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Irony processing in the native and non-
native language in Polish-English
bilinguals: Evidence from event-related
potentials

Przetwarzanie ironii w języku ojczystym
oraz obcym polsko-angielskich
dwujęzycznych: Badanie z
wykorzystaniem potencjałów
wywołanych zdarzeniem

Rozprawa doktorska napisana

na Wydziale Anglistyki

Uniwersytetu im. Adama Mickiewicza w Poznaniu

pod kierunkiem prof. UAM dr hab. Katarzyny Bromberek-Dyzman

i dr Rafała Jończyka

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OŚWIADCZENIE

Ja, niżej podpisany/a

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Jednocześnie przyjmuję do wiadomości, że gdyby powyższe oświadczenie okazało się nieprawdziwe, decyzja o wydaniu mi dyplomu zostanie cofnięta.

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.....
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(czytelny podpis)

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Introduction

Communicating meaning implicitly constitutes the backbone of verbal irony. In this dissertation I intend to present the phenomenon of verbal irony and analyze how it has been conceptualized in prior research. Historically, irony was considered a figure of speech, whereby the ironist says one thing, but intends to communicate the opposite of the literal meaning of their words (Gibbs and Colston 2024). Traditionally, irony was seen as a deviation from the norm, an anomaly, which violated the first maxim of Quality (Do not say what you believe to be false, Grice 1975). Irony is a prominent tool of implicit communication and is used on a daily basis. Gibbs (2000) suggests that since ironic communication accounts for 8% of interactions it may mean that irony is not a special rhetorical device reserved for unusual situations, but a significant tool used to impart blatant and subtle meanings. Speakers use multiple forms of ironic statements such as jocularity, sarcasm, hyperbole, rhetorical questions, and understatement (Gibbs 2000). It has been studied by rhetoricians, linguists, philosophers, literary theorists and psychologists in spoken and textual domains in many areas of everyday life such as political debates, friends' and foes' communication, humor monologs and scholarly as well as workplace interactions. Irony is a cross-disciplinary phenomenon employed in language, painting, photography, film arts, music and bodily expression (Gibbs and Colston 2024). Such a wide range of contexts which adopt an ironic way of expression suggests that irony, being both a linguistic and a cognitive phenomenon, reflects a figurative mode of thinking in people (Gibbs 1994; Gibbs and Colston 2024). One definition, proposed by Gibbs (1994) sees irony as "a situation that contrasts what is expected with what occurs or a statement that contradicts the actual attitude of the speaker." This definition seems like an accurate proposal, in that it addresses two of the main properties of irony, that is emotional attitude and cognitive expectation.

Commonly, ironic statements are classified as conveying either criticism or praise (Caillies et al. 2019). These two attitudes, which naturally, can be expressed literally, in irony employ positive (ironic criticism) or negative (ironic praise) words.

Many theories have been offered to conceptualize the notion of verbal irony. Irony has been conceptualized as an utterance which features two contradictory meanings, the literal and the implicit – the intended one. In addition, the ironic statement was seen as a violation of a conversational maxim (Grice 1975). Irony has been conceptualized as an echoic mention (Sperber and Wilson 1981; Sperber and Wilson 1986), a pretense (Clark and Gerrig 1984), an echoic reminder (Kreuz and Glucksberg 1989), an allusional pretense (Kumon-Nakamura et al. 1995), an utterance which enables the expression of a gap in evaluative perspective (Kotthoff 2003), a statement which conveys an implied reversal of evaluative meaning (Partington 2007), a mental space construct (Kihara 2005), or an utterance which enables the display of an ironic environment (Utsumi 2000). This diversity of approaches to define irony suggests that irony is a complex and multicomponential communicative device. There is some agreement between irony researchers as to one foundational feature of irony, namely, the dichotomy of meanings - incongruity between the ironic comment and the context or the expectations which comprehenders have (Clark and Gerrig 1984; Gerrig and Goldvarg 2000; Grice 1975; Ivanko and Pexman 2003; Kihara 2005; Kotthoff 2003; Kumon-Nakamura et al. 1995; Sperber and Wilson 1981; Sperber and Wilson 1986; Utsumi 2000). Incongruity is a feature of an ironic utterance which comes to fruition when the utterance (signalling a certain thought) conveys a meaning which is contradictory, opposite, or incongruent with the reality that it is embedded in. In this way, the ironist, the speaker who utters the ironic remark, gives vent to their attitude towards a construct. Attitude, indeed, is another instrumental feature of irony. Irony is imbued with a pragmatic meaning, which may carry attitudes, favorable or unfavorable expressions, which is the result of the incongruity of the target comment and the preceding contents (Sperber and Wilson 1981). Specifically, irony enables the speaker to impart an evaluation, that is, communicate an attitude towards a person, an event, or any other kind of stimulus (Sperber and Wilson 1981). When using irony, speakers communicate intentions in an implicit manner, and irony conveys different information from that expressed literally (Dews et al. 1995). Namely, when speaking ironically people intend to be funny, less insulting, in control of their emotions and to avoid hurting their relationship with the person who is the target of the irony (Dews et al. 1995).

Irony is a context-dependent construct. Its recognition and comprehension largely rely on various contextual and extralinguistic features. The success of irony computation depends on the mutual assumptions with which the interlocutors come to the interaction. This construct which ensures a positive outcome of the ironic interaction is called common ground (Averbeck and Hample 2008; Averbeck 2015). Common ground, that is the attitudes, values, beliefs, knowledge and experiences that interlocutors share enable the participants of an ironic interaction to come to an understanding (Kaufer and Neuwirth 1982). Irony is more likely to occur and be entertained between interlocutors in high common ground situations, as compared to low common ground situations (Averbeck and Hample 2008). In addition, irony comprehension is more successful with the knowledge about the speaker's communicative style (Regel et al. 2010a). Finally, given how much context dependent irony is, the knowledge of the world should also have an influence on irony processing. Previous research has not addressed the knowledge of the world in irony processing per se. However, due to the fact that the understanding of some of ironic statements draws upon social norms, it appears that the knowledge about the social norms that ironists refer to should be necessary to properly acknowledge, interpret, and enjoy ironic remarks. This leads us to the discussion of language processing interactive models (Gibbs 1986; Gibbs 1994; Gildea and Glucksberg 1983; Katz et al. 2004; Long and Graesser 1988). Irony processing is a complex undertaking as language processing models posit. Many communicative features such as speaker gender, socio-cultural characteristics, social norms need to be recognized, processed and integrated with the verbal contents. (Katz et al. 2004).

For many years irony research has been concerned with the temporal dynamics of irony comprehension. Specifically, researchers have been interested in whether irony takes longer to process than the literal meaning (Dews and Winner 1999; Gibbs 1986; Giora 1997; Giora and Fein 1999a; Giora and Fein 1999b; Giora et al. 1998; Kreuz and Link 2002). Some evidence suggests that irony comprehension takes longer to read than literal meaning (Giora and Fein 1999a; Giora and Fein 1999b; Giora et al. 1998), while other evidence shows that irony may be read as fast or faster than literal meaning (Gibbs 1986; Kreuz and Link 2002). Prior research aiming at exploring the mechanisms underpinning irony comprehension focused on the serial aspect of the process. Thus, researchers investigated irony with a view to disambiguating whether irony, as a type of figurative meaning, is computed in a one- or a two-stage process. In addition, a great deal of scientific attention has concerned the question of whether ironic meaning is more demanding to process than

literal meaning. These two approaches, advocating a one- or a two-stage process, have been formulated as two distinct models. *The Graded Salience Hypothesis* (Giora 1997; Giora and Fein 1999a; Giora and Fein 1999b; Giora et al. 1998) proposes that irony comprehension involves processing of both literal and ironic meanings. This is because, in irony, the literal meaning is salient while the intended, ironic meaning is non-salient. Salient meanings, that is conventional, frequent, familiar and enriched by preceding context are processed before the non-salient ones (unconventional, unfamiliar and decontextualized; Giora 1997). The literal meaning of an ironic utterance, being coded in the mental lexicon must obligatorily be processed, before processing the intended, ironic meaning. *The Direct Access Model* (Gibbs 1986; Gibbs 1994) proposes that the literal meaning of ironic utterances does not have to be processed first in order to arrive at the ironic interpretation. In fact, comprehenders can quickly arrive at the intended ironic interpretation in some contexts. The key to understanding irony according to this model (*the Direct Access Model*, Gibbs 1986; Gibbs 1994) is to recognize that ironic statements invoke positive social norms (i.e., those which build on cooperation). What is more, Gibbs (1994) argues that irony is not a rhetorical device, but “a natural mode of thinking about the world and our experience.” In this way, irony can be understood as a part of the figurative foundation of thinking. Gibbs (1994) argues that irony reflects the manner in which we conceptualize incongruous situations, and that this drives our cognition towards figurative modes of thinking, but the available evidence is inconclusive. Specifically, a great body of research investigated the processing differences between literal and ironic meaning (Deliens et al. 2018; Filik and Moxey 2010; Giora and Fein 1999b; Giora et al. 1998; Giora et al. 2007; Kaakinen et al. 2014; Turçan and Filik 2016). Some studies have found that irony processing is more difficult and is processed longer than literal meaning, suggesting that irony comprehension is effortful (Giora and Fein 1999b; Giora et al. 1998). Other studies suggest that, depending on the context, irony processing can be facilitated relative to literal meaning (Gibbs 1986; Kreuz and Link 2002). This is more nuanced than it seems at first glance. The divergent results may be due to methodological differences in the experimental designs and the way irony is conceptualized. It turns out that when we study irony by comparing literal and non-literal meaning, irony tends to be more effortful than literalness. Namely, it takes more time to read or respond to literal than ironic meaning (Giora and Fein 1999b; Giora et al. 1998; Giora et al. 2007). Note, however, that these studies mostly compared two types of meaning - literal praise and ironic criticism. These two types of statements feature the same, positively va-

lenced, words (e.g., literal praise: *Such a beautiful day*, said on a warm, sunny, cloudless day; ironic criticism: *Such a beautiful day*, said on a cold, rainy, gloomy day). When these were compared, irony (criticism) was invariably processed longer than literalness (praise).

Another line of research extended the scope of ironic meanings investigation and compared two types of verbal irony (ironic criticism, ironic praise) with their literal equivalents (literal praise, literal criticism), thus involving a more nuanced representation of meanings involving positive and negative valence (Dews and Winner 1999; Kreuz and Link 2002; Gibbs 1986). This approach allowed to make more fine-grained observations and found that under certain circumstances ironic criticism comprehension may be facilitated (faster, easier) compared to literal criticism and the other, less frequent, and more difficult type of irony - ironic praise. Therefore, it seems essential to further explore irony in its wider scope of meanings. Precisely, apart from ironic criticism, research should also test ironic praise and juxtapose them with their literal meaning equivalents. The mixed results may be taken to demonstrate that the manner of conceptualization of verbal irony, whether as one of the two alternatives in a literal / non-literal dichotomy, predominantly positively worded, or one of a broader range of statement types, positively or negatively worded, with positive and negative literal equivalents, influences the obtained patterns of results, and plays a pivotal role in their interpretation, and the conclusions on the nature of irony drawn. In the present dissertation I present a comprehensive review of irony research which conceptualized irony in those different ways and report my original research that investigates the processing of ironic criticism, ironic praise, literal criticism, and literal praise using behavioral (reaction times, response accuracy) and neurophysiological measures. While the reaction times or response accuracy provide important insights into participants' performance in the experiment, these measures are not capable of tracking the temporal dynamics of meaning comprehension. To this end, researchers have started to adopt a more time sensitive method in studying irony processing – electroencephalography (EEG) (Caffarra et al. 2019; Caillies et al. 2019; Cornejo et al. 2007; Filik et al. 2014; Regel and Gunter 2017; Regel et al. 2010a; Regel et al. 2010b; Shi and Li 2022; Spotorno et al. 2013; Weissman and Tanner 2018). First of all, this method provides unrivalled temporal resolution and allows for a millisecond-level precision in tracking brain activity in real time. In this way, EEG is advantageous compared to behavioral measures which can only provide a delayed response influenced by the apparatus or other sources (e.g. the time it takes to press a key). Secondly, EEG enables the experimenters to investigate processes that cannot be captured

by studying overt behavior (e.g., unconscious processes, shifts of attention, error detection, stage-related aspects of processing). Thirdly, EEG allows us to observe the dynamics of our cognition in real time. Specifically, with the use of EEG we are able to precisely track brain reactions over time and categorize them as responses to a particular stimulus. For all these reasons, studying EEG dynamics of irony processing may offer a better understanding of the underlying cognitive mechanisms. Here, I present an electrophysiological experiment investigating irony processing that will offer a more direct insight into how the brain processes the explicit and the implicit contents in irony.

