognitive interpretation of findings reported in clinical and introspective studies.

Chapter 1: Affect and language

1.1. Introduction

The aim of this chapter is two-fold. First, its goal is to bring to the fore the reciprocal relationship between affect and language in communication, and to connect these two pieces into a coherent whole, consistent with *affective pragmatics* – an emerging field of theoretical and empirical research whose aim is to look into the complex affect-language interface in communicative interactions. Second, its goal is to go beyond the theoretical discussion of affect-language interface in communication and to put it into an empirical, neuroscientific perspective; a perspective I will refer to as *affective neuropragmatics*. Structure-wise, the first chapter is divided into three main sections whose aim is to gradually build the foundation for understanding the principles of *affective neuropragmatics*.

In the first section I review the past and present approaches to emotion, highlighting the ambiguities and controversies around this concept. This section provides the motivation behind a recent theoretical and empirical re-focus on the analysis of more general affective, not emotional, phenomena.

The second section is devoted to affective phenomena. I begin with a discussion of *core affect*, an essential substrate of any affective phenomenon, and a new framework in affective sciences. I follow with a discussion of the everyday manifestation of affect in the domain of evaluation and the hypothesis about the primacy of affect over cognition.

Finally, I address the issue of unconscious affect and provide a review of studies on the neural underpinnings of affective phenomena.

The third and final section of Chapter 1 is reserved for the discussion of how affect manifests itself in verbal language. Here, I review the available evidence from two perspectives – a psycholinguistic perspective and a pragmatic perspective – and point out their weak points: the focus on examining decontextualized affective stimuli (psycholinguistics) and the focus on the rational and cognitive aspects of a communicative interaction, leaving behind its affective substrate (traditional, cognitive pragmatics). For a solution, I turn to *affective neuropragmatics* that assembles what is probably best in the two approaches – the methodological precision and tools (psycholinguistics) with the focus on contextual effects in communication (cognitive pragmatics) - as well as addresses and resolves their above-mentioned weak points. As such, *affective neuropragmatics*, by its focus on neurophysiological measures of affective language in communication, constitutes the methodological framework for the present investigation.

Throughout, I will use the term *emotion* or *emotional* to refer exclusively to the common sense emotion categories, as delineated by *basic emotion* theorists (section 1.2.1; anger, happiness, disgust) and reflected in subjective experience or language (e.g. he is *happy*). The term *affect* or *affective* will be used as a general umbrella term for anything emotional (e.g. emotion, mood, motivation, preference/liking, attitude, valence, arousal). *Core affect*, in turn, will be used in its original sense, as delineated by *psychology construction* theorists (section 1.2.3; e.g., Russell and Barrett 1999; Russell 2003, 2009, 2012, 2015; Barrett 2006a), to refer to the very elemental affective substrate, a basic neurophysiological experience that feels 'good' or 'bad'.

1.2. What is an emotion?[1]: Past to Present

> More than any other species, we are beneficiaries and victims of a wealth of emotional experience. (Dolan 2002: 1191)

[1]The title of this section refers to the seminal work by William James (1884) with the same title.

Despite over a century of theory and research, the understanding of what emotion is and how it should be defined remains unclear. According to Mulligan and Scherer (2012), "[t]here is no commonly agreed-upon definition of emotion in any of the disciplines that study this phenomenon" (2012: 345). Many scholars argue that this confusion about the definition of emotion has significantly delayed progress in both theoretical and empirical understanding of the phenomenon (see Walla and Panksepp 2013; LeDoux 2014, 2012b, 2015; Dixon 2012; Russell 1991; Kleinginna and Kleinginna 1981; Russell 2012; Russell and Barrett 1999; Panksepp and Watt 2011; Duffy 1934a, 1934b). In this subsection, my aim is to present a brief history of the emotion concept as well as to discuss three main currents of thought about the nature of emotion and provide their critical evaluation.

The spark of interest in contemporary emotion research was ignited by Charles Darwin's (1809 – 1882) publication of *The Expression of the Emotions in Man and Animals* (1872), in which Darwin expressed his view that emotions are 'states of mind' that trigger stereotypic patterns of behaviour. Darwin's contemporary, William James (1842 – 1910), disagreed with this observation and postulated that emotion is caused by visceral changes in the body. In his seminal essay entitled *What is an emotion?* James (1884) writes:

> Our natural way of thinking about these standard emotions [currently referred to as basic emotions, e.g. fear, anger] is that the mental perception of some fact excites the mental affection called the emotion, and that this latter state of mind gives rise to the bodily expression. My thesis on the contrary is that *the bodily changes follow directly the PERCEPTION of the exciting fact, and that our feeling of the same changes as they occur* IS *the emotion* [emphasis in the original, RJ]. (1884: 189–190)

Therefore, to James (1884, 1913) emotional states were generated as a result of physiological reactions in the body, not the other way around. This view was in turn criticized by Walter Cannon (1871 – 1945), an American physiologist, who, together with his student Philip Bard (1989 – 1977), formulated an opposing model of emotion referred to as the Cannon-Bard theory (Cannon 1927). Based on extensive research of the autonomic nervous system (ANS) in a cat, Cannon concluded that emotions might be elicited in the absence of autonomic feedback. Furthermore, Cannon claimed that feelings and visceral reactions were separate, independent processes engendered by the brain in the

course of processing of emotional stimuli. These views were articulated in Cannon's seminal work entitled *The James-Lange theory of emotions: A critical examination and an alternative theory* (1927). For a detailed discussion of the two opposing theories by James (1884, 1890) and Cannon (1927), refer to Friedman (2010).

The theoretical views on the nature of emotions expressed by Charles Darwin and William James have had an immense impact on emotion inquiry and research, and, among others, have provided the foundation for three main contemporary approaches to emotions. In the Darwinian tradition, emotions have been interpreted as being biologically given 'natural kinds' that are hard-wired into the brain; they are observable in nature and recognized by the mind; they are complex, automatic reflexes elicited by stimuli in the environment (Ekman et al. 1987; Ekman 1992, 1993; Izard 1994, 2009; Tomkins 1962, 1963; Panksepp 1998; Panksepp and Watt 2011; Arnold 1960). In the Jamesian tradition, emotions are considered 'mental constructs' that are elicited by more basic psychological processes; they are not recognized but constructed by the mind (Barrett 2006b, 2006a; Barrett and Bliss-Moreau 2009; Lindquist and Barrett 2012; Barrett 2013, 2011; Gendron and Barrett 2009; Russell 2012, 1994, 2003; Mesquita and Boiger 2014; Wundt 1902; James 1884, 1913; Schachter and Singer 1962). The followers of Darwin's arguments have represented what is referred to as the *natural kind* (or *basic emotions*) view while the Jamesian tradition is thought to have inspired the *appraisal approach* to emotion (Arnold 1960; Lazarus 1966, 1991; Frijda 1986, 1993, 2013; Scherer 1984; Ellsworth and Scherer 2003; Scherer 2009; Mulligan and Scherer 2012), and laid the foundation for the *psychological construction* view of emotion (Russell 2009; Barrett 2011, 2013; Barrett and Russell eds. 2015).

These approaches will be discussed in turn in the following subsections. It should be noted, however, that a detailed description of their theoretical and empirical bases is beyond the scope of this dissertation. For a comprehensive review of the historical development of emotion research and the presentation of the emotion approaches, refer to Gendron and Barrett (2009) and Strongman (2003).

1.2.1. Emotions as basic, natural kinds

The *natural kind* or *basic emotions* paradigm has guided contemporary research on emotion in the last three decades (LeDoux 2012b). This theory proposes a set of biologically given emotion categories (e.g. fear, anger), each being characterized by distinct neural and psychophysiological correlates; each thought to be the *basic*, *primitive*, *universal*; each thought to be the *natural kind* (Tomkins 1962, 1963; Ekman et al. 1987; Ekman 1992, 1993; Izard 1993, 1994, 2009; Panksepp 1998; Panksepp and Watt 2011). In the *natural kind* view, emotions could be therefore compared to atoms such that they are thought to constitute the fundamental features of the mind and brain (Barrett 2011).

The research on *basic emotions* and the idea of universality and essentiality of a number of emotion categories was based on empirical investigation of the perception of facial expressions among literate and pre-literate cultures (Ekman et al. 1969; Ekman and Friesen 1971; Izard 1971; Ekman and Friesen 1977; Ekman et al. 1987). The initial accounts of the *basic emotions* theory were presented in the paper by Ekman, Sorenson, and Friesen (1969) in which the researchers reported cross-cultural agreement in the recognition of photographs of facial expressions depicting happiness, fear, disgust-contempt, anger, surprise, and sadness. These results were further supported by a simultaneous cross-cultural study by Izard (1969). Not long after the studies had been published did the classification of happiness, fear, disgust, anger, surprise, and sadness as the basic and universal emotional categories enter the psychology course books. The *basic emotions* model has become the *standard view* according to which emotional phenomena have been explained and investigated for the next 30 years (Russell 1991, 1994; LeDoux 2012b). Many scholars seemed to acknowledge the *basic emotion* theory as a scientific law; for example, Matsumoto (1990: 195) argued that "the universality of facial expression of emotion is no longer debated in psychology"; Izard and Saxton (1988: 651–652) agreed that "[t]he evidence for the innateness and universality of the expressions of the fundamental emotions is sufficiently robust to consider Darwin's hypothesis as an established axiom of behavioral science"; finally, Brown (1991: 26) affirmed that "[t]he conclusion seems inescapable: There are universal emotional expression".

1.2.1.1. Critical evaluation

This "established axiom", as argued by Izard and Saxton (1988: 652), however, did not escape criticism. Indeed, throughout the years the *basic emotions* theorists have been criticized for not reaching consensus on which emotions should be classified as basic and what the guidelines are for such a classification (LeDoux 2012b; Ortony and Turner 1990). Some of the *basic emotion* theorists introduced changes to their own sets of basic emotion categories. For example, Ekman (1992) extended his original set of 6 basic emotions with additional categories of awe, amusement, contempt, embarrassment, excitement, guilt, interest and shame. In a later paper, Ekman (1999) added some positive basic emotion categories such as amusement, pride in achievement, satisfaction, relief and contentment. At the same time, however, Ekman's set of basic emotion categories has significantly differed from those proposed by other *basic emotions* theorists (Panksepp 1998, 2005; Panksepp and Watt 2011; Walla and Panksepp 2013; Izard 1994, 2009; Frijda 1986, 2013). Due to this confusion around the classification of basic emotion categories, some researchers questioned the validity of the *basic emotion* model (see Ortony and Turner 1990; LeDoux 2012b).

Further criticism of the theory has been directed at poor reliability of the forced-choice paradigm implemented in typical experiments on emotion perception (for argumentation see Russell 1991, 1993, 1994; Walla and Panksepp 2013; Clore and Ortony 2013; Ortony and Turner 1990; LeDoux 2012b; Gendron et al. 2012). In a forced-choice task, participants view posed expressions of emotions and are asked to select from a list of emotion words one that best describes the facial expression. Oftentimes, as was the case in the seminal work by Ekman et al. (1969), the list of choices fully corresponded to the instances of basic emotions expressed by the facial stimuli; filler items were rarely made available to participants. Contemporary research shows, however, that the forced-choice paradigm might skew the data to support the formulated hypothesis (Russell 1993; Widen et al. 2011; Lindquist et al. 2006; Gendron et al. 2012). For example, a recent study by Widen et al. (2011) found that in a free-labelling task, in which participants spontaneously labelled four facial expressions (contempt, shame, embarrassment, compassion), more than

80% of attributions were made incorrectly. By contrast, in a forced-choice response format the accuracy ratings significantly improved (Widen et al. 2011). This study supports the hypothesis that perception of emotion is to a significant extent contingent upon the accessibility of linguistic cues (see the language-as-context hypothesis; Lindquist et al. 2006; Gendron et al. 2012) such that when participants are asked to make a perceptual judgment on a facial expression in the absence of linguistic labels, their performance significantly deteriorates. These findings have challenged the reliability of the body of evidence supporting the universality of emotion perception that has provided the foundation for *basic emotions* theory.

Another methodological concern expressed by some opponents of the *basic emotion* theory involves the ecological validity of the facial expressions used in standard emotion perception studies. According to Clore and Ortony (2013: 338), facial expressions – considered the "gold standard" for emotion differentiation – display posed emotions that are not typically encountered in social interactions. In a similar vein, Walla and Panksepp (2013) argue that facial expressions may not reliably represent human emotional experience in the first place:

> [A] facial expression is an emotion of the person the face belongs to. The image of a facial expression is not necessarily in itself a matching affective stimulus such as the scene that elicited affect in the person demonstrating the facial expression (…). It instantly becomes clear that indirect affective information as communicated via facial expression can be misinterpreted and actually lead to different affective processing and a different emotion in the observer of a facial expression. (Walla and Panksepp 2013: 99; see Sabatinelli et al. 2011)

Finally, recent evidence from the field of human and animal neuroscience has questioned the *basic emotions* theory premise about the existence of hard-wired basic emotion circuits in the brain (e.g. LeDoux 2012b, 2014; Lindquist and Barrett 2012; Oosterwijk et al. 2012; Barrett and Satpute 2013; Lindquist et al. 2012; Kober et al. 2008; Duncan and Barrett 2007; Wager et al. 2008). Considered a leading *basic emotions* neuroscientist, Panksepp (1998, 2005, 2011; Panksepp and Watt 2011; Walla and Panksepp 2013), based on extensive research, has identified 7 basic emotional circuits in the animal brain: SEEKING, RAGE, FEAR, LUST, CARE, PANIC, PLAY. It remains questionable,

however, how the classification of basic, universal emotions proposed by Panksepp (see 1998) correlates with that of Ekman's (1992, 1999; Ekman et al. 1969).

Despite the critical accounts of the *basic emotions* theory, it remains to be said that this approach has not only provoked a lot of questions but in a way provided the foundation for the present investigation of emotion. Notably, it has also left a lasting legacy in the form of the development of the Facial Action Coding System (FACS; Ekman and Friesen 1977) that enables a comprehensive analysis of human facial movements. Finally, one of the key assumptions of the *basic emotions* theory – that there are innate emotion circuits in the brain – cannot be easily disclaimed due to the limited resolution of the available neuroimaging techniques (LeDoux 2012b).

1.2.2. Emotions as *appraisals*

The appraisal theory postulates that emotions are immediate and automatic responses to evaluations (or *appraisals*) and interpretations of the environment (Arnold 1960; Smith and Ellsworth 1985; Ellsworth and Scherer 2003; Lazarus 1991; Leventhal 1984; Ortony et al. 1990; Clore and Ortony 2008, 2013; Scherer 1984; Mulligan and Scherer 2012). The *appraisal* theory is said to have been pioneered by Magda Arnold (1960) and Richard Lazarus (1966) and the roots of which trace back to the ideas expressed by James (1890) as well as to ancient philosophers' reflections about emotions (Moors et al. 2013). The basic assumption of the theory, as originally postulated by Arnold (1960), is that humans constantly and implicitly evaluate the stimuli and events in their environment for personal relevance, and that such meaning analysis triggers an emotion. In a recent reformulation, appraisal theorists conceive of emotions as "adaptive responses which reflect appraisals of features of the environment that are significant for the organism's well-being" (Moors et al. 2013: 119). As such, emotions are conceptualized not as states but as dynamic processes. Depending on the context (personal, situational, cultural), the meaning analysis may vary, leading to an emergence of different emotions. *Appraisal* theories may therefore account

for variability in emotion experience in interpersonal and cross-cultural contexts (Roseman 1991; Moors et al. 2013; Moors 2014).

Appraisal theories postulate that emotional events result from alterations in the underlying mechanisms or components. These components include appraisal (evaluation and interpretation of the environment), motivation (action tendencies), physiological responses, expressive behaviour, and subjective experience or feelings (see Moors et al. 2013: 119–120; Moors 2014). The components are meant to be highly interactive such that alterations in a given component impinge on other components. Notably, appraisal – as an ingredient of an emotional event – has been also incorporated in other emotion theories (e.g. Ekman 1994; Russell 2003). What makes *appraisal* theories stand out is the fact that here appraisal lies at the core of emotion and constitutes the key component of an emotional event (Frijda 2013; Lazarus 1991; Ellsworth and Scherer 2003; Scherer 2009; Mulligan and Scherer 2012; Roseman 1991; Clore and Ortony 2008). Indeed, *appraisal* theorists have proposed a set of appraisal criteria to account for various types of emotional episodes that arise in stimulus-environment interactions, e.g. stimulus novelty, valence, or relevance for an individual's goals (Brosch 2013; Moors 2014).

As in the case of *basic emotion* theory, however, *appraisal* theory is not a homogenous model. *Appraisal* theorists differ, among others, with regard to the delineation of the set of the aforementioned appraisal criteria or features, their degree of automaticity or whether or not the appraisal features are processed in a fixed sequence (for a discussion see Moors et al. 2013; Moors 2014; Clore and Ortony 2008, 2013). Some authors (see Moors 2014; Barrett 2011) thus suggested that contemporary *appraisal* theories can be divided into two distinct strands (Moors 2014: 304). The first strand is reminiscent of the *basic emotion* theory whereby it focuses on the analysis of a limited set of causal antecedents of distinct mental events that are observable in nature and correspond to a specific set of emotion words such as 'fear' or 'anger' (Arnold 1960; Scherer 1984; Lazarus 1991; Roseman 1991). In line with this view, appraisals *cause* emotions (Barrett 2011); or more specifically, "different patterns of appraisal elicit different emotions" (Roseman 1991: 162). By contrast, the second strand of *appraisal* theories analyses emotional episodes in terms of the more general, underlying causal mechanisms (components), without the

precondition that such processes have to be emotional in nature (Scherer 2009; Ortony et al. 1990; Smith and Ellsworth 1985; Schachter and Singer 1962; Clore and Ortony 2008, 2013). Here, appraisals do not cause but *constitute* emotions as psychological phenomena that arise from non-emotional ingredients (Moors et al. 2013; Moors 2014; Barrett 2011; Clore and Ortony 2008). Hence, the second strand of *appraisal* theories is by some scholars viewed as a *constructionist* approach (e.g. Barrett 2011), the discussion of which I defer to the following subsection. Some authors, however, remain sceptical about making such categorizations. For example, while Brosch (2013) acknowledges the many commonalities between *appraisal* and *constructionist* theories of emotion, he does not subsume *appraisal* theory under *constructionist* theories. Furthermore, Brosch (2013) seems to more explicitly demarcate the line between the non-modular *appraisal* and modular *basic emotion* theories, to quote:

> While some theorists have indeed developed appraisal profiles with the aim of specifying the elicitation of basic emotions (Roseman 1991), most appraisal theorists see emotional episodes as an ongoing emergent process that is characterized by continuous changes in the underlying appraisals, and focus on the dynamic nature of an emotional response (Frijda, 1986; Scherer & Ellsworth, 2009). Thus, most appraisal theorists would agree that there are as many different emotional states as there are different dynamic appraisal outcomes. (Brosch 2013: 370)

1.2.2.1. Critical evaluation

Criticism of the *appraisal* theory has been mainly directed at two of its assumptions: a) the conception that *appraisal* is a causal mechanism, and b) the (mis)conception that *appraisal* is a controlled, cognitive process.

The conception of *appraisal* as a process that triggers emotion has provoked considerable criticism in emotion research (e.g. Barrett 2012; Barrett et al. 2007; see Moors 2013), also on the part of *appraisal* theorists (for a discussion see Moors 2014). For example, Clore and Ortony (2013), the advocates of the Ortony, Clore, Collins (OCC) *appraisal* model (see Ortony et al. 1990; Clore and Ortony 2008, 2013) suggest that "appraisals [are] characterizations rather than causes of emotions (…). Emotion may thus

be *constructed* rather than *triggered* [emphasis mine, RJ]" (Clore and Ortony 2013: 9), thus comparing *appraisal* to a "sculptor" of emotional episodes (Clore and Ortony 2013: 9). In a similar vein, Barrett et al. (2007) have objected to such "functionalist assumptions that reduce the experience of emotion to its immediate causal relations" (Barrett et al. 2007: 375).

The second line of criticism concerns the cognitive, supposedly non-automatic nature of the *appraisal* process and thus questions the possibility of the influence of appraisal on the elicitation of rapid emotional responses (for a discussion, see Clore and Ortony 2008, 2013; Brosch 2013; Moors et al. 2013). Many appraisal theorists, however, highlight that appraisal may occur at both conscious and unconscious, automatic level (van Reekum and Scherer 1997; Leventhal and Scherer 1987; Mulligan and Scherer 2012; Frijda 2013; Moors et al. 2013; Moors 2010; Brosch 2013). According to Frijda (2013: 106), "appraisal processes are, in principle, nonconscious. Their outcomes may be conscious, in how one sees and experiences emotional events (…)". Frijda's (2013) argument echoes Arnold's (1960) original formulation of appraisals as "sense judgments" that are "direct, immediate, non-reflective, nonintellectual and automatic [in] nature" (Arnold 1960: 175). Precisely in which circumstances appraisal is an automatic/non-automatic phenomenon remains an empirical question.

1.2.3. Emotions as psychological constructs

With roots in the ideas of William James (1884, 1913), the *psychological construction* model considers emotional experiences as highly variable mental states constructed by basic, global processes (*psychological primitives*) that are not specific to emotion (Barrett 2011, 2012, 2013; Gendron and Barrett 2009; Lindquist 2013; Russell 2003, 2009). While the first articulation of the *psychological construction* view on emotion is dated back to James' essay in *Mind* entitled "What is an emotion?" (1884), the author dedicated more space for the discussion of emotion in "The Principles of Psychology" (1890):

> The trouble with the emotions in psychology is that they are regarded too much as absolutely individual things. So long as they are set down as so many eternal and sacred psychic entities, like the old immutable species in natural history, so long all that can be done with them is reverently to catalogue their separate characters, points, and effects. But if we regard them as *products of more general causes* (as 'species' are now regarded as products of heredity and variation), the mere distinguishing and cataloguing becomes of subsidiary importance [emphasis in the original, RJ]. Having the goose which lays the golden eggs, the description of each egg already laid is a minor matter. (James 1913: 449)

James (1913) was also sceptical about the idea to introduce emotion as a new entity or discipline in light of evidence from other established disciplines that could already explain this phenomenon: "emotion is the resultant of a sum of elements, and each element is caused by a physiological process of a sort already well known" (James 1913: 453). Such views have been typically associated with a *constructionist* approach, expressed and reemphasized throughout the years by other researchers (e.g. Duffy 1934a, 1934b; LeDoux 2012b, 2012a). For this reason I dedicate a separate subsection to specifically address the question whether the concept of emotion is necessary for further progress in the field (see section 1.2.4).

At present, the *psychological construction* model of emotion is a family of different accounts (Russell 1980, 2003, 2009; Barrett 2014; Barrett et al. 2015; Mesquita and Boiger 2014; Boiger and Mesquita 2015; Cunningham et al. 2015; Lindquist 2013), also referred to as a research programme, all sharing a common *constructionist* foundation (Russell 2015). This common underlying principle echoes Jamesian conviction that emotions are *constructed*, not *engendered*, out of more basic *psychological primitives* that are not emotion-specific but "domain-general ingredients from which experiences emerge more generally" (Barrett et al. 2015: 84). A notable premise of the *psychological construction* accounts is, further, that emotions are highly heterogeneous phenomena characterized by considerable variation that, following Barrett et al. (2015: 85), "is the key to survival".

By analogy to *basic emotion* and *appraisal* theories, there is a certain degree of variation in the formulations of and emphasis on some *constructionist* assumptions in different *constructionist* models. As already noted, *constructionist* accounts unite in the investigation of basic, *psychological primitives* underlying subjective experience, but differ in their delineation and formulation. For example, Russell's (2003, 2009, 2012, 2015) *psychological construction* perspective proposes *core affect* (see section 1.3.2) as the most

basic and fundamental property of a human mind, a *psychological primitive* that constitutes a vital ingredient of subjective emotion experience. Barrett (2012, 2014; Barrett et al. 2015), in her *Conceptual Act Theory*, focuses more on how the interplay between basic, core systems (like *core affect*) gets constructed and conceptualized by the perceiver in what she refers to as *situated conceptualization*. In a yet different *psychological construction* perspective, Mesquita and Boiger (2014; 2015) argue that "emotions emerge from social interactions and relationships, which they in turn constitute, shape, and change (…). [S]ocial interaction and emotions form one system of which parts cannot be separated"(2014: 298). In this model, interpersonal, social, and cultural contexts become the core systems from which emotions are constructed.

1.2.3.1. Critical evaluation

It seems that the contemporary *psychological construction* models of emotion have so far managed to evade strong criticism, possibly because *psychological construction* accounts – in their current form – are relatively recent and some of them are still in the making. One valid objection to *psychological constructionists'* denial of the existence of discrete neural circuits of basic emotions, however, was raised by a neuroscientist Joseph LeDoux (2012b). Specifically, LeDoux (2012a, 2012b, 2014, 2015) argues that despite rapid development in human neuroscience, the available neuroimaging techniques do not allow for detailed enough a picture of the neural correlates of basic emotions in humans; hence, due to such technological limitations, one cannot disprove the hypothesis proclaiming distinct, innate neural circuits of 'fear', 'anger', and other basic emotions (LeDoux 2012b), as argued by psychological constructionists (e.g. Barrett 2006a; Lindquist et al. 2012; Barrett and Satpute 2013).

1.2.4. Does the concept of emotion serve any useful purpose in scientific psychology?[2]

In her article entitled "Emotion: an example of the need for reorientation in psychology", Duffy (1934a: 186) argued that "lack of success in recognizing emotion could be due to faulty experimental techniques and to inadequate guides for introspection, but it could also very well be due to the fact that the object of our search is, in the form in which we seek it, non-existent". It has been 81 years separating Duffy's publication from present investigations of emotion, a period marked by remarkable progress in research methodology. The improvement of behavioural and development of neuroimaging techniques have made it possible to indirectly measure neural correlates of processes involved in emotional experience. Despite such advances, however, the scientific understanding of emotion remains to be poorly understood and its definition constantly debated (LeDoux 2012b); this could be also inferred from the aforementioned discussion of different approaches to emotion. Hence, echoing the ideas of James (1884, 1890) and Duffy (1934a, 1934b), most recent approaches to emotion have focused on the investigation of more global non-emotional processes that underlie subjective experiences of emotion (Schachter and Singer 1962; Russell 2003, 2009, 2015; Barrett 2014; Barrett et al. 2015; LeDoux 2012b, 2012a, 2015; Clore and Ortony 2013; Scherer 2009; Moors et al. 2013; Panksepp and Watt 2011; Walla and Panksepp 2013), abandoning the common sense term 'emotion' as an object of scientific investigation. In line with LeDoux (2012),

> [t]he challenge for emotion researchers is to understand the relation of the phenomena to the field of emotion without redefining them as fundamentally emotional phenomena, and thus infusing the phenomena with confusing implications. (…) Stepping back from the overarching concept of emotion and focusing instead on key phenomena that make emotion an interesting topic may be the best way out of the conceptual stalemate that results from endless debates about what emotion is. (LeDoux 2012b: 653–654)

This does not mean that the term 'emotion' should be discarded altogether. It is indeed a fundamental ingredient of human interactions when used as a folk term to conceptualize and communicate the myriad of otherwise elusive bodily sensations. In the context of

[2]A quotation from Duffy (1934a: 184).

scientific investigation, however, it seems that the *psychological construction* analysis of component parts of emotional experience constitutes a more reliable and transparent scientific paradigm that might in the long run provide a comprehensive understanding of this phenomenon. Focus on a more general process (e.g. valence, arousal, body feedback) might therefore allow for more testable hypotheses, as well as more accurate and generalizable interpretations of findings in future research on such processes that contribute to the construal of subjective emotion experiences.

1.3. Theoretical framework

1.3.1. *Psychological construction*: a framework for the present investigation

The *psychological construction* analysis of emotional phenomena constitutes a theoretical framework that, at present, most accurately accounts for the way in which emotional processes will be investigated in this dissertation. Specifically, consistent with *psychological construction* model, the present investigation does not focus on the analysis of the common sense, folk terms of emotions, but rather on more general *affective* processes and their realization and manifestation in language. One such process, *valence*, will be given particular importance, especially in the analysis of the *affect*-language interface. *Valence* is a term coined by a German-American psychologist, Kurt Lewin (1935), and refers to the intrinsic pleasant (positive/attractive) or unpleasant (negative/unattractive) quality of a stimulus, event or situation that arises in an interaction between an individual and their environment. From the perspective of a *psychological construction* model, *valence*, along with *arousal* (the level of intensity of physiological response to a stimulus, event or situation), constitute a fundamental ingredient of human emotion experience and the most basic *affective* substrate – *core affect* (Russell 1980; Russell and Barrett 1999; Russell 2003, 2009, 2012, 2015).

In what follows, I will provide a theoretical account of the concept of *core affect*, which has emerged relatively recently, but at present might constitute a reliable and accurate theoretical framework for the analysis of the whole array of human emotional experiences. Following the discussion of *core affect*, I will proceed to the overview of the ubiquitous process accompanying human life – evaluation –, where more general *affective* processes play a key role. I will then review what is referred to as the *affective primacy* hypothesis, according to which *affect* dominates social interaction and thus is given priority in the course of processing. In this context, I will also try to tentatively propose the view that both evaluation and the processes underlying affect processing might be contingent upon people's current state of *core affect*. The final part of this section devoted to theoretical and empirical analyses of *affective* phenomena will be devoted to a review of the neural correlates of *affective* processes from the perspective of *psychological construction* model.

1.3.2. Core affect

The primary motivation behind the attempt to formulate a new concept that might account for the wealth and variety of human emotional experiences was quite straightforward: first, the *prototypical emotional episodes* or so called *full-blown* emotions (e.g., anger, fear, sadness; see Russell and Barrett 1999) turned out to be too specific categories to do so effectively; second, they are constrained to the English language that in itself turned out to be very limiting when attempting to analyse cross-cultural emotion experiences (see Russell 1991, 1994). Thus, consistent with the *psychological construction* model there was a need for the re-analysis of the concept of emotion by focusing on more basic, primitive ingredients of emotional phenomena that might provide a more comprehensive understanding of human emotion experiences.

The concept of *core affect* was born out of the analyses of people's subjective reports about their feelings and moods in a given point in time (Russell 1979; Russell et al. 1989; 2015). Such analyses demonstrated that how individuals felt might be reliably

represented as a mixture of two general, independent, bipolar dimensions: valence (pleasant/unpleasant) and arousal (active/drowsy); this relation may be represented in a two-dimensional space, as demonstrated in Figure 1. According to Russell and Barrett (1999) a representation of an individual's state of *core affect* requires that the two dimensions of valence and arousal be taken into account; experience-wise, however, *core affect* is a single feeling (Russell 2012).

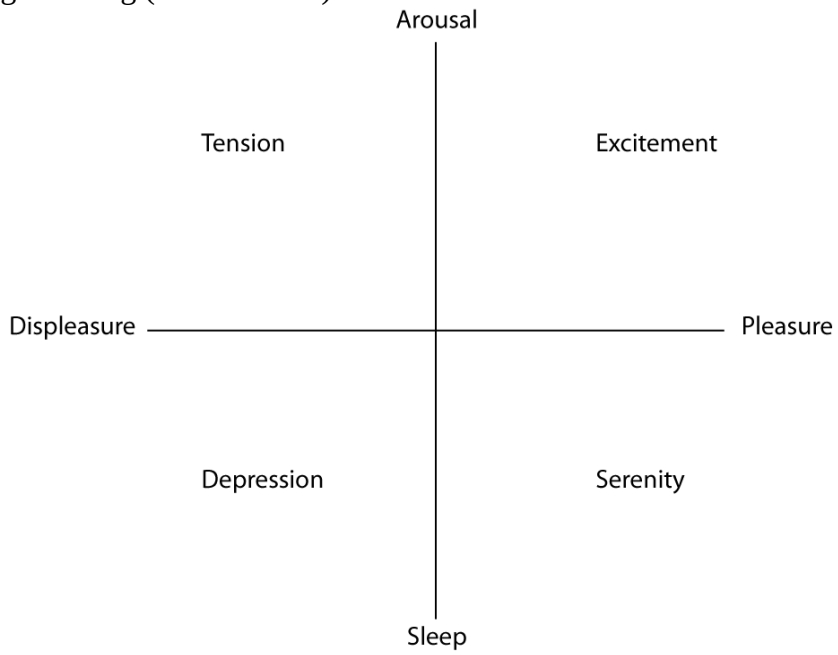

Figure 1. A representation of core affect in a two-dimensional circumplex model (after Russell 2012: 86)

Core affect thus represents "the most elementary consciously accessible affective feelings" (Russell and Barrett 1999: 806). More precisely, it has been construed as "a pre-conceptual primitive process, a neurophysiological state, accessible to consciousness as a simple non-reflective feeling: feeling good or bad [the dimension of valence], feeling lethargic or energized [the dimension of arousal]" (Russell 2009: 1264). In short, the state of *core affect* individuals find themselves in would be reflected in an answer to a question: "How do you feel?" (Russell 2015: 198). Notably, unlike *full-blown* emotions, *core affect* does not require an object; in other words, it can be "free-floating", about *nothing* in particular (e.g. I feel good!), in which it resembles moods (Russell and Barrett 1999: 806; Russell 2003, 2015). If it does get attributed to an object (e.g. Your presence makes me feel good!), however, it then constitutes one of the sub-events of *prototypical emotional*

episodes. Hence, c*ore affect* is thought to be the basic *affective* substrate that constitutes an essential ingredient of *full-blown* emotions.

Another characteristic feature of *core affect* is that it "ebbs and flows" as a function of time (Russell and Barrett 1999: 806). Such fluctuations in *core affect* vary in degree and may have important implications for other cognitive processes. For instance, a person being in a state of negative *core affect* may be more likely to perceive and appraise their environment in a more negative light. Other cognitive processes, such as decision making, have been also argued to be contingent upon the current state of *core affect* (see Russell 2015). In fact, it has been demonstrated that *core affect* modulates participants' behavior even if it is not consciously experienced (Berridge and Winkielman 2003; Winkielman and Berridge 2004; Winkielman et al. 2005). Hence, according to Barrett (2006b: 50) *core affect* is a "neurophysiologic *barometer* of the individual's relationship to an environment at a given point in time [emphasis mine, RJ]". In other words, it is thought to be the governor of our perceptions and behaviours. As such it is considered a *psychological primitive*; a concept that is irreducible at the psychological level (Russell 2012). This has two implications. First, as the core characteristic of a *psychological primitive* is that it is not specific to any particular domain, so is the case with *core affect* and the domain of emotion. Specifically, it has been shown that *core affect* may also play a significant role in other non-emotional processes such as vision (see Barrett 2011). Second, it should be brought to the fore, that, although irreducible as a psychological phenomenon, *core affect* can be broken down into more elementary processes on the neural level of analysis. Although the investigation of *core affect* in the brain is a relatively recent development, it already provides initial evidence that individuals' self-reports of their *core affective* states are strongly correlated with the neural activation in specific brain areas; activation that is not common to various instances of *prototypical emotional episode* (see Wilson-Mendenhall et al. 2013).

1.3.3. Affective evaluations

The neurophysiological state of core affect might play a significant role in human social interactions (Zajonc 1980; Kopytko 2002)[3]. While the research on the relation of *core affect* and other psychological domains is still in its infancy, there is introspective and objective evidence to tentatively suggest that individuals are constantly and often unconsciously (Berridge and Winkielman 2003, 2003) influenced by their affective states that guide their actions and behaviours. One important domain guided by *core affect* is the domain of evaluation, an indispensable part of people's everyday experience (Barrett 2006b: 38). Evaluation is thought to arise when the free-floating, neurophysiological state of *core affect* gets attributed to an object in the environment (e.g. another individual, an event, a situation). In other words, the process of evaluation may be construed as an individual's feeling *about* a particular stimulus (Russell and Barrett 1999). People evaluate their environment continuously and effortlessly, consciously and unconsciously. Hence, according to Winkielman et al. (2003: 189) each human being has become 'an evaluating human'- *homo evaluaticus*. Governed by *core affective states*, evaluation is essentially about an organism's binary decision what is pleasant or unpleasant (valence), valuable or worthless (appraisal), and is automatically linked to approach-withdrawal behaviours (Chen and Bargh 1999: 220). Evaluation may be also manifested in what is often referred to as a 'gut feeling' (Gigerenzer 2008). It often happens that we spontaneously decide to choose a restaurant, having already discarded many alternative options, but fail to provide a good reason for it. We somehow 'like' or 'prefer' one over the others. Or we simply say that we 'feel it in our gut'. This 'gut feeling' is probably what Russell (2003, 2009, 2012, 2015) might refer to as *core affect*. Overall, evaluations are thought to be primarily based on the interaction between a current state of *core affect*, a stimulus in the environment to which *core affect* is directed, and, crucially, the wealth of an individual's experience.

Extensive scientific investigation of evaluative processing in the fields of social and psychological sciences has demonstrated that such processing is fairly automatic (see Bargh

[3]However, both Zajonc (1980) and Kopytko (2002) refer to more general *affective* phenomena rather than *core affect* (see Russell and Barrett 1999).

1997; Bargh et al. 1992, 1996; Chen and Bargh 1999; Bargh et al. 2012; Williams and Bargh 2008). Interestingly, a number of studies have demonstrated a uni- as well as bi-directional influence of the experience of physical warmth or coldness on how individuals perceive and interpret interpersonal relationships and use of language (see Williams and Bargh 2008; IJzerman and Semin 2009, 2010; Zhong and Leonardelli 2008). Specifically, the experience of increased physical warmth induced by holding a warm beverage (e.g. IJzerman and Semin 2009; Williams and Bargh 2008), staying in a warm room (IJzerman and Semin 2009), or taking a warm bath (Bargh and Shalev 2012) resulted in participants' exhibiting prosocial behaviour (Williams and Bargh 2008), using more concrete language in their narratives – which is reflective of greater social proximity (see IJzerman and Semin 2009) –, and even compensating for the feelings of social distance, exclusion and loneliness (Bargh and Shalev 2012: 12). This pattern of findings was reversed in the coldness condition. Of note, all these processes have been reported to take place outside of participants' awareness.

Although not interpreted in the *core affect* paradigm, this body of research could provide evidence in support of the hypothesis that fluctuations in the *core affective state* (here, reflected by alterations in the physiological measure of body temperature) not only influence subsequent evaluations or impressions of the environment but may also be consciously or unconsciously regulated[4] to achieve a desired state or feeling (Russell 2003, 2012; Bargh and Shalev 2012). Furthermore, the study by IJzerman and Semin (2009) demonstrated that alterations in the experience of physical warmth have a bearing on the use of language. It would be interesting to investigate this phenomenon further or to see if the reverse relationship would also be true: Could language, just like physical warmth, be considered a factor influencing a state of *core affect*? A common sense answer might be positive. Language is a communicative tool that, among others, is used to express how people feel (and thus in a way reflecting their current *core affective state*), but it may also be a *reason* why they feel that way. For example, the *core affective barometer* (Barrett 2006a) might undergo dynamic fluctuations when reading poetry, hearing a compliment, a

[4]In fact, Russell (2003, 2012, 2015) discusses individuals' ability to modulate their current state of *core affect* through, what he refers to as, *affect regulation*. Russell argues that "[o]ne can seek to alter or maintain Core Affect directly – affect regulation – from the morning coffee to the evening brandy" (Russell 2015: 196).

joke, a reprimand or an insult. Hence, the relationship between language and *core affect* might constitute an interesting area of future empirical investigation.

In sum, research reviewed in this subsection aimed to highlight the omnipresence of evaluations in people's everyday life (for a detailed discussion see Bargh et al. 2012; Bargh 1997; Bargh and Chartrand 1999). Although this extensive body of research is not typically interpreted in the *core affective* paradigm, there might be a relationship between *evaluative processes* and the individual's *core affective state*. At this point, however, this issue awaits and requires empirical verification.

A more established and common view is that evaluative processes are governed by general *affective* processes (Winkielman et al. 1997). Affective information encoded in previous experience and stored in memory as well as – possibly – an individual's current *core affective* state together constitute the foundation for evaluation[5]. In such a view, cognitive processing is engaged in evaluative processing to a very limited - if any – extent (Winkielman et al. 1997, 2003, 2005; Winkielman and Berridge 2004; Zajonc 2000). This limited role of cognitive resources relative to affective resources has been the main issue in the debate on *affective primacy* hypothesis put forward by Robert Zajonc in his 1980's paper that created a real turn in affective sciences (Winkielman 2010: 357).

1.3.4. Affective primacy hypothesis

The main premise of the affective primacy hypothesis is that affective processing is primary and indifferent to cognitive processing (Zajonc 1980: 153). While feeling and thinking should not be seen as inseparable from each other, according to Zajonc (1980: 154) affect is always a faithful companion of thought, but the reverse is not always the case.