Previous EEG research in irony processing has primarily focused on analyzing three event-related potentials (ERPs) – time-domain averages of brain activity in response to a stimulus (e.g., a critical word in a sentence) - P200 (reflecting higher-order perceptual processing and attentional mechanisms), N400 (reflecting lexico-semantic processing) and P600/LPP (reflecting meaning reanalysis and reallocation of attention). Studies show that irony elicits increased amplitudes of P200 (Regel and Gunter 2017; Regel et al. 2010a; Weissman and Tanner 2018), N400 (Cornejo et al. 2007; Shi and Li 2022; Filik et al. 2014) and P600/LPP (Cornejo et al. 2007; Regel et al. 2010a; Spotorno et al. 2013; Weissman and Tanner 2018) compared to literal meaning. The available evidence suggests that irony may require early semantic access retrieval of the word meaning (Regel and Gunter 2017) and attentional resources when speaker-specific information is presented, as attested by increased P200 amplitudes. Some evidence shows that larger N400 amplitudes elicited by irony may reflect more effortful semantic processing or contextual incongruity processing difficulty (Cornejo et al. 2007; Shi and Li 2022; Filik et al. 2014). Yet, the ERP component most commonly studied in irony processing research is P600/LPP. The irony modulations of this late potential most probably reflect pragmatic inferential processes (Regel and Gunter 2017; Regel et al. 2010a; Spotorno et al. 2013) or meaning reanalysis (Regel and Gunter 2017). What is more, the processing patterns of ironic praise and ironic criticism differ. Matched for word valence, ironic praise may be more difficult to process than literal criticism, but ironic criticism may be easier than literal praise as observed on the N400 amplitude (Caillies et al. 2019). Moreover, at the later stage (P600), ironic criticism may require additional processing resources compared to literal praise, in the absence of such a necessity in the case of ironic praise as compared to literal criticism (Caillies et al. 2019). Other evidence suggests that when foreign-accented, ironic praise, but not ironic criticism, is more demanding to understand (Caffarra et al. 2019). EEG provides a whole new range of

possibilities to discover in language processing, previously unrecognizable in behavioral measures. With this project, I would like to gain a better insight into irony and further disambiguate some crucial aspects of this communicative phenomenon. Firstly, I intend to determine how the conceptualization and operationalization of verbal irony, particularly the choices concerning stimulus selection and contextual framing modulate the cognitive and neurocognitive mechanisms of irony processing, thereby advancing theoretical accounts of verbal irony. Secondly, I will investigate the phenomenon of verbal irony processing in the context of bilingualism by comparing native (L1) and non-native (L2) irony processing using a high-temporal resolution electrophysiological method (EEG) enabling precise time-course analyses of the processing differences.

Nowadays, as bilingualism is the norm and the majority of the world's population use two or more languages or dialects (Grosjean 2021), bilingual speakers encounter irony in their native (L1) and non-native (L2) languages on a daily basis. As irony research gradually begins to inquire into bilinguals' L1 and L2 irony understanding it appears that irony processing efficiency may largely depend on individual characteristics such as the level of cognitive maturity, language proficiency or the amount of communicative experience (Bromberek-Dyzman 2024). A constitutive aspect of the present dissertation is the fact that it is focused on irony processing in the bilingual context. In order to make sense of the ironic comments, interpreters must identify and correctly interpret ironic (critical and praising) intentions communicated implicitly in their second language as much as in the native language. This task is expected to be much more demanding in the L2. Research in irony processing in the context of bilingualism provides mixed results. Some studies show that bilinguals process irony similarly in L1 and L2 (Bromberek-Dyzman and Rataj 2016; Bromberek-Dyzman et al. 2010; Bromberek-Dyzman et al. 2021). Other studies suggest that irony processing is less efficient (slower, less accurate) in the L2 (Ellis et al. 2021, Peters et al. 2015). Still, some other studies provide evidence suggesting that under certain circumstances irony processing may be processed more efficiently in L2 compared to L1 when participants are asked to interpret ironic remarks presented auditorily (Bromberek-Dyzman et al. 2021). With this dissertation I hope to contribute to the understanding of how irony is processed depending on the language of operation.

The present dissertation aims at gaining insight into irony processing through employing the electroencephalography. It seeks to systematically explore the valence-related explicit (literal) linguistic contents along with the intended implicit (ironic) contents.

Throughout the course of the present PhD dissertation, I intend to make clear the distinction between the polarity-based lexical valence as communicated by the sentence literal meanings (positive, negative), and the valence of the communicative intention which is behind each ironic (and literal) statement – to praise or to criticize. Some previous research addressed the role of the evaluative aspect of ironic attitudinal (affective) meaning (Bromberek-Dyzman 2014; Dews and Winner 1999; Gibbs 1986). Here, the distinction is further clarified, and the uniqueness of lexical valence and intention valence is emphasized.

In this PhD dissertation I investigate the sophistication of irony encapsulated in the incongruity between the context and the target comment with lexical valence modulating the intended meaning. In addition, the interplay of the context and the target comment creates the underlying outcome of irony – intention valence – the speaker intended meaning. The dissertation offers a novel perspective on the results of irony processing studies. The theoretical literature review in the dissertation has been designed in such a way to reflect the categorization of the studies presented above. Specifically, the evidence from studies testing irony alongside literal meaning is presented first, followed by the evidence from studies introducing the lexical valence-based extension. Finally, the category of intention valence is introduced, and the relevant research is presented.

The study presented here was undertaken to meet two overarching goals. First of all, I intend to broaden our understanding of the nature of irony through exploring the electrophysiological mechanisms of irony processing. Second of all, the goal of the present study is to investigate these mechanisms in L1 and L2 of Polish-English bilinguals to explain whether these mechanisms differ depending on the language of operation. Based on these two major research goals, I also seek to find answers to the following research questions:

- i. Is irony processing more effortful than literal meaning processing?
- ii. Is irony processing more effortful than literal meaning in the native and non-native language?
- iii. Are comments with negatively valenced adjectives (literal criticism, ironic praise) more difficult to process than comments with positively valenced adjectives (literal praise, ironic criticism)?
- iv. Is the lexical-semantic access to negatively valenced meanings impeded in L2 compared to L1?

- v. Is criticism (expressed literally and ironically) processed differently than praise (expressed literally and ironically)?
- vi. Are criticism (expressed literally and ironically) and praise (expressed literally and ironically) processed differently depending on the language of operation?

This dissertation is divided into two main parts. The aim of Part 1: Conceptualizing irony (chapters 1 - 4) is to introduce the phenomenon of irony and present a relevant literature review of extant irony processing studies. Chapter 1 introduces the concept of verbal irony, offers a review of the theories of irony comprehension and presents the role of contextual and extralinguistic features in irony processing. Chapter 2 provides a comprehensive review of irony processing behavioral studies (rating studies, response times, accuracy rates, eye-tracking studies). Chapter 3 provides a description of event-related potentials components analyzed in prior irony processing studies and covers a review of irony processing electrophysiological studies. Chapter 4 introduces the concept of bilingualism and attempts to build a connection between bilingualism, Theory of Mind and executive functions as crucial concepts in irony comprehension. What is more, chapter 4 provides a review of previous irony processing research in the area of bilingualism. The aim of Part 2: Empirical study: Electrophysiological correlates of irony processing in bilinguals' native and non-native language (chapters 5 – 7) is to present an original research study conducted for the purpose of the present dissertation. Chapter 5 describes norming studies conducted designed to validate the stimuli created for the purpose of exploring irony. Two norming studies were carried out to test the degree of irony and one norming study tested cloze probability of the experimental stimuli used in the study. Chapter 6 presents the electrophysiological study and specifies the hypotheses, methodology and results. Finally, chapter 7 offers a discussion of the study results which are situated in the context of electrophysiological studies in irony processing and more globally, in the context of prior irony processing studies, in general. Conclusions are offered and potential implications for further research are suggested.

Part 1: Conceptualizing irony

Chapter 1: Verbal irony

1.1. Introduction

Human communication abounds in emotional content (Bromberek-Dyzman 2012). Irony is an example of language which is imbued with emotions (Bromberek-Dyzman 2012). Historically, irony was considered a “figure of speech” which was used by the author to communicate something opposite to the literal meaning of their words (Gibbs and Colston 2024). Irony is a multifaceted phenomenon and may be transmitted via a range of figures such as sarcasm, jocularly, hyperbole, understatement, rhetorical questions, satire, parody and hypocrisy (Gibbs and Colston 2024). This chapter aims to present the concept of irony and how it has been construed in previous research. I will begin with an attempt at defining what irony is. Interestingly, it appears that irony is best defined through characterizing it rather than merely defining it. Gibbs and Colston (2024) provided an example of verbal irony in which a speaker says “You sure are in a pleasant mood today” uttered with reference to a person who has been acting unpleasantly (to convey the sarcastic meaning of “You are not in a pleasant mood today”). In this example, a positive statement (being in a pleasant mood) is used to convey a negative meaning (that the person is really in an unpleasant mood), which creates a mismatch, an incongruity between the two surfaces – a literal one (what is said), and an ironic, non-literal one (what is meant). In the foregoing example, irony was built via positive words conveying a negative meaning. This form of irony, a very common one, is known as *ironic criticism*. Through the use of the positive words, it invokes positive social norms (being in a good mood) while, simultaneously, conveying an opposite meaning, as if through the back door. Another type, to use a similar example, uses negatively valenced words e.g., “You are in an unpleasant mood” to convey a positive intended meaning is called *ironic praise* and is less commonly used than ironic criticism. While ironic criticism refers to positive social norms, ironic praise does not refer

to any social norms, as there are no commonly respected social norms of being in a bad mood, so it rather refers to the violation of social norms. The distinction of irony into ironic criticism and ironic praise, along with their literal equivalents (literal praise and literal criticism) has frequently been made by irony researchers studying irony comprehension (Bromberek-Dyzman et al. 2022; Caffarra et al. 2018; Caffarra et al. 2019; Dews and Winner 1999; Gibbs 1986, Tiv et al. 2023).

Next, I present a review of theories of irony comprehension to build a picture of what irony is as stipulated by the predominant theoretical accounts, and what its constitutive elements are (such as expressing attitudes or having certain expectations as necessary to understand ironic meaning). Over the years of research devoted to conceptualizing irony many theories of irony comprehension have been proposed. These theoretical accounts include *the Standard Pragmatic Model* (Grice 1975), *the Echoic Mention Theory* (Sperber and Wilson 1981; Sperber and Wilson 1986), *the Pretense Theory* (Clark and Gerrig 1984), *the Echoic Reminder Theory* (Kreuz and Glucksberg 1989), *the Allusional Pretense Theory* (Kumon-Nakamura et al. 1995), *the Evaluative Gap Account* (Kotthoff 2003), irony as reversal of evaluation account (Partington 2007), *the Mental Space Theory* (Kihara 2005) and *the Implicit Display Theory* (Utsumi 2000). The theories have been proposed to capture the nature of irony and clarify what ironic meaning is.

A picture of irony that is drawn by the diversity of theories suggests that irony is a complex phenomenon, and many verbal, social and contextual effects can modulate irony recognition and comprehension. Two features seem to serve as building blocks of irony – incongruity, which is central to an ironic remark, and attitude, which is expressed through uttering an ironic remark. The incongruity is created through the clash of the context and the target sentence, or through what the author of irony knows and what their audience knows (Ivanko and Pexman 2003; Utsumi 2000). Ironic statements convey the speaker's attitude towards the world, the interlocutor or another element of the environment (Clark and Gerrig 1984; Kotthoff 2003; Kreuz and Glucksberg 1989; Kumon-Nakamura et al. 1995; Partington 2007; Sperber and Wilson 1981; Sperber and Wilson 1986; Utsumi 2000). This attitude is usually negative, dissociative, and delivered in the guise of positive words (“You sure are in a pleasant mood today” meaning “You sure are in an unpleasant mood today”). The attitude can also be positive, approving, and delivered by means of negative words (“You sure are in an unpleasant mood today” meaning “You sure are in a pleasant mood today”). The latter is less frequent, less conventional and more difficult to under-

stand, due to its lack of positive norms to refer to. The former one, on the other hand, owing to its reference to the positive social norms of being in a good, positive, pleasant mood facilitates irony understanding.

The overview of the theories will be followed by a description of contextual and extralinguistic features which add to the understanding of irony. These include common ground (Averbeck and Hample 2008; Averbeck 2015), the world knowledge (Hagoort et al. 2004) and the information regarding the speaker, the author of irony (Regel et al. 2010a). These examples of extralinguistic knowledge contributing to irony meaning making will be followed by a section dedicated to the interactive models of language processing which will serve as a transition to chapter in which I will focus on irony processing models and empirical evidence.

1.2. Defining irony

A great deal of what we communicate transgresses the boundaries of the mere words that we utter and the literal meaning that the words carry (Dews and Winner 1995). Human communication is replete with veiled messages expressed by means of various pragmatic tools, for instance irony. Interpreting the intended meaning of “You are such a punctual person” uttered with reference to a person who is chronically late requires going beyond the literal meaning of the utterance and understanding that the speaker, for whatever reason, is alluding to their expected state of events (being punctual) when confronted by a repeat late-comer. In order to arrive at the accurate interpretation of that remark one needs to possess certain communicative skills such as the ability to recognize and interpret intentions of their interlocutors.

Irony is an example of a pragmatic tool which enables the communication of intentions implicitly. It is also a pretty common one, and not necessarily used in unusual, extraordinary circumstances exclusively (Gibbs 2000; Pfeifer and Pexman 2024). Wilson and Sperber (1992) defined irony as “a figure of speech which communicates the opposite of what is literally said.” Indeed, as this definition succinctly notes, irony is characterized by the dichotomy and incongruence of the literal and ironic communicative intent. Ironic statements can be classified on the basis of the valence of the lexical input into positive and negative. To translate that into literal / ironic division, statements which convey something

nice literally (“You’re so kind” spoken to a person who has just made a flattering remark about the interlocutor’s look) and statements which convey something critical ironically (“You’re so kind” spoken to a person who has just made a derogatory remark about the interlocutor’s look) employ positive valence. When such a positive remark is used literally the statement is referred to as *literal praise*, but when the same words are used ironically the statement is referred to as *ironic criticism*. On the contrary, statements which convey something unkind literally (“You’re so mean” said to a person who has just made a derogatory remark about the interlocutor’s look) and statements which convey something praising ironically (“You’re so mean” said to a person who has just made a flattering remark about the interlocutor’s look) employ negative valence. When such a negative remark is used literally the statement is referred to as *literal criticism*, but when the same words are used ironically the statement is referred to as *ironic praise*.

1.3. Theories of irony comprehension

Traditionally, verbal irony was regarded as a trope, and the substitution of a figurative for a literal meaning was at its core (Wilson and Sperber 1992). On this view irony was seen as a powerful tool that a speaker has at their disposal in order to criticize in a polite manner without a risk of being held accountable for the literal meaning of their words, which is the criticism itself (Grice 1975). According to the semantic approach to figurative language comprehension, irony is a figure of speech, and the said meaning duality is central to its nature, whereby a literal statement conveys a different message figuratively (Sperber and Wilson 1981). In the following sections some of the theories of irony comprehension are presented.

1.3.1. The standard pragmatic model

The opposition of meanings, on the one hand, the literal, and on the other hand, the figurative one was noted by Grice (1975) and gave rise to *the Standard Pragmatic Model* (Grice 1975). This account is based on the assumption that an ironic speaker intentionally flouts the first maxim of Quality (“Do not say what you believe to be false”) and sees an ironic

speaker as conveying a different proposition than the one expressed by the literal meaning of their words. It is suggested that the most plausible interpretation is the one which contradicts the literal meaning of the utterance (Grice 1975). Grice (1975) claims that the ironist who resorts to the indirect manner of communicating their intention implicates the opposite of what the words convey literally (Wilson and Sperber 1992).

As for the reasons why a speaker chooses to express their intention in an ironic manner, Grice (1989) proposes that irony enables one to express their feelings, attitudes, or evaluations in a polite manner. In addition, an ironic comment is believed to “reflect a hostile or derogatory judgment or a feeling such as indignation or contempt” (Grice 1989). At the same time, in order to make an accurate interpretation of an ironic speaker’s utterance an interpreter needs to be aware of the speaker using disguise, which is not explicitly hinted at by the speaker, but needs to be recognized by the interpreter (Grice 1989). For Grice (1975) irony is an example of language whereby the literal and ironic contradict each other. Based on the Gricean supermaxim of Quality (“Try to make your contribution one that is true”), the first maxim of Quality (“Do not say what you believe to be false”), in particular, and the Cooperative Principle (“Make your conversational contribution such as is required, at the stage at which it occurs, by the accepted purpose or direction of the talk exchange in which you are engaged”), being cooperative and truthful in conversation is the norm. Irony flouts the maxim of Quality, in that the proposition communicated is different from the one uttered. The two propositions are most likely related and contradictory (Grice 1975).

In response to *the Standard Pragmatic Model* (Grice 1975) which proposed a theoretical description of how irony is construed and why people resort to irony, researchers have raised concerns regarding the difficulty of defining the opposite meaning of one’s words (Gibbs and O’Brien 1991, Kaufer 1981). Gibbs and O’Brien (1991) argue that the opposite of a sentence’s literal meaning is often difficult to identify and does not bring us closer to understanding what the speaker’s intended meaning is. On top of that, Attardo (2000) argues that it is any of the Gricean maxims’ violations that lead to the environment conducive to irony and not the Quality maxim exclusively. Interestingly, ironic utterances do not have to convey the opposite of the literal meaning (Amenta and Balconi 2008, Giora et al. 2005). Ironic statements can assume the form of jocularly, sarcasm, hyperbole, rhetorical questions, understatements (Gibbs 2000) or overstatements (Giora et al. 2005). In addition, Wilson (2006) challenges the Gricean account as well and shows that *the Standard Pragmatic Model* fails to account for the reasons why a speaker would choose to use

the opposite of what they really mean (falsehood) while the same could be expressed literally.

1.3.2. The echoic mention theory

Sperber and Wilson (1981) attempted to clarify the questions borne out by the Gricean account (Grice 1975), namely what an ironist does when speaking ironically, and why they would decide to speak ironically in the first place. On their view, irony is an echoic mention of a proposition, whereby an ironic speaker expresses (echoes) their immediate reaction (attitude) toward the proposition (Sperber and Wilson 1981). Echoing refers to invoking remarks or opinions which the speaker sees as ludicrously inappropriate or irrelevant (Sperber and Wilson 1981). In order to understand this perspective, it is essential to introduce the notion of *use* and *mention* of an utterance. When an expression is used, one refers to what that expression denotes. In turn, when an expression is mentioned, it is the expression itself that the speaker is referring to. Specifically, an ironist mentions a proposition (utterance), and an interpreter, aware that the speaker knows the proposition to be false, inappropriate or irrelevant, attends to the interpretation process. The hearer needs to know that the said utterance is a (echoic) mention (and not a use) of the speaker's attitude to the proposition (literal meaning of the utterance).

Sperber and Wilson (1986) suggest that one reason for uttering an ironic comment is that it enables the speaker to implicitly express their attitude toward the world, a comment or another speaker. It is suggested that an ironist dissociates themselves from the proposition echoed and uses irony as a vehicle for that dissociation. The recognition of irony is possible when a hearer identifies the utterance as relevant, which is conducive to accepting it as true and worthy of consideration. The discovery of the intended interpretation relies, according to Sperber and Wilson, on the inferential steps the interpreter needs to follow. The accessibility of the intended meaning depends on the inferencing skills of the message receiver, the amount of experience in communication one has, the amount of interaction with the given speaker, assumptions and expectations one has about the world, and the context, in which a particular communicative situation is embedded (Sperber and Wilson 1986). On top of that, in order for the comprehension to be successful, the speaker and the hearer need to share the common linguistic code. The inferencing process starts with the

interpreter recognizing the utterance as echoic, identifying the source of the opinion, which is being echoed and, ultimately, interpreting it as one of rejection and disapproval. Namely, in order to infer what the speaker means by what they say, the interpreter needs to assume that what is said is not equivalent to what is meant, and that the speaker refers to a failed expectation in order to express a disapproving attitude. In the case of irony communication, the expression of the attitude is mostly implicit, which compels the hearer to make use of contextually and prosodically available cues (Sperber and Wilson 1986). Moreover, the echoic nature of an ironic utterance can vary in terms of its strength and type as there are ironic comments which echo immediately or in a delayed manner, refer to actual or imagined sources, and root back to an identifiable or unidentifiable referent (Sperber and Wilson 1981). The theory has been tested experimentally and its assumptions confirmed (Jorgensen et al. 1984). However, this view of irony has been challenged and recognizing an utterance as echoic or identifying the source of the proposition are not sufficient to derive an ironic meaning from the proposition (Attardo 2000). Sperber and Wilson's (1986) attempt at explaining the mechanisms underlying irony comprehension, which is the recognition of a failed expectation by the addressee was a valuable observation on irony. However, it did not cater to all the necessary and sufficient conditions required for the understanding of how irony is created and comprehended. The dissatisfaction with this account led to more inquiries into the nature of irony.

1.3.3. The pretense theory

Another view proposed by Clark and Gerrig (1984) and named *the pretense theory* posits that irony can be explained by means of uncovering the implicit attitude communicated via pretense, whereby an ironic speaker pretends to be an injudicious person addressing an uninitiated audience, who expects the audience to discover their attitude. Specifically, according to *the pretense theory*, the speaker pretends to be someone else speaking to the alter ego of the addressee and communicating uninformed or injudicious message. The speaker expects the audience/hearer to uncover the intended message via discovering that the speaker is merely pretending to say one thing while they intend to mean something else. In this account, the speaker as if says, or pretends to say, and manifests via nonverbal behavior that what they say is not what they mean. The addressee's alter ego, in their ignorance, is sup-

posed to miss the pretense, and interpret the speaker's words as sincere. The addressee, in turn, is expected to discern the pretense, the pretending speaker's injudiciousness, the alternative addressee's ignorance and the speaker's attitude towards the speaker's alter ego (and what they said) and the addressee's alter ego. Moreover, *the pretense theory* makes claims about several features of irony. Firstly, when speaking ironically, people are more likely to make positive pretenses such as "What a clever idea!" than negative ones such as "What a stupid idea!". Ignorant, uninitiated addressees are expected to identify with positive pretenses referring to norms of success, rather than the ones which invoke failure or negative situations. These social norms seem to be essential for this account, as they are unconscious assumptions used for interpreting people's behaviors, including communicative ones. What is more, according to *the pretense theory* of irony, an ironic speaker assumes an appropriate tone of voice which enables them to express their attitude. The prosody of ironic statements is conducive to the identification of the speaker intended meaning. Clark and Gerrig (1984) suggest that their theory and the notion of pretense complement the notion of mention (Sperber and Wilson 1986). Specifically, apart from the essential role of (belittling) attitude that the speaker expresses, the spirit of irony can be fully experienced depending on one's awareness of the pretense and the discovery of deception.

1.3.4. The echoic reminder theory

Another account of irony comprehension which recognized the expression of a veiled attitude as central to irony understanding was proposed by Kreuz and Glucksberg (1989) in their *echoic reminder theory* of irony. On this account irony serves as an echoic reminder of some antecedent state of affairs. When speaking ironically, the ironist expresses their attitude (e.g., disappointment, ridicule) toward a comment or a state of affairs. An ironic comment, therefore, serves as a reminder of possible expectations, hopes or inaccurate predictions. Here, the speaker builds on the common ground of shared norms, assumptions and interpretive infrastructure. The reminding aspect of ironic statements has previously been hinted at in the echoic mention theory (Sperber and Wilson 1981, 1986), which treated irony as echoing or alluding to thoughts, opinions, utterances or behaviors of people other than the speaker's. Kreuz and Glucksberg (1989) proposed a modified version of the echoic account, underscoring the reminding role of ironic utterances, and showed the two are simi-

lar but not identical. First of all, their goal was to accentuate the fact that ironic statements do remind hearers of something (thoughts, opinions, expectations, etc.). Secondly, they intended to show that all ironic statements have the reminding function, but not all of them are supposed to be echoic, in the sense that, not all ironic utterances echo actual or implied utterances. For instance, a comment “Another gorgeous day,” used ironically does not, necessarily, need to echo another speaker’s utterance, but it alludes to a commonly held belief (expectation) that good weather is the desirable one. A series of experiments illustrated the theory’s predictions. In one experiment Kreuz and Glucksberg (1989) explored the prediction that the presence of explicit antecedents (victims) is more essential for negative sarcastic utterances (e.g., “This certainly is awful weather” said on a warm and sunny day) than for positive ones. Participants were more likely to interpret comments as sarcastic when they could explicitly identify the victim of the remark, than when such explicitly identifiable victim was absent. Moreover, this experiment showed that positive statements were rated as more sensible than negative statements. On top of that, while in the case of the positive statements, the presence of an identifiable victim did not play a role, for the negative statements such an antecedent was crucial. Specifically, while the positive statements were rated similarly sensible regardless of whether the victim was identifiable or not, the negative statements were rated higher when the victim was identifiable than when it was not. This aligns with the theory’s prediction that negative statements do not rely on any implicit expectations or norms for reminders as necessary to achieve ironic intent. This account fortifies the instrumental role of attitude in irony comprehension. Additionally, it shows that positive statements can be understood without explicitly reminding the hearer about an antecedent. Negative statements, in turn, do require explicit antecedents in order to be understood as intended. This discrepancy stems from the fact that positive, unlike negative, statements implicitly invoke social norms and expectations which are, for the most part, positive.

1.3.5. The allusional pretense theory

According to *the allusional pretense theory* of irony (Kumon-Nakamura et al. 1995) ironic statements achieve their effect by alluding to failed expectations. The property of ironic statements referring to expectations which fail to be met as central to irony recognition

seems to be a strong link between multiple accounts (Clark and Gerrig 1984; Kreuz and Glucksberg 1989; Kumon-Nakamura et al. 1995; Sperber and Wilson 1986). Kumon-Nakamura and colleagues (1995) point to pragmatic insincerity as the key to interpret irony. The speaker is insincere in what they are saying, and they intend that the hearer discover this insincerity. In a series of experiments, Kumon-Nakamura and colleagues (1995) tested this theory. The first experiment showed that ironic statements allude to failed expectations and that they are perceived as insincere, compared to the literal statements. Although literal statements were perceived as allusive as well, ironic statements were almost invariably perceived as such. This finding demonstrates, according to them, that allusion may be considered a central feature of verbal irony. As regards (in)sincerity, ironic statements were perceived to be insincere, in contrast to the literal statements which were evaluated as sincere. Another experiment showed that the existence of negative expectations that people hold legitimizes the use of negative statements uttered in positive contexts (ironic praise), without the need for an explicit negative antecedent. Instead, positive statements were more likely to be used ironically compared to negative statements in negative contexts, in spite of implicit negative expectations. This, according to the authors, shows that although negative expectations may be available, positive ironic statements (ironic criticism) can be used ironically, due to general positive expectations and norms. In this way, this result provides support for the implicit social norm hypothesis, whereby ironic remarks allude to implicit social norms and expectations, and that there are distinct assumptions about socially desirable (positively valenced) and undesirable (negatively valenced) norms. Consequently, negative statements commenting on positive events can be used ironically (leading to ironic praise) with negative expectations available. Positive statements commenting on negative events, in turn, do not depend on the existence of negative expectations for their pragmatic ironic effect, and can be used ironically regardless of the negative expectations recognized, as they allude to positive norms. These findings provide some justification for the higher societal expectations for the positive social norms, as evidenced by the higher frequency of expressing negative attitudes (compared to positive ones) which contradict positive expectations, and therefore are easier to notice and rely on. This is what is often observed for ironic criticism. This form of irony (ironic criticism) is used to criticize but by literally positive verbal means, which stems from the higher frequency of positive expectations (compared to negative ones). In yet another experiment, the authors found that the level of politeness conveyed ironically matters and modulates the perceived irony.

Specifically, over-polite requests were rated as ironic more often than appropriately polite or under-polite requests, because when using over-polite requests, one does not take the risk of being perceived as rude and avoids losing face, which is not the case when uttering an under-polite request. This links with the social norm hypothesis, by showing that politeness, just like positive social norms, and the positive valence used to verbalize attitudes are associated with a higher potential for irony.