This view has been corroborated by evidence from multiple studies on the *mere-exposure effect* (also *mere-repeated-exposure effect*) and *subliminal affective priming* (e.g.

[5]This view has been commonly referred to as *feelings-as-information* model (Murphy and Zajonc 1993; Winkielman et al. 1997).

Kunst-Wilson and Zajonc 1980; Monahan et al. 2000; Murphy et al. 1995; Zajonc 1968; Murphy and Zajonc 1993; Winkielman et al. 1997, 2005; Berridge and Winkielman 2003; Barrett and Bar 2009). In a mere-repeated-exposure paradigm, researchers measure a participant's unfolding preference for a stimulus following repeated exposures (supraliminal or subliminal) to that stimulus. In short, with increased exposure to a stimulus comes increased liking and familiarity of that stimulus, independent of recognition. In mere-exposure experiments, participants are not engaged in any additional tasks, and very often not even aware of the presented stimuli (Zajonc 2001). Kunst-Wilson and Zajonc (1980) reported that affective discrimination can occur with minimal or no access to cognition. Their experiment consisted of 2 parts: first, participants were exposed to octagons flashed for a brief period of time; second, they were asked to recognize and evaluate the octagons. There were 2 sets of octagons: set A and set B, consisting of 10 octagons each. In the first part of the experiment, a participant was exposed to one of the sets only. During the second part they viewed both sets of octagons in a comparative manner and were asked (1) to indicate the octagon they liked more and (2) to indicate the octagon they remembered. Despite very low (close to chance) recognition, affective recognition was preserved, providing evidence in favour of mere-exposure effect with no cognitive mediation (Kunst-Wilson and Zajonc 1980: 558). In a subliminal affective priming paradigm, researchers investigate whether and how subliminal presentation of an affective stimulus (i.e. an affective prime) has a bearing on the processing of the subsequently presented target stimulus. In an affective priming study, Murphy and Zajonc (1993) conducted a series of 6 experiments to directly investigate the interaction between affective and cognitive processing. All experiments provided strong evidence in favour of the affective primacy hypothesis, whereby affective valence of primes (facial stimuli) modulated the preference for target stimuli (Chinese ideographs) in the subliminal priming condition (stimulus exposure = 4 ms), while non-affective features of primes (e.g. shape, symmetry) influenced participants' likeability ratings only in the supraliminal priming condition (stimulus exposure = 1000 ms; for details, see Murphy and Zajonc 1993). These results may be interpreted in line with the hypothesis that affect is primary and influences subsequent cognitions. The study by Murphy and Zajonc (1993) also demonstrated that

human beings have the ability to make valence discrimination (good vs. bad) outside of consciousness, which is possibly a trace of evolution.

The affective primacy hypothesis was criticized by Richard Lazarus – the proponent of *cognitive primacy* hypothesis (see Lazarus 1984, 2006). Contrary to Zajonc (1984), Lazarus (1984) claimed that cognition was a prerequisite for affective reaction to occur, to quote: "[c]ognitive activity is a necessary precondition of emotion because to experience an emotion, people must comprehend (…) that their well-being is implicated in a transaction, for better or worse" (1984: 124). What should be noted, however, is that Zajonc (1984) did not proclaim, what Lazarus interpreted as (1984), "the independence of cognition and *emotion* and the primacy of *emotion* [emphasis in the original, RJ]" (1984: 124). Instead, Zajonc's research focused on the primacy of *affective processing*, organism's primitive mechanisms that enable instant evaluations of a stimulus (positive vs. negative) in the environment to guide its behaviour (approach vs. withdraw). Even if at that point in time Zajonc did not really differentiate between affect and emotion, his focus was mainly on investigating how subliminal perception of repeated exposure to affective stimuli could influence instant preferences for that stimulus. Such basic evaluations or preferences may happen without the company of cognition as demonstrated by the substantial evidence supportive of this claim (see Zajonc 2000), which was also reviewed in the previous section on evaluative processes. Lazarus's (1984) rebuttal might not seem to be valid as it looks as if he built his counter-arguments on the foundation of emotion experience, not affect perception. Therefore, the tension between the two scholars might arise from a fundamental difference in their theoretical and empirical approaches to affect and emotion, an issue of terminology that – as already argued in the introductory sections – permeated theoretical and empirical research on affect and emotion resulting in misinterpretations, ambiguity and hindering further progress in the field. Hence, *affective primacy* hypothesis and the *cognitive primacy* hypothesis should not be necessarily seen as opposing theories; to the contrary, they could complement each other, when understood as different stages of affect perception and experience.

In sum, the debate between Zajonc and Lazarus provoked many questions that translated into further quests for investigating the causal mechanisms underlying affective

reactions. Some researchers raised questions related to the potential existence of *unconscious affect* that would impact behaviour, but whose elicitation would not require the medium of consciously experienced feelings. This line of research is the topic of the next section.

1.3.5. Unconscious affect

> Emotions cannot be unconscious because they must be felt, and feelings are by definition conscious. (Clore et al. 1994: 290)

> It is surely of the essence of an emotion that we should feel it, i.e. that it should enter consciousness. (Freud 1950: 109–110)

Research by Robert Zajonc demonstrated that the underlying, causal mechanisms of affect and affect assignment may function on the unconscious level. At the same time, however, Zajonc argued that the affective state, when elicited, was always assumed to be *experienced consciously*, as a feeling or emotion (Winkielman 2010: 358; Berridge and Winkielman 2003: 185; see Zajonc 2000); in that, he would possibly agree with Freud (1950) and Clore (1994). In a similar vein, William James (1913) argued that a feeling or emotion – even if elicited on the unconscious level – is eventually *experienced* and enters human consciousness. Overall, the debate on whether affect or emotion might be processed unconsciously has had a strong presence in this field of research, particularly since the Zajonc-Lazarus (Zajonc 1984; Lazarus 1984) confrontation (see Prinz 2004).

Based on already reported findings implicating the independence of the affect system from the cognitive system, some researchers set out to investigate if subliminal affective priming may have an impact on subsequent cognitive processing without the elicitation of conscious feelings (e.g. Winkielman et al. 1997, 2005; Berridge and Winkielman 2003). For example, Winkielman, Zajonc, and Schwarz (1997) investigated participants' preference for Chinese ideographs in a covert affective priming paradigm with happy or angry faces. Participants in the study were purposely informed that the ideographs would be preceded by a negative or a positive face (experiment 1) or that the music playing

in the background might elicit a positive or negative mood (experiment 2; Winkielman et al. 1997: 442; Winkielman and Berridge 2004: 121). Hence, they were asked to pay attention to their feelings, but not to rely on them while expressing preferences for ideographs. The experiments revealed that the affective priming effect was still present irrespective of the attributional manipulations. Furthermore, post-experiment interviews with participants revealed that they did not experience changes in affective states to primes throughout the experiment, but did so in response to music (Winkielman et al. 1997: 456). This led the authors to hypothesize that basic preferences may be influenced by unconscious affect elicited by subliminally presented affective faces (Winkielman et al. 1997: 462). As suggested by Winkielman and Berridge (2004: 121), however, the reason for participants' not having reported any affective changes in response to primes in the study might be attributed to simply not remembering the feelings during a post-study interview. To address this issue in further experiments Winkielman et al. (2005) collected participants' self-reported ratings of mood and stimuli directly after the presentation of subliminal affective primes. The authors demonstrated that subliminal presentation of affective primes had an influence on the amount of beverage consumed and the beverage ratings. These changes in behaviour did not translate into changes of self-rated mood, which was interpreted as evidence in favour of the existence of unconscious affect (Winkielman et al. 2005: 132). These results show that basic affective processing influences not only basic behaviour such as whether to approach or withdraw, but also more complex behaviours such as consuming a beverage. Furthermore, this study extended previous research showing that "preferences need no inference" (Zajonc 2000) and demonstrated the affect-motivation interaction (Winkielman et al. 2005: 132). In sum, the study by Winkielman et al. (2005) was possibly the first to provide preliminary evidence that unconscious affect may have a direct impact on human behaviour (Winkielman et al. 2005: 133).

The discussion on unconscious affect or emotion has also strongly resonated in the research on animals (Panksepp 1998; Walla and Panksepp 2013; LeDoux 2012b). Specifically, it has been argued that since rodents and non-human primates exhibit basic, instinctive *affective* or *emotional* responses, such as freezing or fleeing in response to

threat, by analogy, this evolutionary trace would also be preserved in humans in similar contexts (LeDoux 2012a, 2015). LeDoux (2012b, 2014, 2015), however, cautions against applying subjective human experiences to animals calling such responses *emotional* or *affective*, and instead describes them as basic, innate *survival* functions or responses guided by *survival circuits* that "did not evolve to make emotions but to give organisms behavioural tools to stay alive" (LeDoux 2014: 319). As such, basic *survival responses* (e.g. seeing a bear in the woods[6]) may be relevant to emotion, but they should not be considered direct causes of emotions. Hence, the unconscious responses to threat or danger in the event of seeing a bear in the woods or a snake in the grass should not be viewed as unconscious instances of *fear*, as argued by other animal researchers (see Panksepp 1998; Walla and Panksepp 2013; Panksepp and Watt 2011), but rather as more elementary, non-emotional *survival responses*. These arguments show that the debate on whether unconscious affect or emotion exist might again to a significant extent depend on how researchers define the phenomena in question.

1.3.6. The neuroscience of affect

> there is no 'affective brain', 'social brain', or 'cognitive brain'. Each human has one brain whose functional properties can be understood differently for different time scales and levels of organization. (Barrett and Satpute 2013: 368)

Until recently, the leading idea in neuroscience was that certain cognitive faculties like language or emotion were meant to be *generated* and *localized* in specific parts of the brain that, by analogy, would specialize in the processing of specific, linguistic or emotional, information, respectively. This idea was postulated by the *faculty psychology* framework (e.g. *basic emotion* theory) that views common sense experiences in terms of basic faculties of the mind (see Lindquist and Barrett 2012). This framework has been prevalent in affective neuroscience for the recent 30 years, whereby researchers would set out to discover the *brain loci* of basic emotion categories (e.g. where fear is located in the brain?),

[6] The famous example used by William James (1884, 1890).

looking for evidence in favour of the innate and distinct neural correlates of each emotion category. And so, early findings from neuroscience of emotion hailed amygdala as the host and generator of *fear* (Sprengelmeyer et al. 1999; see Vytal and Hamann 2010), anterior insula as the host and generator of *disgust* (Wicker et al. 2003; see Vytal and Hamann 2010), subgenual anterior cingulate cortex (sgACC) as the host and generator of *sadness* (see Murphy et al. 2003), and rostral ACC and right superior temporal gyrus (STG) as the hosts and generators of *happiness* (see Vytal and Hamann 2010).

Most recent evidence from neuroscience, however, does not confirm the previous predictions of the *faculty psychology* approach to emotion. Contemporary research demonstrates that brain regions previously identified with generation of particular emotions are also engaged in a wide array of different mental processes (see Barrett and Satpute 2013; Lindquist and Barrett 2012; Lindquist 2013). To give but one example, the amygdala –commonly perceived as the centre of emotion processing in the brain– is also activated in response to novel stimuli that are not in any way affectively loaded (Weierich et al. 2010; Moriguchi et al. 2011), with the activation being comparable to that elicited by stimuli valence or arousal (Weierich et al. 2010: 10). Furthermore, more often than not brain regions associated with the processing of a specific emotion category (e.g. amygdala and fear processing) failed to elicit consistent neural activation in response to that emotion, or, by contrast, became activated in response to more than one emotional category (for evidence see Lindquist et al. 2012). In line with the *psychology construction* model, these findings contribute to the hypothesis that the brain does not *respect* categories constructed by the human mind, such as *emotion*, *cognition*, or *perception* (Lindquist et al. 2012: 138). Instead, what seems to be – at this point in time – a more evidence-driven explanation is that the human brain responds primarily to more primitive, basic processes (i.e. *psychological primitives*) that elicit a mixture of activations and deactivations of complex and large-scale distributed neural networks (and connections between those networks) with no single locus that would be selectively activated to a specific kind of stimulus (Power et al. 2011; Tomasi and Volkow 2011; Crossley et al. 2013; Yeo et al. 2011). LeDoux (2014) has recently commented on this issue by means of a ‘soup’ metaphor:

> With regards to conscious emotions (feelings), my view (…) can be summarized by way of analogy to the way the character of a soup arises from its ingredients. None of the ingredients are soup ingredients. They are things that exist in nature and that can be used in soups of various kinds, and in other kinds of dishes as well. But the particular combination of ingredients gives the soup its character. Similarly, nonemotional ingredients (…) come together to give rise to an emotion, a feeling. (LeDoux 2014: 319)

The *psychological construction* view of the affect-brain interaction also echoes the arguments of William James (1913) who questioned the idea of the existence of special neural centres dedicated to emotion. Such an approach seems to be not only more intuitive, but also more explanatory of the incredible economy and holism of the brain's organization and function (Bullmore and Sporns 2012). In what follows, I review the most recent findings concentrating on the neural correlates of *core affect* and more general affective processes from the more holistic perspective offered by the psychological constructionism model. Specifically, I will focus on the most recent neuroscience evidence outlining the neural networks engaged in the affect processing as well as the interplay between affective and social processes in the brain.

In a recent and influential resting-state functional connectivity MRI (rs-fcMRI)[7] study among 1,000 participants, Yeo et al. (2011: 1135) demonstrated that the human cerebral cortex consists of a collection of 7 large-scale distributed association networks characterized by highly interconnected regions. These networks include the *visual*, *somatomotor*, *dorsal attention*, *ventral attention* (also referred to as the *salience network*), *limbic*, *frontoparietal*, and *default* networks (for illustration and description of brain regions included in each of the networks, see Figure 2). Some or all of those networks have been already reported in previous investigations of neural networks in the human brain (e.g. Beckmann et al. 2005; Damoiseaux et al. 2006; De Luca et al. 2006; Fox et al. 2006; Vincent et al. 2008; Buckner et al. 2008). Importantly, four of the aforementioned networks have been associated with affective processing, namely the *salience* network, the *frontoparietal* network, the *default* network, and, to a lesser degree, the *limbic* network (e.g. Oosterwijk et al. 2012; Lindquist 2013; Barrett and Satpute 2013). For example, in an fMRI

[7]Resting-state functional connectivity MRI (rs-fcMRI) enables to investigate spontaneous fluctuations in brain activity during resting state, i.e. when participants are not asked to perform any explicit task (Fox and Greicius 2010; Yeo et al. 2011).

study, Oosterwijk et al. (2012) measured participants' brain activity within large-scale distributed networks in response to scenarios that were used to evoke emotions, body sensations or thoughts (for details see Oosterwijk et al. 2012: 4). The study showed that all mental states elicited activation in the *salience*, *frontoparietal*, *default*, and, less so, *limbic* networks (Oosterwijk et al. 2012: 14–15).

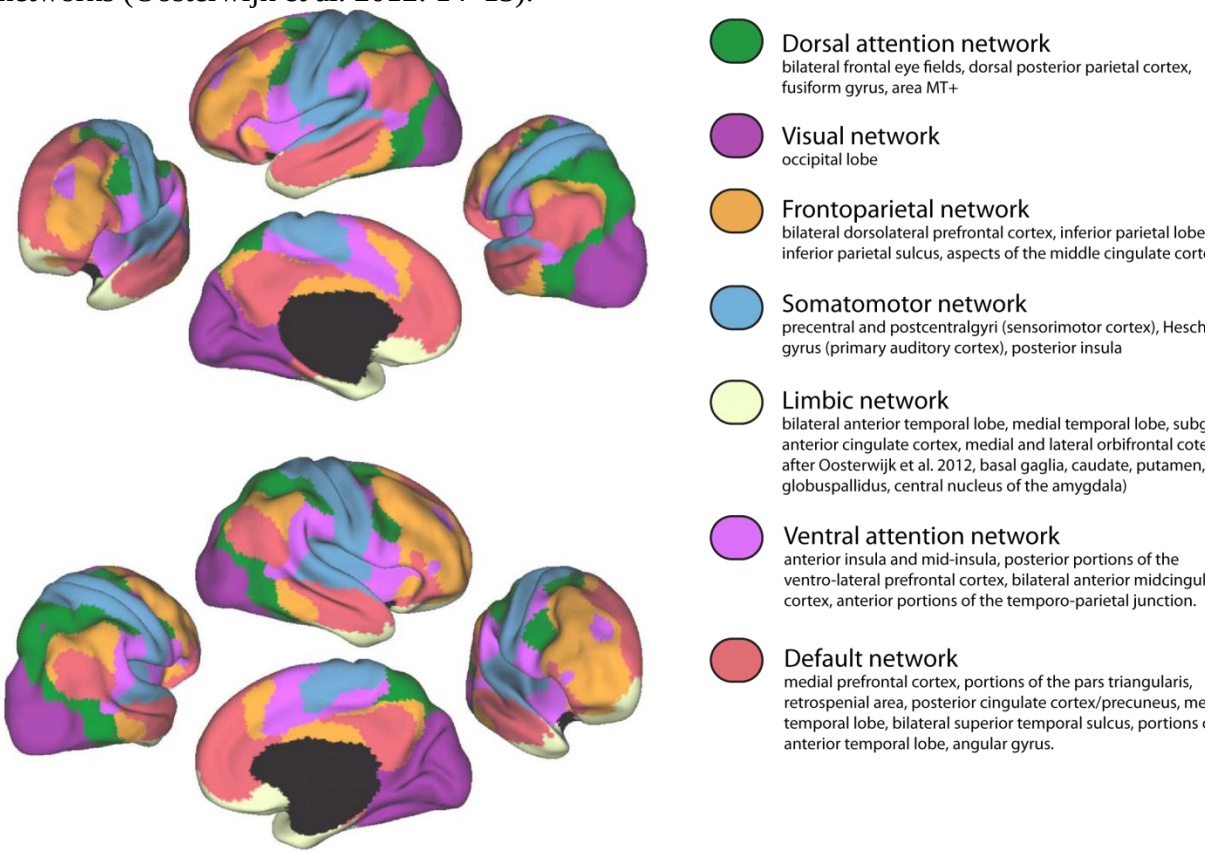

Figure 2. The visualization of the 7 brain networks (after Yeo et al. 2011: 1137), with an added description of the regions included in each of the network (see Yeo et al. 2011; Oosterwijk et al. 2012)

Similar findings have been also reported in meta-analyses of neuroimaging studies on affect and emotion (Lindquist et al. 2012; Kober et al. 2008; Lindquist and Barrett 2012; Barrett 2012). A recent meta-analysis of 397 fMRI and positron emission topography (PET) studies found that positive and negative affect is processed in shared neural networks, with no distinct region for positivity or negativity in the brain (Lindquist et al. 2015). These findings show that affect processing elicits activation within widely distributed neural networks and, notably, that similar neural networks are engaged in the processing of other, not necessarily affect-related, mental states. Indeed, a recent meta-

analysis using the *activation likelihood estimation* (ALE)[8] reported that both socio-cognitive and emotional tasks employed in the studies selected for analysis elicited activation within a common neural network consisting of dorso-medial prefrontal cortex (DMPFC), middle and anterior superior temporal gyrus (STG), the precuneus, and the ventrial striatum (Schilbach et al. 2012: 6). This finding might provide evidence for a significant role of affect in social cognition. In a similar vein, numerous studies demonstrated that the cognitive and affective neural networks largely overlap (Shackman et al. 2011; Raz et al. 2012, 2014; Duncan and Barrett 2007). For example, the dorsolateral prefrontal cortex (dlPFC) that until recently was perceived the 'cognitive' centre of the brain has been also demonstrated to be engaged in top-down control of emotion and motivation (see Okon-Singer et al. 2015: 15). Finally, control processes have been thought to play an important role in the context of threat, whereby there is a necessity to monitor risk, and the unfolding of a potentially dangerous action. This is also reflected in the shared neural networks of negative affect and cognitive control in the midcingulate cortex (e.g. Shackman et al. 2011; Lin et al. 2014; see Okon-Singer et al. 2015: 17).

In sum, contemporary research in the field of neuroscience has adopted a more holistic, network-based approach to the investigation of neural correlates of emotion. In doing so, the focus in the research shifted from analysing specific and distinct *loci* in the brain where emotion categories were believed to be generated and processed (aka the *faculty psychology* framework) to investigating activation of large-scale distributed neural networks in response to psychological primitives, or "lowest common denominators" (aka the psychology constructionism framework; Lindquist and Barrett 2012: 5) that are thought to lie at the core of the mental states we experience on the surface.

Evidence from neuroscience demonstrating shared neural correlates of affect and social processing may provide yet another vital information about the nature of affect, i.e. that affect is by nature ingrained in social interaction (see Schilbach et al. 2012). Robert Zajonc (1980) has proposed that "affect dominates social interaction" (1980: 153; for a similar view see Kopytko 2002); furthermore, affect is generally thought to be shaped by

[8]The ALE approach enables to statistically analyze activations and deactivations of selected brain regions across published neuroimaging reports (Schilbach et al. 2012: 1).

personal experience and social interactions, and therefore is not seen as a stimulus property (Barrett 2006b: 50).

One of the primary mediums of communicating affect is language; both its non-verbal and verbal aspects. In the following sections I will provide an overview of the interaction between affect and language from two different perspectives: (1) a psycholinguistic perspective, which has been very productive in explaining the psycho- and neuro-mechanics of how people process affective language, but did not consider context an important variable in such investigations and thus decreased their ecological validity (section 1.4.1), and (2) a pragmatic perspective, which so far has produced only a few studies on the affect-language interaction, but in doing so it has provided first insights into how people might process affective language in everyday communicative interactions (section 1.4.2).

1.4. Affective processing of verbal stimuli

> Affect permeates the entire linguistic system. Almost any aspect of the linguistic system that is variable is a candidate for expressing affect. In other words, language has a heart as well as a mind of its own. (Ochs and Schieffelin 1989: 22)

Common sense dictates that affect and language are closely connected, if not inseparable phenomena (Moeschler 2009). Affect is smuggled in everyday linguistic interactions (both speech- and text-based), and its presence particularly reveals itself in the melody of language (prosody), poetry or in the use of taboo words and swearwords. As argued by Besnier (1990: 421), "affect floods linguistic form on many different levels of structure in many different ways". Despite the proclaimed pervasiveness of affect in language, however, this topic has been understudied in the field of mainstream linguistics[9] (see Besnier 1990; Reilly and Seibert 2003; Langlotz and Locher 2013; Jay and Janschewitz 2007) that focused mainly on the denotative (rather than connotative) meaning of language

[9]Here, I mainly refer to structural and generativist approaches to linguistics. Some functionalist approaches to linguistics, by contrast, have made initial attempts to include the emotive or expressive function of language in their analyses (Bühler 1934; Jakobson 1960).

and its purely cognitive, non-emotional nature. Indeed, the relationship between affect and language has been addressed more often in the fields of anthropology (e.g. Malinowski 1923; Besnier 1990) and, even more so, psychology (to be reviewed below).

In the coming subsections, I will start by reviewing the body of research from the field of psycho- and neurolinguistics that has revealed the special role of affective content in the processing of language. As I will try to show, however, this area of research has been largely limited to the analysis of affect in the area of lexicon. This limitation has constituted the main motivation for studying affect in a broader linguistic context, consistent with the recent frameworks of *affective pragmatics* and *neuropragmatics*, the discussion of which is reserved for subsequent sections of this chapter.

1.4.1. Affect – language interface: A psycholinguistic perspective

In this section, I will provide a review of behavioural and neuroimaging studies investigating the processing of affective words and sentences from a psychological perspective. By first discussing the effects of affective valence in single words and then sentences, my aim is to provide the foundation for understanding the importance of investigating affective language in a broader context, which will be fully dealt with in the discussion on *affective pragmatics* and *neuropragmatics*.

1.4.1.1. Processing advantage of affective words: Behavioural evidence

Research addressing the question of how affective valence influences the processing of language has been mainly conducted in the domain of single words. There is ample evidence to date demonstrating that positive and negative words have a processing advantage over neutral words both in the domain of perception (see Kousta et al. 2009; Eviatar and Zaidel 1991; Kanske and Kotz 2007; Zeelenberg et al. 2006) and memory (Doerksen and Shimamura 2001; Kensinger and Corkin 2003; Zeelenberg et al. 2006).

Usually, this translates into participants' reacting more quickly and/or accurately to affective stimuli than non-affective stimuli, as well as recognizing and/or recalling affective stimuli with greater ease and accuracy compared to non-affective stimuli.

Some studies found the valence effects to be asymmetrical, with negative valence leading to a generic slowdown in processing speed at low arousal levels (Algom et al. 2004; Estes and Adelman 2008; Estes and Verges 2008) or facilitation in processing speed at high arousal levels (Hofmann et al. 2009; Nakic et al. 2006; Larsen et al. 2008; Kanske and Kotz 2007), and with positive words leading to a general facilitation in processing speed (Kanske and Kotz 2007; Scott et al. 2009; Kuchinke et al. 2005; Schacht and Sommer 2009b). The former has been referred to as *negativity-bias* (Cacioppo and Gardner 1999; Taylor 1991) or *automatic vigilance* (Pratto and John 1991; Fox et al. 2001), while the latter as *positivity-offset*. Evidence against *negativity-bias* and *automatic vigilance* was soon offered by Larsen et al. (2006) in their meta-analysis of 32 emotional Stroop studies that reported supportive evidence for the hypotheses. The result of their analyses showed that the previously reported generic slowdown effect for negative words could be confounded by not matching the stimuli on such variables as word length or lexical frequency. Specifically, the authors found that across the 32 emotional Stroop studies, negative stimuli were longer, less frequent and had smaller orthographic neighbourhoods compared to control words, which possibly led to slower processing of negative stimuli (Larsen et al. 2006: 69–70). In response to this criticism, Estes and Adelman (2008) reported slower response latencies and naming for a large set of carefully matched negative stimuli, again providing supportive evidence for the *automatic vigilance* hypothesis.

Most recent studies, carefully matching all relevant lexical variables across conditions, have demonstrated that both positive and negative valence facilitates stimuli processing (Vinson et al. 2014; Yap and Seow 2014), and that this effect may be independent of the levels of arousal (Vinson et al. 2014). For a more in-depth review of theoretical and empirical bases of affective valence asymmetry, please refer to Bromberek-Dyzman (2014: 277–315).

1.4.1.2. Processing advantage of affective words: Neuroimaging evidence

Further evidence supportive of the processing advantage of affective stimuli comes from neuroimaging studies that have focused on measuring the spatial and/or temporal dynamics of affective compared to neutral words processing. The following review will be centred around the discussion of findings from studies that used the electroencephalography (EEG), a neuroimaging technique implemented in the present project. Nevertheless, I will start by briefly covering the main findings reported in functional Magnetic Resonance Imaging (fMRI) research on affective words processing, whose aim is to provide an understanding of the neural correlates of affective language.

FMRI is a noninvasive neuroimaging technique that indirectly monitors neural activity over time. It is characterized by decent spatial resolution (25-30 cubic millimetres), but poor temporal resolution (1 – 3 seconds), which is why this technique is most effective at tackling questions related to the neural architecture rather than neural processes (Ashby in press). Despite this, a number of researchers set out to investigate neural correlates of affective language processing through the lens of fMRI. Such studies have identified numerous regions with increased activation to affective compared to neutral words, including the amygdala (Lewis et al. 2007; Kensinger and Schacter 2006; Herbert et al. 2009), the anterior insula (Lewis et al. 2007), the anterior cingulate cortex (Posner et al. 2009; Kuchinke et al. 2005; Lewis et al. 2007; Schlochtermeier et al. 2013), the orbito-frontal cortex (Kuchinke et al. 2005; Lewis et al. 2007), the parahippocampal gyrus (Kuchinke et al. 2005; Citron et al. 2014), the temporo-occipital lobe and extra-striate cortex (Herbert et al. 2009). Furthermore, negative compared to positive affective valence in words was found to elicit greater activation in the left inferior frontal gyrus, right superior temporal gyrus and right inferior parietal lobe (Kensinger and Schacter 2006), as well as in the cerebellum (Herbert et al. 2009). By contrast, positive compared to negative affective valence in words was found to trigger more pronounced activation in the left amygdala and left extra-striate cortex (Herbert et al. 2009), the left fusiform/lingual gyrus and the right middle temporal gyrus (Kensinger and Schacter 2006), as well as the bilateral anterior cingulate gyrus, left posterior cingulate gyrus, right lingual gyrus and right

hippocampus (Kuchinke et al. 2005). These findings demonstrate that affective words elicit strong activation in numerous subcortical and cortical areas in the brain and that such activation is more pronounced relative to non-affective words. This possibly reflects a greater capacity of affective words to attract attention in the course of processing and, consistent with behavioural evidence, enables preferential processing of affective relative to non-affective words.

As already mentioned, the effectiveness of fMRI in the investigation of neural processes rather than neural architecture has not been without controversy (Ashby in press). With its poor temporal resolution, fMRI does not reliably represent the neural dynamics of affective processes. This is why ample studies investigating affective language processing have implemented another neuroimaging technique, EEG, that records oscillations of the brain's electric potential at the human scalp with 0 ms delay and thus provides a large-scale, dynamic measurements of the human neocortex at work (Nunez and Srinivasan 2006: 3). This being the case, EEG has been often referred to as "a window on the mind" (Nunez and Srinivasan 2006: v). Unlike fMRI, it is characterized by fine temporal resolution, but poor spatial resolution; this makes it an effective tool to track and register rapid affective responses at the cortical level, but an ineffective tool in establishing a precise locus (or loci) of such responses in the deeper, sub-cortical brain regions. Finally, while in fMRI researchers associate response to a stimulus with an activation in a particular brain area, in EEG studies researchers look at event-related potentials (ERPs) elicited by the stimuli of interest. ERPs constitute an average of all measured brain responses time-locked to the stimuli of interest (e.g. all positive or negative words) that are extracted from a raw EEG signal (Luck 2014: 7; Nunez and Srinivasan 2006: 10; Van Berkum 2012).

To date, a number of ERPs have been associated with the processing of affective valence in words (for a detailed review, see Kissler et al. 2006; Citron 2012; Fischler and Bradley 2006). For the sake of clarity, in this section I will focus on two ERP components that have been consistently elicited in response to affective valence in single words – the early posterior negativity (EPN), and the late positivity complex (LPC). This review covers the most recent findings from studies on the electrophysiological correlates of affective valence in verbal stimuli.

EPN is a negative-going waveform that peaks between 200 – 300 ms post-stimulus onset at the occipito-temporal scalp sites (Citron 2012: 213). Ample evidence has been collected so far demonstrating that positive and negative words elicit more pronounced EPN amplitudes compared to neutral words (Herbert et al. 2008; Scott et al. 2009; Kissler et al. 2009; Schacht and Sommer 2009b; Kissler and Herbert 2013; Citron et al. 2013). In some studies this effect was limited to an advantage of positive over neutral words (Schacht and Sommer 2009a; Hinojosa et al. 2010; Schindler et al. 2014), or negative over neutral words (Frühholz et al. 2011; Ponz et al. 2014). The EPN effects have been reported across various tasks, e.g. lexical-decision task (Scott et al. 2009; Schacht and Sommer 2009a; Palazova et al. 2011; Citron et al. 2013), silent reading (Herbert et al. 2008; Kissler et al. 2009), word counting (Kissler et al. 2009), word identification (Hinojosa et al. 2010) semantic decision task (Schacht and Sommer 2009b; Ponz et al. 2014), and valence judgment task (Schacht and Sommer 2009b; Frühholz et al. 2011); however, the elicitation of EPN was also shown to be task-dependent (Hinojosa et al. 2010; Frühholz et al. 2011; Kaltwasser et al. 2013; Bayer et al. 2012) and word-category dependent, e.g. more pronounced EPN amplitudes to positive compared to negative adjectives, positive compared to neutral verbs, and positive and negative compared to neutral nouns (Palazova et al. 2011). Overall, this ERP component is thought to index implicit and automatic processing of affective information (Citron 2012: 213).

Unlike EPN, LPC (also referred to as LPP – late positivity potential), is a positive-going waveform that peaks in the 500 – 800 ms time window post-stimulus onset at centro-parietal electrode sites (Citron 2012: 213). Positive and negative words have been consistently reported to elicit increased LPC amplitudes compared to neutral words (Kanske and Kotz 2007; Carretié et al. 2008; Schacht and Sommer 2009a; Hinojosa et al. 2010; Kaltwasser et al. 2013; González-Villar et al. 2014), with some studies reporting more pronounced LPC for positive compared to neutral and/or negative words (Herbert et al. 2006, 2008; Kissler et al. 2009; Palazova et al. 2011; Kissler and Herbert 2013; Schindler et al. 2014; Bayer et al. 2012), or negative compared to neutral and/or positive words (Kanske and Kotz 2007; Frühholz et al. 2011; Citron et al. 2013; Fritsch and Kuchinke 2013; Ponz et al. 2014). Similarly to EPN, LPC effects were reported in a variety

of tasks, including lexical decision task (Kanske and Kotz 2007; Carretié et al. 2008; Schacht and Sommer 2009a, 2009b; Palazova et al. 2011; Citron et al. 2013; Fritsch and Kuchinke 2013; Bayer et al. 2012), silent reading (Bayer et al. 2012; Herbert et al. 2008; Kissler et al. 2009), word identification (Hinojosa et al. 2010), valence judgment task (Herbert et al. 2006; Schacht and Sommer 2009b; Frühholz et al. 2011; González-Villar et al. 2014), and semantic decision task (Schacht and Sommer 2009b; Ponz et al. 2014). Like EPN, LPC effects have been reported to be task-dependent (Schacht and Sommer 2009b; Hinojosa et al. 2010), and modulated by stimuli features such as concreteness (see Kanske and Kotz 2007). Overall, this ERP component is thought to index the allocation of attentional resources as well as more explicit emotion processing.

The aforementioned electrophysiological evidence demonstrates that affective valence in words attracts more attentional resources and thus is often given priority in the course of processing compared to neutral words. These findings provide an important insight into the psychophysiological and neural correlates of affect in single words, but poorly account for the complex affect-language interaction in a sentence-based, everyday communicative context. As such, research on single decontextualized words should be seen as the first step in understanding everyday affective interactions. The interpretation of such evidence, however, should be limited as such research is marked by little ecological validity, and leaves a lot of space for ambiguity, especially in the case of polysemous words. Furthermore, taking into consideration the fact, that psycho- and neurolinguistic research is already conducted in an unnatural, laboratory context, this limitation should be compensated for with the use of more natural, sentence-based affective language to increase the reliability of research findings. To date, however, little research has been devoted to investigate electrophysiological reaction to affective valence elicited by words embedded in sentence context. In the following section my goal is to review the available evidence.

1.4.1.3. Effects of affective valence in sentences: Electrophysiological evidence

The ERP components most often associated with affect processing in sentences are LPC, EPN, and N400. The latter is probably the most important ERP component in the study of psychophysiological correlates of language. Its discovery by Marta Kutas and Steven Hillyard (1980) boosted the development in the area of electrophysiological underpinnings of language, which for decades has provided vital information about the neural dynamics of linguistic processes (for a review see Kutas and Federmeier 2011).

The N400 component is a negative-going waveform peaking at around 400 ms post-stimulus onset at centro-parietal scalp sites, known to index difficulty integrating upcoming words in a sentence context (Kutas and Hillyard 1980; Kutas et al. 1984). Hence, the N400 amplitude significantly increases in response to words that are unexpected and/or incongruent with the preceding context, e.g. I long for Italian food, I think I'll eat a *building*. Some studies, however, have reported N400 modulations to affective information in sentences (Holt et al. 2009; Jiang et al. 2014; Moreno and Vázquez 2011; De Pascalis et al. 2009). For example, in a semantic decision task[10], De Pascalis et al. (2009) reported more pronounced N400 to negative compared to positive and neutral words embedded in a sentence context. This effect was also modulated by the degree of participants' impulsivity such that high-impulsive participants showed more increased N400 to negative sentences compared to low-impulsive participants. Of note, however, this study did not dissociate effects of affective valence from effects of semantic congruity; hence, the reported N400 effect might have been driven by semantic integration difficulty. Moreno and Vázquez (2011), by contrast, demonstrated larger N400 amplitudes to positive critical words compared to negative critical words that were highly expected from the positively-biased and negatively-biased sentence frames, respectively. According to the authors, this effect could reflect easier semantic integration for negative rather than positive sentence outcomes.

[10]In a semantic decision task, participants are asked to indicate upon seeing the sentence-final target word whether a sentence makes sense or not.

As in the case of single words, researchers have also reported LPC modulations to affective words embedded in sentence context (Bayer et al. 2010; Holt et al. 2009; Fields and Kuperberg 2012; Otten and Jonas 2014). For example, Bayer et al. (2010) found more pronounced LPC amplitudes to negative verbs compared to neutral verbs embedded in neutral sentence frames. A similar finding, but for negative nouns, was reported by Holt et al. (2009). Fields and Kuperberg (2012), on the other hand, reported increased LPC amplitudes to both positive and negative relative to neutral words that were embedded in 2-sentence scenarios in a silent reading task. In a more recent study, Otten and Jones (2014) asked the participants to read feeling-evoking scenarios (happiness, anger, humiliation, shame) and then think about the elicited emotional reaction whilst undergoing an EEG recording. The researchers found more pronounced LPC amplitudes to the feeling of humiliation compared to the feeling of happiness, shame, and anger. Other studies on the processing of affective words in sentences did not report standard emotion effects on ERPs (Martín-Loeches et al. 2012; Rellecke et al. 2011).

In this section my goal was not only to provide a review of the contemporary findings from psycholinguistic research on affective language processing, but also to show that the importance of studying affective language in context has for long been overlooked in this field of research. The studies reviewed above provide the first insights into how the brain processes affective sentences. Still, however, investigations of the dynamic interactions between contextual and affective information, as they are encountered in everyday communication, are scarce in psycholinguistic research. Such interactions, however, are of great interest to the relatively young field of *affective pragmatics* that views affect as a deeply contextualized if not context-driven phenomenon. While *affective pragmatics* has mainly addressed the issue of affective language in theoretical terms, there is also preliminary empirical evidence that supports its claims. Both theoretical and empirical foundation of *affective pragmatics* will be covered in the next section.

1.4.2. Affect – language interface: A Pragmatic perspective

Everything that is, has its context of being. (Kopytko 2004: 525)

Pragmatics, defined broadly, is the science of communication. It is fundamentally concerned with the nitty-gritty of language in action, hence the term pragmatikos (from Greek, "fit for action"). Unlike other subdisciplines of linguistics, pragmatics adopts a more holistic approach to the analysis of language in order to arrive at a comprehensive understanding of a communicative interaction. To achieve this, it builds on the premises of other subdisciplines such as syntax and semantics, but, importantly, adds more. This added value is context, "a psychological construct, a subset of the hearer's assumptions about the world [, with] each new experience [adding] to the range of potential contexts" (Sperber and Wilson 1995: 10). Therefore, pragmatics goes beyond the classical code model of communication, whereby communication is seen as an encoding-decoding process, and takes into account speakers' assumptions and intentions as well as the nature of a communicative situation. In doing so, pragmatics carefully examines not only 'what' is said – the language-coded 'strong' communication –, but more importantly 'how' it is said as well as what is implied – the extra-linguistically coded 'weak communication'. Pragmatics, therefore, deals mainly with the *unprocessed, raw* communicative material that has been largely overlooked and fragmented in other areas of linguistics.

An important assumption in pragmatics is that the code alone may not suffice to fully account for a communicative interaction, an arena of an interplay between weak and strong communication where both explicit and implicit information is conveyed (Sperber and Wilson, 1995: 10). According to Sperber and Wilson (1995; see also, Bromberek-Dyzman 2014), language is but a valuable supplement to interpersonal communication, but as such is not essential for it to be successful and effective. In a similar vein, Moeschler (2009: 454) argues that "linguistic communication is a special case of communication". Indeed, there is a lot more to communication than the linguistic meaning (*ideational, propositional* meaning); the affective relation between the speakers, their feelings and attitudes permeate communication and are essential to meaning interpretation; they constitute the *non-propositional, relational* meaning (Moeschler 2009; Bromberek-Dyzman

2014). The primary and possibly most efficient medium of non-propositional meaning is nonverbal language, e.g. body posture, facial expression, prosody. Non-propositional meaning, however, is also parasitic on and omnipresent in verbal language (see Ochs and Schieffelin 1989; Besnier 1990; Bromberek-Dyzman 2014).

Interestingly, traditional pragmatics has been rather reasonable, logical and cognitive in its approach to communication; that is, pragmatists have been primarily interested in what people infer from what is verbally communicated to them (Grice 1975; Sperber and Wilson 1995; Levinson 2000; for a discussion see Moeschler 2009; Bromberek-Dyzman 2014). Less so, however, have they been occupied with *non-propositional* meaning in interpersonal communication; that is, what is expressed beyond words (attitudes, affect, etc.). Bromberek-Dyzman (2014: 22) argues that "[s]o far pragmatic research has been focused on investigating the 'say-mean' dyad that combines the linguistic meaning (carried by words, sentences) with the speakers meaning – linguistic meaning endowed with communicative intentions (…). The 'feel-mean' dyad has been left implicit in pragmatic research".

This 'feel-mean' dyad has been of particular interest to an emerging field of *affective pragmatics* (Arndt and Janney 1991; Bromberek-Dyzman 2014; Caffi and Janney 1994; Kopytko 2002, 2004; Peräkylä and Sorjonen 2012) that provides the theoretical foundation for the present investigation. Consistent with *affective pragmatics*, affect pervades communication and is thus considered an intrinsic element of a communicative interaction to the extent that "we are not capable of escaping from affective events" (Kopytko 2004: 529). In short, *affective pragmatics* has been interested in the question of how affect is perceived and expressed in communication (see Kopytko 2002). According to affective pragmatists, in order to have a full picture and a theory of communication both its cognitive and affective aspects have to be taken into account (Kopytko 2002, 2004; Bromberek-Dyzman 2014).

Human communication - both verbal and non-verbal - is soaked in affect. The manifestation and evaluation of emotions, moods, attitudes, etc. constitute a fundamental human's need to which language is responsive on all its levels (Ochs and Schieffelin 1989). Based on affective neuroscience research, affective pragmatics considers affect an

idiosyncratic phenomenon such that each individual experiences affect differently to different stimuli in the environment. According to Kopytko (2002) each individual is born with their own 'individualized affective potential' (IAP) that builds on the universal affect system program - 'the universal affective potential - present in all human beings but whose manifestation is idiosyncratic and a matter of individual variability. Through experience, the affective associations (positive/negative) and strategies (approach/withdrawal) are stored in affective memory so as to be able to more effectively act on a subsequent encounter of that same or similar stimulus in the future (Kopytko 2002: 239; Barrett and Bar 2009). In a similar vein, Barrett (2006b) refers to the phenomena of 'emotional granularity' and 'valence focus', both of which are characterized by high inter-individual variability. More specifically, Barrett (2006b) identifies individuals that may be either low or high in emotional granularity and valence focus. Individuals low in emotional granularity are seen as not being specific about the emotion they feel in a given moment, and relying more on the pleasant-unpleasant continuum when describing how they feel; by contrast, individuals high in emotional granularity are seen as being very specific and aware of which emotion(s) they experience in a particular moment. By analogy, individuals with high valence focus are thought to be more sensitive to the property of valence, which has been supported empirically by their perceptual advantage in the processing of valence facial expressions over participants low in valence focus (see Barrett and Niedenthal 2004).

The common underlying denominator of these views is that there is a great variability in individual's sensitivity to affect and that affective responses are context-dependent as well as shaped by prior experience. According to Cacioppo and Gardner (1999) humans are a unique species in that our affective evaluations and categorizations are dynamic, i.e. they are modulated 'online' by learning and experience. This learning by experience makes it possible to predict stimuli and events in the environment and have some control over our attention and cognition. Ochs and Schieffelin (1989) referred to this ability as social referencing, a term adopted by the authors from developmental psychology to describe the development of affective strategies (approach/withdrawal) in response to new stimuli encountered in the environment. While originally social referencing was focused on the analysis of how children recognized affect from facial expressions of

significant others (e.g. Klinnert et al. 1986; Feinman 1982). Ochs and Schieffelin (1989) took the understanding of this notion even further suggesting its important role in language acquisition and use, to quote: "[j]ust as interactants use facial expressions to signal how they feel about entities, speakers use language for the same purpose. Moreover, just as interactants seek out affective information from one another's faces, so they seek out affective information from one another's language" (Ochs and Schieffelin 1989: 9). In this context, language plays an immense role as it is responsive to this innate human necessity to convey affective information on all its levels (Ochs and Schieffelin, 1989: 22). And it does seem to have all the means required to accomplish it, since, according to Wierzbicka (see 1992), all languages seem to be equipped with the vocabulary to communicate the basic affective valence dimension: pleasant vs. unpleasant. This could also be reflected in the ample research demonstrating processing advantage of affective compared to neutral words, which was discussed in the previous section.

Affect is always present in interactional context (Besnier 1990). Affective situations, however, undergo dynamic changes just as affective states do. As a consequence, they are quite unique and highly specific to a given context (Kopytko 2002). This is why affect is not only idiosyncratic, but also relational, whereby it is not a property of a stimulus but rather a mixture of the experience and background of an individual and their relation to a given stimulus in a given context (Kopytko 2002; Barrett 2006b). As argued by Kopytko (2004: 529), "affect is not an inherent feature of the emotional stimulus, nor is it immanent to a universalized actor; rather, it is the idiosyncratic relation between the effector (the contextual stimulus) and the affected person which brings into being the event (or the feeling and emotional response)". As such, affect should be considered a non-discrete phenomenon, a continuum, a causal relationship between individuals' affective relation systems and the affective situation - context (Kopytko 2002). This has been adequately described by Lazarus (2006), who claimed that "emotions always depend on what transpires between a person and the environment, which mostly consists of other persons" (2006: 10). Affective and contextual information are therefore essential to and inseparable from communication. The omnipresence of context and affect in communicative interactions is the premise of the 'aboutness principle' proposed by Higgins

(1998). Higgins (1998) states that whenever people communicate they automatically absorb not only the verbal content of the message, but also all of the surrounding extra-linguistic features of a communicative situation that are relevant for communication. While the majority of the linguistic and extra-linguistic cues are simply taken for granted and processed without awareness, they exert a huge influence on the dynamics and effectiveness of communication. Hence, feelings, attitudes or moods, are co-activated and co-manifested with verbal contents in what can be called a communicative melting pot.

Although affect is mainly manifested through non-verbal cues such as the tone of voice, prosody, or body posture, it is concealed in all linguistic structures (Besnier 1990). Affect can be covertly manifested through the use of a sentence, a word, or an exclamation mark. Here, there are no real limits; it is all context-dependent. Such a prevalence of affect, however, has a direct consequence in the form of the multiple keys dilemma, whereby a potentially positive phrase such as 'this is great!' can be interpreted as an enthusiastic opinion or as irony, sarcasm, etc. depending, for example, on the tone of voice (Besnier 1990). Research shows that whenever such conflict of keys is present it is the prosody or facial expression that is the primary medium of affect interpretation (e.g. Hess et al. 1988; Wallbott and Scherer 1986). This can be explained by the fact that the non-verbal manifestation of affect (e.g. gestures, facial expression, prosody) is more salient and transparent than the verbal one. If non-verbal cues are not available (e.g. in the form of written discourse), individuals infer the intention of a message by relying purely on the context in which such a phrase appeared. The role of affective pragmatics is thus to understand this complex affect-language relationship.

It should be brought to the fore that until recently pragmatic theories and premises (including affective pragmatics) were based on evidence from observation and interpretation of human's behaviour as well as on intuition. With the recent development of *experimental and neuro-pragmatics*, it has become possible to empirically investigate the language-context interface. In the following subsection I will briefly discuss recent neuropragmatic studies and move on to the review of the few studies that have attempted to empirically investigate the dynamic affect-language interactions.

1.4.3. Affective Neuropragmatics

Neuropragmatic research has used such neuroimaging methods as EEG or fMRI to acquire a better understanding of how individuals construct contextualized meaning in everyday communicative interactions (Van Berkum 2010: 202). The neuropragmatic evidence collected to date demonstrates a significant impact of contextual information on all areas of language processing (see Van Berkum 2012). For example, discourse-contextual coherence can fully offset the classical N400 effect elicited by the violation of local animacy (Nieuwland and Van Berkum 2006) or local context anomaly (Filik and Leuthold 2008). What is more, when making sense of an utterance, listeners tend to immediately take into account the speaker's social background (Van Berkum et al. 2008). In a recent study, participants with high levels of empathy showed more pronounced N400 amplitudes to social language processing than less empathizing participants (Van den Brink et al. 2012). Such studies provide preliminary evidence that contextual cues, linguistic and/or social, may be constantly and immediately taken into consideration while arriving at an interpretation of a text or utterance (for a detailed review, see Van Berkum 2004, 2008, 2012).

Much less evidence is available about whether and how social and/or linguistic context modulate participants' responses to affective language. In an initial attempt to address this issue, Van Berkum et al. (2009) investigated the neurocognitive responses to sentences whose meaning was in conflict with the value system of the Strict Christian or non-Christian participant group (e.g. "I think euthanasia is an unacceptable/acceptable course of action"; Van Berkum et al. 2009: 1094). The researchers reported more pronounced N400 to value-inconsistent compared to value-consistent critical words in both groups, possibly reflecting the impact of the implicit process of valuation on language comprehension. The N400 was followed by an increased LPC to value-inconsistent compared to value consistent critical words, which was thought to reflect the allocation of additional attentional resources required to process the clash of moral values. Notably, both effects were absent in the control condition, where ERPs were measured to targets appearing prior to the issue to be evaluated (e.g. "I think it is unacceptable/acceptable that

people consider euthanasia"; Van Berkum et al. 2009: 1094). This study shows that an individual's affective response may be modulated as a function of their moral core and/or their background and as such supports the assumption that affect is an idiosyncratic, relational entity.

The principles of affective neuropragmatic approach to the study of affect-language interface are also evident in a study conducted by Herbert et al. (2011) who investigated the time course of affective responses to self-other reference. In the study, participants read affective or neutral nouns preceded by a personal pronoun "my" (the "self" condition), "his" (the "other" condition) or by a determiner "the" (the control condition). The researchers were interested in the possible differential affective responses to stimuli preceded by self- compared to other-reference. The findings revealed a general increase in the EPN amplitudes to positive and negative compared to neutral nouns. Notably, in the "self" condition negative compared to positive and neutral targets elicited attenuated N400 and increased LPC amplitudes, reflecting the processing facilitation of negative nouns preceded by self-reference (Herbert et al. 2011). The results of this study indicate an important relation between socio-affective factors such that individuals differentiate between self-other reference prior to the integration of stimulus meaning. By contrast, in a different study Fields and Kuperberg (2012) found no effect of self-relevance on the processing of affective words embedded in two-sentence scenarios (e.g. "A man knocks on Sandra's/your hotel room door. She/You see(s) that he has a GIFT/TRAY/GUN in his hand"; Fields and Kuperberg 2012: 5). This inconsistency in the findings was attributed to the choice of stimuli (for a discussion see Fields and Kuperberg 2012: 14).

In a recent study, Rohr and Rahman (2015) investigated electrophysiological responses to affective words embedded in a communicative and non-communicative setting. In a communicative setting condition affective and neutral words were spoken by a speaker in a video, resembling a face-to-face communication. In the non-communicative situation condition, the stimuli were spoken by the same videotaped speaker, but this time the speaker's mouth and eyes were closed. The study reported significantly enhanced affective responses to affective words in a communicative setting, starting as early as 150 ms and lasting till 800 ms after stimulus onset. This study is probably the first to provide

empirical evidence that affective stimuli elicit more pronounced affective reactions when embedded in meaningful socio-pragmatic context. The results of the study align with the main principle of the present investigation, whereby embedding experimental stimuli in a meaningful context may bring the affective experience closer to a real-life pattern and in effect enhance the affective response to that stimuli.

Altogether, the research on affect-language interface investigating affective responses to stimuli embedded in genuine socio-pragmatic context is still scarce. This is not surprising, because the recreation of an authentic communicative interaction in a laboratory setting is a difficult, if not impossible, task. More recent studies, however, start to appreciate this effort and acknowledge context as a vital variable in their experimental designs. This was also the aim of the experiment that constitutes the foundation of the present dissertation, the detailed description of which will be covered in Chapter 3.

1.5. Conclusion

The main goal of Chapter 1 was to provide the theoretical and empirical foundation for the investigation of affective phenomena as manifested in language.

To achieve this, I began the discussion by reviewing the main currents of thought about the concept of emotion, and provided argumentation why present scientific research might benefit from reformulating its hypotheses to study more general affective, not emotional, phenomena, as proposed by the *psychological construction* model. In what followed, I discussed a relatively new theoretical paradigm in affective sciences, *core affect*, that might provide a reliable framework of analysis of the variety of affective phenomena in future research. I also discussed the ubiquity of affective processes in everyday life as manifested in the automatic evaluation of and preference for stimuli in the environment, as well as addressed the issue of unconscious affect along with the review of findings from the neuroscience of affect. Finally, I brought to the fore the relationship between affect and language from the angle of psycholinguistics and pragmatics. Specifically, following the review of available findings, I tried to argue that, at present,

neither of the approaches is able to reliably account for the affect-language interface as encountered in everyday communication. In my view, the understanding of this phenomenon might be enriched by adopting the framework of *affective pragmatics*, and more specifically, *affective neuropragmatics*, an emerging field of research that builds on the strengths and weaknesses of traditional psycholinguistic and pragmatic approaches.

Building on the above presented theoretical and empirical foundation, Chapter 2 will extend the debate on affect and language to the bilingual context. Undoubtedly, today's reality is a bilingual reality, thus probing into how affect might manifest itself in the native and non-native language will provide a more faithful picture of how people communicate and comprehend affective meaning in everyday communicative encounters.

Chapter 2: Affect processing in the non-native language(s)

2.1. Introduction

Today's world has offered optimum conditions for the development of a communicative phenomenon that has been recently shown to play a vital role in affective communication. This phenomenon might not only to a substantial degree colour communicative interactions, but also considerably change their character. As such, it needs to be taken into consideration in the research on affect-language interface to achieve an authentic picture of communicative interactions. This phenomenon is bilingualism.

The scope of this chapter will be dedicated to the discussion of how affective information is perceived and expressed through the lens of the non-native language of bilingual individuals, and what value it may bring for the understanding of affective communicative interactions in general. In today's multilingual reality, communicating in two or more languages has become a norm, rather than exception (Grosjean 1984, 2010). This has a significant bearing on the investigation of affective language processing, and raises important questions: Do individuals process affective information differently in their native or non-native language(s)? If so, could it serve any specific purpose? Is the native language the 'language of the heart' (Pavlenko 2005)? What factors might influence affect processing in the native and non-native language(s)?

In addressing these questions, following Dewaele and Pavlenko (2002; also, Dewaele 2004b) and Wierzbicka (2003), I will argue that a comprehensive picture of bilinguals' affective repertoires can only be achieved by means of triangulation, whereby a

scientific inquiry is carried out using different methodologies by researchers with different scientific background and expertise, which would offer a holistic perspective on the phenomenon.

In what follows, I set out to provide a comprehensive review of studies that have addressed the issue of an interplay between affect and bilingualism from the perspective of clinical, social and psychological sciences, respectively. The aim of this review is to provide the grounds for and explain the motivation behind conducting my own study discussed in Chapter 3. The structure of the review is based on Pavlenko (2012), but extended by findings from the most recent empirical studies. The final section of the review will be dedicated to the analysis of methodological issues observed in contemporary research on affective language in bilingualism. Of note, it is beyond the scope of this dissertation to discuss how affect manifests itself through bilinguals' languages in each and every domain of their life[11]. Hence, I limit the review to the body of scholarship that I believe provides sound foundation for the current investigation.

First, however, I would like to introduce and/or clarify a few terms that will be used throughout the chapter. Following Grosjean (1984, 2010), I will call a *bilingual* an individual who speaks two or more languages on a regular basis. In describing bilinguals' linguistic repertoires, I will make a distinction between a *non-native* (also *foreign*, or *second*) and a *native* (also *first*) language. In describing bilingual participants with different language history I will refer to *early* bilinguals (i.e. individuals who acquired a non-native language prior to age 12), and *late* bilinguals (i.e. individuals who acquired a non-native language after the age of 12) as a factor of *age of acquisition*. Another factor, *context of acquisition*, will refer to the context in which a non-native language was acquired, i.e. *naturalistic* (natural L2 environment) or *instructed* (e.g. foreign language classroom). Finally, as it will be shown, the relationship between the native and non-native language(s) is a dynamic one, whereby in certain circumstances the non-native language might become a *dominant* language.

[11]For example, 1) for evidence of diverse affective repertoires in bilingual/translingual writers, see Pavlenko (2005, 2014) and Grosjean (2010), 2) for differences in affect and emotion terms and concepts across languages, see Pavlenko (2005, 2008, 2014; also, Dewaele and Pavlenko 2002) and Wierzbicka (1992, 1994).

2.2. Affective proximity or affective distance? Bilinguals in Psychotherapy

The accounts of the differential role that the native and non-native languages may play in psychotherapeutic analysis were probably first reported by Breuer and Freud (1955) and Ferenczi (1916). Such reports suggested that a switch to the non-native language created a certain kind of affective detachment for a patient when discussing experiences of anxiety or taboo-related topics; further, the non-native language functioned as a vehicle for the expression of 'obscene', and often sexually-related, words. Ferenczi (1916) argues that this could be the case because the non-native language does not capture the vividness and intensity of experiences to a similar extent as the native language: "delicate allusions to sexual processes, and scientific or *foreign designations* for them, do not have this effect [the effect of conjuring up a vivid image of the object a word denotes], or at least not to the same extent as the words taken from the original popular erotic vocabulary of one's *mother tongue* [emphasis mine, RJ]" (Ferenczi 1916: 116). Following Ferenczi (1916), the issue of affect-language interface in psychotherapy was more specifically addressed in the later works by Greenson (1950), Buxbaum (1949), and Krapf (1955) who assigned the non-native language a role of a superego, "keeping infantile sexuality and aggression at bay" (Katsavdakis et al. 2001: 249). However, it seems that the role of the non-native language in psychotherapy was not given enough credit until the work by Luis R. Marcos (1976a, 1976b; Marcos et al. 1973, 1977; Marcos and Urcuyo 1979). Marcos observed that when bilingual patients switched to their non-native language, they seemed to be "more emotionally withdrawn" (Marcos 1976a: 552), and affectively detached. Echoing Ferenczi (1916), Marcos (1976a) thought that this effect could be due the non-native language's disconnection from the affective experiences that are usually acquired in and bound to the native language, particularly in the case of childhood memories. This idea was succinctly summarized by Aragno and Schlachet (1996) founding their argument on the observation of their bilingual patients in psychoanalysis, to quote:

> The affective component of this material [experiences in the native language] appeared to be enveloped, attached to, or one with the actual sounds and contexts in which these experiences were first lived, and was therefore unavailable when spoken about in a language distant from or alien to this developmental period. Neither the sounds nor the words held the same meaningful connotative valence or connection to the original experiences. Returning the

> recollections to the original language opened the floodgate of reliving and consequently to emotional working through in its full sense of therapeutic reintegration. (1996: 24–25)

Consistent with Aragno and Schlachet (1996), two main messages emerge from the clinical observations of bilingual patients. First, the non-native language has been often construed as affectively detached and thus constituted a vehicle for the discussion of otherwise too arousing memories and experiences. By contrast, the native language has been the key that unlocks the door to past, sometimes subconsciously repressed (Javier 1995), memories and allows a patient to re-experience or relive them anew. Second, the likely explanation for the affective distance offered by the non-native language is that it is usually detached from affective memories and experiences that were mostly acquired and lived in the native language. Notably, this argument implies that access to and experience of past affective events may be contingent upon the language in which such an event was encoded, lived by and retrieved (Pavlenko 2014). Hence, some affective memories might be activated by means of the first and others by means of the second language (Javier 1995). In a similar vein, Guttfreund (1990) argued that "it is not the other tongue [as such] but rather the *qualities* of the specific language being used together with the *role* that language plays in the individual's life that will have an impact on a bilingual's emotional experience [emphasis mine, RJ]" (Guttfreund 1990: 606). The author based this claim on the results of his study on English-Spanish and Spanish-English coordinate bilinguals, in which both groups of participants reported overall greater affective experience in Spanish.

In sum, while the majority of findings from clinical studies have reported bilinguals' affective detachment in the non-native language and affective proximity in the native language, in some circumstances this picture seems less transparent and more complex. Indeed, contemporary studies reporting bilinguals' subjective experiences of psychotherapy (Verdinelli and Biever 2009; Dewaele and Costa 2013) as well as studies on bilinguals' autobiographical memories (Schwanberg 2010) suggest that the retrieval of affective experiences might be to a significant extent dependent on the language in which such an experience occurred and was encoded. This is depicted in the following report provided by a bilingual participant in a Dewaele and Costa's (2013) study: "'I remember being given permission/being asked to express a traumatic incident in the language in which it

happened. This I found very liberating.' (C168, French, Italian, English, German, Spanish)" (Dewaele and Costa 2013: 44). This illustrates that the reported differences in affect perception and expression in the first and second language might be to a significant extent contingent upon the language in which the affective situation was experienced and encoded by bilingual individuals.

Clinical studies have provided important insights into the role of bilinguals' respective languages in the experience and perception of affective information. This evidence, however, is mostly based on single case-studies and/or anecdotal self-reports, which might tell only part of the story. The following subsections will complement clinical studies with evidence from larger population samples and various methodological approaches.

2.3. Affect manifestation in bilinguals' autobiographic memory

> The royal road to childhood memories (and, by extension, any other memories) lies through the language in which these memories took place. (Schrauf and Rubin 1998: 440)

Studies conducted in a psychoanalytic context have presented preliminary evidence that the choice of language from a bilingual's linguistic repertoire might have a direct influence on the activation and, possibly facilitated and more intense, recall of memories that were encoded in that language. This provoked questions about the possible role of bilinguals' languages in the recall of autobiographic memories (Schrauf and Rubin 1998, 2000; Larsen et al. 2002; Marian and Neisser 2000; Marian and Kaushanskaya 2004, 2008; Matsumoto and Stanny 2006; see Pavlenko 2005, 2012, 2014). This question has been addressed with the use of two main methodological paradigms: free recall and cued recall (Pavlenko 2005, 2014). The free recall paradigm in a way resembles the psychoanalytic context, whereby participants are requested to freely talk about a selected positive or negative life experience in the language in which it occurred (e.g. Javier et al. 1993; Otoya 1988; Marian and Kaushanskaya 2008). Usually, there are two sessions counterbalanced across participants: one conducted in the native and another in the non-native language. In a cued recall

paradigm, participants are provided with cue or prompt words and are asked to describe in writing an autobiographic episode related to and/or elicited by the cues (Otoya 1988; Schrauf and Rubin 1998, 2000, 2004; Larsen et al. 2002; Marian and Neisser 2000; Marian and Kaushanskaya 2004; Matsumoto and Stanny 2006). In a similar vein, there is a native and non-native language session that are usually conducted in separate days. Furthermore, some studies have also introduced the cue manipulation by presenting cues in the native and non-native language during the non-native and native session, respectively (e.g. Marian and Neisser 2000). Such a manipulation enables to investigate the effects of congruent recalls (encoding and recall in the same language), crossover recalls (encoding in one language, cue words in another), or mixed recalls (autobiographic episodes encoded in both native and non-native languages; Pavlenko 2014).

Studies on bilinguals' autobiographic memory with different bilingual populations[12] have consistently reported that bilinguals' recall of autobiographic episodes is facilitated, more detailed and elaborated when the language of encoding/experience matches the language of retrieval (the congruent recall effect; e.g. Schrauf and Rubin 2000, 2004; Larsen et al. 2002; Marian and Neisser 2000; Matsumoto and Stanny 2006), with the effect being possibly independent of the language of the cue/prompt words (the crossover recall effect; Marian and Neisser 2000). These findings have led some authors to conclude that "the predominant language at the time of encoding an event becomes part of the memory itself" (Otoya 1988: 124); "memory retrievals bear the imprint of linguistic encoding" (Schrauf and Rubin 2000: 621); or that "information that is acquired in a certain linguistic ambience is likely to become more accessible when recall takes place in that same ambience" (Marian and Neisser 2000: 367).

But will the retrieval of autobiographic memories be also more affectively coloured if experienced and encoded in the same language? Javier et al. (1993) addressed this question in a study with 5 Spanish-English coordinate bilinguals. The participants were asked to think about a pleasant or unpleasant event from their past and report it in the

[12]To date, autobiographic memories in bilinguals have been conducted among Spanish-English (Otoya 1988; Javier et al. 1993; Schrauf and Rubin 1998, 2000, 2004), Russian-English (Marian and Neisser 2000; Marian and Kaushanskaya 2004, 2008), Polish-Danish (Larsen et al. 2002) and Japanese-English (Matsumoto and Stanny 2006) bilingual populations.

language in which the event was experienced. Following a 30-minute break, the participants were asked to retell the same experience in the other language. The researchers reported that when the language of experience and recall were matched participants' narratives were more descriptive and affectively charged compared to the mismatch condition. The effect was reported for both Spanish and English.

Two other studies conducted by Marian and Kaushanskaya (2004, 2008) corroborated these findings with Russian-English bicultural bilinguals. In the first study Marian and Kaushanskaya (2004) employed the cued recall paradigm among 47 Russian-English participants to investigate whether self-construal and affect expression are contingent upon the language of encoding and retrieval of autobiographic episodes. As predicted, narratives in English and Russian elicited individualistic and collectivist self-construal, respectively. Notably, when the language in which an autobiographic episode was experienced and recalled matched, the episode was recalled with more pronounced affectivity. In the second study, the authors examined the experiences of immigration in 47 Spanish-Russian bilinguals. Each participant's task was to provide a detailed account of their experiences of immigration to the USA. Half of the participants reported their experiences in Russian and half in English. The results showed that in their narratives, Russian-English bilinguals tended to use, in general, more negative than positive words. A closer look at the data, however, revealed that bilinguals used more negative words when recounting the experiences in their L2 English. This finding was interpreted in line with the hypothesis that the L2 might be affectively more distant than L1; hence, participants in this study might use more negative words to compensate for otherwise low affective quality of their narratives (Marian and Kaushanskaya 2008). The results of the study should be interpreted with limited scope as its design made it impossible to analyse the individual variation in the affective quality of English and Russian narratives.

Overall, research on the bilinguals' autobiographic memories demonstrates that such memories may be recalled more vividly and with greater affective intensity when retrieved in the same language in which they were experienced. Some bilinguals, like a bilingual Russian-French-English writer Vladimir Nabokov (1899 – 1977), have left compelling accounts of such experiences (for details see Pavlenko 2005, 2014). Nabokov's

autobiography entitled "Conclusive Evidence: A Memoir" (1951), first published for the US readership, turned out to have two subsequent versions. First, a Russian translation, published upon request under the title "Drugie Berega"[13] (1967), in which Nabokov's Russian activated early childhood memories and "allowed for elaboration of those only sketched in English" (Pavlenko 2014: 189). Second, – a direct consequence of the elaborations introduced in the Russian translation – a revised English version published under the title "Speak memory: An autobiography revisited" (1966), in which Nabokov commented on this experience: "This re-Englishing of a Russian re-version of what had been an English re-telling of Russian memories in the first place, proved to be a diabolic task" (Nabokov 1966: 12-13 as quoted in Pavlenko 2014: 189).

Nabokov's example, as well as the studies discussed above, illustrate the fascinating yet complex relationship between, among others, the languages, memories, and affective experiences of bilingual speakers.

2.4. Bilinguals' affective repertoires from an introspective perspective

In the previous two sections I tried to illustrate the complex and dynamic relationship between bilinguals' linguistic and affective repertoires that was initially observed in psychoanalysis and further addressed, among others, in the research on bilinguals' autobiographical memory. These intriguing findings provoked questions about how a bilingual individual might experience and manifest affect in their day-to-day interactions, extending beyond the consulting room of a psychoanalyst, or interviews about past experiences. To address this question, in this section I will report main findings from The Bilingualism and Emotions Questionnaire (BEQ) conducted by Aneta Pavlenko and Jean-Marc Dewaele (Dewaele 2004b, 2004a, 2006, 2008, 2010; Pavlenko 2004, 2005, 2006). BEQ constitutes the largest questionnaire-based investigation of affect-language interface in bilingual individuals. Consistent with BEQ (2.4.1), I will present the data from two perspectives: (1) how bilinguals subjectively perceive affective intensity in their respective

[13]Translated into English as "Other shores" (Pavlenko 2014: 189).

languages (section 2.4.2), and (2) which of bilinguals' languages serve(s) as the medium of affect manifestation (section 2.4.3). The aim of this section is to provide the essence of findings from BEQ. For a detailed discussion of BEQ, refer to Pavlenko (2005) and Dewaele (2010).

2.4.1. The Bilingualism and Emotions Questionnaire (BEQ)

The BEQ was accessible online at the Birkbeck College (University of London, UK) website between 2001 and 2003 and administered in English. In its final version, it comprised 34 questions, both 5-point Likert-based closed questions as well as open-ended questions, including a section on sociobiographical information (Pavlenko 2005).

Originally, BEQ collected data from a sample of 1039 bilinguals, but has been recently extended to 1579 respondents (see Dewaele 2010). BEQ respondents represent a heterogeneous bilingual sample (age range: 16-73; speakers of 75 different native languages); the majority, however, is of similar education background (academia). Given the language and nature of the questionnaire, the sample is also biased towards users of English with access to the internet (for an overview of other limitations see Pavlenko 2005, 2012; Dewaele 2010).

2.4.2. Bilinguals' perception of affective intensity in their languages

The BEQ addressed a few issues related to the perception of affect in bilinguals' languages, e.g. how bilinguals 'feel' the intensity of swearwords and taboo words or the phrase 'I love you' in their respective languages. The former was addressed by Dewaele (2004b) who, based on the BEQ data, reported that swearwords and taboo words carry greater affective load in bilinguals' L1 compared to later acquired languages. Further, this perceived affectivity would gradually attenuate in later acquired languages, being more intense in L2

than L3, L3 than L4, and comparable in L4 and L5. This idea was captured by one of the respondents:

> Estela (Romanian L1, German L2, French L3, English L4, Italian L5): Romanian is more appropriate for hurting and insulting because it carries more weight and I can distinguish more nuances. (Dewaele 2004b: 213)

The degree to which the affective charge in a non-native language was felt by BEQ respondents was modulated by the context in which the language was acquired. Usually, languages reported to have been acquired in a natural context were perceived as more affective than languages learnt in an instructed, foreign language classroom context:

> Pierre (French L1, Dutch L2, English L3, German L4): I do not feel the emotional load of words in foreign languages. I've only learned them in an "instructed" environment. (Dewaele 2004a: 99)

The perceived affective load in bilinguals' languages was also found to be correlated with gender, whereby females provided higher ratings of affective charge of swearwords than male respondents. Other sociobiographical factors (e.g. age, education level, IQ score) did not have an effect. Notably, Dewaele (2004b) also observed that the affective charge in L1 might attenuate when L1 is not the dominant language (Dewaele 2004b).

As regards perception of positive affect, Dewaele's (2008) analysis of the BEQ respondents' perceived affectivity of the phrase 'I love you' in their languages demonstrates that as regards sentiments the respondents are less consistent in their responses. Those for whom the phrase 'I love you' carried greater affective load in L1 constituted almost half of the respondents. Others, have pointed out that the affective charge of that phrase is contingent upon the context in which love was experienced:

> Eric (French L1, German L2, English L3, dominant in French): As far as I am concerned 'I love you' has the same emotional weight or force in either my L1 or L2 as *I have lived love in the context of both languages* [emphasis in the original, RJ]. However, I have said ''Ich liebe dich'' before and really meant it. Moreover you might say I'm a romantic but I think the concept of love prevails regardless of what language you use to express it. (Dewaele 2008: 1769)

Still others considered an important if not deciding factor how the phrase 'I love you' sounds in their languages:

> AK (German L1, English L2, French L3, dominant in German and English): It sounds pathetic in German, a bit cheesy in English, wonderful in French! (Dewaele 2008: 1770)

According to Dewaele (2008) how bilinguals feel about the phrase 'I love you' might be contingent upon their native and non-native language(s) history and use as well as proficiency.

2.4.3. Bilinguals' choice of language for affect manifestation

> K. (Finnish L1, English L2, Swedish L3, German L4): If I would happen to hit myself with a hammer the words coming out of my mouth would definitely be in Finnish. (Dewaele 2004a: 94)

The BEQ data was also analysed to determine which of the bilinguals' languages are usually selected for the expression of affect in general, for manifesting anger (Dewaele 2004a, 2006, 2010), love (Dewaele 2008) or for affect communication between parents and children and partners in a relationship (Pavlenko 2004, 2005; Dewaele 2010).

In the same vein as in perception data, overall the BEQ respondents showed their preference for affect expression in their L1 (Dewaele 2004a, 2010). A closer look at the qualitative data, however, suggests that the situation is more complex. Some bilinguals reported that their language selection was contingent upon the particular feeling they want to express:

> Marco (Italian L1, English L2, German L3, French L4, Dutch L5): I would use different languages according to the subject that I deal with. Italian for what happened during the day for example. English for general feelings, German for love emotions. Or deepest and perhaps harshest statements. (Dewaele 2010: 90)

Others, might manifest affect in their non-native languages due to first language attrition or infrequent use of L1. When expressing anger or swearing, BEQ respondents thought that

the use of L1 was perceived as more accurate and more intense. Notably, however, for some this heavy affective load in L1 might have an opposite, distancing effect:

> Maria [Spanish L1, English L2]: I never swear in Spanish. I simply cannot. The words are too heavy and are truly a taboo for me. (Dewaele 2010: 111)

Hence, relying on a non-native language when expressing anger or swearing (e.g. in the context of an argument) may offer greater affective detachment and control (Pavlenko 2005). Furthermore, due to cross-linguistic and cross-cultural differences, bilinguals may find their non-native language more appropriate and accurate for affect manifestation (Pavlenko 2005). Interestingly, one bilingual individual stated that his/her selection of a linguistic medium of affect expression was dependent on the interlocutor:

> ML [Portuguese L1, French L2, English L3, Greek L4, Dutch L5): I express my anger and deepest feelings in the language that the person I'm talking to will understand better. (Dewaele 2010: 120)

Finally, Pavlenko (2004) also demonstrated that parent-child communication is similarly characterized by a great variety of cross-linguistic choices that are largely dependent on the context; here, again, L1 may not always constitute the preferred medium of affect expression. Pavlenko (2004) illustrated this idea on her own example:

> I use Russian to shower my son with elaborate diminutives, since even his name, a paltry Nik or Nikita in English, can be transformed in Russian into a dazzling array of Nikitochka, Nikochka, Nikushechka, Nikitushechka and so on. I also marvel at his *ushki* (dear-littleears), *ruchki* (dear-little-hands), and *nosik* (dear-little-nose). At the same time, I tell him that I love him much more often in English than in Russian, simply because in Russian the direct statement *Ia tebia lubliu*/'I love you' is associated with the discourse of romantic love and is not commonly used in parent-child communication [emphasis in the original, RJ]. (Pavlenko 2004: 199)

2.4.4. Summary

> Being bilingual is like having a palette with more colours: whereas monolinguals have some colours with which to paint their emotions, bilinguals have even more and can thus use a greater variety of emotions. (Panayiotou 2004: 133)

The bilinguals' perception and expression of affective language illustrated in this section point out the diversity of bilinguals' emotional lives and the extent to which bilinguals' linguistic repertoires might have a bearing on affect manifestation.

However, research focused on the observation of bilingual individuals in psychoanalytic situations or analysis of bilinguals' subjective perceptions of affect manifestation in their languages is marked by little objectivity and does not directly investigate the mechanisms underlying conscious affective experiences (Pavlenko 2012). Further, surveys or interviews with bilingual participants, according to some researchers, are difficult to quantify and may be marked by little credibility (see Caldwell-Harris et al. 2011). Nevertheless, bilinguals' insights into their subjective affective experiences in their respective languages greatly contribute to the general picture of affect-language interface in bilingualism, and as such provide the baseline, inspiration and motivation for experimental research.

In the next sections I review studies that have addressed the issue of affective language processing in cognitive paradigms. Using more objective measures these studies try to understand the cognitive and psychophysiological mechanisms underlying affect processing in the respective languages of bilingual speakers.

2.5. Affective language processing in cognitive paradigms

2.5.1. Memory advantage for affective words

As mentioned in Chapter 1 (section 1.4.1.1) research on monolingual participants demonstrated that positive and negative words are often given priority in the course of processing compared to neutral words. This translates, among others, to them being recalled and/or recognized faster and with greater accuracy (e.g. Doerksen and Shimamura 2001; Kensinger and Corkin 2003; Zeelenberg et al. 2006). In bilingualism, researchers set out to investigate the potential differences in recall and recognition of affective words in the

respective languages of bilingual speakers (Anooshian and Hertel 1994; Ayçiçeği and Harris 2004; Ayçiçegi-Dinn and Caldwell-Harris 2009; Ferré et al. 2010, 2013).

Probably the first to address the issue of memory effects in bilinguals were Anooshian and Hertel (1994) who investigated the recall of affective and neutral words through the implementation of a rating task. English-Spanish and Spanish-English late bilinguals were asked to rate affective and neutral stimuli on a number of dimensions. Following the rating task, participants were asked to recall as many words as they could remember from the rating task (a free recall surprise task). The researchers found that affective words were recalled with greater accuracy only in the L1s of both bilingual groups, with no difference in stimuli recall in their L2s. According to the authors, lack of memory advantage for affective words in L2 might reflect a detachment of affective meaning from L2 words, possibly due to the fact that such words were acquired later in life (Anooshian and Hertel 1994). The interpretation of the results, however, should be cautious and possibly limited as the researchers did not match their stimuli on affective word type, including words referring directly to emotion along with emotion-laden, positive, or negative words (Pavlenko 2012).

10 years later, Ayçiçeği and Harris (2004) set out to investigate potential differences in the recall and recognition of emotional stimuli in L1 and L2 of late proficient Turkish-English bilinguals residing in the USA. The stimuli in the study comprised 16 positive (e.g. 'bride'), 16 negative (e.g. 'cruel'), 16 neutral (e.g. 'column') and 9 taboo (e.g. 'asshole') words as well as 7 reprimands (e.g. 'I hate you!'); all stimuli were matched for familiarity. Stimuli were presented to participants either in L1 or in L2, in a visual or auditory modality. The participants' task was to rate the presented or heard stimulus on a scale in terms of valence. After the task half of the participants underwent a surprise free word recall task and the other half a word recognition task. The results from the recall data demonstrated that taboo words were recalled significantly better while negative words significantly worse than neutral words in L1. In L2, taboo and positive words as well as reprimands were recalled better than neutral words. As regards recognition data, in L1 the recognition advantage was only present for taboo words; in L2, by contrast, a recognition advantage was reported for positive, negative and taboo words. Altogether, this study

demonstrated that recall and recognition of affective stimuli compared to neutral stimuli were found in both languages, with the memory effects being more pronounced in L2 rather than in L1. Two main methodological issues that were not addressed by Ayçiçeği and Harris (2004), however, should be mentioned while interpreting the results. First, it seems that experimental stimuli in the study were not matched on word category (nouns, verbs, and adjectives were mixed together), word frequency in L1 and L2, word concreteness (concrete and abstract words mixed together), and word arousal, which could have a significant impact on stimuli processing. Second, it is not clear why each participant was exposed to all factors within the same experimental block, i.e. a stimulus could appear in L1 or in L2, in a visual or auditory modality. Such an approach might to a significant extent increase cognitive effort and potentially impact recall and recognition of words in a non-native language.

In a different study Ayçiçegi-Dinn and Caldwell-Harris (2009) examined potential memory effects for affective compared to neutral stimuli in 59 late, proficient Turkish-English bilinguals living in Turkey. Participants were randomly assigned to either a shallow processing tasks (letter counting) or one of the deeper processing tasks (intensity ratings, translation, word association). The stimuli in the study were taken from Ayçiçeği and Harris (2004). Independent of the task employed in the study, in both languages taboo words and reprimands were recalled with highest accuracy followed by positive words that were in turn recalled better than negative and neutral words; furthermore, upon closer analysis, reprimands turned out to be recalled better in L2 English compared to L1 Turkish, which was interpreted as a novelty effect. Hence, reprimands were excluded from further analysis of possible task-specific effects. This analysis showed that memory-effects were higher in L1 compared to L2 in the rating task with the situation being reversed in the translation task. In sum, similarly to a previous study by Ayçiçeği and Harris (2004), Ayçiçegi-Dinn and Caldwell-Harris (2009) reported overall comparable memory effects of affective words in L1 and L2. Of note, since the researchers used the same stimuli as in Ayçiçeği and Harris (2004), the potential confounding effects mentioned previously might have a similar impact on the results of this study.

These potential methodological shortcomings were addressed in a study by Ferré et al. (2010) who investigated the memory-effects in L1 and L2 of three bilingual groups that differed in language immersion, dominance, context of L2 acquisition, and language similarity. The participants in the study were Spanish-Catalan and Catalan-Spanish early immersed bilinguals (acquired the L2 in a naturalistic context) as well as Spanish-English late bilinguals (acquired the L2 in an instructed, classroom context). The stimuli in the study consisted of 12 positive (e.g. puppy), 12 negative (e.g. knife) and 12 neutral (e.g. table) words that were adopted from the Spanish adaptation version of Affective Norms for English Words (Redondo et al. 2007). This time all stimuli were carefully matched on word valence, arousal, frequency, word length, concreteness and imageability. The participants were asked to conduct a valence rating task that was followed by a free word recall task. The results of the study demonstrated that the memory-effects for affective compared to neutral words were of comparable magnitude in the L1 and L2, irrespective of such factors as language immersion, language dominance or age and context of language acquisition (Ferré et al. 2010).