Kumon-Nakamura and colleagues (1995) argue that *the allusional pretense theory* replaces previous accounts such as *the echoic mention* (Sperber and Wilson 1981), or *the echoic reminder* (Kreuz and Glucksberg 1989) as these can be subsumed under the broader notion of allusion. Kumon-Nakamura and colleagues (1995) showed that irony serves as a tool to express one's attitude, to save one's face and to be perceived as polite. In addition, the theory offers a broader perspective, in that, apart from assertives, it broadens the notion of discourse irony and includes other speech acts such as offers, requests or questions, to name a few, which can all be used ironically. For instance, asking questions such as "How old are you?" by an insincere speaker who does not expect an answer can be interpreted as ironic. A parent making a request toward their teenager child watching loud TV such as "Would you mind if I asked you perhaps to consider turning off the TV?" is very likely to be taken ironically. Yet another example, when someone has eaten an entire pizza and there is nothing left for others, making an offer of another slice of pizza will probably be understood as irony. Importantly, this account puts emphasis on the role of social norms and expectations. Although it is not explicitly asserted, these concepts drift toward the concept of evaluation – valence. In short, for negative ironic statements (ironic praise) to be understood as ironic, one needs to have negative expectations. However, for positive ironic statements (ironic criticism) such negative expectations are not obligatory, as the positive statements have the power of alluding to general positive norms due to their higher frequency and simplicity.

1.3.6. The evaluative gap account

An account proposed by Kotthoff (2003) goes a step deeper into identifying the cognitive mechanism of irony production/comprehension, as it proposes that the key to irony comprehension is the ability to capture and bridge the evaluative gap which results from the two

surfaces of an ironic statement – the said (the dictum) and the intended (the implicatum), and they are closely connected with emotional valuation. In one study, Kotthoff (2003) analyzed how irony was received in two different contexts which differed in the level of formality (informal dinner conversations among friends and pro and con TV debates). The goal of the study was to investigate how interlocutors react and respond to irony depending on the setting. Results showed that depending on the level of formality of the situation interlocutors choose to respond to either the said or the intended. In the informal setting of a dinner with friends, interlocutors were more inclined to respond to the said (the dictum) of an ironic remark. This can transform into a humorous exchange, and other teasing remarks may ensue, resulting in friendly irony. Instead, in the formal setting of a formal TV debate, interlocutors were more likely to respond to the intended meaning (the implicatum). These exchanges do not feature any teasing or funniness, but, rather, proceed on a serious note, resulting in implicit criticism. These different levels of context formality lead to a different politeness norms spectrum. As a result, interlocutors in formal and informal settings interpret ironic remarks by relying on different meaning surfaces – in informal situations, they prefer to rely on and respond to the salient meaning (the said), while in the formal situation they opt for the non-salient meaning (the implicated) for their responses. The relationship between the said and the intended is a matter of implicit evaluation, which constitutes the gap, that Kotthoff (2003) suggests is central to irony understanding.

1.3.7. Irony and reversal of evaluation

Another account of irony comprehension which places evaluation at its core and brings us closer to the concept of valence without explicitly using this name was proposed by Partington (2007) who suggested that irony comprehension may necessitate the reversal of evaluative meaning. Based on a corpus study Partington (2007) suggested that an implied reversal of the evaluative meaning of a statement is the main mechanism driving irony. This account, therefore, diverges from the dichotomous categorization of literalness and non-literalness and suggests that irony could not be treated as a mere said / meant opposition. Instead, Partington (2007) argues, irony expresses an evaluation which should be understood as determining whether something is good or bad, favorable or unfavorable, profitable or unprofitable, enjoyable or unenjoyable, and sensible or insensible. This account is,

therefore, yet another one, placed in the line of paradigms gravitating towards evaluation, i.e., attributing valenced attitudes to implicit ironic meanings. Evidence from the corpus study demonstrated that irony is driven by evaluation, driven by a dualistic, bi-dimensional sense of how speakers (or writers) evaluate: approve or disapprove, enthuse or abhor, applaud or criticize the verbal content they explicitly express, and how they position the addressees (hearers, readers) to do the same. This account, importantly, explicitly states that the central mechanism underlying irony, in its two dimensions, is the reversal of evaluation. This links with the concept of valence whereby positive valence in irony communicates a negative (critical) message, and negative valence in irony communicates a positive (praising) message. The key feature of irony in the form of the said (dictum) / meant (implicatum) dichotomy is an example of such a reversal of evaluation. While the dictum reflects the favorable, the implicatum reflects the unfavorable in the evaluative terms. In essence, this dichotomous relationship of the evaluative reversal (implicatum) and the propositional reversal (dictum) are neither mutually preclusive nor exclusive. In fact, they work in collaboration in order to give rise to irony.

1.3.8. The mental space theory

The accounts discussed above represent a discovery – a progressive line of investigation into the nature of irony focusing on one essential feature – attitude, that is positive or negative evaluation. These accounts share one essential feature – they have predictions about attitude as a key aspect of irony. Another important aspect of irony comprehension, as already emphasized in the early accounts of irony (Clark and Gerrig 1984; Kreuz and Glucksberg 1989; Kumon-Nakamura et al. 1995; Sperber and Wilson 1986) is expectation. Kihara (2005) presents a view in which an ironic utterance refers to a counterfactual mental space of expectation. According to the mental space theory of irony, “verbal irony is a reference to a mutually manifest expectation space (that is, in short, an expectation held by someone that the speaker assumes is recognizable by the hearer) without any distinct space builders.” According to Kihara (2005) an ironic speaker communicates that something is the case in the mental space of expectation so that it becomes clear (mutually manifest) that the expectation has been failed. On this account, the only necessary factor for an utterance to be interpreted as ironic is the mutually manifest expectation space. Ironic statements are

designed to refer to something in the counterfactual expectation space. What an ironist does when they engage in an ironic mode of speaking is say that something is the case and intend the addressee to understand that it is not the case. In this way, this account, while accentuating the role of expectations, builds on evaluation (valence) phenomenon, whereby poles apart-like propositional and intended meanings are juxtaposed and result in irony. Kihara (2005) addressed the notion of asymmetry of affect by showing that both critical and praising irony achieve their effect by referring to a mutually manifest expectation space. However, while ironic criticism, whereby the speaker's expectation is synonymous with the standard expectation (what is praiseworthy aligns with what is expected) and it does not need an antecedent utterance for its effect, ironic praise, whereby the speaker's expectation contradicts the standard expectation (what is blameworthy clashes with what is expected) does need an antecedent utterance or context to achieve its ironic effect. This observation demonstrates that ironic criticism may be easier to understand because it stimulates (invokes) expectations, a property missing in ironic praise.

1.3.9. The implicit display theory of verbal irony

Signaling expectations as constitutive to irony, both production and comprehension, has also been recognized by Utsumi (2000) in *the implicit display theory* of verbal irony. On this view, an utterance achieves its ironic intent when it is delivered in a situation embedded in an ironic environment. An ironic environment consists of three events/states, i.e., (i) the speaker must have a certain expectation, (ii) that expectation has to be failed (incongruent with the reality), and (iii) the speaker must have a negative emotional attitude (that of disappointment, anger, reproach or envy) towards that incongruity of expectations and reality. These three factors are necessary to mark the environment as ironic. Utsumi (2000) suggests that verbal irony has the ability to implicitly display an ironic environment, which is a suitable situational setting in the discourse context which enables the occurrence of ironic language. Therefore, in this account, it is essential to acknowledge that the ironic message should be recognized as achieving implicit display and the discourse situation must be considered as ironic environment. Without these two factors, irony remains merely a potential meaning that may not be inferred if the interpreter of the potentially ironic message is not in the ironic frame of mind, and/or does not recognize that the message belongs

to ironic discourse. Practically, what needs to happen for one in order to succeed in communicating and/or comprehending irony, with the three aforementioned factors in mind (having an expectation, the expectation failing, and having a negative attitude), is understanding what the speaker says, recognizing how they say it, and computing that the speaker implicitly gave vent to their disappointment (failed expectation) and combining all these pieces of information to arrive at the correct interpretation.

1.4. Attitude and irony comprehension

As has been stated before irony involves an implicit expression of an attitude toward the world, the circumstances, the comment or the speaker (Sperber and Wilson 1986). The expression of attitudes can happen in multiple ways using a number of tools (Gibbs 2000). Gibbs (2000) identified five main types of irony that participants used. It was observed that irony was implicitly expressed by means of jocularity, sarcasm, hyperbole, rhetorical questions and understatements. Such a wide array of linguistic forms accounts for 8% of people's communication and is comfortably used in order to communicate multiple interpersonal meanings both blatantly and subtly (Gibbs 2000). Leggit and Gibbs (2000) found out that speakers uttering sarcastic comments were perceived by participants as feeling negative emotions and thus displaying an emotional attitude. Due to the dichotomous nature of irony, the expression of an attitude by an ironic comment happens on the spectrum of an evaluative duality (Partington 2007). It has been argued that evaluation is a central brain response to the sensory input coming from the outside world, which is incessantly active whenever one is awake and receives perceptive signals from the outside world (Damasio 2010). Damasio (2010) claims that people assign value to the continuous stream of stimuli affecting them by forming favorable (like) or dissociating (dislike) attitudes and expressing them in a communicative interaction. People, or more broadly, all living creatures through their brains, automatically, incessantly and swiftly assign value to the stimuli that they perceive through any sensual modality. These value attribution related processes are unconscious and take place before any cognitive processes begin (Zajonc 1980). Affective and cognitive systems exhibit quite distinct properties. While the cognitive system offers an infinite diversity, flexibility and precision in terms of expression, the affective system does it with a repertoire of emotions and feelings much smaller and much more constrained to

the primary life related functions (Zajonc 1980). The primacy and independence of the affective system of the cognitive system have been postulated by Zajonc (1984) in the *Affective Primacy Hypothesis*. According to this view, the arousal of affect operates without any involvement of the cognitive system and as such the two systems are independent of each other, with the former being primary and responsible for more confident reactions. Research shows that affective stimuli can be processed faster than non-affective stimuli (Murphy and Zajonc 1993), and since the perception and expression of irony is inherently connected with the perception and expression of an implicit attitude (affective reaction), irony comprehension may likely be modulated by the value-related attitudinal content either explicitly or implicitly communicated via language. This perception and processing also extend to the explicit and implicit attitudinal meaning carried by language, with irony being an example of implicit evaluation (Bromberek-Dyzman 2014).

However, Lai and colleagues (2012) argue that the question of affective content primacy over non-affective content is ill-posed. Instead, it might be more accurate to accept that affective information may be prioritized in some contexts and non-affective information in others. In a set of two studies, they tested the context-dependence of affective and non-affective content in the case of visual scenes and words. In the first study, when participants were asked to make judgments of presented visual scenes, they made affective judgments faster than non-affective judgments. Moreover, in both groups (affective context and non-affective context) responses were significantly faster to affective compared to non-affective trials. Importantly, the affective judgments speed advantage over non-affective ones was greater in the affective context group than in the non-affective group. This shows that context played a significant role in judgment making, in a situation when the judgments participants made and the stimuli to which they responded were kept constant. In the second study, when participants were asked to make judgments on presented words, faster responses were recorded to affective than non-affective judgments in the affective context, but in the non-affective context participants responded faster to non-affective trials. Lai and colleagues (2012) concluded that these results challenge the Affective Primacy and the Cognitive Primacy hypotheses, by showing that a simple generalization of affective information advantage over the non-affective information might be an oversimplification. In turn, this study showed that words and pictures are operated by distinct neurocognitive mechanisms, and the way in which stimuli of various modalities are processed largely depends on the stimuli themselves and the context they are embedded in. The issue of the

affective value of stimuli, contextual and perception modulations need to be further studied to get a more comprehensive understanding of their complexity and dynamics.

Speaker attitude can be expressed by words, their linguistic and emotional contents as well as a repository of prosodic tools, or visual cues. The type of cues available in a particular situation depends on their relevance in a particular context, and unless the linguistic context or the common ground cue an ironic intent strongly enough, interpreters rely on the prosodic cues (if available) (Bryant and Fox Tree 2002; Bryant and Fox Tree 2005). Cheang and Pell (2011) underscore the significance of being aware of and receptive to extralinguistic features that communication in general, and communication among foreign speakers is imbued with. Although vocal cues are not an indispensable component of an ironic utterance, they largely contribute to the latency and accuracy rates of irony comprehension in a conjoint manner with other markers (Bromberek-Dyzman et al. 2021).

Contrarily, if irony is marked too strongly and its presence is too conspicuous, an ironic remark loses its pragmatic effect (Cutler 1974; Bryant and Fox Tree 2002). The overly marked ironic intent may be a result of exaggerated prosodic features or contextual cues. If context prompts the ironic interpretation too strongly, comprehenders may fail to discern the ironic intention in the absence of other prosodic cues (Capelli et al. 1990). Hence, prosodic cues are neither fundamental nor indispensable elements of context that irony comprehension cannot do without. Indeed, in some contexts the mere incongruity between the utterance and the situation it occurs in is sufficient for a correct interpretation. Yet, prosodic cues are invaluable in creating expectations, which, in turn, boost the speed and accuracy processing rates as well as the overall interpretation of utterances.

As we have seen the expression of an attitude is an instrumental feature of verbal irony. Many theoretical accounts of irony comprehension have recognized attitude as an important feature of irony (Clark and Gerrig 1984; Kotthoff 2003; Kreuz and Glucksberg 1989; Kumon-Nakamura et al. 1995; Partington 2007; Sperber and Wilson 1981; Sperber and Wilson 1986; Utsumi 2000). This attitudinal meaning is expressed through some sort of evaluation. Most of the theories of irony comprehension presented above make some predictions about the valence of the comment (Clark and Gerrig 1984; Kreuz and Glucksberg 1989; Kumon-Nakamura et al. 1995; Partington 2007; Sperber and Wilson 1981; Sperber and Wilson 1986).

1.5. The role of context and extralinguistic information in irony comprehension

Previous research demonstrates that context is essential in irony processing (Dews and Winner 1999; Gibbs 1986) and that it streamlines and facilitates the understanding of ironic meanings. Studies show that irony can be processed as fast as or even faster than literal meaning as long as the context supporting irony (i.e., normative context) is provided (Gibbs 1986). The role of contextual information and the content which partakes in irony processing have been recognized in interactive models of language comprehension (Gibbs 1986; Katz et al. 2004; Long and Graesser 1988). Information from different sources, both local (semantic meaning) and global (contextual cues), collectively contributes to the final meaning computation. It is noteworthy that the significance of each meaning may be a function of their relevance (Sperber and Wilson 1986), salience (Giora 1997) and contextual strength (Gibbs 1994). Before I move on to the review of the contextual factors contributing to the comprehension of ironic meaning, the notion of context merits clarification. Context is defined as a set of relevant features of a dynamically changing setting or environment in which a linguistic input occurs and is used (Huang 2014). According to Huang (2014), there are three main components of context coming from various sources. They include (i) physical context, which denotes the physical environment of an utterance, (ii) linguistic context, which comprises neighboring utterances and (iii) general-knowledge context, also referred to as common ground (Stalnaker 1974, as cited in Huang 2024), which comprises a set of true assumptions, mutually shared by both the speaker and the listener. In addition to the typically contextual information, the correct identification and interpretation of ironic meaning relies upon extralinguistic contents such as background knowledge that an interpreter enjoys about the interlocutor and the world (Hagoort et al. 2004; Hald et al. 2007) and the relationship between the interlocutors characterized by common ground (Averbeck and Hample 2008, Averbeck 2015).

1.5.1. Common ground

Contextual or extralinguistic cues are instrumental in irony comprehension, and the type of contextual information which has been found to be most conducive to irony understanding is the common ground (Averbeck and Hample 2008, Averbeck 2015). Common ground,

among other things, denotes the set of mental states such as attitudes, beliefs, values and knowledge shared by the interlocutors (Averbeck 2015). Recognition of pragmatic intent comes at a lower processing cost if it is supported by common ground entertained and if interlocutors share beliefs and experiences which help them find it easier to appreciate communicative subtleties conveyed by ironic remarks (Kaufer and Neuwirth 1982). Irony comprehension relies on common ground in that it is intrinsically related to making inferences (Sperber and Wilson 1986), which are based on the knowledge of social conventions and norms (Katz and Lee 1993). Common ground shared by interlocutors facilitates inferencing which is indispensable for irony comprehension (Averbeck and Hample 2008). Averbeck and Hample (2008) examined factors, including common ground, which play a pivotal role in endorsing or suppressing an ironic message. The relationship between the speaker and the audience (the interpreter) determines whether a proposition is endorsed (understood) or suppressed (misunderstood, considered false). Moreover, the extent to which interlocutors share common ground is of the utmost importance for effective irony endorsement, that is the probability of irony endorsement increases together with the common ground. Interestingly, Averbeck (2015) found that people who are in close relationships have a stronger proclivity for communicating ironically than people whose relationships are more casual. It is a plausible assumption that closer relationships lead to greater common ground shared, which, in turn, leads to greater common knowledge, which results in the facilitated ability to comprehend figurative meaning (Averbeck 2015). Averbeck (2015) notices that while common ground largely contributes to the understanding of figurative meaning, low amount of common ground prompts irony judgment as false and irrelevant, and the lack of it thwarts irony discovery completely.

In a series of three experiments, Kreuz and Link (2002) explored the role of common ground in irony processing. Participants were reading scenarios ending with an evaluation which biased the interpretation of the scenarios towards an ironic or a literal reading. Participants were asked to make a judgment of how ironic (Experiment 1), sensible (Experiment 2), and appropriate (Experiment 3) the evaluation was. The evaluations were uttered by the speaker to the addressee who shared high or low common ground. For the high-common ground scenarios the addressees were described as “intimates” or “friends” (e.g., the speaker’s mother), and for the low-common ground scenarios the addressees were described as “acquaintances” or “strangers” (a stranger sitting at a neighboring table at a restaurant). Participants’ reading times were measured and showed that in all three experi-

ments the statements uttered by interlocutors sharing high common ground were read faster than the statements uttered by interlocutors sharing low common ground regardless of the focus of the judgment. This evidence, according to the authors (Kreuz and Link 2002) supports the importance of common ground in attending to and making sense of inconspicuous meaning nuances conveyed by figurative language such as irony. Indeed, Kreuz and Link (2002) demonstrated that comprehenders process irony more easily when they can identify the high level of common ground shared by the interlocutors of the “overheard” (or read as in the experiments) interactions.

This demonstrates that there is a link between irony processing and common ground shared by the interlocutors (Averbeck and Hample 2008). In some situations, other cues (linguistic, contextual, or prosodic), as well as the incongruity between the utterance and what precedes it may be sufficient for irony understanding, making common ground less indispensable. However, such information as the beliefs which interlocutors commonly share (in the form of the common ground) may be conducive to the final ironic intent interpretation. Common ground may be invaluable in creating expectations for irony and can largely influence the comprehension process (Averbeck and Hample 2008).

1.5.2. The role of world knowledge

Evidence from language processing shows that people are constantly and immediately relating upcoming words to a preceding narrative discourse context (Nieuwland and Van Berkum 2006; Van Berkum et al. 2003; Van Berkum et al. 1999), one’s knowledge of the world (Hagoort et al. 2004; Hald et al. 2007) and one’s knowledge about a story and the associated characters (Filik and Leuthold 2013). Hagoort and colleagues (2004) studied the integration of semantic and world knowledge information and found that sentences that ended in semantic violations and in world knowledge violations elicited the classic N400 effect with larger N400 amplitudes elicited by semantic and world knowledge violations. These findings demonstrate that lexical semantic knowledge and general world knowledge are concurrently integrated as attested by the N400 effect starting at around 300 ms post word onset obtained for both types of knowledge violations. Similarly, in a study on the second language processing, Martin and colleagues (2015) found that the N400 was significantly larger for both semantic violations as compared to correct sentences and for world

knowledge violations as compared to correct sentences. Such results suggest that world knowledge and semantic integration proceed similarly in the non-native and native language comprehension (Martin et al. 2015). Moreover, research shows that not only is the world knowledge and the local discourse context in constant interaction, but also new or differing information can be easily integrated if the local discourse provides appropriate context (Hald et al. 2007). Importantly, Hald and colleagues (2007) found that neither the local discourse context nor world knowledge information stored in long-term memory overrides each other, in that, even if a particular piece of world knowledge information is correct, its integration may be hampered if the local discourse context does not support that interpretation. Together, these data provide additional support for a view that multiple sources of information (syntax, semantics, discourse and world knowledge) work together in pursuit of meaning comprehension (Hald et al. 2007). To the best of my knowledge, prior research has not explored the role of world knowledge in irony processing. Given how context-dependent irony is, and how much irony processing draws upon extralinguistic information in the form of pragmatic knowledge about the speaker or the level of intimacy and shared knowledge (common ground) between the interlocutors, it seems only right to explore the role of world knowledge in irony processing. Prior knowledge with which people attend to irony processing may have a significant impact on whether and how they, ultimately, arrive at the intended interpretation.

1.5.3. The role of speaker information

Previous research has demonstrated that the speaker knowledge can affect language processing (Bergen and Grodner 2012; Foucart et al. 2015). The dichotomous effect of ironic statements can be achieved by various means such as the incongruity between the preceding linguistic context and the utterance, the incongruous tone of voice of both the comment and the preceding context or the incongruity between speaker identity and the utterance (Regel et al. 2010a). Irony research has demonstrated that when interlocutors are unfamiliar with each other's language and culture, they are at a disadvantage for irony comprehension (Cheang and Pell 2011; Peters et al. 2015; Caffarra et al. 2018). Moreover, the information about the speaker such as their accent (Caffarra et al. 2018), occupation (Pexman and Olineck 2002), communicative style (Regel et al. 2010a) may modulate irony processing as

well. This extra-linguistic knowledge interacts with the message being processed in an immediate fashion (Van Berkum et al. 2008). All meaning is embedded in context. Neurocognitive research shows that the human brain links whatever information it has about the speaker to the meaning being processed (Van Berkum et al. 2008). Language processing is not just about putting words together in a context-free semantic space. Instead, the speaker factor is immediately taken into account and affects the semantic meaning (Caffarra et al. 2018; Regel et al. 2010a; Van Berkum et al. 2008).

In an electrophysiological study, Van Berkum and colleagues (2008) studied participants' brain responses to auditorily presented utterances that sometimes conveyed a mismatch between participants' expectations formed on the basis of the speaker's identity and the content of an utterance. The sentences were constructed in such a way that their lexical content was suggestive of a particular speaker type. Sentences were either odd for a male speaker, a female speaker, a young speaker, an adult speaker, a speaker with an upper-class accent, or a speaker with a lower-class accent. The speaker-content inconsistency was achieved by violating (Dutch) social stereotypes. Event-related brain potentials revealed that message and speaker integration occurred very rapidly, 200-300 ms after the relevant word onset. Moreover, the speaker-inconsistent sentences elicited an N400 and a P600 effect. The fact that brain responses as visible in the ERPs elicited by speaker inconsistencies were observed points to the fact that linguistic meaning is inextricably linked to the pragmatic meaning at very early processing stages. It shows that interpreters immediately extract and use extra-linguistic features to categorize the speaker accordingly (Van Berkum et al. 2008).

Several studies demonstrate that the speaker's identity is taken into account when making inferences about intentions which is also the case in irony (Regel et al. 2010a; Katz and Pexman 1997; Puhacheuskaya and Järvikivi 2022). Pragmatic knowledge about the speaker's communicative style has been demonstrated to influence irony processing at very early stages (Regel et al. 2010a). Not only have Regel and colleagues' (2010a) results confirmed the influence of the speaker on language processing, but their study has also demonstrated that people grasp such subtly marked knowledge and swiftly integrate it and use that knowledge in a subsequent task. The speaker's communicative style may be a result of their occupation and the perception of those occupations by interpreters can have an influence on irony processing (Katz and Pexman 1997). Katz and Pexman (1997) have showed that the knowledge of the speaker's occupation and the stereotypical notions about their communi-

cative style that come with it, help derive the ironic intended meaning, and that ability increases as the knowledge about the speaker's occupation becomes more salient. Similarly, Pexman and Olineck (2002) suggest that speaker occupation stereotypes are continuously being integrated in the comprehension process, but their effect on the final interpretation depends on the strength and markedness of other available cues. That is, when the context made the congruity or incongruity clear and unambiguous, the knowledge about the speaker's occupation did not contribute to the sarcasm perception. Such knowledge only became useful and managed to affect the sarcasm perception when the congruity or the lack thereof were not clear-cut (Pexman and Olineck 2002).

1.6. Interactive models of language processing

Language processing is a complex undertaking our brains have to deal with. The complexity results from various sources of information that have to be integrated in order to arrive at the speaker intended meaning. These processes have been found to take place in parallel. Various levels of a linguistic structure such as phonology, syntax and semantics form bigger units. According to the parallel constraint-based architecture the processing can start with any level and continue in any order (Jackendoff 2002). When processing incoming stimuli our brains do not just combine the semantic meaning of each word separately, but they immediately probe into the source of these words and establish who the speaker is (Van Berkum et al. 2008). The knowledge about the speaker is not the only source of information that is integrated. In previous sections, various sources of information that shape the final, intended meaning in irony processing have been described. Previous research demonstrated that during language processing the brain rapidly integrates the knowledge of the world relevant in the particular context (Hagoort et al. 2004; Martin et al. 2015), and the knowledge of the story and its characters (Filik and Leuthold 2013). What is more, people connect incoming information and words to a preceding narrative discourse context during language processing (Nieuwland and Van Berkum 2006; Van Berkum et al. 2003; Van Berkum et al. 1999).

Prior irony research has demonstrated that irony processing is facilitated when the interlocutors share common ground (Averbeck and Hample 2008; Averbeck 2015), when the incongruity between an ironic comment and the preceding discourse context is properly

marked (Ivanko and Pexman 2003), when prosodic cues signal (but not overly) an ironic intent (Bryant and Fox Tree 2002), when interpreters are familiar with the speaker's communicative style (Regel et al. 2010a), possess the knowledge about the speaker's occupation (Katz and Pexman 1997), or speaker's accent in the non-native language (Caffarra et al. 2018).

These various sources of information are processed conjointly (Katz et al. 2004; Pexman 2008), since it is evident that language is not a mere concatenation of words in separation (Hagoort 2016). Katz and colleagues (2004) proposed *the parallel-constraint-satisfaction approach* to irony comprehension. According to this interactive view, various sources of information (constraints) are immediately ready to provide support for competing interpretations, and they get activated in a parallel manner. Multiple cues, relevant in the particular context, including linguistic and discourse factors contribute to the detection and processing of irony (Pexman 2024). Katz and colleagues (2004) claim that the discovery of the speaker intended meaning is inherently linked to the constraints suggesting the same interpretation. If all constraints support the same meaning, a satisfactory interpretation is found rapidly. If, however, several alternatives receive a comparable amount of constraint support, processing is delayed. The parallel-constraint-satisfaction model draws upon Gibbs' (1986) interactive view – *The Direct Access Model*. The two proposals similarly suggest that when processing irony, the intended, ironic meaning is processed from the earliest moments after the exposure to the stimulus. Yet, if the ironic alternative is not properly cued, so that the hearer does not expect it, the recognition of irony may be delayed. When the available cues signal ironic meaning in a more salient manner, its interpretation may be enhanced, arrived at faster than the alternative – literal interpretation.