Finally, in a recent follow-up study, Ferré et al. (2013) investigated memory-effects for affective words in the L1 and L2 of early Catalan-English and English-Catalan bilinguals in two indirect encoding tasks. Participants were presented with positive, negative and neutral words, taken from Ferré et al. (2010), in the English and Catalan language block and their task was to first rate each word in terms of concreteness (experiment 1) and to count the number of vowels in the presented stimulus (experiment 2). The results of the study pointed to a memory advantage for positive compared to negative and neutral words, with the effect being language- and task-independent. As such, Ferré et al. (2013) demonstrated that the memory-effects for affective words are of comparable magnitude in the two languages of early Catalan-Spanish bilinguals in tasks that do not require paying attention to meaning but to structure of stimuli.

Altogether, the findings reported so far in the research on recognition and/or recall of affective words in bilingual speakers have been largely inconclusive. The possible reason for it might be the use of different tasks and stimuli, as well as conducting research among bilinguals with different language background and proficiency in the second

language. Most importantly, however, as yet it is arguable to what an extent the reported memory effects might be influenced by stimuli affective quality and not, for example, by differences in stimuli concreteness or frequency and stimuli novelty.

2.5.2. Allocating attentional resources to affective words: Emotional Stroop and RVSP tasks

In an emotional Stroop task affective words and neutral words are presented on a screen in different colours and the participants' task is simply to name or respond to the colour without focusing on the meaning of that word. It has been observed in monolingual research that affective words, particularly negative words or swearwords, elicit an interference effect, whereby it would take participants longer to identify the colour of affective compared to neutral words.

This paradigm has been also successfully applied to investigate potential interference effects to affective words in the first and second language of bilingual individuals. For example, Sutton et al. (2007) conducted an emotional Stroop study among highly proficient Spanish-English bilinguals. The participants viewed negative and neutral words that appeared in green or blue in two separate blocks. Within these blocks, half of the stimuli were presented in English and the other half in Spanish. All stimuli were matched on several measures including word frequency, valence, arousal and word length. The type, colour and language of the stimuli were counterbalanced across participants. In the experiment, the participants were asked to respond as fast and as accurately as possible to the colour of the stimuli by pressing an appropriate button on the keyboard. Sutton et al. (2007) reported the emotional Stroop effect for both L1 and L2, whereby negative words produced an interference effect of comparable magnitude in both languages. These results showed that highly proficient Spanish-English bilinguals processed affective stimuli in an implicit and automatic way in their L1 and L2, with no significant differences between the languages.

In a similar vein, Eilola et al. (2007) set out to investigate whether positive, negative and taboo words would elicit an emotional Stroop effect in the L1 and L2 of late unbalanced but proficient Finnish-English bilinguals. Each stimulus was presented to participants in 4 different colours (red, blue, green, yellow). The word type (positive, negative, neutral, taboo) and language (English, Finnish) were blocked, thus creating a total of 8 blocks in the experiment. As in the study by Sutton et al. (2007), participants were asked to quickly and accurately identify the colour of the word by pressing an appropriate button on a response box. Data analysis indicated a main effect of word type, whereby negative and taboo words processed significantly longer than other stimuli. As in the case of a study by Sutton et al. (2007), this interference effect was of comparable magnitude in L1 and L2 suggesting that automatic processing of affective words may be comparable in L1 and L2. This effect was also recently replicated in an emotional Stroop study among Hungarian-Serbian immersed bilinguals (Grabovac and Pléh 2014).

The above-mentioned findings were not replicated by Winskel (2013) who investigated implicit and explicit affective word processing by means of an emotional Stroop task and an affective valence-rating task, respectively, among late Thai-English bilinguals and a control group of English monolinguals. The materials in the study comprised negative and neutral words matched in Thai and English on several stimulus variables. Following a typical procedure in the emotional Stroop task, based on Sutton et al. (2007), participants were asked to rate the experimental stimuli for affective valence on a seven-point Likert scale in both Thai and English[14]. The analysis of response latencies indicated a word type (negative; neutral) by language (Thai; English) interaction, whereby bilingual participants responded significantly slower to negative compared to neutral words in Thai, but not in English. Interestingly, no language effect was reported for post-experiment ratings of affective valence. Two important findings emerge from this study: first, the contradictory results reported in the implicit and explicit task possibly point to the depth of processing as an important factor influencing affective language processing; second, the results of the emotional Stroop task might reflect a possible difference in the

[14]English controls did the rating in English only.

processing of affective language among early and late bilinguals speakers, even when there is no significant difference in their proficiency levels (Winskel 2013).

Another measure to examine the allocation of attentional resources to stimuli is the Rapid Search Visual Presentation (RSVP) paradigm. In the RSVP task stimuli are sequentially flashed on the screen in the same spatial location for a brief period of time, long enough for a participant to identify a word. The participants' task is to identify a specific target in the sequence of words and ignore the rest of words. Typically, the RSVP paradigm produces an *attentional blink* (AB) effect, whereby participants fail to identify the second target word if it was presented app. 180 – 450 ms after the first target (Raymond et al. 1992). Of note, the AB was found to be reduced for affective words, suggesting that these types of words require allocation of fewer attentional resources (Anderson 2005). Colbeck and Bowers (2012) used this methodology to investigate automatic processing of affective words among proficient Chinese-English bilinguals studying and living in England, and a group of monolingual English controls. The stimuli in the study consisted of 26 taboo/sexual and 26 neutral critical distracters, 60 non-word noncritical distracters, and 10 colour target words. The participants' task was to identify the target colour word and ignore the rest of the stimuli. The results of the study demonstrated that English speakers were less accurate at identifying a target colour word when it was preceded by a taboo or sexual word compared to neutral word, thus triggering the AB effect. For the Chinese-English group, however, the AB impairment was significantly alleviated. On the basis of these results, Colbeck and Bowers (2012) concluded that affective words in L2 might capture less attention compared to affective words in L1, and thus questioned the conclusion drawn from previous studies (Eilola et al. 2007; Sutton et al. 2007) that argued for automatic processing of affective words is both L1 and L2.

Research investigating selective and automatic attention allocation to affective words in bilinguals by means of emotional Stroop and RSVP tasks have produced mixed results. As observed by Colbeck and Bowers (2012) as yet it is difficult to identify why the results from emotional Stroop paradigms and RSVP studies produce different results despite attempts to control for variables that are known to have an impact on affective language processing in bilinguals (e.g. L2 proficiency, age and context of acquisition). The

recent emotional Stroop study by Winskel (2013), however, demonstrated that automatic processing of affective valence in bilingual speakers might be indeed influenced by language proficiency and context of L2 acquisition such that bilinguals who acquire their L2 in an instructed context later in life process affective words in a less automatic fashion.

2.5.3. Processing advantage for affective words: Affective priming and lexical decision paradigms

Further evidence that contributes to the broad picture of affective language processing in bilingual speakers comes from studies investigating the possible facilitation effects of affective words processing by means of affective priming paradigm or a standard lexical decision task procedures.

For example, in a recent study by Ponari et al. (2015) the researchers investigated processing of affective words among highly proficient non-native speakers of English whose native languages were typologically different. The materials in the study included carefully matched positive, negative and neutral words and non-words. The participants task was to determine as quickly and as accurately as possible whether a stimulus presented on the screen was a word or a non-word (a standard lexical decision task). The results of the study indicated facilitation effects of affective words processing in both the L1 and L2 of bilingual speakers, with the effect being reported for both early and late, highly proficient bilinguals. Further, this affective valence effect was not contingent upon language immersion, or similarity between participants' L1 and L2 English.

The aforementioned results are in contrast with a previous study conducted by Degner et al. (2012), in which the authors addressed a question of whether the automaticity of affective language processing might be modulated by the degree of immersion in the L2. German-French and French-German proficient bilinguals that differed in the degree of L2 immersion and frequency of English use took part in the experiment. Participants conducted two tasks: an affective priming task and a semantic priming task. In the former, participants were presented with French-German word-pairs consisting of positive,

negative or neutral prime words followed by positive or negative target words; their task was to ignore the prime, and attend to the target word by evaluating its valence (positive/negative). In the former, participants were presented with semantically congruent or incongruent word-pairs; their task was to ignore the first word and attend to the second word by determining whether it was a word or a non-word. The results of the study showed that the affective priming effect was present for L1 and L2 of French-German bilinguals living in Germany, but only for the L1 of German-French bilinguals. The semantic congruity effect was present for all languages of both bilingual groups. Given that the affective priming effect in L2 was obtained only in the immersed group, Degner et al. (2012) concluded that immersion in the L2 culture as well as the frequency of L2 use might to a significant extent modulate affective processing in everyday communication.

In another study, Altarriba and Basnight-Brown (2011) set out to investigate the automatic processing of affectively loaded (e.g. snake, gift) and emotion (fear, happy) words in an Affective Simon task among Spanish-English bilinguals and English monolinguals. In such a task, each stimulus could appear in white, blue or green colour. Upon being presented with a stimulus in white, participants were asked to identify whether the stimulus has a positive or a negative connotation by pressing an appropriate button ('P' for positive; 'Q' for negative). By contrast, upon being presented with a stimulus in blue or green, participants were asked to determine the colour of the stimulus by means of a button press ('P' for green; 'Q' for blue). Having familiarized participants with the procedure in a practice session consisting of a block of white stimuli and a separate block of blue and green stimuli, participants proceeded into actual experiment where white, blue and green stimuli were mixed together in each language block. In a congruent condition, it was predicted that a positive word (e.g. happy) would be responded to faster if it were to appear in green rather than blue due to the same required response pattern (pressing 'P' on a keyboard), thus creating an Affective Simon effect. The results of the study demonstrated that Affective Simon Effects were present for both L1 and L2 of Spanish-English bilinguals, irrespective of language dominance, for affectively loaded words. As regards emotion words, however, the Affective Simon Effects to positive emotion words were more pronounced in the dominant L2 English. Altarriba and Basnight-Brown (2011) concluded

from the findings that language dominance may be the deciding factor modulating automatic processing of emotion words in bilinguals.

In short, studies investigating potential facilitation effects of affective words processing in bilinguals have reported that affective valence processing might, under certain conditions, be automatized in both L1 and L2 of bilingual individuals. Factors that have been proposed to modulate this effect are language dominance and/or frequency of L2 use (see Degner et al. 2012; Altarriba and Basnight-Brown 2011). Another factor that might have an impact on the obtained results is purely methodological in nature and involves the selection of tasks and stimuli.

2.5.4. Summary

Findings from cognitive studies demonstrated that affective words tend to be recalled and recognized with comparable accuracy in the respective languages of bilingual speakers. In a similar vein, findings from emotional Stroop and RSVP paradigms suggest that affective words in both L1 and L2 are processed in an implicit and automatic way. Other cognitive paradigms have also reported facilitation effects of affective word processing in both the native and non-native languages of bilingual speakers. As shown, however, these findings are by no means uniform. The inconsistencies across studies might stem from numerous factors such as differences between participant populations and/or experimental stimuli. As argued above, (see Caldwell-Harris et al. 2011; Simcox et al. 2012) several studies did not manage to tightly match their experimental stimuli on variables known to influence lexical processing, which could have to a significant extent influence participants' performance.

To get a more detailed picture of how bilingual individuals process affective language in their respective languages, the following section will build on and extend the cognitive research in two ways: first, it will address the potential influence of autonomic arousal on affective stimuli processing in L1 and L2, often going beyond single words and using short phrases as experimental stimuli; second, it will complement behavioural paradigms by collecting psychophysiological responses to stimuli.

2.6. Affective language processing in psychophysiological paradigms

Psychophysiological studies examine changes in psychological and physiological arousal in response to bodily internal spontaneous events and/or external stimuli as indexed by electrodermal activity or skin conductance (Lyrken and Venables 1971). A phasic change in skin conductance in response to a stimulus appearing at 1 to 1.5 ms post-stimulus onset has been referred to as a *skin conductance response* (SCR). Studies among monolingual populations have demonstrated that electrodermal activity is particularly sensitive to threatening, highly arousing stimuli, e.g. taboo or swearwords, as well as emotion words, leading to increased SCRs when compared to neutral stimuli (LaBar and Phelps 1998; Buchanan et al. 2006) or euphemisms (Bowers and Pleydell-Pearce 2011).

This body of research constituted the inspiration for Harris et al. (2003) who set out to investigate potentially differential patterns of skin conductance to words and phrases in the native and non-native language. The researchers invited to the experiment late, proficient Turkish-English bilinguals who at the time of the study were US residents for a mean number of 4 years. Participants were presented with positive (e.g. joy), negative (e.g. kill), neutral (e.g. door) and taboo/sexual (e.g. breast) words as well as reprimands (e.g. Go to your room!) and conducted a valence rating task. Stimuli were not repeated across languages, but were presented in both visual and auditory modalities. Experimental stimuli were matched on valence and frequency; however, word frequency occurred to be higher for Turkish translations of English words. The results of this study indicated differential electrodermal activity to taboo words in L1 and L2 such that increased psychophysiological responses were reported to taboo words in the native language, with the effect being restricted to the auditory modality. Furthermore, more pronounced childhood reprimands were reported in Turkish compared to English in both modalities. Two potential limitations of the study should be taken into consideration when interpreting the results, however. First, given that psychophysiological measures like SCRs are most sensitive to stimulus arousal, it is not clear why Harris et al. (2003) did not control for this stimulus variable. Since the stimuli in the study were not repeated across languages, it could happen that stimuli selected for presentation in Turkish were simply more arousing than those presented

in L2 English. Second, given that psychophysiological measures are also responsive to stimulus relevance, it might happen that the reported higher frequency of stimuli in Turkish resulted in more pronounced psychophysiological response compared to stimuli in English. Overall, however, Harris et al. (2003) provided initial evidence pointing to more pronounced psychophysiological responses to taboo words and reprimands in the native compared to non-native language.

Harris et al.'s (2003) was the first in a series of studies on psychophysiological measures of affective language in bilingual speakers (Harris 2004; Caldwell-Harris and Ayçiçeği-Dinn 2009; Caldwell-Harris et al. 2011). In a follow-up study, Harris (2004) looked at possible differential electrodermal responses to affective stimuli in the native and non-native language as a function of age of acquisition. The participants in the study were early and late proficient Spanish-English bilinguals. Stimuli in the experiment comprised taboo/sexual words, reprimands, endearments and insults that were partially adapted from Harris et al. (2003). Half of the stimuli in the experiment appeared in the visual and half in the auditory modality. Upon seeing or hearing a stimulus participants were asked to do a valence rating task. The data analysis showed that in both languages, taboo words elicited the most pronounced SCRs with no difference across languages. The only difference between the languages and the age of L2 acquisition was reported to childhood reprimands. Namely, SCR amplitudes to childhood reprimands for late bilinguals were larger in their L1 Spanish than L2 English. Early bilinguals responded comparably to reprimands in L1 and L2. The study suggests that emotional responses to stimuli in L1 and L2 may differ as a function of the level of proficiency in L2. Here, early learners did not show more pronounced responses to reprimands in L1 and L2, contrary to late learners who did demonstrate that difference. One methodological concern might be, however, that little is known about stimuli norming data. Harris (2004) mentions that English and Spanish words were rated for arousal and frequency by as little as three Spanish-speaking students, but a reader does not know whether these speakers were native or non-native speakers of Spanish and what was their proficiency in English and Spanish. Finally, the author reports that "[t]he final set of items was selected so that Spanish and English items were *approximately similar* on these dimensions" (Harris 2004: 232 italics not in the original); this claim,

however, was not supported by statistical analyses or reports. This being the case, the interpretation of the reported results might be limited.

This methodological limitation was addressed in another study by Caldwell-Harris and Ayçiçeği-Dinn (2009) who investigated electrodermal activity to affective (insults, reprimands, endearments) and neutral stimuli as well as true/false statements in two experiments among late Turkish-English bilinguals who acquired their L2 English in an instructed, classroom context. In experiment 1, participants were asked to rate the insults, reprimands, endearments and neutral words on affective intensity (i.e. emotional phrases task). In experiment 2, participants read out loud statements in L1 Turkish and L2 English that were either true or false. An additional twist in the study design consisted in a further subdivision of true and false statements into statements that were of high (e.g. religious beliefs) and low (e.g. beverage preferences) moral relevance. Following the task, participants were asked to evaluate how strongly they felt when reading false statements. Results of experiment 1 indicated larger SCRs to all affective categories (with no across-category effects) compared to neutral words as well as more pronounced SCRs to Turkish compared to English reprimands. Results of experiment 2 revealed more pronounced SCRs to false compared to true statements as well as to statements uttered in English rather than Turkish. Overall, the study corroborated findings from previous studies, whereby psychophysiological responses to positive and negative phrases in L1 Turkish were increased compared to L2 English, with the effect being most robust for reprimands. Furthermore, the study reported more pronounced SCRs to true and false statements in the L2 English, which was interpreted as an anxiety modulation resulting from speaking in a foreign language (Caldwell-Harris and Ayçiçeği-Dinn 2009). A potential limitation of the study, however, was the implementation of decontextualized words in the neutral condition only. Thus, the increased SCRs reported to affective phrases compared to neutral words might result from context effects.

This limitation was addressed by Caldwell-Harris et al. (2011) who examined SCRs to affective and neutral phrases in early and late Chinese-English bilinguals. Similarly to previous studies, participants were asked to do a rating task upon hearing a stimulus. What was methodologically different was the fact that participants were asked to imagine a

situation, based on prior experience, in which that stimulus was used before rating it. The study reported two main findings. First, the results of the study revealed that Mandarin speakers with high proficiency and use of Mandarin showed more pronounced SCRs to English endearments compared to Mandarin. This effect was interpreted as reflecting a cultural difference such that expressing affect in the L2 English was perceived as more liberating and easy by Chinese-English bilinguals. By contrast, lower proficient Mandarin speakers showed more pronounced SCRs to Mandarin rather than English endearments. This result was in turn interpreted as reflecting greater cognitive effort when listening to Mandarin, which possibly translated into greater SCRs. Second, reprimands in both languages elicited comparable SCR amplitudes in Chinese-English bilinguals despite the fact that a different pattern occurred in stimuli ratings, i.e. reprimands in Mandarin were rated as more affectively loaded than reprimands in English. This result was tentatively attributed to a task effect.

Finally, a recent psychophysiological study by Simcox et al. (2012) presents a different methodological approach to the one reported in experiments by Caldwell-Harris and colleagues (Harris et al. 2003; Harris 2004; Caldwell-Harris and Ayçiçeği-Dinn 2009; Caldwell-Harris et al. 2011). Simcox et al. (2012) observed that the aforementioned studies used tasks that were focused on and biased towards the connotative meaning of affective stimuli (valence or arousal ratings). In their experiment, English-Spanish bilinguals proficient in both languages (with English being the dominant language), were asked to read aloud taboo and neutral words in both English and Spanish. No additional rating task was required of the participants. The study reported overall more pronounced SCRs to Spanish than English and to taboo rather than neutral stimuli. Importantly, a language by emotion interaction revealed that psychophysiological responses were greater to taboo compared to neutral words in English only. These effects were mainly attributed to the less automatic processing in the non-dominant Spanish reflecting more pronounced SCRs to stimuli in Spanish due to greater cognitive demands, and less pronounced SCRs to taboo words in Spanish, due to less automatic access to the meaning of threatening stimuli (Simcox et al. 2012)

Psychophysiological studies give insight into the automatic processing of psychological and physiological arousal, an important attribute of affective language. On the one hand, these studies provide consistent evidence for more pronounced psychophysiological responses to threatening or offensive stimuli compared to neutral stimuli. On the other hand, there is great inconsistency among the findings in relation to differential processing of autonomic arousal in L1 and L2 stimuli. For example, one study reported increased SCRs to reprimands in the dominant language of bilingual speakers in both visual and auditory modality (Harris et al. 2003), while another did not report such a difference whatsoever (Caldwell-Harris et al. 2011). These inconsistencies might arise not only from different participant populations or stimuli in the experiments, but also from the difficulty interpreting the patterns of electrodermal activity that might be contingent upon many factors (see Caldwell-Harris and Ayçiçeği-Dinn 2009; Caldwell-Harris et al. 2011; Simcox et al. 2012). These methodological issues led some authors to question the reliability of psychophysiological paradigms (Caldwell-Harris et al. 2011; Simcox et al. 2012). Caldwell-Harris et al. (2011: 349) observed that "measuring physiology is not the panacea to emotion researchers' woes", and argued for an interdisciplinary approach to the investigation of affective language in bilinguals. These researchers also called for the investigation of neural underpinnings of affective language processing in the native and non-native language (Caldwell-Harris and Ayçiçeği-Dinn 2009), which might offer more accurate and reliable research instruments on the one hand, and may provide a more complete picture of affect-language interaction in bilinguals on the other.

2.7. Affective language processing in neuroimaging paradigms

With the development of neuroimaging techniques such as the fMRI or EEG and a growing body of research investigating neural correlates of affective language processing in monolingual individuals (for review, see sections 1.4.1.2, 1.4.1.3), a few recent studies looked into the neural underpinnings of affective processing in the respective languages of bilinguals. The possible advantage of neuroimaging techniques, in particular EEG, over

cognitive or psychophysiological measures is that these techniques collect both behavioural and neuroimaging data that could be further correlated to provide a comprehensive picture of participants' reaction to stimuli.

For example, Conrad et al. (2011) set out to investigate the behavioural and electrophysiological responses to affective words in German-Spanish and Spanish-German bilinguals. The stimuli in the study were tightly matched on several variables and consisted of positive, negative and neutral words as well as filler words and pseudo-words in both languages. In a lexical decision task, participants were asked to determine whether a presented stimulus is a word or a non-word in German (German lexical decision) or Spanish (Spanish lexical decision) while they underwent electrophysiological recording. Analysis of reaction times showed that affective stimuli elicited shorter response latencies than neutral stimuli in the Spanish lexical decision task for both native speakers of Spanish and German. Such a processing advantage of affective stimuli was not observed in the German lexical decision task, which was attributed to a potential influence of German non-words (for a discussion see Conrad et al. 2011: 6). Furthermore, analysis of error rates showed that Spanish native speakers made more errors to negative German words, followed by neutral and positive words. German native speakers, by contrast, had greater difficulty recognizing neutral words in Spanish, with high accuracy rating registered for positive and negative words. The ERP data analysis revealed the EPN and the LPC amplitudes modulation to affective words in the L1 German and L1 Spanish, corroborating available evidence in monolingual research (see section 1.4.1.2). When reading in their L2s, Spanish and German participants showed more pronounced EPN amplitudes to positive compared to neutral words. Of note, German participants also demonstrated more pronounced EPN amplitudes to negative compared to neutral words in L2 Spanish. Similarly, the LPC effects were reported for affective stimuli in the L2s of Spanish and German participants. For German participants reading Spanish words, more pronounced LPC amplitudes were elicited by positive and negative words compared to neutral words. For Spanish participants reading German, however, LPC effects were reported only for the contrast between positive and neutral words. The negativity-bias reported on the EPN component in German-Spanish bilinguals and the positivity-bias reported on the LPC component in the Spanish-German

bilinguals was tentatively interpreted as reflecting cross-group and cross-linguistic differences.

In another ERP study, Opitz and Degner (2012) examined neural responses to affective words in German-French and French-German late bilinguals. In this study, participants conducted a lexical monitor task (LMT) during which they were asked to respond as quickly as possible to a pseudo-word by pressing spacebar on a keyboard. The results of the study demonstrated overall more pronounced EPN amplitudes to affective compared to neutral stimuli. Notably, affective words in L2 produced comparable EPN amplitudes those elicited by affective words in L1. The only reported difference between languages was in the onset of the effect, with the EPN component occurring at a later stage in response to L2 words, suggesting less automatic processing of affective words in L2. The effects reported in the study were not modulated by the age of acquisition, self-rated proficiency or the frequency of L2 use. These findings demonstrate that affective words in a native and non-native language may elicit a comparable affective response in both languages, but words in a non-native language might be processed with less automaticity.

Implementing an implicit translation-priming paradigm, Wu and Thierry (2012) investigated the influence of word valence on spontaneous translation in Chinese-English late immersed bilinguals using ERPs. The stimuli in the study consisted of 90 word pairs in English and Chinese; all stimuli were tightly matched on variables that have been found to have an impact on bilingual lexical access. In the experiment, participants were asked to indicate upon encountering the second word of a pair whether it was related in meaning to the first word. Notably, the participants were blind to the fact that some word pairs concealed a sound repetition when translated into Chinese. The study found that participants failed to show language unconscious non-selective lexical access from English to Chinese when the English prime in a word pair was negatively valenced; the predicted level of priming was reported for word pairs primed by a positive or a neutral word (Wu and Thierry 2012). This effect was found in the 300 – 500 ms temporal window, resembling the classical N400 component. The authors concluded that lexical access for negative words in the second language might be reduced due to a hypothetical repression

mechanism that would prevent deeper lexical access to potentially threatening stimuli in L2.

In a recent fMRI study, Hsu et al. (2015) investigated neural correlates of reading affectively valenced fragments of Harry Potter in the first and second language of proficient German-English bilinguals. 239 passages were selected from the Harry Potter series and subjected to valence, arousal, fearfulness, and happiness ratings in a norming study. The final stimuli set consisted of 40 happy, 40 fearful, and 40 neutral passages, half of which were in German and half in English. In the experiment, participants were asked to read the passages for comprehension and, from to time, answer comprehension questions related to the previously presented passages. Furthermore, participants were asked to rate the passages for the four aforementioned variables in a post-scanner norming. The results of the study showed that affectively valenced literary passages modulated the neural activity, particularly in the core affect regions (amygdala), but also in brain structures engaged in discourse comprehension or Theory of Mind. Notably, this modulation was shown to vary as a function of language, whereby more pronounced hemodynamic response was reported for positive passages in L1 than in L2 in the regions of bilateral amygdala and left precentral gyrus. The authors concluded that reading positively valenced literature might engender a more robust affective experience in the first language (Hsu et al. 2015).

Neuroimaging research provides sensitive tools to implicitly and objectively measure individuals' responses to affective stimuli on the behavioural and neurophysiological level, thus providing a more holistic picture of the automaticity of affective language processing in L1 and L2. Neuroimaging studies in the field of bilingualism and affect, however, are still scarce. Furthermore, the evidence available to date comes mostly from the investigation of decontextualized affective stimuli that might not reliably represent everyday communication. At present, the study by Hsu et al. (2015) is the only to address the issue of affective language processing from a more pragmatic perspective; however, it remains questionable to what an extent the fMRI technique is a reliable measure of such rapid neural processes as affective processing, given its poor temporal resolution (Ashby in press). Nevertheless, Hsu et al. (2015) demonstrate that the

implementation of natural language in the investigation of affective language in bilinguals might have a substantial impact on the first and second language processing.

2.8. Conclusion

This chapter brought to the fore research on the complex issue of an interplay between affect and language in bilingual speakers. Building on theory and research on affective language processing presented in Chapter 1, I tried to show that in order to draw a more complete and representative picture of affect-language interactions in today's world, it is important to take into account the diverse linguistic repertoires of bilingual individuals.

The body of research reviewed in this chapter presented evidence of the important role of bilinguals' languages in their affective repertoires. This role, however, is highly complex and to a significant extent modulated by three sets of factors as identified in Pavlenko (2005: 149): a) "individual" (e.g. language dominance, language proficiency); b) "contextual" (e.g. linguistic competence of an interlocutor, interactional goals); c) "linguistic" (e.g. differences in affective repertoires across languages).

Overall, findings reported in clinical and introspective studies show that the first language might be construed as the core medium of affect perception and expression, because it is deeply attached to affective experiences and memories. By contrast, however, the same studies highlighted cases in which individuals preferred to express affect in their non-native language with an aim to distant themselves from past traumatic experiences or because the native language did not give them enough freedom or tools to appropriately and accurately capture their affective experiences. In terms of affect expression, the bilinguals' language choice may be also highly dependent on the context. Findings from cognitive and psychophysiological studies, providing more objective and implicit measures of affective language processing in bilinguals, tend to more consistently report a comparable engagement of both languages in affect processing, with the processes being possibly less automatized in the non-native language acquired later in life. Finally, neuroimaging research that provides a window on the bilingual brain and behaviour has

been interested in affect-bilingualism interface since recently, and focused mainly on decontextualized affective stimuli, hence drawing an incomplete picture of how bilinguals process affective language in a meaningful, communicative context.

To date, the investigation of neural correlates of affective language processing has been scarce and limited in methodological design to single affective stimuli, thus providing no insight into how bilingual individuals process affective language in context. Hence, these studies provided the inspiration for the current investigation that focuses on electrophysiological correlates of affective language in context that might be more representative of everyday affective interactions. In Chapter 3, I report two experiments conducted for the current project whose core aim was to investigate how context manipulation might modulate behavioural and electrophysiological responses to affective language in a native and non-native language of Polish-English bilinguals from the perspective of affective neuropragmatics.

Chapter 3: The study

3.1. Introduction

This chapter describes two electrophysiological experiments that constitute the empirical foundation of the present dissertation. The experiments were conducted in the Bangor University Language Electrophysiology Team (BULET) laboratory headed by prof. Guillaume Thierry and run at the School of Psychology of Bangor University, during my 3-month stay in Bangor between September and December 2013.

The experiments were designed to investigate if and how the build-up of linguistic context impacts the electrophysiological and behavioural responses to affective words in the first and second language. This design enabled a pragmatic 'twist' that has been absent from the research on affective language processing in bilingual participants. In what follows I will describe each of the experiments separately in terms of their specific objectives and hypotheses, materials and methodology, and finally results that will be complemented by a short discussion. A more comprehensive discussion of the results and their potential implications will be presented in Chapter 4.

3.2. Experiment 1

3.2.1. Objectives and hypotheses

The aim of experiment 1 was to investigate participants' electrophysiological and behavioural responses to affective adjectives embedded in related and unrelated noun-adjective dyads in the first and second language of Polish-English bilinguals. To introduce context manipulation, target adjectives could be preceded by a neutral, positive or negative prime noun, resulting in the following noun-adjective dyad combinations:

(1) Prime-positive, target-positive, related noun-adjective dyads:
    e.g. life - *beautiful*
(2) Prime-negative, target-negative, related noun-adjective dyads:
    e.g. beggar - *poor*
(3) Prime-neutral, target-positive, related noun-adjective dyads:
    e.g. hair - *beautiful*
(4) Prime-neutral, target-negative, related noun-adjective dyads:
    e.g. coin – *poor*
(5) Prime-positive, target-negative, unrelated noun-adjective dyads:
    e.g. valentine - *poor*
(6) Prime-negative, target-positive, unrelated noun-adjective dyads:
    e.g. depression - *beautiful*
(7) Prime-neutral, target-positive, unrelated noun-adjective dyads:
    e.g. broccoli - *beautiful*
(8) Prime-neutral, target-negative, unrelated noun-adjective dyads:
    e.g. cable - *poor*

In doing so, this experiment sets out to explore the current psycholinguistic and psychophysiological research on affective word processing in mono- and bilingual participants, and provides the baseline for experiment 2 in which the same affective adjectives will be embedded in neutral and affective sentence contexts.

Experiment 1 mainly focuses on the analysis of three ERP components that have been documented in the research on affective words processing in mono- and bilingual participants, i.e. EPN, N400, and LPC (for review, see Citron 2012; Kissler et al. 2006; Fischler and Bradley 2006). I predict that:

(1) Reading unrelated noun-adjective dyads will elicit more pronounced N400 amplitudes compared to noun-adjective dyads related in meaning (see Kutas and Federmeier 2000, 2011). This effect might be modulated by the language of presentation (Thierry and Wu 2007; Martin et al. 2013).

(2) Reading affective noun-adjective dyads may elicit differential responses to positive and negative targets on the EPN, LPC or N400 amplitudes, regardless of the language of presentation (Kissler et al. 2006; Citron 2012; Kissler et al. 2009; Kissler and Koessler 2011; Schupp et al. 2006).

(3) Reading affective noun-adjective dyads will elicit comparable ERPs to L1 and L2 (see Opitz and Degner 2012; Conrad et al. 2011).

(4) Reading target adjectives preceded by affectively congruent noun primes will lead to an affective priming effect (see Herring et al. 2013).

3.2.2. Materials and methods

Participants. 21 native speakers of English and 19 Polish-English bilinguals gave informed consent to participate in the study that was approved by the ethics committee of Bangor University, Wales, UK. All participants were right-handed and reported normal or corrected-to-normal vision. The detailed information about participant population is included in Table 1.

The monolingual group consisted of students at the Faculty of Psychology of Bangor University that were recruited for the study through the SONA systems (https://www.sona-systems.com). All participants were born and lived in the UK. In a pre-study language history questionnaire, the participants reported that they did not speak any foreign language.

The bilingual group consisted of late immersed bilinguals that were residing in the UK at the time of the study. Some of them were students at the Faculty of Psychology, while others were recruited from outside of the university through advertisement. All participants were born in Poland and the majority of them had been living there till the age of puberty. They reported using Polish and English on an everyday basis in both formal and informal contexts, with Polish being spoken mostly at home. The global proficiency ratings and other measures for the bilingual population were collected using the Language History Questionnaire (LHQ) 2.0 (Li et al. 2014). Participants' sociobiographical and linguistic information is presented in Table 1.

Table 1. Sociobiographical and linguistic information about monolingual and bilingual participants. The measures provided correspond to means. The measures provided in brackets reflect Standard Error of the Mean (SEM).

Measure	Monolinguals (7 ♂; 14 ♀)	Bilinguals (9 ♂; 10 ♀)
Age (at testing)	20.26 (.64)	24.36 (1.3)
Right-handedness score[a]	4.48 (.11)	4.76 (.07)
L1 self-rated proficiency[b]	n/a	6.59 (.27)
L2 self-rated proficiency[b]	n/a	5.8 (.18)
Age of L2 acquisition	n/a	11.17 (1.09)
Age at arrival in the UK	n/a	13.2 (1.3)
Length of immersion	n/a	8.06 (.18)

[a] established on a 5-point Likert scale, where 1= exclusively left, 5 = exclusively right
[b] global proficiency rating was measured with a 7-point Likert scale on the basis of reading, writing, speaking, and listening skills, where 1 = very poor, 7 = native-like

Stimuli. A set of 280 English nouns (70 positive, 70 negative, 140 neutral) and 70 English adjectives (35 positive, 35 negative) were selected for the experiment and paired into 280 noun-adjective dyads (see Appendix 1). Half of the noun-adjective dyads were related in meaning (n = 140: 70 positive and 70 negative) and half unrelated in meaning (n = 140: 70 positive and 70 negative). The noun-adjective dyads that were related in meaning included either a positive or negative prime noun followed by a valence-congruent target adjective (e.g. puppy – *cute*; slave – *abused*), or a neutral prime noun followed by a positive or negative target adjective (e.g. picture – *cute*; boy – *abused*). By analogy, the noun-adjective dyads that were unrelated in meaning included either a positive or negative prime noun paired with a valence-incongruent and semantically incongruent target adjective (e.g.

misery – *cute*; god – *abused*), or a neutral prime noun followed by a semantically incongruent target adjective (e.g. tree – *cute*; puzzle – *abused*). The prime word valence modification (neutral or positive/negative) was introduced as a context manipulation. When the final set of English noun-adjective dyads was created, the whole set was translated into Polish by a bilingual Polish native speaker, resulting in an identical set of stimuli in Polish. Table 2 presents an exemplary set of noun-adjective dyads in both English and Polish.

Experimental stimuli were matched across conditions for the variables of valence, arousal, concreteness and lexical frequency. The mean valence and arousal ratings for the English stimuli were obtained from Warriner et al. (2013). Valence ratings for English and Polish stimuli were additionally obtained in a post-experimental valence norming study (see Procedure section of experiment 2 for details). The motivation behind such an approach was to increase the stimuli reliability by collecting valence ratings from the actual participants in the study. The frequency norming data were collected from the SUBTLEX-UK (van Heuven et al. 2014) and SUBTLEX-PL (Mandera et al. 2014) corpora that contain movie and television subtitle-based word frequencies for British English and Polish, respectively.

Table 2. Exemplary noun-adjective dyads.

	Target valence	
Prime valence	Positive	Negative
Congruent	joke – funny	wound – bloody
Neutral	face – funny	nose – bloody
Incongruent	nightmare – funny	baby – bloody
Neutral	door – funny	ladder – bloody

Finally, concreteness ratings for English stimuli were collected from Brysbaert et al. (2014). It was impossible to collect concreteness ratings for Polish stimuli, but given that the Polish set was an exact translation of the English set of stimuli, any differences in concreteness ratings were highly unlikely. The stimuli characteristics and post-experimental valence ratings for prime nouns and target adjectives are presented in Table 3 and Table 4 and Table 5, respectively.

Prior to the experiment, 38 bilingual individuals rated the relatedness of all noun-adjective dyads on a scale from 1 (not at all related) to 7 (highly related). Related noun-adjective dyads were rated as highly related (positive dyads: M = 5.53, SEM = .070;

negative dyads: M = 5.22, SEM= .099) and unrelated noun-adjective dyads were rated as highly unrelated (positive dyads: M = 1.71, SEM= .061; negative dyads: M = 1.67, SEM = .067). Note that, further analysis revealed that positive noun-adjective dyads were more related than negative noun-adjective dyads ($t_{(69)}$ = .013).

Table 3. Stimuli characteristics for prime nouns.

				Prime type		
		$F_{(2, 277)}$	p (η^2)	Positive	Negative	Neutral
Valence[a]	Overall	1002.367	.000 (.87)	7.23 (.07)	2.45 (.07)	5.92 (.05)
Arousal[a]	Overall	129.037	.000 (.48)	5.18 (.09)	5.30 (.09)	3.68 (.06)*
Concreteness[b]	Overall	34.117	.000(.19)	3.35 (.11)	3.44 (.11)	4.35 (.08)*
		$F_{(2,554)}$				
Frequency[c,d]	Overall	19.660	.000 (.06)	4.35 (.05)	3.86 (.05)	4.26 (.04)
	Polish			4.09 (.71)	3.67 (.67)	3.98 (.74)
	English			4.61 (.62)	4.09 (.58)	4.54 (.66)
	Language	68.580	.000 (.11)			
	Val. x Lang	.491	.612			
Word length	Overall	5.964	.003 (.02)	6.48 (.17)	6.77 (.17)	6.04 (.12)
	Polish			6.80 (2.2)	7.18 (2.5)	6.27 (1.9)
	English			6.17 (2.1)	6.35 (2.1)	5.81 (2.0)
	Language	11.597	.001 (.02)			
	Val. x Lang	1.572	.703 (.00)			

[a]from Warriner et al. (2013)
[b]from Brysbaert et al. (2014)
[c]from Mandera et al. (2014)
[d]from van Heuven et al. (2014)
*Neutral > Positive, Negative at p = .000

Table 4. Stimuli characteristics for target adjectives.

				Target type	
		$F_{(1,68)}$	p (η^2)	Positive	Negative
Valence[a]	Overall	1125.456	.000 (.94)	7.42 (.10)	2.47 (.10)
Arousal[a]	Overall	.04	.842 (.00)	5.08 (.17)	5.13 (.17)
Concreteness[b]	Overall	14.660	.000(.17)	2.28 (.10)	2.86 (.10)
		$F_{(1,136)}$			
Frequency[c,d]	Overall	5.083	.026(.03)	4.19 (.08)	3.93 (.08)
	Polish			3.91 (.54)	3.68 (.73)
	English			4.47 (.74)	4.18 (.69)
	Language	21.502	.000(.13)		
	Val. x Lang	.067	.796(.00)		
Word length	Overall	.048	.827(.00)	7.85 (.27)	7.94 (.27)
	Polish			8.42 (2.0)	8.91 (2.8)
	English			7.28 (2.0)	6.97 (2.2)
	Language	15.619	.000(.10)		
	Val. x Lang	1.050	.307(.00)		

Table 5. Post-experimental ratings of prime and target valence.