Interactive processing models have been proposed to resolve ambiguities evoked by metaphor (Gildea and Glucksberg 1983), humor (Long and Graesser 1988) or irony (Gibbs 1986; Gibbs 1994) processing. These models propose that a message is processed in a parallel, rather than serial fashion placing a paramount role on the context. According to *the Direct Access Model* (Gibbs 1986; 1994), the processing of non-literal, figurative meanings can be automatic, devoid of the apparently unnecessary literal meaning processing and leading directly to the intended one. This view assumes such a rapid processing automaticity on the basis of the context sufficiently suggesting the veiled, implicit, intended meaning. Since in a highly constraining context, the figurative meaning is conventional, the prior analysis of the unconventional literal meaning is not necessary but possible (Gibbs 1986;

1994). Indeed, research shows that contextual information affects the comprehension process at early stages, and as such the obligatory processing of the literal meaning may not be necessary (Katz et al. 2004). We need to keep in mind though that while the contextual cues are absolutely essential in ironic meaning making, the hearers need to possess substantial communicative experience and the skills to recognize other people's states of mind and their communicative intentions.

1.7. Conclusion

The goal of this chapter was to introduce and define, or rather, characterize irony, as it falls outside simple definitions. This chapter presented the notion of irony and demonstrated how irony has been conceptualized in many theoretical accounts. Several theories of irony comprehension have been devised to elucidate the complexity of irony. Specifically, irony has been described as an utterance in which the literal and intended meanings are contradictory, and which violates a conversational maxim (Grice 1975), an echoic mention (Sperber and Wilson 1981; Sperber and Wilson 1986), a pretense (Clark and Gerrig 1984), an echoic reminder (Kreuz and Glucksberg 1989), an allusional pretense (Kumon-Nakamura et al. 1995), an act whereby a gap in evaluative perspective is expressed (Kotthoff 2003), an utterance communicating an implied reversal of evaluative meaning (Partington 2007), a mental space phenomenon (Kihara 2005), or an utterance which displays an ironic environment in an implicit fashion (Utsumi 2000).

As much as these accounts remain unique, they share certain distinctive features regarding irony. Several theories of irony comprehension have emphasized the role of emotional attitude as the core feature of irony (Clark and Gerrig 1984; Kotthoff 2003; Kreuz and Glucksberg 1989; Kumon-Nakamura et al. 1995; Partington 2007; Sperber and Wilson 1981; Sperber and Wilson 1986; Utsumi 2000). Certainly, what an ironic speaker intends to happen by an act of uttering an ironic remark is expressing an attitude, most commonly a dissociative one, towards the world, another speaker, or a stimulus. Predominantly, these attitudinal messages use positive words and comment on negative aspects, that is, use a positive comment to talk about negative, disappointing matters (e.g., a comment "What a lush garden" with reference to a garden without any greenery). The reason why ironic criticism is more commonly employed to communicate something ironically is because it refers

to positive social norms, while, implicitly, sneaking in, a negative attitude. The same cannot be said about the other type of irony – ironic praise – which does not refer to positive social norms. The praising type of irony uses negative words to express a positive attitude (e.g., a comment “What a barren garden” with reference to a garden which has a lot of green, healthy plants and flowers). Therefore, ironic criticism is the more commonly employed option when a speaker wishes to communicate irony.

Another pivotal constituent of irony is the incongruity of an ironic remark with the preceding context. In more practical terms, the said incongruity arises between the expectation of the ironic speaker and the reality (Utsumi 2000). To link that back to attitude, in fact, what an ironist does is express a negative attitude towards this incongruity.

In this chapter I also discussed the role of contextual and extralinguistic knowledge in irony comprehension. The context was defined and several phenomena that contribute to the broadly defined context such as common ground (Averbeck and Hample 2008; Averbeck 2015), the world knowledge (Hagoort et al. 2004) and the speaker information (Regel et al. 2010a) were discussed. These manifold extralinguistic contextual elements are integrated concurrently in order to provide the interpreter with some image of the interlocutor’s intended meaning. This led to the discussion of interactive models of language processing (Katz et al. 2004). Chapter 1 ends with a discussion of extralinguistic and contextual features partaking in irony comprehension as well as interactive language processing models which serve as a transition to what I turn to in chapter 2 – irony processing behavioral evidence.

Chapter 2: Irony processing: Behavioral evidence

2.1. Introduction

Originally, approaches to irony processing research were classified based on the assumption of serial aspect of irony processing. Specifically, researchers explored the time course of irony processing with a great deal of their interest lying in the question whether irony takes longer to process than literal meaning, and whether it happens in a one- or a two-stage procedure. Two distinct assumptions were tested, one assuming that irony comprehension takes two stages, and the other assuming that irony comprehension proceeds in one stage. Researchers who assumed that irony is processed in two stages, postulated that both the literal and non-literal meanings were obligatorily processed (Dews and Winner 1999; Giora 1995; Giora 1997; Giora et al. 2007; Giora et al. 1998; Grice 1975). The other major line of investigation – one-stage account assumed that irony is processed in one stage, without the need to process the literal meaning first, before the non-literal meaning is processed (Gibbs 1986; Gibbs 1994; Ivanko and Pexman 2003). Empirical evidence showed that these two major approaches, based on different assumptions, provided mixed results. Some evidence points to the privileged role of the literal meaning, which is considered salient (familiar, coded in the mental lexicon) (Giora 1995; Giora 1997; Giora et al. 2007; Giora et al. 1998). As a result, irony processing takes longer than literal meaning, because of the two surfaces of meanings obligatorily processed (Deliens et al. 2018; Dews and Winner 1999; Filik and Moxey 2010; Giora 1995; Giora 1997; Giora et al. 2007; Giora et al. 1998; Kaakinen et al. 2014; Turçan and Filik 2016). Other evidence suggests that irony does not have to take longer than literal meaning. In fact, under certain circumstances, irony may take as long or even faster than literal meaning (Gibbs 1986; Gibbs 1994; Ivanko and Pexman 2003).

These two major lines of research were formulated as *The Graded Salience Hypothesis* (Giora 1997) and *The Direct Access Model* (Gibbs 1986), respectively.

In my view, the question of the number of stages in irony processing may not provide clarifications for the many nuances communicated by irony. Here, I propose to look at these approaches from a different vantage point. Namely, the approaches to previous irony processing research as well as designing future research can be categorized based on the manner of irony conceptualization that investigators adopt(ed). In this dissertation I would like to propose an alternative approach to the classification of irony processing studies and the conceptualization of the notion of irony in research, in general. In order to make sense of the mixed extant evidence, it seems meaningful to attempt at explaining research results obtained in studies based on the spectrum of stimuli they have tested, either in a simple, rigid distinction of statement types into ironic and literal or in a broader spectrum, much alike what we encounter in everyday situations, accounting for the valence of the target statements. The way of categorizing the phenomena, both irony and non-irony, has had rather significant implications for the obtained results and their further interpretations. Therefore, in the next sections, first, I will discuss prior irony processing behavioral research which adopted a simple literal / non-literal paradigm and compared irony with literal meaning. Secondly, I will present studies which refined the concept of irony and extended the scope of the explored phenomena both in the range of ironic as well as non-ironic stimuli to include ironic criticism, ironic praise as well as literal criticism and literal praise based on the lexical valence of the target word. Thirdly, I will make an attempt at describing evidence which accounted for the intention valence aspect of ironic remarks. Importantly, this chapter focuses on behavioral studies in irony processing and provides evidence from rating studies, response times, accuracy rates, and eye-tracking.

2.2. Irony processing

Given the complexity and a lack of perspicuity of mechanisms underlying irony comprehension, researchers have been trying to disambiguate how people using irony, at both ends of communication – speakers and receivers using ironic intent, eventually come to understand that the intended meaning is the one implicitly shared, and not the explicit, surface meaning. Various methods such as electroencephalography (Cornejo et al. 2007), neuroim-

aging (Uchiyama et al. 2006), eye-tracking (Kaakinen et al. 2014) and response-time measuring paradigms (Gibbs 1986, Giora et al. 1998) have been employed to disentangle the issue, yet while they were successful at extending the understanding of irony as a means of communication, they have failed so far to provide consistent explanation of the cognitive, and linguistic mechanisms underlying irony comprehension. Numerous studies provide a rather complex picture of results indicating a range of mechanisms at play. Initially, research on irony processing was centered around the serial aspect of the process (Giora 1997; Gibbs 1986), and specifically the number of stages it takes to process irony, the order of meaning processing (ironic vs. literal), how much the literal meaning processing affects the intended meaning interpretation and whether irony processing takes longer or shorter than literal meaning, as well as the question of the degree to which context and irony interplay at initial stages (Gibbs 1986). These questions triggered a lot of experimental studies in irony processing (Deliens et al. 2018; Dews and Winner 1999; Filik and Moxey 2010; Gibbs 1986; Gibbs 1994; Giora 1995; Giora 1997; Giora et al. 2007; Giora et al. 1998; Ivanko and Pexman 2003; Kaakinen et al. 2014; Turçan and Filik 2016).

Some researchers, seeking to answer the question about the sequential nature of irony comprehension, were oriented towards studying the interplay of literal and non-literal (ironic) meaning (Grice 1975; Giora 1997). The relationship of the two meaning layers was studied by means of opposition (the binary, literal / non-literal relation; Giora et al. 1998), or negation (Giora 1995), which looked at the literal meaning as the standard variant and the non-literal (ironic) meaning, as an anomaly, or a deviation from the standard meaning (Giora et al. 1998; Grice 1975). On this view irony was treated as a breach of the maxim of quality (Grice 1975), where the intended / literal community of meanings results in an overt violation and compels the interpreter to search for another satisfactory interpretation. According to this approach irony is more difficult to comprehend than literal meaning and the processing involves two stages. First, the interpreter comes to understand the breach of the norm, and when the literal reading of the statements is deemed unacceptable, it is canceled. Consequently, they search for an alternative interpretation, congruent with the speaker's intention. In line with *The Standard Pragmatic Model* proposed by Grice (1975), Giora (1995) proposed an account which also involves a two-stage mechanism, but the role of the literal meaning is particularly emphasized. According to *The Indirect Negation View of Irony* (Giora 1995) both the literal and ironic meanings are considered in the process of irony comprehension, and once the literal reading is deemed inappropriate, it is not can-

celed. The proposed view of irony as indirect negation sees irony as achieving the negation without using an explicit negation marker. Instead, the literal meaning is retained. The incompatibility of literal and ironic meanings leads to the discovery of an implicature which suggests that something diverges from the expected state of affairs. As a result, this view predicts that irony should be more difficult to process compared to literalness due to the longer computation process and more inferencing expended. Following from the view of irony as indirect negation (Giora 1995), Giora proposed *The Graded Salience Hypothesis* (Giora 1997). The hypothesis was formulated as an attempt at exploring the mechanisms behind figurative and literal language processing. According to *the Graded Salience Hypothesis* (Giora 1997), salient (conventional, frequent, familiar, context-enhanced) meanings are activated prior to the less salient meanings. Salient meanings, being lexicalized, retrievable from the mental lexicon instead of the context alone are prioritized (Giora 1999). Giora (1999) suggests that, among other factors, conventionality, frequency and familiarity of a word or an expression can contribute to its level of salience. Similarly to the indirect negation view, *the Graded Salience Hypothesis* predicts that irony processing should be more time-consuming than non-ironic meanings, due to the activation of the additional meaning surface. Unlike literalness processing, irony processing necessitates the activation of the salient literal meaning, before the less salient, intended, ironic meaning can be retrieved (Giora 1997). While Giora's investigations into irony were anchored in the literal vs. non-literal meaning categorization, they compared one brand of irony, namely the more widespread and common one – ironic criticism (e.g., a comment “You are just in time” said to a person who is late to a lecture, Giora et al. 1998), with its literal meaning counterpart – literal praise (e.g. a comment “You are just in time” said to a person who comes to the lecture on time, Giora et al. 1998). In both types of meaning the literal meaning was positive, yet while in the case of the literal condition the literal meaning was the intended message, in the case of the ironic condition, the intended meaning was the implicit critical comment (“You are not on time, you are late”).

Other researchers, more driven by the assumption that all types of meaning are accessed through the cognitive mechanisms that utilize least effort to understand the contents, made no categorical distinction between literal and figurative meaning. At the same time, they presumed that contextual information may facilitate meaning interpretation, and explored irony processing in its broader spectrum, incorporating a wider range of meaning types (abandoning the dual, literal / non-literal distinction) with (positive and negative)

lexical valence of studied statements. On top of that, this line of research focused on concomitant aspects of the comprehension process, such as the role of contextual information (Gibbs 1986, Gibbs 1994). The evidence gathered from irony (Gibbs 1986) as well as indirect requests (Gibbs 1983) studies led to the emergence of a presumption that understanding figurative language can occur without the need to process the literal meaning first and that comprehenders are able to arrive at the speaker's intended meaning directly. This trend materialized under the name – *The Direct Access Model* (Gibbs 1986, Gibbs 1994) and assumes a single-stage process. The one-stage account sees irony processing as an interactional and fully context-dependent process, where the literal meaning is not obligatorily processed, and the successful computation of irony largely depends on the cues that the context is imbued with, and which can dramatically influence the processing. Based on the one-stage account assumptions the literal meaning is not privileged over the non-literal one. Importantly, the two types of meanings are operated by common mechanisms, and both largely rely on the context for their meaningfulness (Gibbs 1986, 1994; Sperber and Wilson 1986).

Behavioral studies (Gibbs 1986; Giora et al. 1998) provide inconsistent results and have failed to unanimously support any of the foregoing models. Studies show that irony can be processed faster or slower than literal utterances. Such a divergence in results may result from a number of factors such as the type of irony studied (ironic criticism, ironic praise) (Caffarra 2018), the task (true/false, lexical decision, evaluative decision) (Gibbs 1986, Peters et al. 2015) or the mode of input presentation (self-paced, limited response window) (Giora et al. 1998, Giora et al. 2007) and the amount of contextually-provided cues, which, depending on their salience, will raise an adequate amount of expectations (Giora 1997, Gibbs 1994). Most importantly, the differences in the results may stem from various conceptualizations of the phenomenon of irony, as this dissertation aims to show.

2.2.1. Irony processing: Literal vs. ironic

In this section I present a review of irony processing research which focused on the literal / ironic dichotomy in the construction of the tested stimuli.

In light of the early theoretical accounts and their conceptualization of irony, irony comprehension necessitates processing the literal meaning and the literal meaning was ex-

pected to be accessed and recognized prior to the ironic import (Giora and Fein 1999a). In one study, Giora and Fein (1999a) asked their participants to read short texts, biasing the final comment towards a literal or an ironic interpretation. After reading each text, participants were asked to complete a fragmented word with the first word that came to their minds. Each text was followed by two fragmented words, one of which was related to the literal and the other one to the ironic meaning of the target sentence. The goal of the experiment was to test written discourses comprehension and verify whether processing utterances in ironically biased contexts activates both literal and ironic meanings, while processing utterances in literally biased contexts activates only the literal meaning. Results showed that in the ironic context there was no difference between compatible and incompatible responses. In the literal context, however, the two types of responses differed significantly. Specifically, irony and literalness comprehension involved the activation of different concepts. While participants tended to activate both ironically and literally related concepts when comprehending irony, in the case of literal meaning, they only activated literally related concepts. These results suggest that the same statements used ironically or literally are processed in different ways. Unlike statements used literally, irony comprehension may require the activation of both the literal and the ironic meanings.

In a series of response times studies Giora and colleagues (1998) tested the predictions of *The Graded Salience Hypothesis* and *The Indirect Negation View of Irony*. The goal of the first experiment was to check whether sentences in ironically biasing contexts take longer to process than sentences in literally biasing contexts. Participants were asked to read short scenarios, which all concluded with a literal or an ironic remark featuring a positively valenced target word – a literal praise or an ironic criticism (e.g. “You are just in time”) and answer a following comprehension question. Participants’ reading times of the target sentences were measured. Results showed that ironic sentences took longer to process than the literal sentences. The second experiment tested the predictions of *The Graded Salience Hypothesis*, namely, that processing a statement in ironically and literally biasing contexts activates the literal meaning regardless of context compatibility, and that the activated concept does not get suppressed but is active in both the literally and ironically biasing contexts. Participants were presented with contexts that biased the following target sentences towards a literal or an ironic interpretation. After the sentences disappeared, a word related to the literal or ironic meaning of the statements (e.g., *table*), or a nonword created by the rearrangement of the letters of the words (e.g., *latbe*) was presented. For half of the

participants the test word/nonword was displayed 150 ms after the target sentence (ISI – interstimulus interval = 150 ms), and for the other half the break between the target sentence and the test word/nonword was 1000 ms (ISI = 1000 ms). The task in the experiment was to assess whether a presented string of letters was a word or a nonword. Overall, participants responded faster to the salient words than to the less salient ones. Both, in the literally and ironically biasing contexts, participants were faster to respond to the literally related (salient) words regardless of the length of the ISI. Interestingly, participants responded similarly in the literally biasing context when the ISI was 150 ms or 1000 ms. In the ironically biasing context, participants responded differentially depending on the final word/nonword interstimulus interval. Specifically, when the context biased the interpretation of the target sentence towards its ironic meaning, participants responded longer when the ISI was only 150 ms than when it was 1000 ms. These results support the predictions of *The Graded Salience Hypothesis* (Giora 1997) in that irony processing necessitates access to the salient (literal) meaning of the word before the less salient (ironic) meaning is activated. In addition, these studies provide evidence for the predictions put forward in *The Indirect Negation View of Irony*, which propose that the activated, salient, literal meaning of an ironic statement does not get canceled or suppressed but is retained and remains active for the ensuing meaning computation. To further test the assumptions of *The Indirect Negation View* and *The Graded Salience Hypothesis*, Giora and colleagues (1998) explored the effects of the literal and ironic meaning processing after an even longer amount of time separating the offset of the target sentence and the onset of the target word / nonword (ISI = 2000 ms). The task in the third experiment was exactly the same as in experiment 2, namely decide if the presented string of letters was a word or a nonword. Results showed that participants responded faster in the ironically biasing contexts. However, they responded similarly fast to the literally and ironically related test words / nonwords in the ironically biasing contexts. In turn, when the context biased their interpretation towards literalness, the responses to the literally related test words / nonwords were slower than to the ironically related ones. Additionally, when the context biased their interpretation toward literal meaning participants took longer to respond when the ISI was 2000 ms than when it was 150 ms or 1000 ms. When the context biased their interpretation toward ironic meaning participants responded longer when the ISI was 150 ms or 1000 ms than when it was 2000 ms. This experiment provided further support for *The Graded Salience Hypothesis* by demonstrating the privileged access to the salient meanings compared to the less salient

ones resulting in longer processing times for ironic compared to literal meaning. What is more, the predictions of *The Indirect Negation View of Irony* were confirmed by demonstrating that the literal meaning of an ironic statement is not discarded but retained in order to arrive at the difference between the said and the referred to. In sum, these studies show that irony is more challenging to process compared to literal meaning, as demonstrated by the longer time required for the comprehension of ironic meaning, which became available late – 2000 ms after the presentation of the target sentence. While the salient, literal meaning is available instantly, the less salient meaning – ironic – is activated late, that is, 2000 ms after the target sentence has been presented. Moreover, the salient, literal meaning of an ironic statement is retained even after such a long ISI as 2000 ms.

In a different study, Giora and Fein (1999b) explored the level of familiarity of ironic statements and compared the processing of familiar (e.g., “Very funny”) and less familiar (e.g., “I think you should eat something”) ironic statements using positively valenced literal (praise) and ironic (criticism) equivalents. During the experiment participants were asked to read short stories and decide whether the following string of letters is a word or a nonword. The string of letters was either a word or a nonword related to the literal (salient) or ironic (less salient) meaning of the target sentence. For half of the participants the test letter string was presented 150 ms after the target sentence and for the other half the letter string appeared 1000 ms post target sentence offset. For the less familiar ironies, when the test letter string appeared after a short break (ISI = 150 ms) participants responded faster to the salient than to the less salient word. When the context suggested the literal reading of the sentence, the contextually compatible (literally related) test words were responded to faster than contextually incompatible (ironically related) ones. When the context suggested the ironic reading of the sentence the contextually incompatible (literally related) test words generated faster response times than the contextually compatible (ironically related) ones. In sum, participants responded faster to the salient (literally related) words at this early processing stage, regardless of whether the context suggested a literal or an ironic reading. After a 1000 ms delay, in the ironically biasing contexts, participants responded similarly fast to the salient, contextually incompatible (literally related) and less salient, contextually compatible (ironically related) test words. When the context biased the target sentence interpretation towards the literal meaning, literally related test words were processed faster than ironically related ones. In line with the predictions of *The Graded Salience Hypothesis* familiar ironies processing did not differ after a short (ISI = 150 ms) or a long (ISI = 1000

ms) delay. Familiar ironies' salient literal and ironic meanings were both activated at the initial stage.

In another set of studies, Giora and colleagues (2007) tested the role of expectations in irony processing and examined whether a strong expectation of irony can facilitate its comprehension at initial stages. In the first experiment participants read dialogs which ended in a target sentence conveying either a literal praise or an ironic criticism. The target sentences were preceded by a few sentences of context. Each dialog contained an ironic utterance midway through the dialog which biased the target sentence towards a literal or an ironic interpretation. In this way the dialogs were supposed to trigger expectations of irony. Participants were asked to read the dialogs for comprehension, advancing the sentences at their own pace. The time of reading was measured. Results showed that expected ironic target sentences were read longer than their literal equivalents. Such an outcome suggests that salience-enriched meanings are still processed faster than context-enriched meanings, even though they cued an ironic interpretation by building the expectations.

In the second experiment, Giora and colleagues (2007) explored the time-course of utterance-level interpretation. Scenarios conveying literal praise and ironic criticism, completed by target sentences featuring target words, and followed by a probe (literally related, ironically related, or unrelated), displayed either 250 ms or 1400 ms after the offset of the target sentence. The task during the experiment was to make a lexical decision and decide whether the presented probe was a word or a nonword. Participants' reading times of the target words were similar in the literally and ironically biasing contexts, demonstrating comparable initial processes. However, when the reading times for the subsequent probes were analyzed, the results revealed that probes following ironically biasing contexts were longer than the reading times of the probes following the literally biasing contexts. Response times showed that after the shorter interstimulus interval (ISI = 250 ms) neither literal nor ironic interpretations were available. The authors proposed that at such an early processing stage (ISI = 250 ms) there was no priming between targets and probes, as the probes were designed to trigger utterance-level interpretation which should probably require more time. However, the interpretations were more available for the unrelated probes. It was suggested that processing may have been impeded by the interference of the salient lexical meaning while the participants were searching for the intended meaning. Response times after the longer interstimulus interval (ISI = 1400 ms) demonstrated that literal mean-

ings were already analyzed while the ironic ones were not. Indeed, ironic meanings took longer to process than the literal ones, regardless of the context (literal, ironic).

In the third experiment, Giora and colleagues (2007) further explored the role of expectations in irony processing, and whether strengthening these would facilitate ironic meaning derivation. The aim of the experiment was to determine whether in some conditions ironic meanings could be facilitated by available irony triggering expectations so that the ironic intent could be accessed earlier than the literal meaning. In a similar procedure to experiment 2, the stimuli set was divided into two groups, one triggering the expectation of irony, and the other one not building such an expectation. The stimuli were short texts which either biased the last sentence (target sentence) towards its literal or an ironic interpretation and, in this way, built the expectation of literalness or irony. The texts were followed by a probe (literally related, ironically related, or unrelated) which appeared 750 ms after the offset of the target sentence. Results showed that the ironic probe was processed longer than both the literal and the unrelated ones, regardless of the presence of expectations. It seems that even when the context biased the interpretation of the target sentence towards an ironic meaning, the expectations built were insufficient to override or match the salience-based (literal) interpretation.

In order to determine whether these results may have been caused by the insufficient time to fully process the target sentence and the probe and to arrive at the utterance interpretation, Giora and colleagues (2007) replicated the experiment with a longer interstimulus interval (ISI = 1000 ms). Similar results to the previous experiment were obtained showing that the amount of provided expectations did not affect the various types of probes differently. Specifically, the response times to the ironically related probes were longer than to the literally related probes. Overall, these experiments demonstrated the privileged, more efficient, processing of salient, literal meanings regardless of whether context suggested an ironic or a literal reading. In the case of irony processing, these studies showed that the context was insufficient to supersede salient (but inappropriate) meanings which slow down the activation of appropriate (ironic) interpretations. Expectation-supported ironic interpretations were overridden by the salience-based literal interpretations, regardless of how much the context implied an ironic one. One alternative interpretation of these results that Giora and colleagues (2007) do not offer is that the stimuli in the form they were used in the studies did not trigger sufficient expectations of irony. The texts were built in such a way, that they biased the interpretation of the target sentence towards its literal or

ironic meaning, but they may have failed to build strong expectations. Giora and colleagues (2007) argue that their evidence provides support for the primacy of salience effects over context effects and suggest that the expectation for a particular type of meaning is insufficient to streamline the comprehension process and cause faster processing times or inhibit contextually inappropriate interpretations, as salience-enriched meanings show resistance to contextual information very early on.

Previous studies employing the dichotomous literal / non-literal meaning distinction of ironic and literal statements showed that the way the notion of irony and expectations is conceptualized is crucial (Giora et al. 1998; Giora and Fein 1999b; Giora et al. 2007). Owing to their complexity and opacity as well as individual approaches to investigating irony, studies provide mixed evidence. Some evidence suggests that access to the knowledge about speaker's personal traits helps with identifying intentions behind irony (Ronderos et al. 2022). Using the two-sided categorization Ronderos and colleagues (2022) explored the role of contextual information in the form of knowledge about the speaker in irony processing. Specifically, participants in the study were asked to read everyday conversations and imagine how the scenarios would sound in the real life. Each scenario was constructed in two versions, one built a strong expectation with respect to the speaker, and the other did not, and was neutral in its tone. The scenarios consisted of eight sentences; the first five sentences served as an introduction which described the situation and triggered an expectation of an ironic or a non-ironic comment (factor 1: speaker intention). The introduction was followed by a sentence describing the speaker's attitude as sincere or insincere (factor 2: speaker attitude), the target sentence (identical in the two conditions), a wrap-up sentence (identical in the two conditions), and a comprehension question with three possible answers, suggesting an ironic, a literal or a misunderstood interpretation. The parts comprising factor 1 (speaker intention) and factor 2 (speaker attitude) were fully crossed. Participants' accuracy and reading times were measured. Results showed that when the speaker's attitude was described as insincere participants tended to interpret the target sentences as ironic, particularly when the expectations were strongly marked. In contrast, when the speaker's attitude was described as sincere, the target sentences were understood as literal, particularly when the expectations were not built. It seems that the extralinguistic contextual information about the speaker was pivotal in how successful participants were at irony comprehension. Reading time rates showed that when participants interpreted the sentence as ironic, the sentence was read faster with strong expectations built compared to when they

had not anticipated anything. These results show that the level of expectations enabled by the context (such as speaker's intention and attitude) predicts faster irony processing. Interestingly, when the context cued a strong expectation of the speaker intention, participants were faster to process the ironically intended sentences compared to the literally intended sentences. When, in turn, the context was neutral and did not provide any particular cues regarding the speaker intention, participants were faster to read the literal statements. These results suggest that the simple, dichotomous division of statements into literal and non-literal may not fully capture the nuanced nature of irony. Literal meanings were not processed faster indiscriminately, but only when the context was neutral and did not prompt anticipation of the speaker intention. Ronderos and colleagues (2022) propose that instead of the literal / ironic distinction, researchers should look to other underlying factors which mediate the irony processing effort such as the context strength and the amount of speaker related information that comprehenders are given access to.