				Prime valence		
		$F_{(2,554)}$	p (η^2)	Positive	Negative	Neutral
Valence	Overall	2175.873	.000(.88)	5.52(.50)	2.04(.47)	4.22(.41)
	Polish			5.65(.48)	1.98(.44)	4.25(.44)
	English			5.39(.49)	2.09(..46)	4.19(.38)
	Language	3.181	.075(.00)			
	Val. x Lang	6.268	.002	p = .000	p = .136	p = .254
				Target valence		
		$F_{(1,136)}$	p (η^2)	Positive	Negative	
Valence	Overall	2856.415	.000(.95)	5.78(.36)	1.99(.45)	n/a
	Polish			5.78(.37)	1.99(.48)	n/a
	English			5.77(.36)	2.00(.44)	n/a
	Language	.000	.989(.00)			
	Val. x Lang	.014	.905(.00)			

Procedure. Participants were seated in a comfortable reclining chair 100 cm away from a CRT monitor in a dimly lit and quiet EEG room. They were asked to read a sequence of two words appearing on the screen and decide upon the presentation of the second word whether the word pair was related in meaning by pressing an appropriate button on a response box. Prior to experimental trials a practice session was administered in the presence of the experimenter. In the actual experiment, participants completed two blocks of trials in English (monolingual groups), or two blocks of trials in English and two in Polish (bilingual group) that were administered in a counterbalanced fashion. During the experiment a native Polish and a native English researcher were present at all times, which enabled a short conversation with participants in the language of the forthcoming block after each pause. Each block of trials consisted of 140 noun-adjective dyads (70 related and 70 unrelated in meaning). None of the noun-adjective dyad was repeated in the course of the experiment in the same language. Each noun-adjective dyad was preceded by a fixation point that lasted 500 ms. Subsequently, a prime noun was presented for 300 ms in the centre of the screen followed by a target adjective preceded by a randomized inter-stimulus-interval (ISI) ranging between 400 and 700 ms in steps of 50. The target adjective stayed on the screen until participant response but no longer than 2000 ms.

ERP recording. Electrophysiological data were continuously recorded in reference to Cz at a rate of 1 kHz from 64Ag/AgCl electrodes placed according to the extended 10-20

convention (American Electroencephalographic Society 1994). Two additional electrodes were attached above and below the right eye to monitor and record ocular activity (eye-blinks, vertical and horizontal eye-movements). Impedances were kept < 5 kΩ. EEG signals were amplified with Neuroscan SynAmps2 amplifier unit (El Paso, Texas) and filtered online with a band pass filter 0.1 and 200 Hz. Pre-processing steps and analyses were performed in MATLAB (R2012b, The MathWorks, Inc.) and a combination of scripts and routines implemented in the EEGLAB (v.13.3.2; Delorme and Makeig 2004) and ERPLAB (v.4.0.2.3; Lopez-Calderon and Luck 2014) toolboxes. The EEG was down-sampled to 500Hz and filtered offline with a 30 Hz low pass non-causal IIR Butterworth digital filter. Epochs ranging from -100 to 1000 ms after the onset of target word were extracted from the continuous, filtered EEG recording and subjected to visual inspection. Epochs with excessive muscular artifacts were manually rejected. Next, an Independent Component Analysis (ICA) was performed to extract and dismiss remaining ocular and muscular artifacts, following guidelines by Jung et al. (2000). No more than four ICA components were removed per participant. Finally, all epochs with activity exceeding ± 75 μV at any electrode site were automatically removed using a peak-to-peak moving window. The mean number of accepted epochs per condition is summarized in Table 6. Baseline correction was performed relative to pre-stimulus activity and individual averages were digitally re-referenced to the average of all scalp electrodes.

Table 6. Mean number of accepted epochs per condition in monolingual and bilingual participants in experiment 1.

Condition	Monolinguals		Bilinguals	
	Mean	SEM	Mean	SEM
Related-negative-English	51.67	1.66	49.26	2.29
Related-positive-English	58.67	1.90	58.26	1.34
Unrelated-negative-English	64.00	1.37	60.15	1.74
Unrelated-positive-English	62.33	1.35	58.21	1.71
Related-negative-Polish	n/a	n/a	52.52	2.29
Related-positive-Polish	n/a	n/a	61.15	1.44
Unrelated-negative-Polish	n/a	n/a	59.57	2.30
Unrelated-positive-Polish	n/a	n/a	59.21	2.39

ERP data analysis. In experiment 1, the analysis is focused on five ERP components: two of them index early visual integration, N1 and P1, while the other three have been previously reported to be modulated by semantic relatedness and/or valence in affective

word processing, EPN, N400 and LPC (see Citron 2012; Schupp et al. 2006; Fischler and Bradley 2006; Kissler et al. 2006) and as such are of main interest to the study. All ERP peaks were analysed predictively, i.e., on the basis of well-established topography and temporal windows. Hence, the P1 component was analysed over 6 electrodes (O1, O2, PO3, PO4, PO7, PO8) between 100 and 130 ms after final word onset. The N1 component was analysed over four electrodes (PO7, PO8, PO9, PO10) between 180 and 230 ms. The EPN was analysed over 19 parieto-occipital electrodes (O1, O2, OZ, PZ, P1, P2, P3, P4, P5, P6, P7, P8, POZ, PO3, PO4, PO7, PO8, PO9, PO10) between 200 and 300 ms. The N400 and LPC were analysed over 10 centro-frontal electrodes (FZ, FC1, FC2, FCZ, C1, C2, CZ, CP1, CP2, CPZ) between 350 and 500 ms, and 600 and 800 ms, respectively. The statistical analyses were conducted within each participant groups by means of a repeated-measures ANOVA with mean ERP amplitudes as dependent variables and relatedness (related, unrelated), affective valence (positive, negative) and language (English, Polish) as within-subject independent variables. The degrees of freedom for the within-subjects comparisons were corrected for deviance from sphericity using the Greenhouse–Geisser correction. Also, *p*-values obtained from *post-hoc* pairwise comparisons were adjusted using the Bonferroni correction for multiple comparisons. The data from two monolingual participants were excluded from the analysis due to excessive alpha rhythm contamination. Also, the context modulation (positive, negative, neutral) could not be analysed with ERPs as an additional independent variable due to an insufficient number of epochs per condition. As it will be shown, however, behavioural data demonstrated that participants' responses to positive and negative targets were not differentially modulated by the neutral relative to positive or negative prime context.

Behavioural data analysis. A within-subject 2(relatedness: related, unrelated) by 2(target valence: positive, negative) by 2(language: Polish, English)[15] Repeated Measures (RM) ANOVA was run to analyse the Reaction Times (RTs) and Error Rates (ERs) to target adjectives. To establish the potential interaction between the valence of primes and targets, I also run a within-subject 2(prime valence: positive; negative; neutral) by 2(target valence:

[15] Only applicable in the analysis of the bilingual group.

positive, negative) by 2(language: Polish, English) RM ANOVA. Where applicable, a Greenhouse-Geisser correction was administered to correct for violation of sphericity. All *p*-values reported in the *post-hoc* pairwise comparisons were adjusted using the Bonferroni correction for multiple comparisons.

3.2.3. Results and discussion

3.2.3.1. Behavioural data

Monolingual group. Analysis of RTs revealed a significant interaction between relatedness and target valence, $F_{(1,20)} = 5.528$, $p = .029$, $\eta 2 = .21$. Post-hoc analyses showed that in the related condition only, participants responded slower to negative (M = 753.31 ms, SEM = 36.17) compared to positive (M = 721.86 ms, SEM = 32.57) target adjectives, at $p = .029$. No other significant effects were observed. The prime valence-by-target valence RM ANOVA revealed a main effect of prime valence, $F_{(1.720, 34.396)} = 6.252$, $p = .007$, $\eta 2 = .23$, whereby faster RTs were recorded to targets following a negative (M = 725.36 ms, SEM = 33.72) and positive (M = 724.89 ms, SEM = 34.61; $p = .048$) prime rather than a neutral (M = 753.98 ms, SEM = 35.61; $p = .003$) prime. There were no other effects found.

Analysis of ERs demonstrated a main effect of relatedness, $F_{(1,20)} = 6.643$, $p = .018$, $\eta 2 = .24$, whereby participants made more errors whilst identifying related (M = 20.17%, SEM = 1.98) than unrelated (M = 10.54%, SEM = 3.21) target adjectives. The analysis also revealed a main effect of valence, $F_{(1,20)} = 15.762$, $p = .001$, $\eta 2 = .44$, with negative target adjectives (M = 17.34%, SEM = 1.85) leading to more errors than positive target adjectives (M = 13.36%, SEM = 2.09). Finally, ERs were modulated by an interaction between relatedness and valence, $F_{(1,20)} = 21.411$, $p = .000$, $\eta 2 = .51$, such that participants made more errors when judging negative target adjectives to be related (M = 25.71%, SEM = 2.28) compared to positive target adjectives (M = 14.62%, SEM = 2.29; $p = .000$). By

contrast, in the unrelated condition, participants made more errors to positive (M = 12.10%, SEM = 3.59) compared to negative (M = 8.98%, SEM = 2.93; p = .021) target adjectives. An additional analysis on the potential influence of prime valence on ERs revealed a main effect of prime valence, $F_{(1.838,\ 36.762)}$ = 12.771, p = .000, $\eta 2$ = .39, whereby participants made more errors to target adjectives preceded by a neutral (M = 19.08%, SEM = 2.10) compared to negative (M = 13.26%, SEM = 2.53; p = .03) and positive (M = 10.00%, SEM = 1.86; p = .000) primes. No other effects were found.

The statistical analyses of monolingual behavioural data indicate three main findings. First, negative affective valence of adjectives slowed down participants' responses to semantically related noun-adjective dyads and led to more errors in semantic relatedness judgment. I interpret this effect in line with the attentional vigilance hypothesis according to which negative stimuli attract more attentional resources leading to a generic slowdown in processing (Pratto and John 1991; Estes and Adelman 2008; Estes and Verges 2008; for contrary evidence, see Vinson et al. 2014). A reverse pattern of error rates was observed to semantically unrelated noun-adjective dyads, such that more errors were reported to positive rather than negative adjectives. This effect shows that participants could be more eager to accept a positive outcome of a negatively biased context (a negative prime) despite affective and semantic incongruity. To my knowledge, such an effect has not been reported in the research yet, and thus its underlying mechanisms are not clear. It might be possible that the effect at least partially reflects the so called 'Pollyanna' principle (Matlin and Stang 1978) according to which people generally anticipate positive and optimistic outcomes of a situation.

Second, monolingual participants made more semantic relatedness judgment errors to related than unrelated noun-adjective dyads. This effect was also observed in previous studies using semantic relatedness task in affective word processing (e.g. Wu et al. 2012; Dorjee et al. 2015). Greater difficulty in the semantic integration of related noun-adjective dyads might stem from insufficient contextual information that might in turn lead to semantic ambiguity.

Third, participants were faster and more accurate to judge semantic relatedness of positive and negative adjectives preceded by affectively congruent primes rather than

neutral primes. This finding is interpreted as a an affective priming effect (e.g. Fazio 2001; Fazio et al. 2008; Bargh et al. 1992, 1996; Murphy and Zajonc 1993; Winkielman et al. 1997; for a detailed review, see Herring et al. 2013), whereby an affective match between a prime and target leads to processing facilitation.

Bilingual group. The RM ANOVA revealed a main effect of relatedness, $F_{(1,18)} = 27.913$, $p = .000$, $\eta 2 = .60$, whereby faster RTs were reported to related (M = 788.76 ms, SEM = 32.02) compared to unrelated (M = 845.59 ms, SEM = 37.01) target adjectives. There was also a main effect of target valence, $F_{(1,18)} = 43.905$, $p = .000$, $\eta 2 = .70$, with negative target adjectives leading to slower RT responses (M = 840.96 ms, SEM = 36.13) than positive target adjectives (M = 793.39 ms, SEM = 32.51). Finally, the analysis revealed a relatedness-by-valence interaction, $F_{(1,18)} = 9.620$, $p = .006$, $\eta 2 = .34$. Follow-up analyses showed that responses to negative target adjectives were slower compared to positive target adjectives in both related ($p = .000$) and unrelated ($p = .010$) conditions. The RM ANOVA analysing the influence of prime valence on target valence revealed a significant prime valence-by-target valence interaction, $F_{(1.138,\ 20.488)} = 28.384$, $p = .000$, $\eta 2 = .61$. Post-hoc analyses revealed that, when preceded by neutral primes, negative adjectives elicited slower RTs (M = 843.20 ms, SEM = 37.02) compared to positive adjectives (M = 798.90 ms, SEM = 33.62; $p = .000$). In a similar vein, when preceded by positive primes, negative target adjectives elicited slower RTs (M = 862.19 ms, SEM = 38.43) compared to positive adjectives (M = 742.70 ms, SEM = 30.05; $p = .000$).

Analysis of ERs revealed a main effect of relatedness, $F_{(1,18)} = 5.569$, $p = .030$, $\eta 2 = .23$, with more errors to related (M = 19.32%, SEM = 2.40) compared to unrelated (M = 13.38%, SEM = 2.55) target adjectives. A significant main effect of valence, $F_{(1,18)} = 66.373$, $p = .000$, $\eta 2 = .78$, demonstrated that participants were less accurate at identifying negative target adjectives (M = 19.19%, SEM = 2.3) relative to positive target adjectives (M = 13.51%, SEM = 1.98). Further, the ERs were modulated by an interaction between relatedness and valence, $F_{(1,18)} = 32.730$, $p = .000$, $\eta 2 = .64$, such that participants made more errors to related negative adjectives (M = 25.90% SEM = 3.17) compared to related positive adjectives (M = 12.74%, SEM = 1.73; $p = .000$), with no difference in the unrelated

condition (p = .12). Finally, the ERs were also modulated by a three-way interaction between relatedness, valence, and language, $F_{(1,18)}$ = 5.618, p = .029, η2 = .23, whereby related negative target adjectives in English (M = 27.97%, SEM = 3.32) led to more errors than related negative target adjectives in Polish (M = 23.83%, SEM = 3.21; p = .015). There were no other effects.

The prime valence-by-target valence analysis showed a main effect of prime valence, $F_{(1.879, 33.824)}$ = 5.778, p = .008, η2 = .24, with more errors to target adjectives preceded by neutral (M = 17.74%, SEM = 2.15) compared to positive (M = 13.15%, SEM = 1.93; p = .007) primes, with no difference between neutral and negative primes (M = 16.76%, SEM = 2.75; p = .10). The analysis further revealed a significant three-way interaction between prime valence, target valence, and language, $F_{(1.828, 32.904)}$ = 3.600, p = .042, η2 = .16. Post-hoc analyses showed that English negative targets (M = 24.06%, SEM = 3.54) were identified less accurately than Polish negative targets (M = 28.64%, SEM = 3.91; p = .048) when preceded by a negative prime. No other effects were found.

The analysis of bilingual behavioural data shows that bilingual participants largely pattern after monolingual controls in their behavioural responses. Bilinguals' responses were less accurate and slower to negative compared to positive target adjectives, as it would have been predicted by the attentional vigilance hypothesis. Further, bilinguals were faster but less accurate when identifying related relative to unrelated target adjectives. Of note, the semantic relatedness judgment accuracy varied as a function of language, with more errors to related negative adjectives in English than Polish. This finding could point to a more difficult semantic integration in the second language (Thierry and Wu 2007; Martin et al. 2013). Finally, bilinguals' responses were slower to negative adjectives preceded by neutral and positive primes, and overall less accurate to targets following neutral primes. Likewise to the monolingual control data, this finding is interpreted as an affective priming effect.

For an illustration of mean RTs and ERs for each condition and participant group in experiment 1, refer to Figure 3.

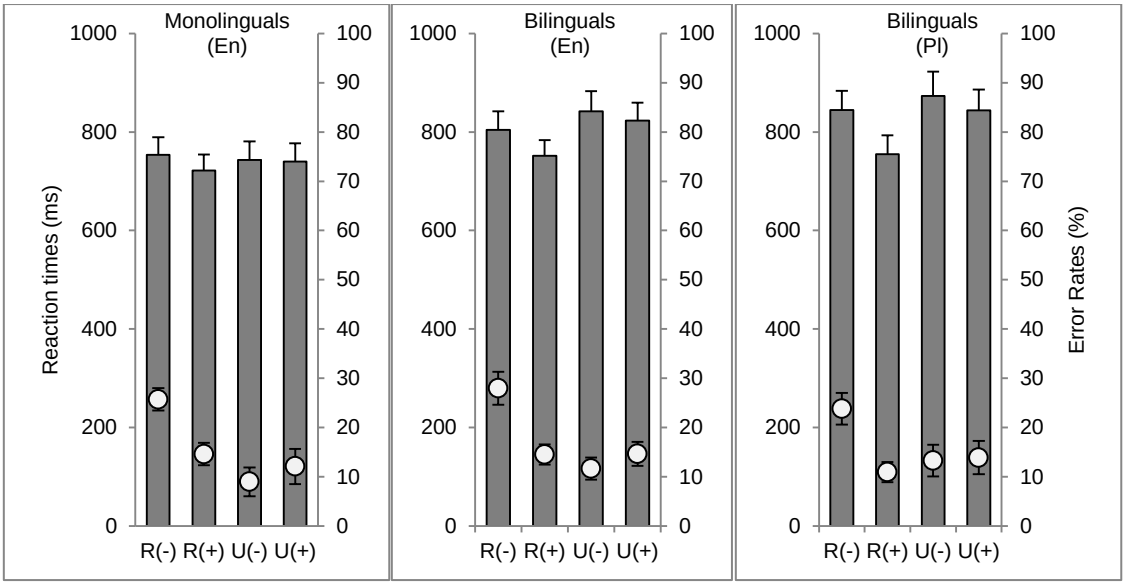

Figure 3. Mean reaction times (bars, left axis) and error rates (bullets, right axis) for English monolingual and Polish-English bilingual participants in experiment 1 in the following conditions: related negative (R(-)), related positive (R(+)), unrelated negative (U(-)), unrelated positive (U(+)). Error bars reflect SEM.

3.2.3.2. Electrophysiological data

Monolingual group. RM ANOVA revealed a main effect of relatedness on the N400 wave, $F_{(1,18)} = 15.636$, $p = .001$, $\eta 2 = .46$, with more pronounced N400 amplitudes to unrelated ($M = -.1.212$, $SEM = .29$) compared to related ($M = -.239$, $SEM = .38$) target adjectives. There was also a main effect of valence on the EPN component, $F_{(1,18)} = 6.065$, $p = .024$, $\eta 2 = .25$, with more pronounced EPN to negative ($M = -.339$, $SEM = .43$) compared to positive ($M = .034$, $SEM = .40$) target adjectives (see Figure 4). No other significant amplitude differences were found on the N400, EPN, LPC, N1, and P1 components ($ps > .05$).

Increased N400 amplitudes to unrelated compared to related noun-adjective dyads reflect semantic integration difficulty, a well-documented electrophysiological finding in the literature on word and sentence processing (see Kutas and Federmeier 2000, 2011). The EPN modulation to affective words has been commonly reported in psychophysiological research (Herbert et al. 2008; Scott et al. 2009; Kissler et al. 2009; Schacht and Sommer 2009b; Citron et al. 2013; Hinojosa et al. 2010; Palazova et al. 2011; Schupp et al. 2003; for review, see Kissler et al. 2006; Citron 2012). This ERP component is thought to index

allocation of perceptual attention to affective information that results in processing facilitation (Schupp et al. 2003).

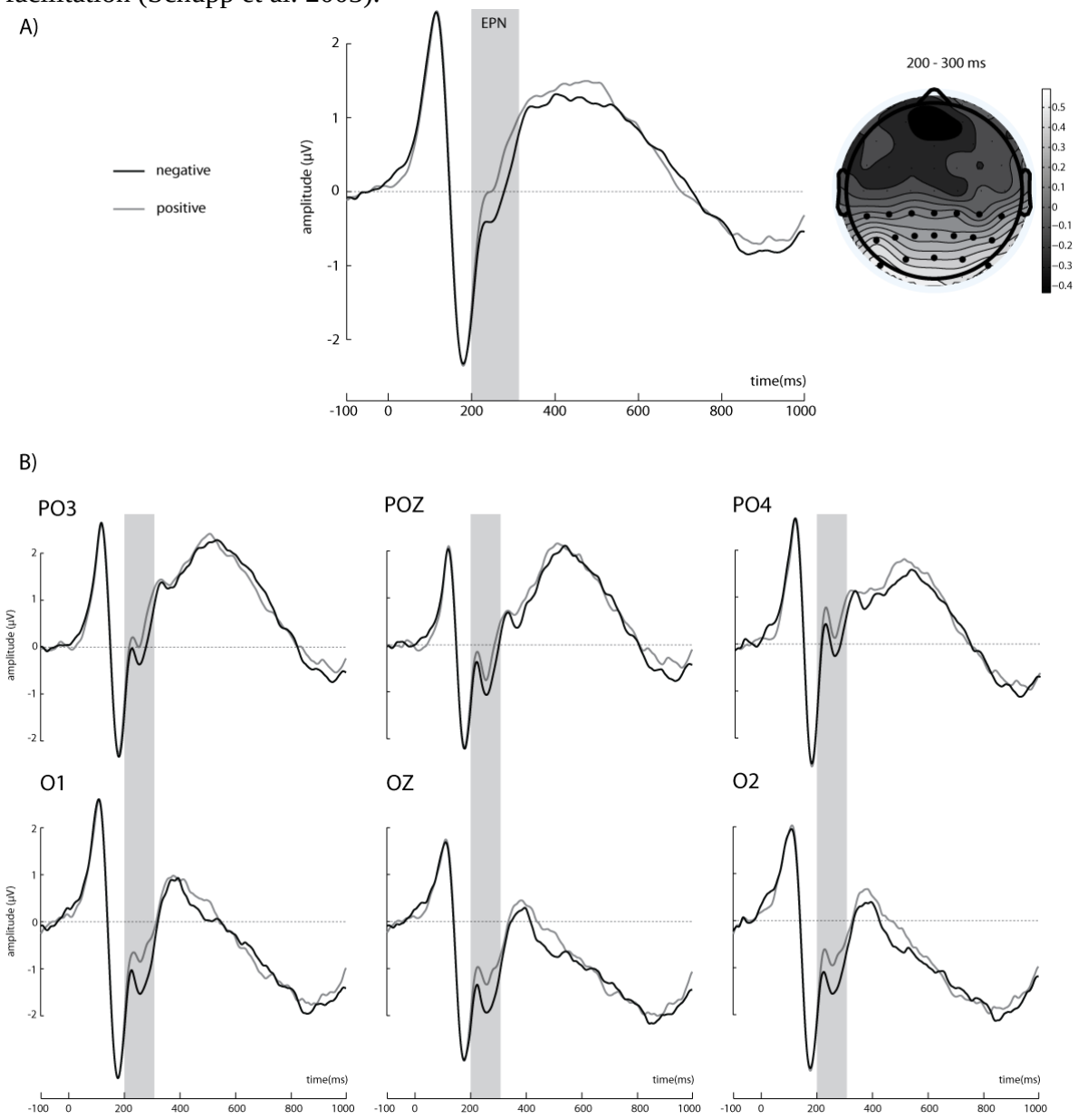

Figure 4. EPN elicited by target adjectives in English monolinguals. A: Waveforms illustrate brain potential variations computed via linear derivation from 19 parieto-occipital electrodes (O1, O2, OZ, PZ, P1, P2, P3, P4, P5, P6, P7, P8, POZ, PO3, PO4, PO7, PO8, PO9, PO10). Shaded areas represent significant difference between conditions in the 200 – 300 ms time window. B: EPN at selected 6 electrode sites where the effect was maximal. The schematic head reflects difference topography of cortical responses to positive minus negative adjectives 200 - 300 ms post-adjective onset at the electrode sites of interest.

Previous studies reported increased EPN to both positive and negative words compared to neutral words (e.g. Herbert et al. 2008; Scott et al. 2009; Citron et al. 2013) or to positive compared to negative words (e.g. Hinojosa et al. 2010; Palazova et al. 2011).

The pattern of result in the present study, however, presents a different picture, whereby reading negative target adjectives triggered enhanced EPN amplitudes compared to positive target adjectives. This effect might be accounted for by the nature of the task employed in the previous and present studies. To date, only one study implemented a similar design to the present experiment, where participants responded to affective verbs preceded by congruent affective primes in a semantic decision task (e.g. lover - kiss; Schacht and Sommer 2009b). This study found enhanced parieto-occipital negativities reflecting the EPN effect to both positive and negative compared to neutral verbs. Despite the fact that EPN is thought to be task-independent (Citron 2012), in the present design negative noun-adjective dyads could have attracted more attention and led to deeper processing than positive noun-adjective dyads, which was also reflected in the behavioural data.

Bilingual group. RM ANOVA revealed a main effect of relatedness on the N400 wave, $F_{(1,18)} = 18.801$, $p = .000$, $\eta 2 = .51$, with more pronounced N400 amplitudes to unrelated ($M = -.232$, $SEM = .26$) compared to related ($M = .320$, $SEM = .24$) targets. Figure 5 presents N400 amplitudes reported in mono- and bilingual participant groups. There was also a main effect of valence, $F_{(1,18)} = 13.443$, $p = .002$, $\eta 2 = .42$, with increased N400 amplitudes to negative ($M = -.076$, $SEM = .24$) compared to positive ($M = .165$, $SEM = .24$) targets. This valence effect was also observed on the LPC component, $F_{(1,18)} = 9.889$, $p = .006$, $\eta 2 = .335$, with increased LPC amplitudes to positive targets ($M = 1.884$, $SEM = .26$) compared to negative targets ($M = 1.521$, $SEM = .26$). No other significant amplitude differences were found on the N400, EPN, LPC, N1, and P1 components ($ps > .05$). The valence modulation on the N400 and LPC waves is illustrated in Figure 6.

In line with my first hypothesis, reading unrelated noun-adjective dyads elicited increased N400 amplitudes. This result reflects the classical N400 effect that indexes

semantic integration difficulty (see Kutas and Federmeier 2000, 2011). Figure 5 depicts the reported N400 to stimuli in the monolingual and bilingual group.

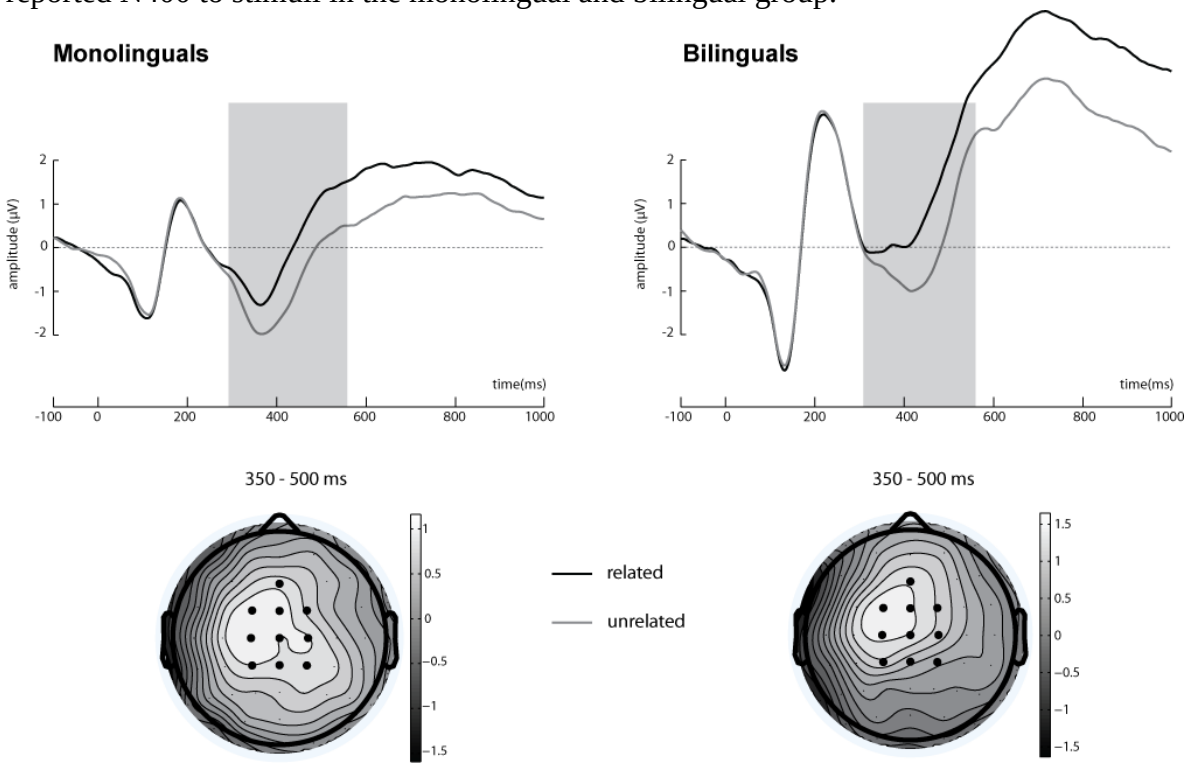

Figure 5. N400 elicited by related and unrelated target adjectives in Polish-English bilinguals and English monolinguals. All waveforms represent brain potential variations computed via linear derivation from 10 central electrodes (FZ, FC1, FC2, FCZ, C1, C2, CZ, CP1, CP2, CPZ). Shaded areas represent significant difference between conditions in the 350 – 500 ms time window. The schematic head reflects difference topography of cortical responses to related minus unrelated noun-adjective dyads 350 – 500 ms post-adjective onset at the electrode sites of interest.

As predicted by the second hypothesis, the statistical analyses revealed no significant differences in electrophysiological responses to affective words in the first and second language of Polish-English bilinguals. This means that participants processed affective stimuli in their respective languages in a similar manner (Conrad et al. 2011; Opitz and Degner 2012). Finally, as predicted by the third hypothesis affective valence modulated the N400 and LPC waves (see Figure 6). More pronounced N400 amplitudes to negative compared to positive adjectives echo some previously reported effects among monolingual participants (Herbert et al. 2008; Kanske and Kotz 2007-only in experiment 2), and reflect processing facilitation for positive words (Herbert et al. 2008). This interpretation was further corroborated by increased positivity to positive adjectives on the LPC wave.

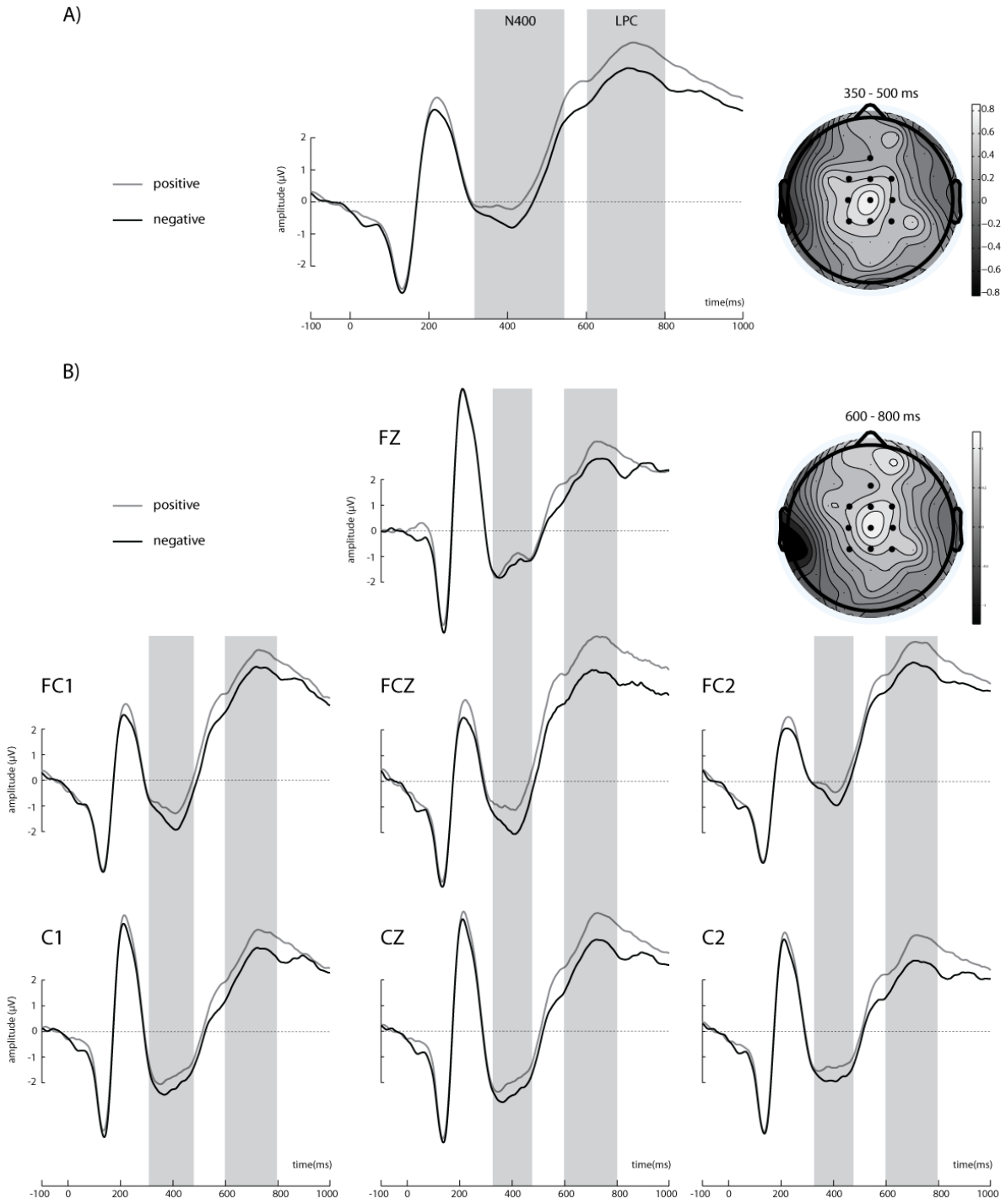

Figure 6. N400 and LPC elicited by target adjectives in Polish-English bilinguals. A: Waveforms illustrate brain potential variations computed via linear derivation from 10 centro-frontal electrodes (FZ, FC1, FC2, FCZ, C1, C2, CZ, CP1, CP2, CPZ). Shaded areas represent significant difference between conditions in the 350 – 500 and 600 – 800 time window. B: N400 and LPC at selected 7 electrode sites where the effects were maximal. The schematic heads reflect difference topography of cortical responses to positive minus negative target adjectives 350 – 500 ms and 600 – 800 ms post-adjective onset at the electrode sites of interest.

This ERP has been associated with allocation of attentional resources towards affective stimuli and an increase in memory encoding for affective words (Hajcak et al. 2009; Bradley and Lang 2007; Hinojosa et al. 2010; Naumann et al. 1992). More pronounced LPC amplitudes to positive compared to negative words have been already reported in monolingual literature (Herbert et al. 2008; Kissler et al. 2009; Palazova et al. 2011; Bayer et al. 2012). Of note, both N400 and LPC amplitudes reported in the present study have not been previously reported with bilingual individuals. While Conrad et al. (2011) did report valence modulation on the LPC component among bilingual participants, the effect was significant only in comparison to a control neutral condition that is absent in the present design. No significant differences were found between EPN amplitudes to positive and negative noun-adjective dyads (Herbert et al. 2008; Scott et al. 2009; Kissler et al. 2009).

3.3. Experiment 2

3.3.1. Objectives and hypotheses

The aim of experiment 2 was to investigate the electrophysiological and behavioural responses to the same set of affective adjectives used in experiment 1, but embedded in a sentence context. This "pragmatic twist" in methodological design made it possible to directly investigate the influence of context build-up on the processing of affective adjectives in monolingual and bilingual participants. Also, to my knowledge this is the first study to investigate electrophysiological correlates of affective sentence processing in bilingual individuals.

In experiment 2, affective adjectives were embedded in a sentence-final position of neutral, positive and negative sentence frames, resulting in the creation of the following sentence types:

(1) Context-positive, target-positive, semantically congruent sentences:

e.g. The 65th anniversary of their marriage was special and *beautiful*.

(2) Context-negative, target-negative, semantically congruent sentences:
e.g. Veterans are ignored and often become undervalued and *poor*.
(3) Context-neutral, target-positive, semantically congruent sentences:
e.g. It is the presence of her friends that makes her life *beautiful*.
(4) Context-neutral, target-negative, semantically congruent sentences:
e.g. The trip to Africa made him realize what it meant to be *poor*.
(5) Context-negative, target-positive, semantically incongruent sentences:
e.g. Veterans are ignored and often become undervalued and *beautiful*.
(6) Context-positive, target-negative, semantically incongruent sentences:
e.g. The 65th anniversary of their marriage was special and *poor*.
(7) Context-neutral, target-positive, semantically incongruent sentences:
e.g. The trip to Africa made him realize what it meant to be *beautiful*.
(8) Context-neutral, target-negative, semantically incongruent sentences:
e.g. It is the presence of her friends that makes her life *poor*.

Experiment 2 mainly focuses on the analysis of two ERP waves, N400 and LPC, that have been shown to be modulated by semantic congruity and/or valence in sentence processing among monolingual participants (Kutas and Hillyard 1980; Kutas et al. 1984; Kutas and Federmeier 2000, 2011; Holt et al. 2009; Bayer et al. 2010). I predict that:

(1) N400 amplitudes will be more pronounced in response to incongruent relative to congruent sentences (see Kutas and Federmeier 2000, 2011). This effect might be modulated by the language of presentation (Thierry and Wu 2007; Martin et al. 2013, 2012).
(2) Affective valence of target adjectives will interact with language at the stage of lexico-semantic access as indexed by the N400 wave, with the effect being independent of semantic congruity effect (exploratory hypothesis).
(3) Affective valence of target adjectives will interact with language at the stage of stimuli re-evaluation as indexed by the LPC wave, with the effect being independent of semantic congruity effect (exploratory hypothesis).
(4) Reading target adjectives preceded by an affectively congruent context will lead to an affective priming effect (see Herring et al. 2013; Moreno and Vázquez 2011).

3.3.2. Materials and methods

Participants. All participants were the same as in experiment 1. The order in which participants performed the experiments was counterbalanced.

Stimuli. 35 positive and 35 negative target adjectives from experiment 1 were embedded in a sentence-final position of 140 constraining sentence frames, of three types: positive (n = 35), negative (n = 35), and neutral (n = 70). Sentences were further divided into four categories: a) positive sentence frames ending in a semantically and affectively congruent or incongruent target adjective (e.g. Their honeymoon in the gorgeous scenery of Paris was so *romantic / burnt******), b) negative sentence frames ending in a semantically and affectively congruent or incongruent target adjective (e.g. Gloria accidentally poured boiling water over herself and was *burnt / romantic******), c) neutral sentence frames ending in a semantically congruent positive or semantically incongruent negative target adjective (e.g. Women find him interesting, because Harry is very *romantic* / *burnt******), and d) neutral sentence frame ending in a semantically congruent negative or semantically incongruent positive target adjective (e.g. Jerry spent a whole day in the sun and now his skin is *burnt / romantic**). In total, there were 140 congruent and 140 incongruent affective sentences whose length ranged from 8 to 15 words (M = 10.97, SEM = .13; see Appendix 2). Prior to the experiment, 42 individuals rated the predictability of all target adjectives on a scale from 1 (unpredictable) to 7 (certain). Congruent adjectives were rated as highly predictable (positive sentences: M = 5.54, SEM = .068; negative sentences: M = 5.50, SEM= .076) and incongruent adjectives were rated as rather unpredictable (positive sentences: M = 1.67, SEM= .064; negative sentences: M = 1.62, SEM = .066). Critically, positive and negative sentence endings were equally predictable ($t_{(69)} < 1$).

Procedure. Participants were seated in a comfortable reclining chair 100 cm away from a CRT monitor in a dimly lit and quiet EEG room. They were asked to read sentences presented on the screen and decide whether the sentences made sense or not upon reading the final word by pressing appropriate buttons on a response box. Prior to experimental

trials a practice session was administered in the presence of the experimenter. In the actual experiment, participants completed two blocks of trials in English (monolingual groups), or two blocks of trials in English and two in Polish (bilingual group) that were administered in a counterbalanced fashion. Likewise to experiment 1, a native Polish and a native English researcher were present at all times during the experiment, which enabled a short conversation with participants in the language of the forthcoming block after each pause. Each block of trials consisted of 70 sentences (35 congruent and 35 incongruent), with each sentence appearing only once in English and Polish throughout the experiment. Participants were asked to first read the initial part of the sentence (a sentence frame) and then press a button to trigger the delivery of the second part in which words appeared one at a time until the sentence-final target adjective. Each word of the second part was displayed for 200 ms in the centre of the screen with an ISI of 500 ms. Target adjectives remained on the screen until participant response, but no longer than 2000 ms and were preceded by a randomized ISI ranging between 400 and 700 ms in steps of 50. After the experiment participants were asked to rate all target adjectives in English (monolingual participants) and in Polish and English (bilingual participants) in terms of affective valence. Following the rating procedure, participants were debriefed about the real objectives of the experiment 1 and 2 and their methodological design and compensated with course credit or payment of 12 £.

ERP recording. ERP recording followed the steps described in experiment 1. The mean number of accepted epochs per condition is presented in Table 7.

Table 7. Mean number of accepted epochs per condition in monolingual and bilingual participants in experiment 2

Condition	Monolingual participants		Bilingual participants	
	Mean	SEM	Mean	SEM
Congruent-negative-English	29.56	.99	29.37	1.16
Congruent-positive-English	31.56	.60	31.36	.67
Incongruent-negative-English	31.33	.68	30.74	.83
Incongruent-positive-English	31.11	.83	29.57	.77
Congruent-negative-Polish	n/a	n/a	30.57	.81
Congruent-positive-Polish	n/a	n/a	32.00	.54
Incongruent-negative-Polish	n/a	n/a	30.21	.73
Incongruent-positive-Polish	n/a	n/a	29.78	.97

ERP data analysis. In experiment 2, the analysis is focused on four ERP components: two of them index early visual integration, N1 and P1, while the other two have been previously reported to be modulated by semantic congruity and/or valence in sentence processing, N400 and LPC (Kutas and Federmeier 2000, 2011; Herbert et al. 2011; Bayer et al. 2010; Holt et al. 2009). All ERP peaks were analyzed predictively, i.e., on the basis of well-established topography and temporal windows. Hence, the P1 component was analyzed over 6 electrodes (O1, O2, PO3, PO4, PO7, PO8) between 100 and 130 ms after final word onset. The N1 component was analyzed over four electrodes (PO7, PO8, PO9, PO10) between 180 and 230 ms. The N400 and LPC were analyzed over 10 electrodes (FZ, FC1, FC2, FCZ, C1, C2, CZ, CP1, CP2, CPZ) between 280 and 550 ms, and 600 and 800 ms, respectively. The statistical analyses were conducted within each participant groups by means of a repeated-measures ANOVA with mean ERP amplitudes as dependent variables and congruity (congruent, incongruent), affective valence (positive, negative) and language (English, Polish) as within-subject independent variables. The degrees of freedom for the within-subjects comparisons were corrected for deviance from sphericity using the Greenhouse–Geisser correction. Also, *p*-values obtained from *post-hoc* pairwise comparisons were adjusted using the Bonferroni correction. The data from two monolingual participants were excluded from the analysis due to excessive alpha rhythm contamination.

Behavioural data analysis. In the same vein as in experiment 1, a within-subject 2(congruity: congruent, incongruent) by 2(target valence: positive, negative) by 2(language: Polish, English) RM ANOVA was run with RTs and ERs as dependent variables. To test the possibility that context valence and target valence interact, I conducted a within-subject 2(context valence: positive; negative; neutral) by 2(target valence: positive, negative) by 2(language: Polish, English) RM ANOVA. Where applicable, a Greenhouse-Geisser correction was administered to correct for violation of sphericity. All *p*-values reported in the *post-hoc* pairwise comparisons were adjusted using the Bonferroni correction for multiple comparisons.

3.3.3. Results and discussion

3.3.3.1. Behavioural data

Monolingual group. The RM ANOVA revealed a main effect of congruity, $F_{(1,20)} = 5.870$, $p = .025$, $\eta 2 = .227$, with RTs being slower to incongruent (M = 910.49 ms, SD = 36.68) compared to congruent (*M* = 850.61 ms, *SEM* = 30.10) sentences. Also, there was a congruity-by-valence interaction, $F_{(1,20)} = 18.431$, $p = .000$, $\eta 2 = .480$. Post-hoc analyses showed that, in the congruent condition, RTs to negative target adjectives (*M* = 883.11 ms, *SEM* = 31.31) were slower than to positive target adjectives (*M* = 818.11 ms, *SEM* = 32.07; $p = .004$); in the incongruent condition, by contrast, slower responses were reported to positive (*M* = 935.07 ms, *SEM* = 38.45) rather than negative (*M* = 885.91 ms, *SEM* = 35.86) targets, at $p = .001$. The second RM ANOVA revealed a main effect of context valence, $F_{(1.911, 39.544)} = 23.234$, $p = .000$, $\eta 2 = .537$, whereby shorter RTs were observed for targets following positive (*M* = 815.55 ms, *SEM* = 33.90) compared to negative (*M* = 881.17 ms, *SEM* = 33.79) and neutral (*M* = 909.33 ms, *SEM* = 29.61) context. Notably, a context valence-by-target valence interaction was also observed, $F_{(1,20)} = 18.431$, $p = .000$, $\eta 2 = .480$. Follow-up analyses demonstrated that RTs to negative targets were shorter when preceded by a negative context (*M* = 855.28 ms, *SEM* = 31.46) rather than neutral context (*M* = 908.78 ms, *SEM* = 29.86; $p = .02$). Moreover, shorter RTs were observed to positive targets following a positive context (*M* = 767.32 ms, *SEM* = 33.31) rather than incongruent, negative context (*M* = 863.78 ms, *SEM* = 41.02). No differences in RTs were observed between positive and negative targets preceded by a neutral context ($p = .949$).

ERs were modulated by an interaction between congruity and valence, $F_{(1,20)} = 8.832$, $p = .008$, $\eta 2 = .30$, whereby participants made more errors to negative target adjectives (*M* = 12.51%, *SEM* = 2.29) relative to positive target adjectives (*M* = 7.75%, *SEM* = 1.16; $p = .026$) in the congruent condition. By contrast, in the incongruent condition, positive target adjectives (*M* = 13.87%; *SEM* = 3.43) were identified with

marginally worse accuracy compared to negative target adjectives (M = 10.06%, SEM = 2.13, p = .057).

The context valence-by-target valence analysis revealed a main effect of context valence, $F_{(1.933, 38.659)}$ = 6.877, p = .003, η2 = .256, with participants being less accurate at identifying target adjectives embedded in a neutral sentence context (M = 13.14%, SEM = 2.17) compared to positive sentence context (M = 7.99%, SEM = 1.62; p = .005). No difference was observed for target adjectives embedded in a neutral and negative sentence context (M = 9.92%, SEM = 2.17; p = .13). ERs were not modulated by an interaction between context valence and target valence (p = .44).

These results to a significant extent pattern after the findings reported in experiment 1. Likewise to experiment 1, monolingual participants' responses were slower and less accurate to negative relative to positive sentence targets in the congruent condition, with a reverse effect being reported in the incongruent condition. Unlike in experiment 1, however, monolingual participants were faster to rate congruent rather than incongruent sentence targets (Kutas and Federmeier 2000, 2011; Kutas et al. 1984). As regards the influence of context valence on the processing of target words, positive sentence context led to overall shorter RTs compared to neutral or negative context as well as lower error rates compared to neutral sentence context. This effect could be associated with the positivity-offset (Cacioppo and Berntson 1994; Cacioppo et al. 1994, 1993) and 'Polyanna' (Matlin and Stang 1978) principles according to which people generally anticipate positive and optimistic outcomes, with positive information being also more prevalent and thus more easily accessible in memory than negative information, which would lead to a facilitation in positive information processing. Finally, both positive and negative sentence targets were responded to faster when embedded in affectively congruent sentence context resulting in an affective priming effect.

Bilingual group. The RM ANOVA showed a main effect of congruity, $F_{(1,18)}$ = 41.331, p = .000, η2 = .69, such that shorter RTs were reported to congruent (M = 826.56 ms, SEM = 29.24) compared to incongruent (M = 939.42 ms, SEM = 33.50) sentence targets. There was also a main effect of target valence, $F_{(1,18)}$ = 13.068, p = .002, η2 = .42, with slower

responses to negative (*M* = 902.06 ms, *SEM* = 32.62) compared to positive (*M* = 863.91 ms, *SEM* = 28.96) sentence targets. The analysis also revealed an interaction between congruity and valence, $F_{(1,18)}$ = 13.304, *p* = .002, η2 = .42, whereby in the congruent condition responses were slower to negative (*M* = 864.01 ms, *SEM* = 31.20) compared to positive (*M* = 789.10 ms, *SEM* = 29.35; *p* = .000) sentences. No differences were observed between positive (*M* = 940.11, *SEM* = 37.28) and negative (*M* = 938.72, *SEM* = 30.71) sentence targets in the incongruent condition (*p* = .917). Finally, the RM ANOVA revealed a three-way interaction between congruity, valence and language, $F_{(1,18)}$ = 7.021, *p* = .016, η2 = .28. Post-hoc analyses demonstrated that in the congruent English and Polish condition, negative sentences (English: *M* = 867.54 ms, *SEM* = 48.13; Polish: *M* = 860.48 ms, *SEM* = 36.06) were processed slower than positive sentences (English: *M* = 786.56 ms, *SEM* = 39.16; Polish: *M* = 791.65 ms *SEM* = 34.29), at *ps* = .001.

The second RM ANOVA revealed a main effect of context valence, $F_{(1.694,\ 28.793)}$ = 15.933, *p* = .000, η2 = .48, whereby negative (*M* = 867.80 ms, *SEM* = 31.55) and positive (*M* = 842.82 ms, *SEM* = 33.56) context led to faster responses to sentence targets compared to neutral context (*M* = 898.45 ms, *SEM* = 31.64), at *p* = .003 and *p* = .000, respectively. There was also an interaction between context valence and target valence, $F_{(1.292,\ 21.961)}$ = 17.241, *p* = .000, η2 = .50. Subsequent post-hoc analyses revealed that participants responded faster to negative targets embedded in a negative context (*M* = 837.02 ms, *SEM* = 34.12; *p* = .000) compared to when embedded in a neutral (*M* = 911.95 ms, *SEM* = .32.64; *p* = .000) or positive (*M* = 915.37 ms, *SEM* = 41.68; *p* = .046) context. Also, faster responses were observed to positive targets embedded in positive sentence context (*M* = 770.27 ms, *SEM* = 30.29) rather than negative (*M* =898.58 ms, *SEM* = 32.54) or neutral (*M* = 884.95 ms, *SEM* = 32.49) sentence context, at *ps* = .000.

The analysis of ERs revealed a significant interaction between congruity and valence, $F_{(1,18)}$ = 6.948, *p* = .017, η2 = .27. Post-hoc analyses demonstrated that participants made more errors when identifying negative target adjectives (*M* = 14.06%, *SEM* = 2.57) compared to positive target adjectives (*M* = 9.62%, *SEM* = 2.02; *p* = .031) in the congruent condition only. In the incongruent condition, there was a tendency for positive target

adjectives (*M* = 14.73%, *SEM* = 1.92) to elicit more errors than negative target adjectives (*M* = 12.48%, *SEM* = 2.12), but the effect was insignificant (*p* = .094).

The second analysis revealed a main effect of context valence, $F_{(1.533,\ 27.587)} = 9.871$, *p* = .001, η2 = .35, with more errors to target adjectives embedded in a neutral sentence context (*M* = 14.74%, *SEM* = 1.94) compared to negative (*M* = 11.62%, *SEM* = 1.86; *p* = .004) and positive (*M* = 9.88%, *SEM* = 1.55; *p* = .001) sentence context. Further, the analysis demonstrated a significant interaction between context valence and language, $F_{(1.856,\ 33.409)} = 7.706$, *p* = .002, η2 = .30. Follow-up analyses showed that participants made more errors to target adjectives embedded in neutral (*M* = 16.46%, *SEM* = 2.18) compared to negative (*M* = 11.23%, *SEM* = 2.32; *p* = .005) and positive (*M* = 8.15%, *SEM* = 1.43; *p* = .000) sentence context in the English condition only.

These analyses once again demonstrate the robust effect of a slowdown in the processing of incongruent compared to congruent and negative compared to positive target adjectives. In a similar vein to monolingual participants, bilinguals' responses were slower and less accurate to negative than positive congruent sentences. Incongruent sentences, by contrast, were processed with similar speed, with a tendency to make more errors to positive rather than negative incongruent sentences. Further, participants responses were faster and more accurate when positive and negative sentence-final adjectives were preceded by affectively congruent sentence contexts, leading to an affective priming effect. Finally, bilinguals made more errors to target adjectives preceded by a neutral sentence context in English, which possibly reflects additional semantic integration difficulty as a function of second language.

Figure 7 represents mean RTs and ERs to target adjectives in each condition and participant group in experiment 2.

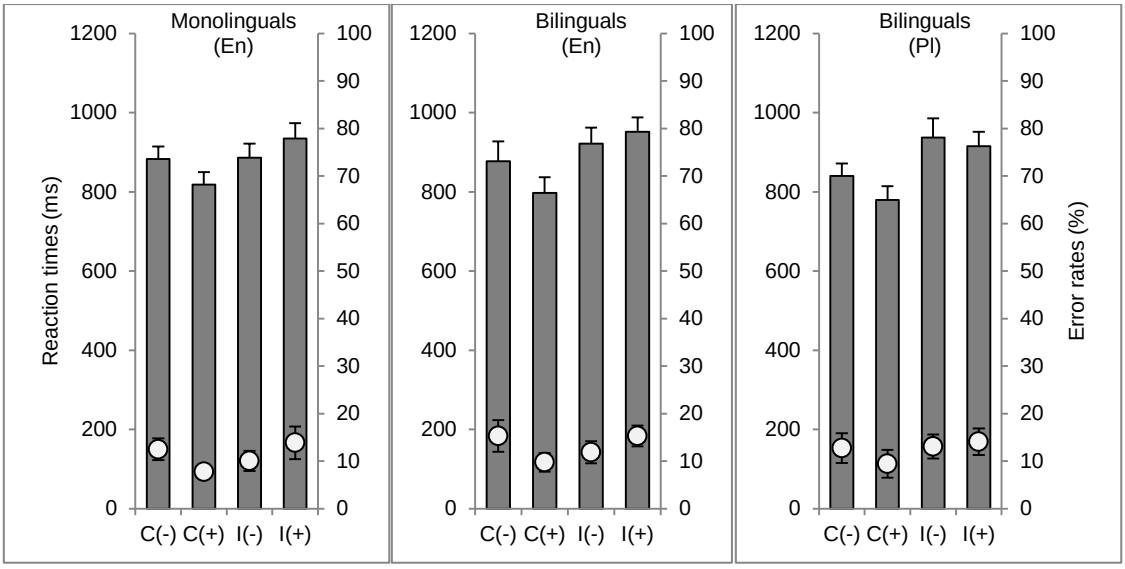

Figure 7. Mean reaction times (bars, left axis) and error rates (bullets, right axis) for English monolingual and Polish-English bilingual participants in experiment 2 in the following conditions: congruent negative (C(-)), congruent positive (C(+)), incongruent negative (I(-)), incongruent positive (I(+)).

3.3.3.2. Electrophysiological data

Monolingual group. RM ANOVA revealed a main effect of congruity on the N400 component, $F_{(1,18)} = 13.571$, $p = .002$, $\eta 2 = .43$, with more increased N400 amplitudes to incongruent ($M = .814$, $SEM = .47$) compared to congruent ($M = 1.688$, $SEM = .46$) sentence targets. Furthermore, the RM ANOVA found a marginally significant interaction between congruity and valence, $F_{(1,18)} = 3.547$, $p = .074$, $\eta 2 = .16$. Follow-up post-hoc pairwise comparisons showed that positive sentence targets ($M = 1.459$, $SEM = .48$) elicited marginally more pronounced N400 amplitudes compared to negative sentence targets ($M = 1.917$, $SEM = .47$), at $p = .068$. The main effect of valence was insignificant ($p > .05$). No significant P1 or N1 amplitude differences were found ($ps > .05$).

Monolingual electrophysiological data provides support for the well-documented N400 effect to semantically incongruent and unexpected sentence endings, which indexes semantic integration difficulty (Kutas et al. 1984; Kutas and Hillyard 1980; Kutas and Federmeier 2000, 2011; Van Berkum 2008, 2012; Hagoort and van Berkum 2007). The N400 amplitude was not modulated by affective valence, a result that has been already

demonstrated in previous a study by Holt et al. (2009). Two studies, however, did report more pronounced N400 to negative compared to positive sentences (Moreno and Vázquez 2011; De Pascalis et al. 2009). The inconsistent results stem from different methodological approaches. In a study by Holt et al. (2009) target words were embedded in nonconstraining sentence frames and thus could not be predicted from the context. De Pascalis et al. (2009) did include affective words that were either congruent or incongruent with the preceding context, but the author do not report any norms on which such congruity or incongruity was established (e.g. a cloze probability test). In these two studies, it would be therefore difficult if not impossible to tease apart effects of semantic congruity and valence on the N400 wave. This limitation was accounted for by Moreno and Vázquez (2011) who found increased N400 to congruent negative compared to congruent positive sentence targets with carefully normed sentences. In the present study, I report a marginal effect of valence in the congruent condition only that is opposite to the one found by Moreno and Vázquez (2011), with positive sentences leading to more pronounced N400 amplitudes than negative sentences. A similar finding was already demonstrated by Herbert et al. (2011) in a study on the influence of self-reference on the processing of affective words.

Bilingual group. RM ANOVA revealed a main effect of congruity on the N400 component, $F_{(1,18)} = 15.849$, $p = .001$, $\eta 2 = .468$, with more pronounced N400 amplitudes to incongruent ($M = .847$, $SEM = .34$) than incongruent ($M = 1.360$, $SEM = .30$) sentence-final target adjectives. Figure 8 presents N400 amplitudes reported in mono- and bilingual participant groups. Further, there was also a main effect of language on the N400 component, $F_{(1,18)} = 5.843$, $p = .026$, $\eta 2 = .24$, with more negative N400 amplitudes to Polish sentences ($M = .850$, $SEM = .33$) compared to English sentences ($M = 1.357$, $SEM = .33$). Finally, there was a significant interaction between language and valence on the N400 component, $F_{(1,18)} = 7.403$, $p = .014$, $\eta 2 = .29$. Follow-up pairwise comparisons revealed that N400 amplitudes to negative sentences in English were significantly attenuated ($M = 1.530$, $SEM = .35$) compared to negative sentences in Polish ($M = .773$, $SEM = .33$; $p = .002$). No such effect was observed between positive English ($M = 1.183$, $SEM = .32$) and

positive Polish (*M* = .927, *SEM* = .35; *p* = .308) sentences. Furthermore, N400 amplitudes to negative English sentences were more attenuated compared to positive English sentences, at *p* = .021. Of note, the reported language-valence effect was not driven by semantic incongruity, as demonstrated by highly insignificant valence-by-congruity interaction (*p* = .870).

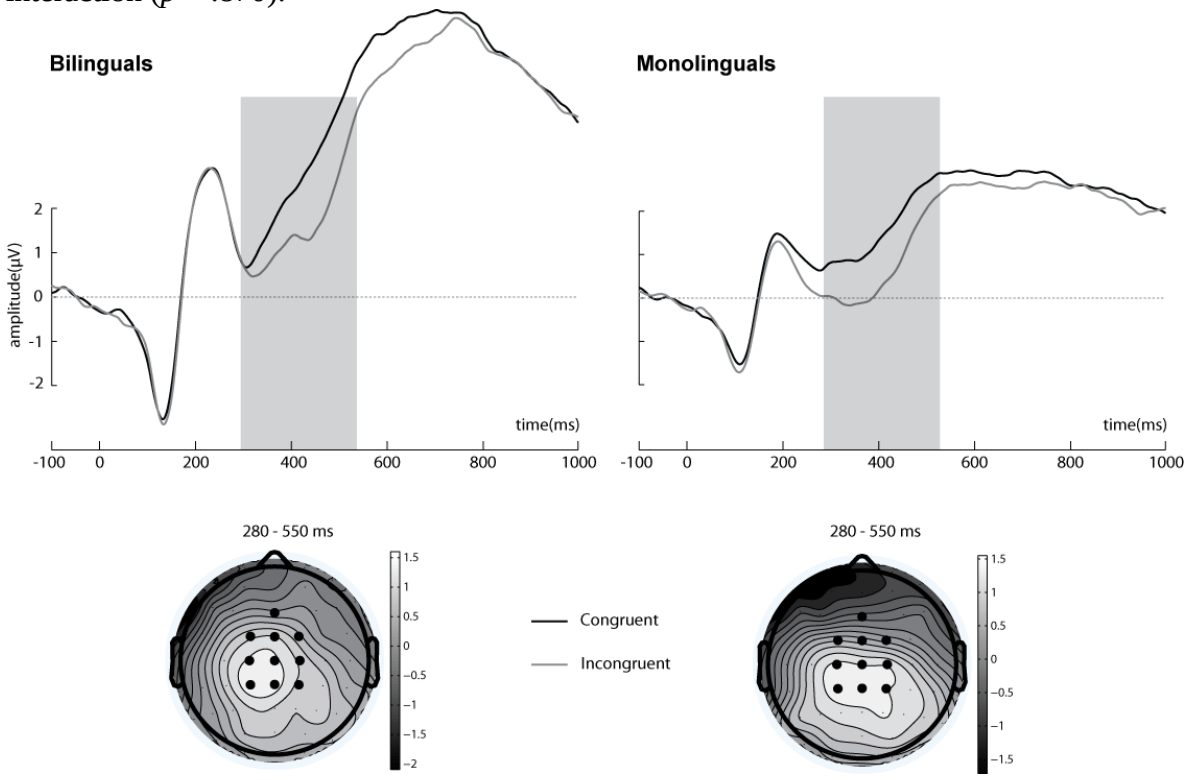

Figure 8. N400 elicited by congruent and incongruent target adjectives in Polish-English bilinguals and English monolinguals. All waveforms represent brain potential variations computed via linear derivation from 10 centro-frontal electrodes (FZ, FC1, FC2, FCZ, C1, C2, CZ, CP1, CP2, CPZ). Shaded areas represent significant difference between conditions in the 280 – 550 ms time window. The schematic heads reflect difference topography of cortical responses to congruent minus incongruent sentence-final adjectives 280 – 550 ms post-adjective onset at the electrode sites of interest.

The RM ANOVA also showed a significant valence-by-language interaction on the LPC component, $F_{(1,18)} = 8.007$, $p = .011$, $\eta 2 = .30$. Post-hoc pairwise comparisons revealed a significant difference on the LPC component between positive Polish (*M* = 3.091, *SEM* = .42) and negative Polish (*M* = 2.552, *SEM* = .40) sentences, with the former eliciting more pronounced LPC amplitudes at *p* = .005. Also, negative sentences in English (*M* = 3.363, *SEM* = .39) elicited more positive LPC amplitudes than negative sentences in Polish (*p* = .024). No significant P1 or N1 amplitude differences were found (*ps* > .05). The N400 effect is presented in Figure 9 and Figure 10. The LPC effect is illustrated in Figure 11.

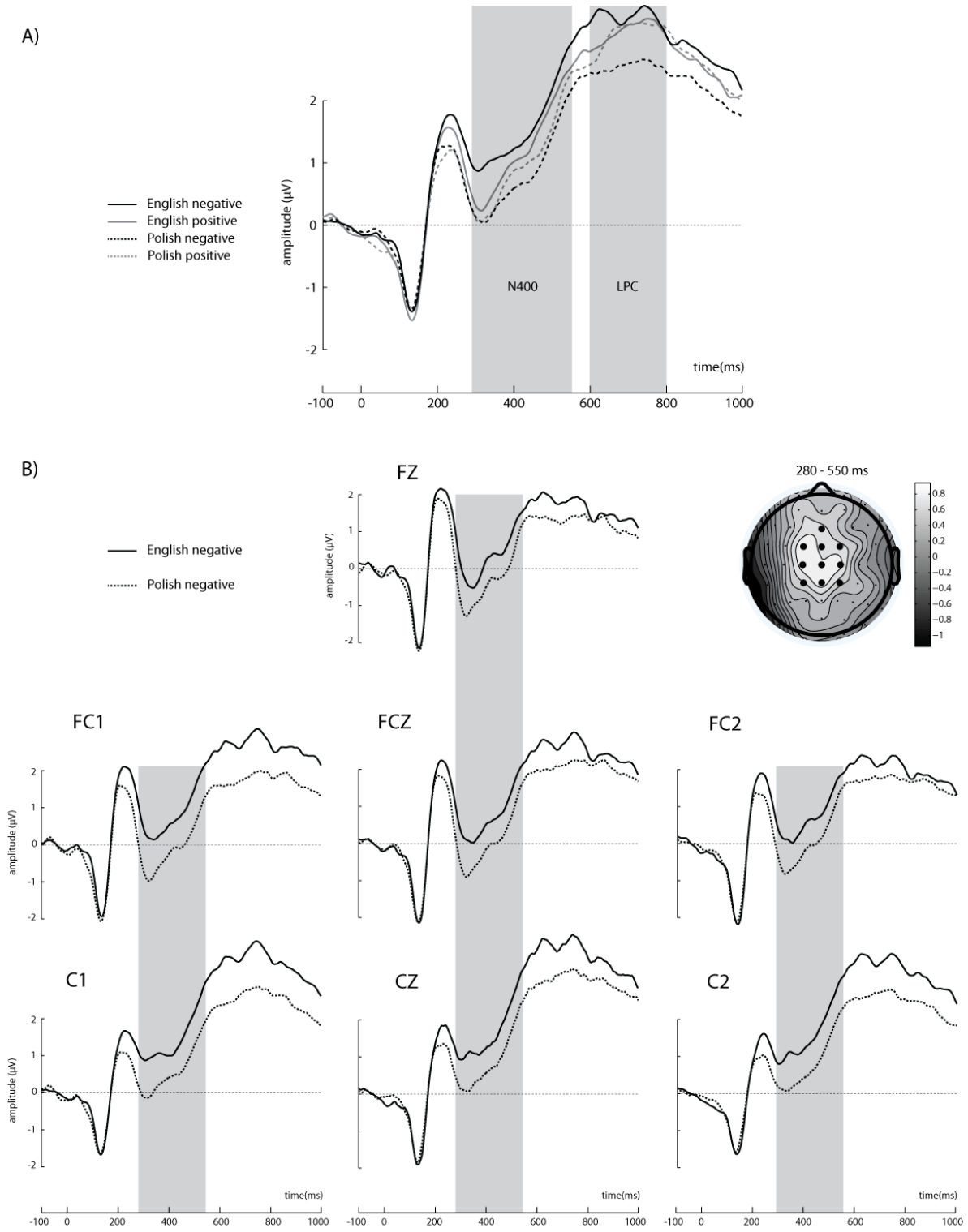

Figure 9. N400 and LPC elicited by target adjectives in Polish-English bilinguals. A: Waveforms illustrate brain potential variations computed via linear derivation from 10 centro-frontal electrodes (FZ, FC1, FC2, FCZ, C1, C2, CZ, CP1, CP2, CPZ). Shaded areas represent significant difference between conditions in the 280 – 550 and 600 – 800 time window. B: N400 at selected 7 electrode sites where the effect was maximal. The schematic head reflects difference topography of cortical responses to English negative minus Polish negative target adjectives 280 – 550 ms post-adjective onset at the electrode sites of interest.

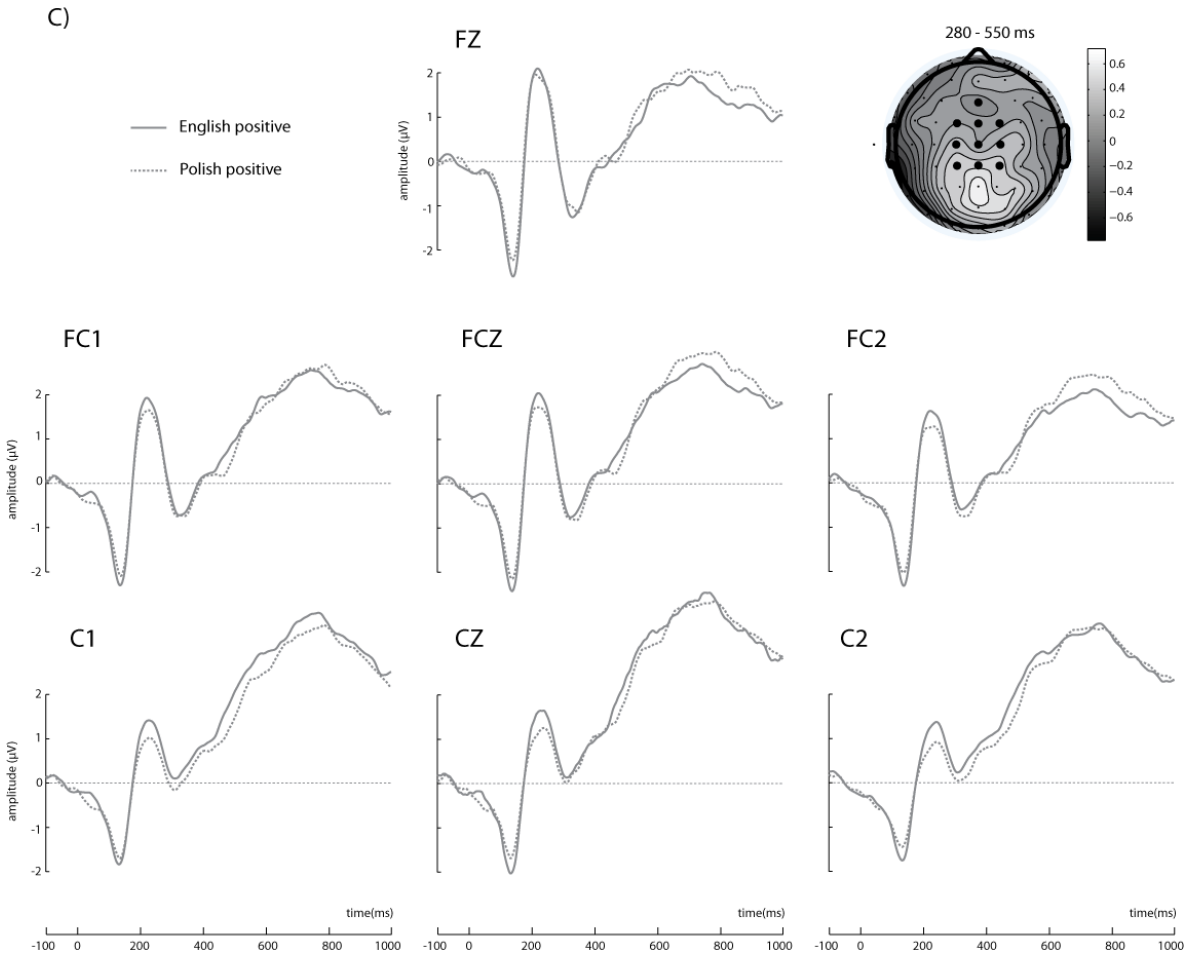

Figure 10. C: N400 at selected 7 electrode sites where the effect was maximal. The schematic head reflects difference topography of cortical responses to English positive minus Polish positive target adjectives 280 – 550 ms post-adjective onset at the electrode sites of interest.

In the same vein as monolingual electrophysiological data, the analysis demonstrated a robust N400 to incongruent compared to congruent sentences; this effect was not modulated by language. Interestingly, participants also showed overall greater semantic integration difficulty in Polish rather than English. This effect was not expected, since previous research reported increased N400 to stimuli in a second language (Thierry and Wu 2007) or difficulties anticipating sentence-final words in L2 (Martin et al. 2013). However, because affective content is more perceptible and salient in bilinguals' native language, Polish sentences may have triggered more pronounced N400 amplitudes, cancelling the previously reported difference in semantic integration between L1 and L2 (Jończyk et al. forthcoming). Indeed, this is what the present study found. Bilingual participants demonstrated reduced N400 amplitudes to negative sentences in English

compared to Polish, which may suggest that lexico-semantic access to sentence-final negative adjectives in the second language of bilinguals is filtered at the early stages of semantic integration. This robust effect provides support for the hypothetical repression mechanism proposed by Wu and Thierry (2012) in their study on noun-noun dyads. I defer further discussion and potential implications of this and other findings to the discussion section of the thesis.

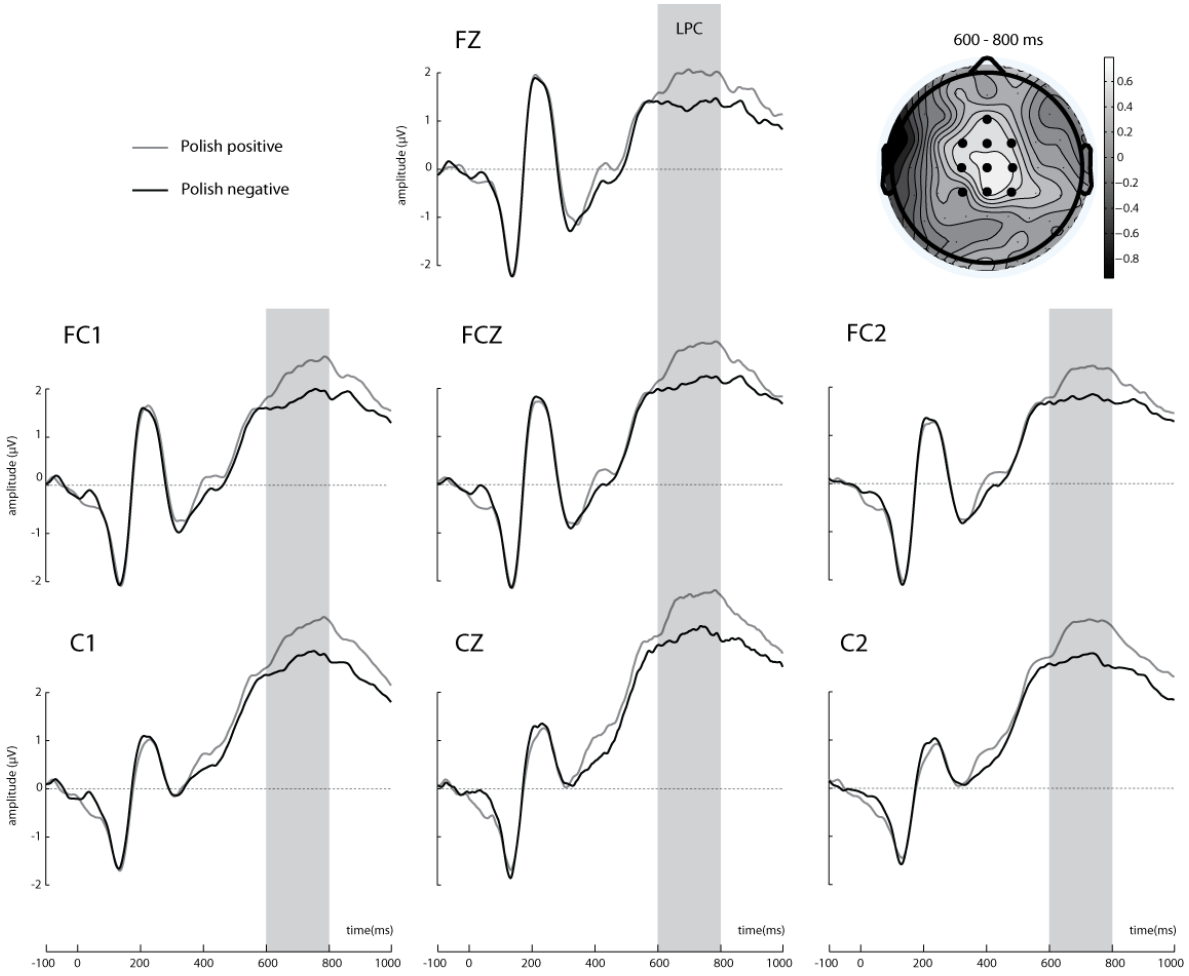

Figure 11. LPC at selected 7 electrode sites where the effect was maximal. The schematic head reflects difference topography of cortical responses to Polish positive minus Polish negative target adjectives 600 – 800 ms post-adjective onset at the electrode sites of interest.

3.4. Discussion

In this chapter, I presented the results of two experiments whose main objectives were to investigate and compare electrophysiological and behavioural correlates of the processing of affective adjectives embedded in prime and sentence context. The motivation behind such a design was to introduce a pragmatic perspective into the psychophysiological research on affective language processing in bilingualism and analyse how build-up of linguistic context impacts bilinguals' responses to affective stimuli in their respective languages.

As predicted, bilinguals' behavioural and electrophysiological responses to noun-adjective dyads in experiment 1 were not modulated by an interaction between affective valence and language of presentation. This means that bilinguals processed affective adjectives in a similar manner in their L1 Polish and L2 English, corroborating findings from two previous electrophysiological studies (Opitz and Degner 2012; Conrad et al. 2011). Crucially, however, when the same affective adjectives from experiment 1 were embedded in larger linguistic context in experiment 2, the analyses revealed robust language-by-valence interactions in the electrophysiological data pointing to significant differences in bilinguals' response to sentence-final affective adjectives in their L1 Polish and L2 English. Specifically, the main finding of the study points to attenuated N400 amplitudes to negative adjectives in English compared to Polish, which could reflect the inhibition of deeper semantic access to negative sentences in the second language. I defer a more elaborate analysis of the meaning and implications of this and other effects reported in experiment 1 and 2 to a separate discussion presented in Chapter 4.

Chapter 4:General discussion and summary

The remit of this dissertation is to probe into the neural and behavioural correlates of affective language processing in context in the native and non-native language of Polish-English bilinguals. To achieve this, a series of two electrophysiological experiments investigated the semantic integration of affectively salient stimuli in single-word prime (experiment 1) and sentence context (experiment 2) in the first- and second-language of late immersed Polish-English bilinguals. I predicted

(1) greater semantic integration difficulty to unrelated (experiment 1) and incongruent (experiment 2) affective stimuli, as indexed by N400 wave (see Kutas and Federmeier 2000, 2011). Further, this effect might be modulated by the language of presentation (Thierry and Wu 2007; Martin et al. 2013);
(2) differential modulation by affective valence in experiment 1, irrespective of language of presentation (Conrad et al. 2011; Opitz and Degner 2012);
(3) differential modulation by affective valence in L1 and L2 as a factor of the build-up of contextual information in experiment 2 (exploratory hypothesis);
(4) an affective priming effect to affective stimuli preceded by affectively congruent prime and sentence context.

The proposed experiments have advanced behavioural and electrophysiological findings in the field of affective language processing in bilingualism. The "pragmatic twist" in the experimental design has enabled to explore the impact of contextual information on the processing of affective stimuli in the first and second language. Since the main focus in the study was on the electrophysiological correlates of affective language processing in L1

and L2, below I focus mainly on the discussion of ERP findings and their implication for research on affect and bilingualism.

Consistent with the third – and key – hypothesis, I found a differential modulation of an early N400 and a late LPC wave by affective valence in the first and second language. This effect appeared only in experiment 2, in which affective adjectives were embedded in a sentence context.

The early and robust N400 effect revealed significantly reduced amplitudes to negative sentences in English relative to positive sentences in English as well as positive and negative sentences in Polish. This effect was not driven by semantic integration difficulty, as demonstrated by highly insignificant interaction between affective valence and semantic congruity. Given that the human brain constantly anticipates the semantic (Kutas and Federmeier 2011; Martin et al. 2013; Van Berkum 2012; Van Berkum et al. 2008) and affective (Moreno and Vázquez 2011; Van Berkum et al. 2009; Wager et al. 2008) resolution of a sentence, this effect may reflect reduced lexico-semantic access to negative sentences in bilinguals' second language at very early, implicit stages of semantic integration. In other words, semantic access to negative information in L2 sentences may be constrained as early as 280 ms post-stimulus onset. This finding provides support for the hypothetical repression mechanism put forward by Wu and Thierry (2012). In an implicit translation-priming paradigm, Wu and Thierry (2012) found an effect of reduced lexical access for negative words in the L2 of Chinese-English bilinguals, as indexed by N400 wave. In their study, Chinese-English participants were presented with English noun-noun dyads, in which target words were preceded by a positive, negative, or neutral prime. Unbeknownst to the participants, both the prime and target nouns concealed a sound repetition when translated into participants' L1 Chinese. Wu and Thierry (2012) demonstrated that the predicted priming effect modulated the N400 wave to targets primed with positive and neutral nouns only. The authors concluded that "reading negative words in the second language fails to automatically activate translation equivalents in the native language" (Wu and Thierry 2012: 6488), attributing the effect to a hypothetical repression mechanism that would inhibit lexical access to potentially threatening stimuli in the second language.

The present finding, however, presents new evidence that may give a more complete picture of the mechanism of repression reported by Wu and Thierry (2012). To start with, the here reported effect is more robust and detectable at an earlier stage of processing than the one reported by Wu and Thierry (2012). This could be accounted for by high level of anticipation afforded by more natural, sentence context in experiment 2. Wu and Thierry (2012) used noun-noun dyads that were unrelated in meaning and thus the target noun could not be anticipated from the minimal, single-word prime context. It has been already proposed that the human brain is highly proactive, whereby it is not limited to the sheer analysis of incoming information (Bar 2007; Bar et al. 2006; Bar 2009). Indeed, the human brain is a prediction mechanism that rapidly monitors and interprets the incoming information based on what is already known through analogy and associations (Bar 2007; Van Berkum 2010). This has been well documented in research on semantic integration of words in the preceding context (Kutas and Hillyard 1980; Kutas et al. 1984; Kutas and Federmeier 2000, 2011; Van Berkum et al. 2008; Van Berkum 2008, 2012). The here reported N400 modulation to affective valence demonstrates that people might not only anticipate the semantic but also the affective resolution of a message, possibly giving more weight to the latter. Indeed, Moreno and Vázquez (2011) found that integration of less expected, affectively incongruent words into an affectively-biased context[16] elicited less pronounced N400 amplitudes compared to non-sense sentence endings, and more pronounced N400 amplitudes compared to expected, affectively congruent endings. This finding demonstrates that affectively biased messages create affective predictions that might be partially independent of or largely complement semantic integration processes (Moreno and Vázquez 2011). Hence, in experiment 2 negative sentence context created high degree of anticipation of a sentence-final negative adjective with a potentially adverse effect in the second language, which would have hindered semantic access efficiency at early stage of processing (Jończyk et al. forthcoming).

What is intriguing, however, is the reversed pattern of affective modulation in L1 and L2 observed on the LPC wave that was documented in the later, explicit stages of

[16]E.g. "At the edge of the cliff, someone came from behind and *pushed* / *rescued* / *invented* him" (Moreno and Vázquez 2011: 135).

processing. The LPC wave is known to index semantic re-evaluation and relocation of attentional resources to affective stimuli (see Kissler et al. 2006; Citron 2012). In the present study, negative sentences in L1 Polish elicited substantially attenuated LPC amplitudes compared to negative sentences in L2 English and positive sentences in L1 Polish. This finding shows that following initial, unconstrained and automatic semantic access to negative meaning in the native language, participants blocked its re-evaluation and re-analysis in the later, explicit stage of processing. This provides a mirror effect of the result obtained for negative sentences on the N400 component, whereby semantic access to negative meaning in L2 was blocked in the early, but re-evaluated in the later stages of processing. Together, the effects observed in the N400 and LPC time-windows considerably extend our understanding of the repression mechanism introduced by Wu and Thierry (2012) using single emotional words in L2. Similar N400 amplitudes for negative and positive L1 words suggest that semantic access is unconstrained for negative L1 words presented within a more natural and affective sentential context, and the LPC results suggest that re-evaluation and re-analysis is reduced for these same negative words, possibly the result of a late-stage protection mechanism after coping with full semantic access of these words in the earlier window. By contrast, and consistent with Wu and Thierry (2012), semantic access appears repressed for L2 negative words, and, as a counter-part, greater amplitudes are then elicited in the LPC window, showing that these words require more re-evaluation probably because they have not been processed fully in the first place.

According to Wu and Thierry (2012), this hypothetical repression mechanism of lexico-semantic access might reflect an interaction between the limbic system and caudate nucleus that has been identified as a key brain structure involved in bilingual language control (Abutalebi and Green 2007; Ali et al. 2010). It is thus possible that the build-up of contextual information in experiment 2 relative to experiment 1 might have elicited greater activation of the limbic system. Hence, if the repression mechanism was indeed at play in experiment 2, a more natural design would have induced a more robust and possibly sooner effect of repression of semantic access (Jończyk et al. forthcoming). The exact nature of the repression mechanism, however, remains unclear and awaits further empirical verification.

Overall, the results of experiment 2 offer compelling electrophysiological evidence for findings reported in clinical (Marcos 1976a; Aragno and Schlachet 1996; Javier 1995; Burbridge et al. 2005) and introspective (Dewaele 2010; Pavlenko 2005, 2006, 2012) studies. Bilinguals' subjective reports of affective detachment in L2, allowing them to recall or express past traumatic experiences or taboo-related topics that would be otherwise too overwhelming in their first language, may be directly related to the repression mechanism. This mechanism seems to constrain early semantic access to potentially harmful information in the second language and at the same time reduce the re-evaluation and re-analysis of such stimuli in the first language in more explicit stages of processing.

Previous psychophysiological and electrophysiological studies found essentially no measurable differences in the processing of affective meaning in L1 and L2 (Ayçiçegi-Dinn and Caldwell-Harris 2009; Eilola et al. 2007; Ferré et al. 2010; Sutton et al. 2007; Conrad et al. 2011; Opitz and Degner 2012). Throughout, I have argued that this might be associated with the implementation of decontextualized affective stimuli. Using single affective words to probe into the processing of affective valence is questionable for a number of reasons. First, insufficient contextual information might lead to semantic ambiguity whilst reading single affective words, particularly in the case of polysemous words. For instance, a recent electrophysiological study by Palazova et al. (2011) showed differential ERP modulation to affective words as a factor of word class (adjectives, nouns, verbs). Given that significant qualitative and quantitative differences were reported in the observed ERPs to single adjectives, nouns and verbs, it raises questions concerning the reliability of verbs and nouns that share one form and that have been commonly used in studies on affective language processing (e.g. kiss, wish, hope, trust, fear, doubt, help, love, smile, harm). Second, the inconsistency in the findings reported in research on affective word processing in both mono- and bilingual research might be associated with the fact that single affective words[17] might not elicit a reliable or strong enough an affective reaction. Further, with single words it seems more difficult to control for interindividual variability in the affective associations with given words, whereby a positive word (e.g. baby) might have positive implications for some and negative for other participants. Implementation of

[17]Here, I exclude from this discussion culturally-specific and highly arousing taboo words or swear words.

contextual information may better control the overall affective valence of a presented situation and may boost participants' affective response to stimuli. This idea has been translated into a research question in a recent study by Rohr and Rahman (2015) who documented substantially enhanced and earlier electrophysiological responses to single affective words presented in communicative context compared to non-communicative context, providing strong empirical evidence of the impact of meaningful socio-pragmatic context on processing of affective language. In a similar vein, the present study brings to the fore the importance of the introduction of linguistic context in the study of affective language processing in bilingual speakers. This might enable to probe into the subtle interactions between affective and semantic meaning that can hardly be uncovered by other means (Hinojosa et al. 2009; Wu and Thierry 2012). Owing to the implementation of natural linguistic context in the study experimental design, robust differences were observed in the processing of affective meaning in L1 and L2 in Polish-English immersed bilinguals.

The implications of findings reported in experiment 2 may reach other scientific domains that have been shown to be under the influence of affect. Decision-making is unquestionably one of them (Damasio 2008, 2012; Gigerenzer 2008). Most recent evidence suggests that being in a second language 'mode' might have significant consequences for bilinguals' decisions and moral judgments (Costa et al. 2014b, 2014a; Geipel et al. 2015; Keysar et al. 2012). For example, Keysar et al. (2012) and Costa et al. (2014a) found that when bilinguals are faced with a dilemma in their second language they seem to worry less about the possible negative consequences of their decisions (they show reduced loss aversion). Also, their decisions tend to be more rational, objective and consistent when made in their second language (Costa et al. 2014a). In two different studies, Costa et al. (2014b) and Geipel et al. (2015) explored the impact of a foreign language on moral judgments. The former study reported that when making moral judgments in a second language (e.g. sacrifice one individual to save lives of 5), bilingual individuals tend to be more utilitarian in their decisions, possibly as a factor of greater affective detachment in the second language (Costa et al. 2014b). Geipel et al. (2015) found that in a second language individuals' moral judgments were more lenient, and at the same time less confident than in

the native language. This effect, however, was mainly attributed to a possible activation inhibition of social and moral norms in the second language, and only marginally so to the affective distance in L2 (Geipel et al. 2015). Altogether, the repression mechanism introduced by Wu and Thierry (2012), whose understanding is substantially enriched in the present study, seems to be consistent with the effect of reduced loss aversion found in studies by Keysar et al. (2012) and Costa et al. (2014a), as well as to an extent account for making more lenient (Geipel et al. 2015) or utilitarian (Costa et al. 2014b) decisions in the second language.

Further, findings documented in experiment 2 might have theoretical implications. In section 1.3.3 of this dissertation, I discussed the possibility of a modulation of an individual's core affective state through the use of language. I argued that language, as a communicative tool, may be used not only to manifest people's feelings, but at the same time linguistic information might be the source of why they feel that way, thus modulating their core affective barometer (Barrett 2006b). In light of the present finding, it may be interesting to further ask whether core affective state might be differentially modulated by the language in which information is conveyed. Given the initial reduction of semantic access to negative meaning in L2 sentences and its re-evaluation in the later stages of processing, as demonstrated by electrophysiological data in the present study, it might be the case that affective information in a second language modulates people's psychophysiological state to a lesser degree than the native language, at least in the early, automatic stages of processing. This hypothesis, however, requires further empirical validation.

This finding also provokes questions about the interaction between affective and cognitive processing. As discussed in section 1.3.4, the affective and cognitive primacy hypotheses propose substantially different approaches to this issue. In line with the former, affect is primary to cognition (Kunst-Wilson and Zajonc 1980; Winkielman et al. 1997, 2005; Zajonc 1980); the latter proposes the reverse (Lazarus 1984). The present finding seems to offer a compromise between the two approaches, at least at the level of sentence processing, whereby there seems to be intense competition between affective and cognitive processes at both early and later stages of language processing. It might be difficult to

clearly delineate the boundary where the "affective" and "cognitive" start and where they stop in language processing. While the present data points to a certain affective control over semantic access in the early and later stages of processing in L1 and L2, I am far from interpreting the data as affect primacy over cognition. Therefore, I am in favour of an interactive view on the affect-cognition "dualism", likewise to Lai et al. (2012).

My second hypothesis assumed differential modulation by affective valence in experiment 1, irrespective of language of presentation. This hypothesis is based on previous behavioural (e.g. Ponari et al. 2015) and electrophysiological research on single affective words presented in L1 and L2 (Opitz and Degner 2012; Conrad et al. 2011) that did not report measurable differences in affect processing between the respective languages of bilingual individuals. Throughout the dissertation I tried to argue that such absence of differential modulation to affective valence in L1 and L2 may be related to the implementation of decontextualized stimuli in the studies to date. Indeed, while such modulation was found for sentences in experiment 2, in experiment 1 bilingual participants displayed a similar pattern of behavioural and electrophysiological responses to the same set of affective adjectives embedded in minimal, single-word context in L1 and L2. Specifically, independent of the language of presentation, positive target adjectives elicited more attenuated N400 amplitudes compared to negative target adjectives, with the effect being reversed on the LPC component. Likewise, two previous electrophysiological studies did not find measurable differences in the behavioural and electrophysiological responses to isolated affective words in the respective languages of bilingual individuals (Conrad et al. 2011; Opitz and Degner 2012). In a lexical decision task, Conrad et al. (2011) found the modulation of EPN and LPC waves to isolated affective words in both L1 and L2 in late German-Spanish and Spanish-German bilinguals. In a lexical monitor task, a modified version of the lexical decision task, Opitz and Degner (2012) reported comparable EPN effects to affective nouns in the L1 and L2 of late German-French and French-German bilinguals. Also, both studies reported similar patterns of behavioural responses to affective stimuli in the respective languages of bilingual participants, whereby negative words slowed down reaction times and led to more errors than positive and/or neutral words (Conrad et al. 2011).

The direction of the valence effect on the N400 and LPC found in experiment 1 has been partially documented in monolingual research. For example, Herbert et al. (2008) reported reduced N400 amplitudes to positive compared to negative words, echoing the present finding in experiment 1. This effect might reflect processing facilitation for positive information (Herbert et al. 2008; Kanske and Kotz 2007). A similar effect was reported by Kiefer et al. (2007) who set out to explore the influence of participants' mood on cortical responses to affective adjectives. The authors documented reduced N400 amplitudes to positive compared to negative adjectives when participants were in a positive mood, which demonstrates that cortical responses to affective stimuli are modulated by affective valence of stimuli as well as current affective state of participants. The effect of increased LPC amplitudes to positive words has been well documented in monolingual electrophysiological research (e.g. Herbert et al. 2006, 2008; Kissler et al. 2009; Palazova et al. 2011). Herbert et al. (2006) observed more pronounced LPC amplitudes to positive compared to negative and neutral words whilst participants rated the stimuli presented on screen in terms of affective valence (i.e. a valence categorization task). In a follow-up study, Herbert et al. (2008) documented increased LPC to positive compared to negative adjectives when participants read the stimuli for comprehension. Likewise, Palazova et al. (2011) found increased LPC amplitudes to positive compared to negative adjectives in a standard lexical decision task. These results show that positive stimuli may engage more attentional resources in the later stage of re-evaluation, which might lead to more efficient encoding of positive words (see Herbert et al. 2008; Kissler et al. 2009).

Taken together, the possible implication of experiment 1 is that late bilinguals proficient in their first and second language, and immersed in the L2 context, process affective meaning of single words in a similar way in their respective languages at both shallow (as demonstrated in Conrad et al. 2011; Opitz and Degner 2012) and deeper levels of semantic processing (the present study). As such, experiment 1 corroborates behavioural (Pratto and John 1991; Estes and Adelman 2008; Estes and Verges 2008) and electrophysiological (see Citron 2012; Fischler and Bradley 2006; Herbert et al. 2008; Kissler et al. 2006, 2009) effects reported in studies on monolingual participants, as well as echoes results obtained in electrophysiological (Conrad et al. 2011; Opitz and Degner

2012) and behavioural (e.g. Eilola et al. 2007; Eilola and Havelka 2010; Sutton et al. 2007; Ponari et al. 2015) paradigms with bilingual individuals.

As predicted by the third hypothesis, data from both experiments provide evidence for the well-documented, classical N400 effect that is known to index semantic integration difficulty (see Kutas and Federmeier 2000, 2011; Hagoort and van Berkum 2007; Van Berkum 2008, 2012). I also hypothesized that the N400 effect might be modulated by the language of presentation. Indeed, previous studies found that semantic integration in the second language might be more difficult (Thierry and Wu 2007; Martin et al. 2013) and/or delayed (Frenck-Mestre and Pynte 1997) thus leading to increased N400 amplitudes. In the present study, however, semantic integration was not modulated by language in neither of the experiments, which is contrary to the initial prediction. The possible explanation for the absence of an interaction between semantic integration and language might be that the affective information, being more salient in the bilinguals' first language, led to more negative N400 amplitudes to noun-adjective dyads and sentences in Polish, thus cancelling the potential semantic integration difference between L1 and L2 (Jończyk et al. forthcoming). It should be noted, however, that a partial support for greater semantic integration difficulty in L2 might be observed in behavioural data. Specifically, in experiment 1, bilingual participants made more errors to English than Polish related target adjectives. In experiment 2, by contrast, bilinguals made more errors to English than Polish target adjectives embedded in a neutral sentence context. This might suggest that despite the absence of electrophysiological evidence in support of greater semantic integration difficulty in L2, bilinguals tend to process L2 sentences more slowly and/or less accurately in their L2, as demonstrated in previous in previous research (see Frenck-Mestre 2002).

My fourth and final hypothesis assumed processing facilitation for target adjectives when preceded by affectively congruent prime nouns, leading to a well-documented affective priming effect. While it was impossible to address this hypothesis with electrophysiological data (for details, see Limitations), behavioural data provided full support for the affective priming effect in both experiment 1 and experiment 2 and among both monolingual and bilingual participant groups, exploring the available evidence on

affective priming effect in both mono- (see Herring et al. 2013) and bilinguals (e.g. Degner et al. 2012).

Limitations

There are few possible limitations to the design of the experiments conducted in the present study. First, while both experiments were originally designed to also examine electrophysiological responses to affective adjectives preceded by affective and neutral contexts, in the end it was impossible to run such analysis on ERPs due to insufficient number of epochs per condition. Therefore, the potential modulation of ERPs by context valence was not investigated in the present study. Second, the bilingual participants in the present study were proficient in English and immersed in British culture, which on the one hand enables to make strong claims about the reported effects, but on the other does not allow for a broader picture of the phenomenon. Ideally, it could be more relevant to compare two groups of bilinguals differing in their degree of proficiency, or L2 immersion rather than comparing an immersed bilingual group to a monolingual control group, having in mind the old adage that a bilingual is not two monolinguals in one brain (Grosjean 1984, 2010). Finally, the present experimental design did not include a neutral, baseline condition. This does not depreciate the reported effects, but having a baseline condition might more fully account for the relation between processing of affective and non-affective information in context in L1 and L2.

Implications for future research

Further studies need to be conducted to get a clearer picture of how bilingual individuals process affective meaning in their L1 and L2 on a daily basis. I hope that the present study will motivate future research to include linguistic context as a vital variable in future experimental designs. Also, future studies should also extend the understanding of affective

language processing in general and the repression mechanism in particular in the auditory modality that, in this context, might be considered more natural than the visual modality. Future studies should also invite bilingual participants with different language backgrounds to get more ecologically valid a picture of how bilinguals process affective language in context in everyday life. Finally, I will argue for the triangulation of scientific inquiry and thus hope that future clinical, introspective, behavioural and neuroimaging studies will all cooperate to better understand the affective repertoires of bilingual individuals.

Conclusion

The present study offers a neurocognitive interpretation of the findings reported in clinical and introspective research on bilingualism and affect (Pavlenko 2012). In a series of two experiments with Polish-English immersed bilinguals, the present study documented that semantic access to negative meaning in L2 sentences was significantly reduced in the early stages of processing. In L1, by contrast, semantic access to negative information was substantially inhibited in the later stage of meaning re-analysis and re-evaluation. Notably, these effects were found only for affective adjectives embedded in sentence context, which brings to the fore the importance of the implementation of contextual information in future studies on affective language processing. Future research will also examine whether such effects are modulated by language proficiency or immersion in L2 culture. Such findings might have implications for bilingual therapy, education and everyday life in the growing multilingual reality.

Abstract

Recent behavioural and psychophysiological research on affective language processing suggests that bilingual individuals process affective information similarly in their two languages (Altarriba and Basnight-Brown 2011; Sutton et al. 2007; Conrad et al. 2011; Opitz and Degner 2012; Ponari et al. 2015). This is contrary to findings reported in clinical and introspective studies that oftentimes find the L2 to be affectively more distant and detached (Dewaele and Costa 2013; Pavlenko 2005, 2012). Most of the behavioural and psychophysiological evidence collected so far, however, comes from studies using decontextualized stimuli – often single words – that provide only a fragmented view of communicative interactions.

The present study set out to investigate the electrophysiological and behavioural correlates of affective language processing in context in the native and non-native language of proficient Polish-English immersed bilinguals. Specifically, the presented experiments test bilinguals' responses to affective adjectives embedded in a minimal, single-word context (experiment 1), and the same set of adjectives embedded in a sentence context (experiment 2), introducing a "pragmatic twist" in the experimental design. Based on previous electrophysiological and behavioural research on affective language in bilingualism it was hypothesized that reading affective adjectives in minimal context (experiment 1) will not produce measurable differences between L1 and L2. In experiment 2, by contrast, I predicted a differential modulation of ERPs by affective valence in L1 and L2 as a factor of build-up of contextual information.

Both hypotheses were confirmed. In experiment 1, comparable N400 and LPC amplitudes were elicited in L1 and L2, showing that processing of single affective words seems to be automatized in both L1 and L2. In experiment 2, however, reduced N400 and enhanced LPC amplitudes were found only for negative sentences in English. Negative sentences in Polish, by contrast, elicited attenuated LPC amplitudes to negative sentences, but comparable N400 amplitudes to positive and negative sentences. This finding has been interpreted in line with the hypothetical mechanism of repression of lexical access to negative words in L2, proposed by Wu and Thierry (2012) with single emotional words. Here, semantic access was unconstrained for negative L1 words presented within a more natural and affective sentence context, with attenuated LPC amplitudes suggesting that re-evaluation and re-analysis is reduced for these same negative words, possibly the result of a late-stage protection mechanism after coping with full semantic access of these words in the earlier window. By contrast, and consistent with Wu and Thierry (2012), semantic access appears repressed for L2 negative words, and, as a counter-part, greater amplitudes are then elicited in the LPC window, showing that these words require more re-evaluation probably because they have not been processed fully in the first place. This result offers the first neurocognitive interpretation for findings reported in previous clinical and introspective research (see Dewaele 2010; Pavlenko 2005, 2006, 2012) and may have important implications for bilingual therapy and education. Notably, the present findings also bring to the fore the importance of the implementation of linguistic context in the investigation of affective language. In doing so, it hopes to motivate future studies in the field to adopt a more pragmatic perspective on the phenomenon under investigation.

Streszczenie

Najnowsze badania behawioralne oraz psychofizjologiczne nad przetwarzaniem języka afektywnego sugerują, że osoby dwujęzyczne przetwarzają treści afektywne podobnie w obu językach (Altarriba and Basnight-Brown 2011; Sutton et al. 2007; Conrad et al. 2011; Opitz and Degner 2012; Ponari et al. 2015). Wyniki tych badań są w konflikcie z wynikami badań klinicznych oraz introspekcyjnych, według których język obcy jest językiem afektywnie oddalonym (Dewaele and Costa 2013; Pavlenko 2005, 2012). Większość wyników badań behawioralnych oraz psychofizjologicznych oparta jest jednak na eksperymentach wykorzystujących słowa afektywne wyrwane z kontekstu, co pozwala na uzyskanie jedynie cząstkowego obrazu interakcji komunikatywnych.

Celem niniejszej pracy było zbadanie elektrofizjologicznych oraz behawioralnych podstaw przetwarzania języka afektywnego w kontekście, w języku ojczystym oraz obcym u Polaków mówiących biegle w języku angielskim, oraz mieszkających na stałe w Wielkiej Brytanii. Zaproponowane w pracy eksperymenty badają reakcje uczestników na przymiotniki afektywne prezentowane poza kontekstem zdaniowym (eksperyment 1) oraz w kontekście zdaniowym (eksperyment 2), oferując tym samym podejście pragmatyczne w obecnym projekcie eksperymentalnym. Opierając się na wcześniejszych badaniach elektrofizjologicznych oraz behawioralnych w dziedzinie badań nad językiem afektywnym w bilingwizmie, postawiłem hipotezę, że czytanie przymiotników afektywnych osadzonych poza kontekstem zdaniowym nie wywoła mierzalnych różnic w danych behawioralnych oraz elektrofizjologicznych w języku pierwszym oraz drugim. W eksperymencie drugim, natomiast, przewidziałem różnicę w modulacji potencjałów wywołanych walencją

emocjonalną w języku pierwszym oraz drugim ze względu na zwiększenie informacji kontekstowej.

Obie hipotezy zostały potwierdzone. W eksperymencie 1, zaobserwowano porównywalne amplitudy potencjałów N400 oraz LPC w języku pierwszym oraz drugim, co pozwala wnioskować, że przetwarzanie słów afektywnych wydaje się być zautomatyzowane zarówno w języku rodzimym jak i języku obcym. W eksperymencie 2, natomiast, zaobserwowano redukcję amplitudy potencjału N400 i zwiększenie amplitudy potencjału LPC na zdania negatywne w języku angielskim w porównaniu ze zdaniami negatywnymi w języku polskim oraz zdaniami pozytywnymi w obu językach. W języku polskim, natomiast, zdania negatywne wywołały porównywalne potencjały N400 jak zdania pozytywne, ale znacznie zmniejszone amplitudy potencjału LPC w porównaniu do zdań negatywnych w języku angielskim oraz pozytywnych w języku polskim.

Wyniki eksperymentu drugiego interpretowane są zgodnie z hipotetycznym mechanizmem represji dostępu leksykalnego do słów negatywnych w języku obcym, który po raz pierwszy zaobserwowany został przez Wu i Thierry (2012) na bodźcach słownych. W obecnym badaniu, zauważono pełen dostęp semantyczny do zdań negatywnych w języku polskim we wczesnym etapie ich przetwarzania. W późniejszej fazie, jednak, proces ponownej analizy ich znaczenia został znacznie zredukowany (zmniejszone amplitudy LPC), prawdopodobnie w wyniku działania mechanizmu obronnego, uniemożliwiającego ponowną analizę negatywnych, potencjalnie szkodliwych informacji. Zgodnie z Wu i Thierry (2012), natomiast, dostęp semantyczny wydaje się być zablokowany dla zdań negatywnych w języku drugim, co z kolei prowadzi do zwiększonych amplitud potencjału LPC wskazując na głębszą re-ewaluację znaczenia zdań negatywnych w języku obcym w późniejszym etapie ich przetwarzania.

Wyniki niniejszego badania oferują pierwszą neurokognitywną interpretację wcześniejszych wyników badań klinicznych oraz introspekcyjnych (Dewaele 2010; Pavlenko 2005, 2006, 2012)wskazujących na większy dystans afektywny w języku drugim, mając tym samym znaczące implikacje m.in. w kontekście terapii oraz edukacji z osobami dwujęzycznymi. Co ważne, niniejsze badanie podkreśla znaczenie kontekstu językowego w badaniach nad językiem afektywnym, oraz wskazuje na konieczność uwzględnienia

perspektywy pragmatycznej w przyszłych badaniach nad zjawiskiem języka afektywnego w bilingwizmie.

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Appendices

Appendix 1

Table 8. A complete set of noun-adjective dyads from experiment 1. "-" depicts negative valence of a prime or target; "+" depicts positive valence of a prime or target; "0" depicts neutral valence of a prime; "*" indicates an unrelated noun-adjective dyad.

	Polish		English	
+;-	Prime	Target	Prime	Target
-;-	pogrzeb	załamany	funeral	devastated
+;-*	luksus	załamany	luxury	devastated
0;-	osoba	załamana	person	devastated
0;-*	liść	załamany	leaf	devastated
+;+	taniec	seksowny	dance	sexy
-;+*	huragan	seksowny	hurricane	sexy
0;+	głos	seksowny	voice	sexy
0;+*	miasto	seksowne	city	sexy
-;-	ogień	poparzony	fire	burnt
+;-*	raj	poparzony	paradise	burnt
0;-	skóra	poparzona	skin	burnt
0;-*	krowa	poparzona	cow	burnt
+;+	randka	romantyczna	date	romantic
-;+*	gorączka	romantyczna	fever	romantic
0;+	powieść	romantyczna	novel	romantic
0;+*	żaba	romantyczna	frog	romantic

-;-	wojna	martwy	war	dead
+;-*	wodospad	martwy	waterfall	dead
0;-	ciało	martwe	body	dead
0;-*	stół	martwy	table	dead
+;+	szczeniak	słodki	puppy	cute
-;+*	nieszczęście	słodki	misery	cute
0;+	obrazek	słodki	picture	cute
0;+*	drzewo	słodkie	tree	cute
-;-	sierota	sama	orphan	alone
+;-*	sympatia	sam	affection	alone
0;-	wyspa	sam	island	alone
0;-*	procent	sam	percentage	alone
+;+	sport	zdrowy	sport	healthy
-;+*	nowotwór	zdrowy	tumour	healthy
0;+	dieta	zdrowa	diet	healthy
0;+*	telefon	zdrowy	phone	healthy
-;-	wybuch	zrujnowany	explosion	ruined
+;-*	skarb	zrujnowany	treasure	ruined
0;-	budynek	zrujnowany	building	ruined
0;-*	płeć	zrujnowana	gender	ruined
+;+	uścisk	przyjazny	hug	friendly
-;+*	piekło	przyjazne	hell	friendly
0;+	ludzie	przyjaźni	people	friendly
0;+*	butelka	przyjazna	bottle	friendly
-;-	zbrodnia	makabryczna	crime	horrible
+;-*	miłość	makabryczna	love	horrible
0;-	konsekwencje	makabryczne	consequences	horrible
0;-*	łyżeczka	makabryczna	teaspoon	horrible
+;+	wynik	szczęśliwy	miracle	lucky
-;+*	powódź	szczęśliwy	flood	lucky
0;+	wynik	szczęśliwy	outcome	lucky
0;+*	woda	szczęśliwy	water	lucky
-;-	operacja	ranny	surgery	injured
+;-*	rozkosz	ranny	delight	injured
0;-	bandaż	ranny	bandage	injured

0;-*	zasłona	ranny	curtain	injured
+;+	pocałunek	namiętny	kiss	passionate
-;+*	bieda	namiętny	poverty	passionate
0;+	związek	namiętny	relationship	passionate
0;+*	lampa	namiętna	lamp	passionate
-;-	wrzask	przerażony	scream	terrified
+;-*	plaża	przerażony	beach	terrified
0;-	mina	przerażona	expression	terrified
0;-*	szklanka	przerażony	glass	terrified
+;+	orgazm	podniecony	orgasm	aroused
-;+*	malaria	podniecony	malaria	aroused
0;+	kobieta	podniecona	woman	aroused
0;+*	plastik	podniecony	plastic	aroused
-;-	ofiara	gwałcona	victim	raped
+;-*	jedzenie	gwałcony	food	raped
0;-	dziewczyna	gwałcona	girl	raped
0;-*	buty	gwałcone	shoes	raped
+;+	dom	bezpieczny	home	safe
-;+*	terrorysta	bezpieczny	terrorist	safe
0;+	podróż	bezpieczna	trip	safe
0;+*	filiżanka	bezpieczny	cup	safe
-;-	zwłoki	zamordowany	corpse	murdered
+;-*	szacunek	zamordowany	respect	murdered
0;-	intryga	zamordowany	plot	murdered
0;-*	nogi	zamordowany	legs	murdered
+;+	milioner	sławny	millionaire	famous
-;+*	HIV	sławny	HIV	famous
0;+	autor	sławny	author	famous
0;+*	balon	sławny	balloon	famous
-;-	cmentarz	przygnębiony	cemetery	depressed
+;-*	nagroda	przygnębiony	reward	depressed
0;-	nastrój	przygnębiony	mood	depressed
0;-*	długopis	przygnębiony	pen	depressed
+;+	żart	zabawny	joke	funny

-;+*	koszmar	zabawny	nightmare	funny
0;+	twarz	zabawna	face	funny
0;+*	drzwi	zabawne	door	funny
-;-	wirus	chory	virus	ill
+;-*	triumf	chory	triumph	ill
0;-	tabletka	chory	pill	ill
0;-*	koło	chory	wheel	ill
+;+	masaż	zrelaksowany	massage	relaxed
-;+*	kryzys	zrelaksowany	crisis	relaxed
0;+	materac	zrelaksowany	mattress	relaxed
0;+*	notatnik	zrelaksowany	notebook	relaxed
-;-	rzeźnia	okrutna	slaughter	cruel
+;-*	urodziny	okrutny	birthday	cruel
0;-	świat	okrutny	world	cruel
0;-*	gleba	okrutna	soil	cruel
+;+	fantazja	niesamowita	fantasy	incredible
-;+*	eutanazja	niesamowita	euthanasia	incredible
0;+	opowieść	niesamowita	story	incredible
0;+*	piasek	niesamowity	sand	incredible
-;-	katastrofa	okropna	disaster	terrible
+;-*	spokój	okropny	peace	terrible
0;-	los	okropny	fate	terrible
0;-*	ławka	okropna	bench	terrible
+;+	rozrywka	radosny	entertainment	joyful
-;+*	wymiociny	radosny	vomit	joyful
0;+	dzień	radosny	day	joyful
0;+*	schody	radosne	stairs	joyful
-;-	zdrada	niewierny	infidelity	unfaithful
+;-*	słońce	niewierny	duck	unfaithful
0;-	partner	niewierny	partner	unfaithful
0;-*	kaczka	niewierna	sun	unfaithful
+;+	dzieciństwo	cudowne	childhood	wonderful
-;+*	stres	cudowny	stress	wonderful
0;+	praca	cudowna	job	wonderful
0;+*	płot	cudowny	fence	wonderful

-;-	więzień	torturowany	prisoner	tortured
+;-*	wiosna	torturowany	spring	tortured
0;-	piwnica	torturowany	basement	tortured
0;-*	deszcz	torturowany	rain	tortured
+;+	puchar	dumny	trophy	proud
-;+*	zdrada	dumny	betrayal	proud
0;+	właściciel	dumny	owner	proud
0;+*	jabłka	dumny	apples	proud
-;-	wdowa	samotna	widow	lonely
+;-*	namiętność	samotny	passion	lonely
0;-	pustynia	samotny	desert	lonely
0;-*	guzik	samotny	button	lonely
+;+	czekolada	zadowolony	chocolate	satisfied
-;+*	pochówek	zadowolony	burial	satisfied
0;+	klient	zadowolony	customer	satisfied
0;+*	ziemniak	zadowolony	potato	satisfied
-;-	niewolnik	maltretowany	slave	abused
+;-*	bóg	maltretowany	god	abused
0;-	chłopiec	maltretowany	boy	abused
0;-*	puzzle	maltretowany	puzzle	abused
+;+	kociak	uroczy	kitten	adorable
-;+*	więzienie	urocze	prison	adorable
0;+	potomstwo	urocze	offspring	adorable
0;+*	śrubokręt	uroczy	screwdriver	adorable
-;-	pistolet	zabity	gun	killed
+;-*	zwycięstwo	zabity	win	killed
0;-	mężczyzna	zabity	man	killed
0;-*	kominek	zabity	fireplace	killed
+;+	wdzięk	magiczny	charm	magical
-;+*	szatan	magiczny	devil	magical
0;+	chwila	magiczna	moment	magical
0;+*	klucz	magiczny	key	magical
-;-	AIDS	umierający	AIDS	dying
+;-*	pieniądze	umierający	money	dying

0;-	zwierzę	umierające	animal	dying
0;-*	mata	umierająca	mat	dying
+;+	sen	spokojny	sleep	peaceful
-;+*	kontuzja	spokojny	injury	peaceful
0;+	wieczór	spokojny	evening	peaceful
0;+*	skorupa	spokojny	shell	peaceful
-;-	rana	zakrwawiony	wound	bloody
+;-*	dziecko	zakrwawione	baby	bloody
0;-	nos	zakrwawiony	nose	bloody
0;-*	drabina	zakrwawiony	ladder	bloody
+;+	ciasto	przepyszne	cake	delicious
-;+*	zabójca	przepyszny	killer	delicious
0;+	koktajl	przepyszny	cocktail	delicious
0;+*	dysk	przepyszne	disc	delicious
-;-	bankrut	bezdomny	bankrupt	homeless
+;-*	natura	bezdomny	nature	homeless
0;-	kot	bezdomny	cat	homeless
0;-*	łyżka	bezdomny	spoon	homeless
+;+	wesele	doskonałe	wedding	perfect
-;+*	wstyd	doskonały	shame	perfect
0;+	kształt	doskonały	shape	perfect
0;+*	góra	doskonała	mountain	perfect
-;-	dyskryminacja	niepełnosprawny	discrimination	disabled
+;-*	przyjęcie	niepełnosprawny	party	disabled
0;-	atleta	niepełnosprawny	athlete	disabled
0;-*	kartka	niepełnosprawny	sheet	disabled
+;+	małżeństwo	pomyślne	marriage	successful
-;+*	wrogość	pomyślny	hate	successful
0;+	biznes	pomyślny	business	successful
0;+*	marmur	pomyślny	marble	successful
-;-	ból	zraniony	pain	hurt
+;-*	kąpiel	zraniony	bath	hurt
0;-	plaster	zraniony	plaster	hurt
0;-*	masło	zraniony	butter	hurt

+;+	pomoc	uratowany	help	rescued
-;+*	nienawiść	uratowany	hatred	rescued
0;+	statek	uratowany	ship	rescued
0;+*	dywan	uratowany	carpet	rescued
-;-	kalectwo	niewidomy	disability	blind
+;-*	niebo	niewidomy	sky	blind
0;-	oczy	niewidomy	eyes	blind
0;-*	kapelusz	niewidomy	hat	blind
+;+	wynalazek	błyskotliwy	invention	brilliant
-;+*	niebezpieczeństwo	błyskotliwy	danger	brilliant
0;+	umysł	błyskotliwy	mind	brilliant
0;+*	młotek	błyskotliwy	hammer	brilliant
-;-	błąd	głupi	mistake	foolish
+;-*	sprawiedliwość	głupia	justice	foolish
0;-	decyzja	głupia	decision	foolish
0;-*	garaż	głupi	garage	foolish
+;+	lato	ciepłe	summer	warm
-;+*	grzech	ciepły	sin	warm
0;+	grzejnik	ciepły	radiator	warm
0;+*	jeleń	ciepły	reindeer	warm
-;-	śpiączka	nieprzytomny	coma	unconscious
+;-*	przygoda	nieprzytomny	adventure	unconscious
0;-	mózg	nieprzytomny	brain	unconscious
0;-*	sznurek	nieprzytomny	string	unconscious
+;+	dzieci	beztroskie	children	carefree
-;+*	zakładnik	beztroski	hostage	carefree
0;+	czas	beztroski	time	carefree
0;+*	laptop	beztroski	laptop	carefree
-;-	napaść	agresywny	robbery	aggressive
+;-*	pragnienie	agresywny	desire	aggressive
0;-	zachowanie	agresywne	behaviour	aggressive
0;-*	plecak	agresywny	backpack	aggressive
+;+	geniusz	inteligentny	genius	intelligent
-;+*	kraksa	inteligentny	crash	intelligent
0;+	pytanie	inteligentne	question	intelligent

0;+*	biurko	inteligentny	desk	intelligent
-;-	wypadek	tragiczny	accident	tragic
+;-*	przyjemność	tragiczny	pleasure	tragic
0;-	przeznaczenie	tragiczne	destiny	tragic
0;-*	ser	tragiczny	cheese	tragic
+;+	odkrycie	fascynujące	discovery	exciting
-;+*	dług	fascynujący	debt	exciting
0;+	miejsce	fascynujące	place	exciting
0;+*	palec	fascynujący	finger	exciting
-;-	śmierć	samobójcza	death	suicidal
+;-*	sukces	samobójczy	success	suicidal
0;-	most	samobójczy	bridge	suicidal
0;-*	obraz	samobójczy	painting	suicidal
+;+	nagość	erotyczna	nudity	erotic
-;+*	wrzód	erotyczny	ulcer	erotic
0;+	bielizna	erotyczna	underwear	erotic
0;+*	migdał	erotyczny	almond	erotic
-;-	żebrak	biedny	beggar	poor
+;-*	walentynka	biedny	valentine	poor
0;-	moneta	biedny	coin	poor
0;-*	kabel	biedny	cable	poor
+;+	życie	piękne	life	beautiful
-;+*	depresja	piękny	depression	beautiful
0;+	włosy	piękne	hair	beautiful
0;+*	brokuł	piękny	broccoli	beautiful
-;-	wylew	sparaliżowany	stroke	paralyzed
+;-*	awans	sparaliżowany	promotion	paralyzed
0;-	kręgosłup	sparaliżowany	spine	paralyzed
0;-*	ołówek	sparaliżowany	pencil	paralyzed
+;+	postęp	znakomity	progress	excellent
-;+*	przemoc	znakomity	violence	excellent
0;+	rysunek	znakomity	drawing	excellent
0;+*	gniazdko	znakomite	socket	excellent
-;-	holocaust	straszny	holocaust	awful

+;-*	zysk	straszny	profit	awful
0;-	smak	straszny	taste	awful
0;-*	śmietanka	straszna	cream	awful
+;+	seks	przyjemny	sex	pleasurable
-;+*	tłuszcz	przyjemny	fat	pleasurable
0;+	doświadczenie	przyjemne	experience	pleasurable
0;+*	pudełko	przyjemne	box	pleasurable
-;-	niepowodzenie	rozczarowany	failure	disappointed
+;-*	zwycięzca	rozczarowany	winner	disappointed
0;-	wybór	rozczarowany	selection	disappointed
0;-*	talerz	rozczarowany	plate	disappointed
+;+	prawda	szczery	truth	honest
-;+*	agonia	szczery	agony	honest
0;+	rozmowa	szczera	conversation	honest
0;+*	delfin	szczery	dolphin	honest
-;-	zanieczyszczenie	skażony	pollution	infected
+;-*	wakacje	skażony	holiday	infected
0;-	powietrze	skażone	air	infected
0;-*	komputer	skażony	computer	infected
+;+	podarunek	miły	gift	kind
-;+*	otyłość	miły	obesity	kind
0;+	gest	miły	gesture	kind
0;+*	folder	miły	folder	kind

Appendix 2

Table 9. A complete set of sentences from experiment 2. "-" depicts negative valence of sentence context or target; "+" depicts positive valence of sentence context or target; "0" depicts neutral valence of sentence context; "*" indicates a semantically incongruent sentence.

	Polish		English	
+ ; -	Sentence context	Target	Sentence context	Target
		1st set		
-/-	Kiedy jej syn został ranny w	załamana	When her son was injured in the	devastated

	wypadku Olga była		accident Claire was	
-/+*	Kiedy jej syn został ranny w wypadku Olga była	seksowna	When her son was injured in the accident Claire was	sexy
+/+	Jej niesamowite, krągłe kształty i świetny gust sprawiają, że Ola jest	seksowna	Katy's amazing curves and her great taste make her so	sexy
+/-*	Jej niesamowite, krągłe kształty i świetny gust sprawiają, że Ola jest	załamana	Katy's amazing curves and her great taste make her so	devastated
0/-	Kiedy Asia dowiedziała się, co stało się z jej psem, była	załamana	When Lily learnt what had happened to her dog, she was	devastated
0/+*	Kiedy Asia dowiedziała się, co stało się z jej psem, była	seksowna	When Lily learnt what had happened to her dog, she was	sexy
0/+	To osobowość, a nie ciało, sprawia, że osoba jest	seksowna	It is not the body but personality that makes one	sexy
0/-*	To osobowość, a nie ciało, sprawia, że osoba jest	załamana	It is not the body but personality that makes one	devastated
		2nd set		
-/-	Przez nieuwagę Zuzia oblała się wrzątkiem i była cała	poparzona	Gloria accidentally poured boiling water over herself and was	burnt
-/+*	Przez nieuwagę Zuzia oblała się wrzątkiem i była cała	romantyczna	Gloria accidentally poured boiling water over herself and was	romantic
+/+	Ich miesiąc miodowy w cudownej scenerii Paryża był tak	romantyczny	Their honeymoon in the gorgeous scenery of Paris was so	romantic
+/-*	Ich miesiąc miodowy w cudownej scenerii Paryża był tak	poparzony	Their honeymoon in the gorgeous scenery of Paris was so	burnt
0/-	Daniel spędził cały dzień na słońcu i jego skóra jest	poparzona	Jerry spent a whole day in the sun and now his skin is	burnt
0/+*	Daniel spędził cały dzień na słońcu i jego skóra jest	romantyczna	Jerry spent a whole day in the sun and now his skin is	romantic
0/+	Michał wzbudza zainteresowanie u kobiet, ponieważ jest bardzo	romantyczny	Women find him interesting, because Harry is very	romantic
0/-*	Michał wzbudza zainteresowanie u kobiet, ponieważ jest bardzo	poparzony	Women find him interesting, because Harry is very	burnt
		3rd set		
-/-	Nieuleczalnie chory Patryk nie zdawał sobie sprawy, że za miesiąc będzie już	martwy	Incurably ill Patrick didn't realize that in a month he would already be	dead
-/+*	Nieuleczalnie chory Patryk nie zdawał sobie sprawy, że za miesiąc będzie już	słodki	Incurably ill Patrick didn't realize that in a month he would already be	cute
+/+	Mały kociak, którego Julka dostała na urodziny jest	słodki	The little kitten Julie got for her birthday is	cute
+/-*	Mały kociak, którego Julka dostała na urodziny jest	martwy	The little kitten Julie got for her birthday is	dead
0/-	Kinga myślała, że jej dziadek śpi, ale okazało się, że był	martwy	Kathy thought her grandfather was asleep, but he was	dead
0/+*	Kinga myślała, że jej dziadek śpi, ale okazało się, że był	słodki	Kathy thought her grandfather was asleep, but he was	cute
0/+	Wiadomość, którą Ula wysłała do swojej przyjaciółki, była	słodka	The message Lynn sent to her friend was	cute
0/-*	Wiadomość, którą Ula wysłała do swojej przyjaciółki, była	martwa	The message Lynn sent to her friend was	dead

4th set

-/-	Od czasu śmiertelnego wypadku jego rodziców, Szymon jest całkiem	sam	Since his parents' fatal accident, Simon has been all	alone
-/+*	Od czasu śmiertelnego wypadku jego rodziców, Szymon jest całkiem	zdrowy	Since his parents' fatal accident, Simon has been all	healthy
+/+	Marcin uwielbia sączyć owocowe koktajle, bo są pyszne i	zdrowe	Martin adores sipping fruit cocktails that are delicious and	healthy
+/-*	Marcin uwielbia sączyć owocowe koktajle, bo są pyszne i	same	Martin adores sipping fruit cocktails that are delicious and	alone
0/-	Jego ostatni związek uświadomił mu, że może powinien być	sam	His last relationship made him realize that maybe he should be	alone
0/+*	Jego ostatni związek uświadomił mu, że może powinien być	zdrowy	His last relationship made him realize that maybe he should be	healthy
0/+	Wystarczy ćwiczyć trzy razy w tygodniu by być	zdrowym	It is enough to exercise three times a week to be	healthy
0/-*	Wystarczy ćwiczyć trzy razy w tygodniu by być	samym	It is enough to exercise three times a week to be	alone

5th set

-/-	Po tym jak potężne tornado uderzyło w wioskę, wszystkie domy były	zrujnowane	After a massive tornado hit the village, all houses were	ruined
-/+*	Po tym jak potężne tornado uderzyło w wioskę, wszystkie domy były	przyjazne	After a massive tornado hit the village, all houses were	friendly
+/+	Na Tomka zawsze można liczyć, jest bardzo pomocny i	przyjazny	You can always count on Adam; he is very helpful and	friendly
+/-*	Na Tomka zawsze można liczyć, jest bardzo pomocny i	zrujnowany	You can always count on Adam; he is very helpful and	ruined
0/-	Kiedy ludzie poznają całą prawdę, życie Andrzeja będzie	zrujnowane	When people hear the whole truth, Andy's life will be	ruined
0/+*	Kiedy ludzie poznają całą prawdę, życie Andrzeja będzie	przyjazne	When people hear the whole truth, Andy's life will be	friendly
0/+	Emilka mieszka tu od roku i uważa, że jej sąsiedzi są	przyjaźni	Emma has lived here for a year and finds her neighbours	friendly
0/-*	Emilka mieszka tu od roku i uważa, że jej sąsiedzi są	zrujnowani	Emma has lived here for a year and finds her neighbours	ruined

6th set

-/-	Wiadomość o kobiecie, która zagłodziła swoje dziecko na śmierć, była	makabryczna	The news about a mother starving her child to death was	horrible
-/+*	Wiadomość o kobiecie, która zagłodziła swoje dziecko na śmierć, była	szczęśliwa	The news about a mother starving her child to death was	lucky
+/+	Hania urodziła śliczną i zdrową córeczkę, więc jest	szczęśliwa	Jennifer had a beautiful and healthy baby, so she feels	lucky
+/-*	Hania urodziła śliczną i zdrową córeczkę, więc jest	makabryczna	Jennifer had a beautiful and healthy baby, so she feels	horrible
0/-	To, co Janek usłyszał o swojej żonie podczas jego nieobecności było	makabryczne	What John heard about his wife while being away was	horrible
0/+*	To, co Janek usłyszał o swojej żonie podczas jego nieobecności było	szczęśliwe	What John heard about his wife while being away was	lucky
0/+	Marek nie jest przesądny, dla niego liczba 7 jest rzeczywiście	szczęśliwa	He is not superstitious; in his case number 7 is indeed	lucky

0/-*	Marek nie jest przesądny, dla niego liczba 7 jest rzeczywiście	makabryczna	He is not superstitious; in his case number 7 is indeed	horrible
		7th set		
-/-	Niespodziewane trzęsienie ziemi pochłonęło 100 ofiar, 350 osób zostało	rannych	A sudden earthquake claimed 100 victims, 350 people were	injured
-/+*	Niespodziewane trzęsienie ziemi pochłonęło 100 ofiar, 350 osób zostało	namiętnych	A sudden earthquake claimed 100 victims, 350 people were	passionate
+/+	Kiedy ich miłość odżyła, ich związek był naprawdę	namiętny	When their love was revived, their relationship was really	passionate
+/-*	Kiedy ich miłość odżyła, ich związek był naprawdę	ranny	When their love was revived, their relationship was really	injured
0/-	Eryk zatrzymał samochód, by pomóc psu, który był	ranny	Eric stopped the car to help a dog, which was	injured
0/+*	Eryk zatrzymał samochód, by pomóc psu, który był	namiętny	Eric stopped the car to help a dog, which was	passionate
0/+	Kobiety uważają, że jego niski głos jest bardzo	namiętny	Women think that his low voice is very	passionate
0/-*	Kobiety uważają, że jego niski głos jest bardzo	ranny	Women think that his low voice is very	injured
		8th set		
-/-	Mały Franek obudził się z krzykiem, był roztrzęsiony i	przerażony	Little Henry woke up screaming; he was shaking and	terrified
-/+*	Mały Franek obudził się z krzykiem, był roztrzęsiony i	podniecony	Little Henry woke up screaming; he was shaking and	aroused
+/+	Widząc parę kochającą się namiętnie na plaży Karol poczuł się	podniecony	Seeing a couple making passionate love on the beach made Denis feel	aroused
+/-*	Widząc parę kochającą się namiętnie na plaży Karol poczuł się	przerażony	Seeing a couple making passionate love on the beach made Denis feel	terrified
0/-	Kiedy Leszek zauważył swoje odbicie w lustrze był	przerażony	When Ben saw his reflection in the mirror he was	terrified
0/+*	Kiedy Leszek zauważył swoje odbicie w lustrze był	podniecony	When Ben saw his reflection in the mirror he was	aroused
0/+	Widok jego częściowo odsłoniętego ciała sprawił, że poczuła się	podniecona	The sight of his partially exposed body made her feel	aroused
0/-*	Widok jego częściowo odsłoniętego ciała sprawił, że poczuła się	przerażona	The sight of his partially exposed body made her feel	terrified
		9th set		
-/-	Zabrali nieprzytomną kobietę do pokoju, gdzie była wielokrotnie bita i	gwałcona	They took the unconscious woman to a room where she was repeatedly beaten and	raped
-/+*	Zabrali nieprzytomną kobietę do pokoju, gdzie była wielokrotnie bita i	bezpieczna	They took the unconscious woman to a room where she was repeatedly beaten and	safe
+/+	Bliskość jej męża sprawia, że Julia czuje się kochana i	bezpieczna	When her husband is close, Julia feels loved and	safe
+/-*	Bliskość jej męża sprawia, że Julia czuje się kochana i	gwałcona	When her husband is close, Julia feels loved and	raped
0/-	Żołnierze, którzy wrócili do kraju mogą ponownie czuć się	bezpieczni	Soldiers who came back to the country could once again feel	safe

0/+*	Żołnierze, którzy wrócili do kraju mogą ponownie czuć się	gwałceni	Soldiers, who came back to the country could once again feel	raped
0/+	Edyta już nigdy więcej nie wejdzie do parku, w którym była	gwałcona	Edith will never again walk through the park where she was	raped
0/-*	Edyta już nigdy więcej nie wejdzie do parku, w którym była	bezpieczna	Edith will never again walk through the park where she was	safe
		10th set		
-/-	Po zniknięciu jej rodziny Dagmara dowiedziała się, że zostali porwani i	zamordowani	After her family vanished Emily learnt that they had been kidnapped and	murdered
-/+*	Po zniknięciu jej rodziny Dagmara dowiedziała się, że zostali porwani i	sławni	After her family vanished Emily learnt that they had been kidnapped and	famous
+/+	Jej urok i piękno w końcu sprawią, że zostanie	sławna	Thanks to her charm and beauty she will eventually become	famous
+/-*	Jej urok i piękno w końcu sprawią, że zostanie	zamordowana	Thanks to her charm and beauty she will eventually become	murdered
0/-	Kamil wyszedł z domu i niedługo po tym został	zamordowany	Kevin went out from home and soon after was	murdered
0/+*	Kamil wyszedł z domu i niedługo po tym został	sławny	Kevin went out from home and soon after was	famous
0/+	Jej powieść już jest w sprzedaży, także wkrótce Iza może zostać	sławna	Her novel is already on sale, so Isabella may soon become	famous
0/-*	Jej powieść już jest w sprzedaży, także wkrótce Iza może zostać	zamordowana	Her novel is already on sale, so Isabella may soon become	murdered
		11th set		
-/-	Po amputacji Miłosz poruszał się na wózku inwalidzkim, więc był bardzo	przygnębiony	After the amputation, Owen was in a wheelchair and very	depressed
-/+*	Po amputacji Miłosz poruszał się na wózku inwalidzkim, więc był bardzo	zabawny	After the amputation, Owen was in a wheelchair and very	funny
+/+	Dawid jest wymarzonym mężem, ponieważ jest troskliwy i	zabawny	David is the dream husband because he is caring and	funny
+/-*	Dawid jest wymarzonym mężem, ponieważ jest troskliwy i	przygnębiony	David is the dream husband because he is caring and	depressed
0/-	Po powrocie do pustego mieszkania, Emilia była naprawdę	przygnębiona	When Emma came back to an empty home, she was very	depressed
0/+*	Po powrocie do pustego mieszkania, Emilia była naprawdę	zabawna	When Emma came back to an empty home, she was very	funny
0/+	Romkowi buzia się nie zamyka, ale często jest przy tym dość	zabawny	Harry never stops talking, but at the same time he is often quite	funny
0/-*	Romkowi buzia się nie zamyka, ale często jest przy tym dość	przygnębiony	Harry never stops talking, but at the same time he is often quite	depressed
		12th set		
-/-	Wkrótce po śmierci matki okazało się, że jego ojciec jest śmiertelnie	chory	Soon after his mother died, he found out that his father was terminally	ill
-/+*	Wkrótce po śmierci matki okazało się, że jego ojciec jest śmiertelnie	zrelaksowany	Soon after his mother died, he found out that his father was terminally	relaxed
+/+	Po masażu jej skóra była gładka i delikatna a umysł	zrelaksowany	After the massage her skin was smooth and delicate, and her mind	relaxed
+/-*	Po masażu jej skóra była gładka i delikatna a umysł	chory	After the massage her skin was smooth and delicate, and her mind	ill

0/-	Kiedy Czarek był na wyjeździe dowiedział się, że jego żona jest	chora	When Charles was away he learnt that his wife was	ill
0/+*	Kiedy Czarek był na wyjeździe dowiedział się, że jego żona jest	zrelaksowana	When Charles was away he learnt that his wife was	relaxed
0/+	Na samą myśl o weekendzie wolnym od pracy, Oliwia czuje się	zrelaksowana	At the very thought of a weekend free from work Olivia feels	relaxed
0/-*	Na samą myśl o weekendzie wolnym od pracy, Oliwia czuje się	chora	At the very thought of a weekend free from work Olivia feels	ill
		13th set		
-/-	Dla sierot świat może wydawać się zły i	okrutny	To orphans, the world may seem evil and	cruel
-/+*	Dla sierot świat może wydawać się zły i	niesamowity	To orphans, the world may seem evil and	incredible
+/+	Jej ciepły głos oraz znakomite aranżacje utworów sprawiają, że jej album jest	niesamowity	Her warm voice and amazing song arrangements make her album	incredible
+/-*	Jej ciepły głos oraz znakomite aranżacje utworów sprawiają, że jej album jest	okrutny	Her warm voice and amazing song arrangements make her album	cruel
0/-	Coraz częściej ludzie traktują zwierzęta w sposób	okrutny	More and more often the way in which people treat animals is	cruel
0/+*	Coraz częściej ludzie traktują zwierzęta w sposób	niesamowity	More and more often the way in which people treat animals is	incredible
0/+	Pokaz sztucznych ogni podczas tegorocznego festiwalu był	niesamowity	The fireworks display at this year's festival was	incredible
0/-*	Pokaz sztucznych ogni podczas tegorocznego festiwalu był	okrutny	The fireworks display at this year's festival was	cruel
		14th set		
-/-	Zdjęcie ukazujące reportera wojennego trzymającego umierające dziecko było	okropne	The picture showing a war correspondent holding a dying child was	terrible
-/+*	Zdjęcie ukazujące reportera wojennego trzymającego umierające dziecko było	radosne	The picture showing a war correspondent holding a dying child was	joyful
+/+	W końcu zrobiło się ciepło i przyjemnie, więc Oliver był	radosny	The weather finally turned nice and warm, which made him feel	joyful
+/-*	W końcu zrobiło się ciepło i przyjemnie, więc Oliver był	okropny	The weather finally turned nice and warm, which made him feel	terrible
0/-	Udało się jej dotrzeć do domu, ale warunki pogodowe były	okropne	She got back home but the weather conditions were	terrible
0/+*	Udało się jej dotrzeć do domu, ale warunki pogodowe były	radosne	She got back home but the weather conditions were	joyful
0/+	Za każdym razem, gdy dziecko zobaczy kukiełkę, jego reakcja jest	radosna	Whenever a child sees a puppet, its reaction is	joyful
0/-*	Za każdym razem, gdy dziecko zobaczy kukiełkę, jego reakcja jest	okropna	Whenever a child sees a puppet, its reaction is	terrible
		15th set		
-/-	Umierająca Monika dowiedziała się, że jej okropny mąż był	niewierny	Dying Pamela heard that her nasty husband was	unfaithful
-/+*	Umierająca Monika dowiedziała się, że jej okropny mąż był	cudowny	Dying Pamela heard that her nasty husband was	wonderful

+/+	Odkąd urodziły im się urocze bliźniaki, ich życie stało się bogatsze i	cudowne	Since they had adorable twins, their lives are rich and	wonderful
+/-*	Odkąd urodziły im się urocze bliźniaki, ich życie stało się bogatsze i	niewierne	Since they had adorable twins, their lives are rich and	unfaithful
0/-	Po tym, co usłyszał, Wojtek nie mógł uwierzyć, że jego żona była	niewierna	After hearing all that, he couldn't believe his wife was	unfaithful
0/+*	Po tym, co usłyszał, Wojtek nie mógł uwierzyć, że jego żona była	cudowna	After hearing all that, he couldn't believe his wife was	wonderful
0/+	Widok starszego małżeństwa trzymającego się za ręce jest	cudowny	The sight of an elderly couple holding hands is	wonderful
0/-*	Widok starszego małżeństwa trzymającego się za ręce jest	niewierny	The sight of an elderly couple holding hands is	unfaithful

16th set

-/-	Budynek runął ujawniając martwych więźniów, którzy byli	torturowani	The building collapsed uncovering dead prisoners who had been	tortured
-/+*	Budynek runął ujawniając martwych więźniów, którzy byli	dumni	The building collapsed uncovering dead prisoners who had been	proud
+/+	Henryk ma śliczne i zdolne dzieci, które sprawiają, że czuje się	dumny	Henry has lovely and talented children who make him feel	proud
+/-*	Henryk ma śliczne i zdolne dzieci, które sprawiają, że czuje się	torturowany	Henry has lovely and adorable children who make him feel	tortured
0/-	Bracia Elizy znają każdy szczegół tego jak była	torturowana	Her brothers know every detail of how she was	tortured
0/+*	Bracia Elizy znają każdy szczegół tego jak była	dumna	Her brothers know every detail of how she was	proud
0/+	Po tym jak Hani udało się go przekonać, czuła się naprawdę	dumna	When she convinced him, Gabby felt really	proud
0/-*	Po tym jak Hani udało się go przekonać, czuła się naprawdę	torturowana	When she convinced him, Gabby felt really	tortured

17th set

-/-	AIDS zrujnowało mu życie towarzyskie i do samego końca czuł się	samotny	AIDS diagnosis ruined his social life and at the very end he felt	lonely
-/+*	AIDS zrujnowało mu życie towarzyskie i do samego końca czuł się	zadowolony	AIDS diagnosis ruined his social life and at the very end he felt	satisfied
+/+	Pyszny posiłek w towarzystwie najbliższych sprawił, że Sławek był	zadowolony	Delicious meals in the company of his loved ones made him feel	satisfied
+/-*	Pyszny posiłek w towarzystwie najbliższych sprawił, że Sławek był	samotny	Delicious meals in the company of his loved ones made him feel	lonely
0/-	Maja kupiła sobie psa, ponieważ nie chciała czuć się	samotna	Gwen bought a dog so that she wouldn't feel	lonely
0/+*	Maja kupiła sobie psa, ponieważ nie chciała czuć się	zadowolona	Gwen bought a dog so that she wouldn't feel	satisfied
0/+	To nowe urządzenie sprawi, że z pewnością będziecie	zadowoleni	This new device will certainly keep you	satisfied
0/-*	To nowe urządzenie sprawi, że z pewnością będziecie	samotni	This new device will certainly keep you	lonely

18th set

-/-	W obozie koncentracyjnym pozbawiono go wolności i był	maltretowany	In the concentration camp, he was deprived of freedom and	abused
-/+*	W obozie koncentracyjnym pozbawiono go wolności i był	uroczy	In the concentration camp, he was deprived of freedom and	adorable
+/+	Kaja jest przeszczęśliwa, ponieważ dostała szczeniaczka, który jest	uroczy	Vanessa is overjoyed because the puppy she was given is	adorable
+/-*	Kaja jest przeszczęśliwa, ponieważ dostała szczeniaczka, który jest	maltretowany	Vanessa is overjoyed because the puppy she was given is	abused
0/-	Jej rodzice nigdy się nie dowiedzieli, że ich córka była	maltretowana	Her parents never found out that her daughter was	abused
0/+*	Jej rodzice nigdy się nie dowiedzieli, że ich córka była	urocza	Her parents never found out that her daughter was	adorable
0/+	Ten mały hotel w bocznej uliczce jest niezwykle	uroczy	This small hotel in a back street is absolutely	adorable
0/-*	Ten mały hotel w bocznej uliczce jest niezwykle	maltretowany	This small hotel in a back street is absolutely	abused

19th set

-/-	Kiedy wystrzelił z broni, przechodzący obok chłopiec został	zabity	When he fired the gun, a boy passing by was	killed
-/+*	Kiedy wystrzelił z broni, przechodzący obok chłopiec został	magiczny	When he fired the gun, a boy passing by was	magical
+/+	Chwila, w której pocałowali się o zachodzie słońca była	magiczna	The moment when they kissed at sunset was	magical
+/-*	Chwila, w której pocałowali się o zachodzie słońca była	zabita	The moment when they kissed at sunset was	killed
0/-	Pozostaje tajemnicą, w jaki sposób ci dwaj mężczyźni zostali	zabici	It remains a mystery how those two men were	killed
0/+*	Pozostaje tajemnicą, w jaki sposób ci dwaj mężczyźni zostali	magiczni	It remains a mystery how those two men were	magical
0/+	Jego przedstawienia sprawiają, że doznania widza są	magiczne	When he performs, he makes one's experience truly	magical
0/-*	Jego przedstawienia sprawiają, że doznania widza są	zabite	When he performs, he makes one's experience truly	killed

20th set

-/-	Złośliwy rak kości uświadomił mu, że jest	umierający	Aggressive bone cancer made him realize that he was	dying
-/+*	Złośliwy rak kości uświadomił mu, że jest	spokojny	Aggressive bone cancer made him realize that he was	peaceful
+/+	Jej kochający mąż sprawia, że Maja czuje się szczęśliwa i	spokojna	Lisa's loving husband makes her feel happy and	peaceful
+/-*	Jej kochający mąż sprawia, że Maja czuje się szczęśliwa i	umierająca	Lisa's loving husband makes her feel happy and	dying
0/-	Wojtek nie powinien podróżować, kiedy jego matka jest	umierająca	Thomas should not be travelling while his mother is	dying
0/+*	Wojtek nie powinien podróżować, kiedy jego matka jest	spokojna	Thomas should not be travelling while his mother is	peaceful
0/+	Norbert często wybiera się do domu w górach by poczuć się	spokojnym	Jack often goes to his house in the mountains to feel	peaceful
0/-*	Norbert często wybiera się do domu w górach by poczuć się	umierającym	Jack often goes to his house in the mountains to feel	dying

21st set

-/-	Po tym jak pogrzebano zwłoki, to boisko wciąż było	zakrwawione	After the bodies were buried, the field was still	bloody
-/+*	Po tym jak pogrzebano zwłoki, to boisko wciąż było	przepyszne	After the bodies were buried, the field was still	delicious
+/+	Ciasto czekoladowe przygotowane na tę wyjątkową okazję było	przepyszne	The chocolate cake made for this special occasion was	delicious
+/-*	Ciasto czekoladowe przygotowane na tę wyjątkową okazję było	zakrwawione	The chocolate cake made for this special occasion was	bloody
0/-	Kiedy Bartek wydmuchał nos zauważył, że chusteczka była	zakrwawiona	James blew his nose and noticed that the tissue was	bloody
0/+*	Kiedy Bartek wydmuchał nos zauważył, że chusteczka była	przepyszna	James blew his nose and noticed that the tissue was	delicious
0/+	Sałatka, którą Arek przygotował na kolację była naprawdę	przepyszna	The salad Nick made for supper was really	delicious
0/-*	Sałatka, którą Arek przygotował na kolację była naprawdę	zakrwawiona	The salad Nick made for supper was really	bloody
		22nd set		
-/-	Tsunami zniszczyło miasto i obecnie wielu ludzi jest	bezdomnych	A tsunami destroyed the city and currently many people are	homeless
-/+*	Tsunami zniszczyło miasto i obecnie wielu ludzi jest	doskonałych	A tsunami destroyed the city and currently many people are	perfect
+/+	On jest w niej szalenie zakochany, więc cokolwiek ona ugotuje jest	doskonałe	He is crazy in love with her, so whatever she cooks is	perfect
+/-*	On jest w niej szalenie zakochany, więc cokolwiek ona ugotuje jest	bezdomne	He is crazy in love with her, so whatever she cooks is	homeless
0/-	Dorota opiekuje się dziećmi, które stały się	bezdomne	Jessica looks after children that have become	homeless
0/+*	Dorota opiekuje się dziećmi, które stały się	doskonałe	Jessica looks after children that have become	perfect
0/+	Kiedy Agnieszka ukończyła lekcje śpiewu, jej głos był	doskonały	When Sophie finished her singing classes her voice was	perfect
0/-*	Kiedy Agnieszka ukończyła lekcje śpiewu, jej głos był	bezdomny	When Sophie finished her singing classes her voice was	homeless
		23rd set		
-/-	Igor wpadł pod samochód i wskutek wypadku jest	niepełnosprawny	He was run over by a car, and because of the accident he is	disabled
-/+*	Igor wpadł pod samochód i wskutek wypadku jest	pomyślny	He was run over by a car, and because of the accident he is	successful
+/+	Zdobycie mistrzostwa świata oraz medalu olimpijskiego pokazuje, że jego sezon był	pomyślny	Winning the world championship and the Olympic medal shows that his season was	successful
+/-*	Zdobycie mistrzostwa świata oraz medalu olimpijskiego pokazuje, że jego sezon był	niepełnosprawny	Winning the world championship and the Olympic medal shows that his season was	disabled
0/-	Kiedy Irek otworzył oczy, pielęgniarka powiedziała mu, że pozostanie	niepełnosprawny	When Adrian woke up, the nurse told him he would remain	disabled
0/+*	Kiedy Irek otworzył oczy, pielęgniarka powiedziała mu, że pozostanie	pomyślny	When Adrian woke up, the nurse told him he would remain	successful
0/+	Pierwszy w karierze występ zespołu na tym festiwalu był	pomyślny	The band’s first ever performance at the festival was	successful

0/-*	Pierwszy w karierze występ zespołu na tym festiwalu był	niepełnosprawny	The band's first ever performance at the festival was	disabled
		24th set		
-/-	Kiedy Ada go zdradziła, czuł się upokorzony i	zraniony	When Ada cheated on him, he felt humiliated and	hurt
-/+*	Kiedy Ada go zdradziła, czuł się upokorzony i	uratowany	When Ada cheated on him, he felt humiliated and	rescued
+/+	Dzięki pomocy mieszkańców ten śliczny owczarek został odnaleziony i	uratowany	Thanks to the inhabitants' help, this beautiful sheepdog was found and	rescued
+/-*	Dzięki pomocy mieszkańców ten śliczny owczarek został odnaleziony i	zranione	Thanks to the inhabitants' help, this beautiful sheepdog was found and	hurt
0/-	Lwica opiekuje się swoimi młodymi by żaden nie został	zraniony	A lioness looks after her cubs so that none get	hurt
0/+*	Lwica opiekuje się swoimi młodymi by żaden nie został	uratowany	A lioness looks after her cubs so that none get	rescued
0/+	Świat wstrzymał oddech do chwili, w której Justyna została	uratowana	The world held its breath until Jessica was	rescued
0/-*	Świat wstrzymał oddech do chwili, w której Justyna została	zraniona	The world held its breath until Jessica was	hurt
		25th set		
-/-	Po tym jak toksyczny kwas prysnął mu w oczy, Bartek stał się	niewidomy	After toxic acid splashed into his eyes, Joe became	blind
-/+*	Po tym jak toksyczny kwas prysnął mu w oczy, Bartek stał się	błyskotliwy	After toxic acid splashed into his eyes, Joe became	brilliant
+/+	Marek ma doskonałe poczucie humoru, jest inteligentny i	błyskotliwy	He has an excellent sense of humour, he is intelligent and	brilliant
+/-*	Marek ma doskonałe poczucie humoru, jest inteligentny i	niewidomy	He has an excellent sense of humour, he is intelligent and	blind
0/-	Krzysiek musiał od nowa przystosować się rzeczywistości po tym jak został	niewidomy	He had to adapt to his new reality after he became	blind
0/+*	Krzysiek musiał od nowa dostosować się rzeczywistości po tym jak został	błyskotliwy	He had to adapt to his new reality after he became	brilliant
0/+	Pomysł studentów na zaliczenie egzaminu był naprawdę	błyskotliwy	The students' idea to pass the test was really	brilliant
0/-*	Pomysł studentów na zaliczenie egzaminu był naprawdę	niewidomy	The students' idea to pass the test was really	blind
		26th set		
-/-	Puszczanie dzieci samych nad zamarzniętą rzekę jest nieodpowiedzialne i	głupie	Letting children go to the frozen river alone is irresponsible and	foolish
-/+*	Puszczanie dzieci samych nad zamarzniętą rzekę jest nieodpowiedzialne i	ciepłe	Letting children go to the frozen river alone is irresponsible and	warm
+/+	W święta bożego narodzenia atmosfera w domu jest bardzo rodzinna i	ciepła	During Christmas, the atmosphere at home is very familial and	warm
+/-*	W święta bożego narodzenia atmosfera w domu jest bardzo rodzinna i	głupia	During Christmas, the atmosphere at home is very familial and	foolish
0/-	Ktokolwiek wpadł na pomysł by	głupi	Whoever came up with the idea to	foolish

	wypuścić go na wolność jest		set him free is	
0/+*	Ktokolwiek wpadł na pomysł by wypuścić go na wolność jest	ciepły	Whoever came up with the idea to set him free is	warm
0/+	Tej nocy niebo było czyste a wiejący wiatr	ciepły	That night the sky was clear and the breeze was	warm
0/-*	Tej nocy niebo było czyste a wiejący wiatr	głupi	That night the sky was clear and the breeze was	foolish
		27th set		
-/-	Sylwek został kilkukrotnie uderzony kijem bejsbolowym, po czym padł	nieprzytomny	After Dan was repeatedly hit with a baseball bat, he fell	unconscious
-/+*	Sylwek został kilkukrotnie uderzony kijem bejsbolowym, po czym padł	beztroski	After Dan was repeatedly hit with a baseball bat, he fell	carefree
+/+	Kiedy Renia ukończyła uniwersytet, czuła się szczęśliwa i	beztroska	When Renee graduated, she felt cheerful and	carefree
+/-*	Kiedy Renia ukończyła uniwersytet, czuła się szczęśliwa i	nieprzytomna	When Renee graduated, she felt cheerful and	unconscious
0/-	Tomek często wspomina lata dzieciństwa, które były tak	beztroskie	Jacob often recalls his childhood years which were so	carefree
0/+*	Tomek często wspomina lata dzieciństwa, które były tak	nieprzytomne	Jacob often recalls his childhood years which were so	unconscious
0/+	Kiedy pielęgniarka weszła do jego pokoju, Karol był	nieprzytomny	When Carl's nurse entered his room, he was	unconscious
0/-*	Kiedy pielęgniarka weszła do jego pokoju, Karol był	beztroski	When Carl's nurse entered his room, he was	carefree
		28th set		
-/-	Kontakt dzieci z przemocą i nadużyciami sprawia, że stają się	agresywne	Exposure to violence and abuse makes children	aggressive
-/+*	Kontakt dzieci z przemocą i nadużyciami sprawia, że stają się	inteligentne	Exposure to violence and abuse makes children	intelligent
+/+	Bogata więź emocjonalna z rodzicami sprawia, że dzieci stają się bardziej	inteligentne	A rich emotional bond with parents makes children more	intelligent
+/-*	Bogata więź emocjonalna z rodzicami sprawia, że dzieci stają się bardziej	agresywne	A rich emotional bond with parents makes children more	aggressive
0/-	Helena unika kontaktu z psem sąsiada, ponieważ jest	agresywny	Helen stays clear of the neighbour's dog, because it is	aggressive
0/+*	Helena unika kontaktu z psem sąsiada, ponieważ jest	inteligentny	Helen stays clear of the neighbour's dog, because it is	intelligent
0/+	Jaśmina gra w szachy od szóstego roku życia, musi więc być bardzo	inteligentna	Yasmin already played chess when she was six, so she has to be very	intelligent
0/-*	Jaśmina gra w szachy od szóstego roku życia, musi więc być bardzo	agresywna	Yasmin already played chess when she was six, so she has to be very	aggressive
		29th set		
-/-	Widok uwięzionego w płonącym samochodzie kierowcy był	tragiczny	The image of the driver trapped in a burning car was	tragic
-/+*	Widok uwięzionego w płonącym samochodzie kierowcy był	fascynujący	The image of the driver trapped in a burning car was	exciting
+/+	Moment przyznania Damianowi złotego medalu w pływaniu był	fascynujący	The moment when Kevin was awarded a gold medal in swimming was	exciting

+/-*	Moment przyznania Damianowi złotego medalu w pływaniu był	tragiczny	The moment when Kevin was awarded a medal in swimming was	tragic
0/-	Los dzieci pozostawionych samym sobie może być	tragiczny	The fate of children left on their own can be	tragic
0/+*	Los dzieci pozostawionych samym sobie może być	fascynujący	The fate of children left on their own can be	exciting
0/+	Widoki, których można doświadczyć podczas skoku ze spadochronem są	fascynujące	The views that one can experience while skydiving are	exciting
0/-*	Widoki, których można doświadczyć podczas skoku ze spadochronem są	tragiczne	The views that one can experience while skydiving are	tragic
		30th set		
-/-	Wkrótce po tym jak zmuszono Emilie by dokonała aborcji miała myśli	samobójcze	Soon after she was forced to have an abortion, Charlotte was	suicidal
-/+*	Wkrótce po tym jak zmuszono Emilie by dokonała aborcji miała myśli	erotyczne	Soon after she was forced to have an abortion, Charlotte was	erotic
+/+	Obrazy Rubensa ukazujące kobiety o bujnych kształtach są wciąż zmysłowe i	erotyczne	Rubens' paintings depicting voluptuous women are still sensual and	erotic
+/-*	Obrazy Rubensa ukazujące kobiety o bujnych kształtach są wciąż zmysłowe i	samobójcze	Rubens' paintings depicting voluptuous women are still sensual and	suicidal
0/-	Jego próba przeprawienia się przez Saharę była	samobójcza	His attempt to cross the Sahara desert was	suicidal
0/+*	Jego próba przeprawienia się przez Saharę była	erotyczna	His attempt to cross the Sahara desert was	erotic
0/+	Sny w okresie dojrzewania mają często lekkie zabarwienie	erotyczne	Dreams in the period of adolescence are often slightly	erotic
0/-*	Sny w okresie dojrzewania mają często lekkie zabarwienie	samobójcze	Dreams in the period of adolescence are often slightly	suicidal
		31st set		
-/-	Kombatanci są ignorowani i często stają się niedocenieni i	biedni	Veterans are ignored and often become undervalued and	poor
-/+*	Kombatanci są ignorowani i często stają się niedocenieni i	piękni	Veterans are ignored and often become undervalued and	beautiful
+/+	65 rocznica ich ślubu była wyjątkowa i	piękna	The 65th anniversary of their marriage was special and	beautiful
+/-*	65 rocznica ich ślubu była wyjątkowa i	biedna	The 65th anniversary of their marriage was special and	poor
0/-	Podróż do Afryki uświadomiła mu, co to znaczy być	biednym	The trip to Africa made him realize what it meant to be	poor
0/+*	Podróż do Afryki uświadomiła mu, co to znaczy być	pięknym	The trip to Africa made him realize what it meant to be	beautiful
0/+	To obecność przyjaciół sprawia, że jej życie jest	piękne	It is the presence of her friends that makes her life	beautiful
0/-*	To obecność przyjaciół sprawia, że jej życie jest	biedne	It is the presence of her friends that makes her life	poor
		32nd set		
-/-	Po wypadku na motocyklu, Jarek był nieprzytomny i	sparaliżowany	After a motorbike accident, Gary was unconscious and	paralyzed
-/+*	Po wypadku na motocyklu, Jarek był nieprzytomny i	znakomity	After a motorbike accident, Gary was unconscious and	excellent

+/+	Jakość tych świeżych i pachnących kwiatów jest	znakomita	The quality of these fresh and fragrant flowers is	excellent
+/-*	Jakość tych świeżych i pachnących kwiatów jest	sparaliżowana	The quality of these fresh and fragrant flowers is	paralyzed
0/-	Jeżeli nie znajdą odpowiedniego fizjoterapeuty, Gabriel może być	sparaliżowany	If they don't find the right physiotherapist, Gabriel may be	paralyzed
0/+*	Jeżeli nie znajdą odpowiedniego fizjoterapeuty, Gabriel może być	znakomity	If they don't find the right physiotherapist, Gabriel may be	excellent
0/+	Jakość jedzenia oraz obsługi w tej restauracji jest	znakomita	The quality of food and service in the restaurant is	excellent
0/-*	Jakość jedzenia oraz obsługi w tej restauracji jest	sparaliżowana	The quality of food and service in the restaurant is	paralyzed

33rd set

-/-	Widok porzuconego, głodnego i przywiązanego do drzewa psa był	straszny	The sight of an abandoned and hungry dog tied to a tree was	awful
-/+*	Widok porzuconego, głodnego i przywiązanego do drzewa psa był	przyjemny	The sight of an abandoned and hungry dog tied to a tree was	pleasurable
+/+	Filiżanka herbaty w towarzystwie jego ukochanej babci jest zawsze	przyjemna	A cup of tea with his lovely grandmother is always	pleasurable
+/-*	Filiżanka herbaty w towarzystwie jego ukochanej babci jest zawsze	straszna	A cup of tea with his lovely grandmother is always	awful
0/-	Wiola jest wegetarianką i uważa, że jedzenie mięsa jest	straszne	Lucy is a vegetarian and thinks that eating meat is	awful
0/+*	Wiola jest wegetarianką i uważa, że jedzenie mięsa jest	przyjemne	Lucy is a vegetarian and thinks that eating meat is	pleasurable
0/+	Pływanie łódką po spokojnej rzece jest zawsze	przyjemne	Rowing a boat on a calm river is always	pleasurable
0/-*	Pływanie łódką po spokojnej rzece jest zawsze	straszne	Rowing a boat on a calm river is always	awful

34th set

-/-	Kiedy Daria go okłamała i zawiodła jego zaufanie, Darek poczuł się	rozczarowany	When Eva lied and betrayed his trust, Daryl felt	disappointed
-/+*	Kiedy Daria go okłamała i zawiodła jego zaufanie, Darek poczuł się	szczery	When Eva lied and betrayed his trust, Daryl felt	honest
+/+	To, co jest w Gosi cudownego to fakt, że jest autentyczna i	szczera	What is lovely about Thea is that she is genuine and	honest
+/-*	To, co jest w Gosi cudownego to fakt, że jest autentyczna i	rozczarowana	What is lovely about Thea is that she is genuine and	disappointed
0/-	Po tym jak Kora nie odprowadziła go na lotnisko, Marek czuł się	rozczarowany	When Shelby didn't see him off at the airport, Mark felt	disappointed
0/+*	Po tym jak Kora nie odprowadziła go na lotnisko, Marek czuł się	szczery	When Shelby didn't see him off at the airport, Mark felt	honest
0/+	Mówienie prawdy nie jest łatwe, ale warto spróbować i być	szczerym	Telling the truth isn't easy, but it's important to try and be	honest
0/-*	Mówienie prawdy nie jest łatwe, ale warto spróbować i być	rozczarowanym	Telling the truth isn't easy, but it's important to try and be	disappointed

35th set

-/-	W skutek zanieczyszczenia oraz powodzi, miasto było	skażone	Because of pollution and flooding, the town was	infected
-/+*	W skutek zanieczyszczenia oraz powodzi, miasto było	miłe	Because of pollution and flooding, the town was	kind

+/+	Mama Mateusza myśli, że jego dziewczyna jest śliczna, inteligentna i	miła	Matthew's mom thinks his girlfriend is pretty, intelligent and	kind
+/-*	Mama Mateusza myśli, że jego dziewczyna jest śliczna, inteligentna i	skażona	Matthew's mom thinks his girlfriend is pretty, intelligent and	infected
0/-	Wstępna analiza próbki mięsa wykazała, że mięso jest	skażone	The initial analysis of the meat sample showed that it was	infected
0/+*	Wstępna analiza próbki mięsa wykazała, że mięso jest	miłe	The initial analysis of the meat sample showed that it was	kind
0/+	Natalia nie spodziewała się, że jej sąsiedzi będą tacy	mili	Natalie didn't expect her neighbours to be that	kind
0/-*	Natalia nie spodziewała się, że jej sąsiedzi będą tacy	skażeni	Natalie didn't expect her neighbours to be that	infected