One context-related feature of irony is the incongruity of an ironic statement and its intended meaning (Gerrig and Goldvarg 2000), which can be likened to the incongruity of expectations and context. Generating expectations is a natural function of our cognition (Van Berkum 2010), and their violation is considered both an indispensable and sufficient component of an ironic utterance (Colston 2000). Gerrig and Goldvarg (2000) found that the perception of irony grew proportionately with the degree of the situational incongruity, with lower degrees of incongruity failing to signal irony.

In a set of experiments Ivanko and Pexman (2003) focused on the role of context in irony processing using a dichotomous categorization of stimuli into ironic and literal and explored the role of situational context and the degree of negativity in the perception of irony. However, they did not compare same-sentence-valence statements (literal praise and ironic criticism), but they compared ironic criticism and literal criticism, which used adjectives with opposite valence meaning (ironic: *Sam is a nice friend*, literal: *Sam is a rotten friend*). In their Experiment 1 participants were asked to rate context-statement paragraphs on their degree of sarcasm, mockery, politeness, and confidence. In the study they used three degrees of contextual/situational negativity (strongly negative, weakly negative and neutral), and two types of statements (ironic and literal), which created a fully rotated design. Results revealed that when the context was strongly or weakly negative, participants tended to rate ironic statements as more sarcastic than literal statements. Moreover, ironic statements were rated as more sarcastic in strongly than in weakly negative contexts. The

sarcasm ratings of literal statements revealed the opposite effect. When literal statements were embedded in strongly negative contexts, they were rated lower for sarcasm than the literal statements in weakly negative contexts. These results demonstrated that the degree of context / statement incongruity predicts the amount of sarcasm perceived in the ironic statements, with increased incongruity leading to an increased sarcasm perception. Results from the ratings of mockery and politeness showed that when the context was strongly negative ironic statements were rated as more mocking, and slightly more polite than literal statements. In the weakly negative contexts ironic statements were rated as only marginally more mocking than literal statements, and significantly more polite than literal statements. Additionally, ironic statements were rated as more mocking, and less polite when they followed strongly negative contexts than when they followed weakly negative contexts. Literal statements mockery and politeness ratings did not differ in strongly and weakly negative contexts. As for confidence ratings, participants were more confident rating statements embedded in strongly negative contexts than in weakly negative contexts. Confidence ratings for literal statements were higher than for ironic statements. These results are in line with Colston's (2002) contrast and assimilation effects of verbal irony. A bigger clash between the target comment and the preceding context was conducive to making ironic interpretations, or mockery judgments. This shows that the contextual valence, or rather the interplay of the contextual valence with the target comment, and the degree of negativity that separates them has a huge influence on the potential of irony recognition.

In another experiment (Experiment 2), Ivanko and Pexman (2003) explored participants' expectations of literal and ironic language depending on the context incongruity. Participants were auditorily presented with contexts (strongly negative, weakly negative, neutral) and two types of statements (literal and ironic). The statements were pronounced with either an ironic or a literal intonation as appropriate. Participants were asked to listen to the context / statement sets, read them along in provided booklets, and decide which statement (literal or ironic) they would rather expect to follow the context. Results showed that in strongly negative contexts participants expected literal statements more often than the ironic statements. In weakly negative and neutral contexts, participants expected literal and ironic statements equally often. These results showed that when the context was strongly negative, participants expectations oriented towards literal criticism endings. This outcome may be taken to mean that participants perceived literally negative comments to be a better fit for strongly negative situational scripts and preferred to match strongly negative

context with literal criticism. Furthermore, this experiment showed that extreme negativity conveyed by the contexts calls for literal criticism, and moderate (weak) situational negativity leads to ironic and literal comments similarly often. The strong situational negativity resulted in strongly offensive comments; therefore, literal criticism was a better match, and more appropriate communicatively. The speaker in these context / statement sets was seriously offended, therefore, their (literal) criticism was justified, and, consequently, socially appropriate, and preferred by the participants.

In experiment 3, they studied the role and the influence of the incongruity of context and statement in irony processing. According to Ivanko and Pexman (2003), the way we conceptualize the incongruity of these two key constructs (context, target statement) is crucial in irony understanding. The stimuli comprised context / statement sets communicating ironic or literal meaning. The contexts differed in their degree of negativity (strongly negative, weakly negative, neutral). Participants were instructed to read the sentences at their own pace, and their reading times were recorded and analyzed. When the context negativity was strongly marked, ironic statements were processed more slowly than literal statements. When the contextual negativity was only weakly marked, irony was processed faster than literal statements. These results demonstrate that irony can be processed as fast as, or faster than literal statements on condition that the contextual negativity is only weakly marked. This might potentially indicate that in order to trigger ironic intent, one needs to mark the communicative / situational context adequately, imbued with sufficient adversarial intent, in irony most often built through negative expectations leading to unwelcome outcomes. In essence, Ivanko and Pexman (2003) report that context incongruity plays a pivotal role in irony processing.

Incongruity has been proven instrumental in irony perception by Colston and O'Brien (2000), who explored pragmatic functions of strong and weak ironic statements embedded in contexts creating different contrast effects. Incongruity plays a central role in Colston's (2002) view of verbal irony and figurative language in general. Colston (2002) introduced the notion of *contrast effects* and *assimilation effects* and argues that the extent to which a person perceives contrast or assimilation which is the result of the discrepancy between an ironic comment and the situation to which it refers can largely contribute to the prediction of pragmatic functions, such as irony (Colston 2002).

In one experiment (Experiment 1), Colston (2002) used the ironic versus literal categorization of stimuli and investigated the contrast and assimilation effects in irony com-

prehension as possible modifiers of cognitive ease/effort in irony comprehension. Participants were presented with stories featuring moderately negative situations, in which the character made comments as if addressed to the participant. The comments varied on the extremity of situational negativity-positivity range, from extremely negative, moderately negative, moderately positive or extremely positive. Participants were asked to read the scenarios and rate their negativity. Results revealed that when the situations were followed by extremely negative comments, they were perceived to be more negative than the situations followed by all the other comment types. When the situations were commented upon with moderately positive comments, they were perceived to be more positive than the situations which were commented upon with moderately negative comments. The ratings for extremely positive and moderately negative or extremely positive and moderately positive did not differ significantly. In other words, when a negative situation is witnessed (e.g. a potentially easy exam turned out to be difficult) it is rated as somewhat negative when a speaker comments on it with a moderately negative (literal) statement (e.g., “that exam was bad”). The same amount of negativity is seen when a speaker uses an extremely positive (ironic) comment (e.g., “that exam was absolutely wonderful”). The situation is seen as relatively more positive when a speaker uses a moderately positive (ironic) comment (e.g., “that exam was good”). This study shows that contrast effects underlie irony comprehension. A set of four experiments (Colston 2002) consistently show that contrast effects stimulate the understanding of irony. Precisely, the contrast is created between the semantic meaning of the ironic statement and the context to which the statement refers. Ironic statements, which assume positive words with reference to negative, undesirable situations and failed expectations trigger the interpreter to anticipate a negative comment. This clash is what facilitates irony recognition, according to Colston (2002).

Woodland and Voyer (2011), adhering to the literal/ironic categorization, studied the degree to which intonation with which the comments were delivered and context, determine the perception of sarcastic utterances, and specifically whether context alters listener’s perception of an utterance. Participants were auditorily presented with contexts / statements sets, which communicated ironic criticism or literal praise, and were asked to indicate the extent to which they heard sarcasm or sincerity in the speaker’s tone of voice on a scale. Each statement had two different contexts (positive and negative) and was uttered in two different tones of voice (sarcastic and sincere). Results showed that participants rated negative contexts as sarcastic and positive contexts as sincere. The ratings for

the tone of voice showed that the sarcastic tone of voice of the scenarios made the scenarios sound sarcastic and the sincere tone of voice of the scenarios made the scenarios sound sincere. Moreover, they found that when the tone of voice that the target statement was uttered in, and its preceding context were congruent (positive context/sincere tone and negative context/sarcastic tone), participants' perception was not altered (that is remained in agreement with the tone of voice of the target statement). However, when the tone of voice that the target statement was uttered in, and its preceding context were incongruent (positive context/sarcastic tone and negative context/sincere tone), participants' perception was altered, and the target statements were judged as neutral in both conditions. Such results might be taken to demonstrate that if an utterance is expressed in a tone congruent with the listeners' expectations (raised by the preceding context), their responses were compatible with the tone of voice. If the opposite happened, and the tone of voice and the contextually raised expectations were incongruent, participants' responses were neutral (in the middle of the scale). It therefore follows that context that precedes an utterance has a tremendous impact on how that utterance is ultimately perceived (Woodland and Voyer 2011). Response times data showed that in both negative and positive contexts, participants made faster decisions when the tone of voice and the context were congruent. That means when the context was negative, and the tone of voice was congruent (sarcastic) participants responded faster than when the tone of voice was incongruent (sincere). Similarly, in the positive context, when the tone of voice was congruent (sincere) participants responded faster than when the tone of voice was incongruent (sarcastic). Woodland and Voyer (2011) suggest that participants may have been unsure about the speaker's intention (sincere or sarcastic) in the situation when the context and the tone of voice were incongruent.

In a set of studies, Deliëns and colleagues (2018) explored the interplay between situational context prosody, and facial expressions in irony comprehension. While these studies did not distinguish between irony types, they did distinguish between two types of literal meaning (positive and negative). The stimuli in the set of studies were videos in French with two characters having an interaction. Each video was followed by a video featuring the second character's reply. Each video trial consisted of the following segments: a context, conceptualized here as a part of the video providing information useful for irony understanding, where one character (A) talks about their knowledge about the other character's (B) preferences regarding the two items visible on the table, a labeling and question, a pause, and a target utterance. Target sentences were associated with four prosody contours

(audio condition) and four facial expressions (video condition) such as *Irony*, *Literal Yes* (a form of literal praise), *Literal No* (a form of literal criticism) and *Neutral*. The goal of Experiment 1 was to assess whether stimuli can be successfully evaluated as either ironic or sincere based on the prosodic or facial expression features alone. Participants were asked to watch (without audio) and listen to excerpts and rate the speaker's tone of voice (audio condition) or the speaker's facial expression (video condition) for their level of irony. Results showed that excerpts spoken with an ironic prosody were rated as more ironic than all the other prosody types. In addition, excerpts in the *Literal No* category were rated as less ironic than the excerpts in the *Literal Yes* and *Neutral* categories, while there was no difference between *Literal Yes* and *Neutral* categories. Results from the video condition showed (quite similarly) that excerpts delivered with an ironic facial expression were rated as more ironic than the excerpts with other facial expressions. Additionally, excerpts in the *Literal Yes* category were rated as more ironic than those in the *Neutral* and *Literal No* categories, and excerpts in the *Neutral* category were rated as more ironic than those in the *Literal No* category. Altogether, these results show that ironic prosody and facial expressions can be correctly discriminated against literal (positive or negative) or neutral prosody as well as facial expressions. It may suggest that, at least, in some circumstances, irony may be recognized with the support of some prosodic and visual facial features.

In the second experiment, Deliens and colleagues (2018) explored the interplay between the extralinguistic features such as prosody and facial expressions and the contextual incongruity in irony processing. Participants were asked to watch videos featuring two characters having a conversation about two items visible on a table. Their task was to listen / watch carefully and decide which item the second character really wanted. Target sentences featured three prosody contours (audio condition) and three facial expressions (video condition) such as *Irony*, *Literal Yes* (categorized in this study as a form of literal praise) and *Literal No* (categorized as a form of literal criticism). Results showed that participants responded less accurately to ironic items compared to the *Literal No* items. Additionally, results revealed that context had a positive impact on the accuracy of participants' decisions when they were responding to the *Irony* items. Facial expressions had a negative influence on the accuracy of the decisions on *Irony* items, but it positively influenced the accuracy of *Literal Yes* items compared to *Irony* ones. These results demonstrate that ironic prosody does not facilitate comprehension and facial expressions accompanying ironic remarks stifle it. Accuracy rates showed that these non-contextual cues are not reliable irony markers.

Reaction times showed that participants responded longer to *Ironic* items than to the other two types. Importantly, prosodic and facial expression features decreased participants reaction times for ironic trials. These results show that these non-contextual cues can speed up irony processing. The fact that accuracy and reaction times show quite dissimilar influence of prosody and facial cues on irony suggests a trade-off in irony processing. While prosody and facial cues prompt irony less reliably than contextual information, they are conducive to building expectations of irony resulting in faster processing. Identifying speakers' intentions was more difficult (less accurate) when they were expressed ironically than literally. Moreover, the incongruence of context and target sentence facilitates the correct interpretation of intentions communicating irony. The speed-accuracy trade-off may be a result of the fact that when participants watched the situations involving prosodic and facial cues, the contextual interpretation of the literal meaning was bypassed. Moreover, it is possible that both contextual and non-contextual cues were processed simultaneously, and while the non-contextual cues can lead to a faster processing, they may also lead to the contextual cues processing being aborted.

In the third experiment, Deliëns and colleagues (2018) further explored the relationship between the prosodic, facial cues and the incongruity of context in irony processing. This experiment only featured two types of stimuli, including *Ironic* and *Literal Yes* categories. In this experiment, however, one group of participants was asked to respond to items featuring all extralinguistic cues along with context (Context group), while the other group was only asked to respond to items featuring all extralinguistic cues without context (No Context group). The stimuli in the Context group included: context, context and facial expression, context and prosody, and context, prosody and facial expression. The stimuli in the No Context group included: no cue, prosody, facial expression and prosody and facial expression. Participants were less accurate when they had no access to context. Reaction times data showed that participants responded faster when the stimuli were enriched by prosodic and facial features. These data demonstrate that the context availability is absolutely critical for irony comprehension, contextual incongruity is a very reliable cue to irony, even more reliable than prosodic or facial expression features. Altogether, the studies conducted by Deliëns and colleagues (2018) suggest that interpreters prefer the extralinguistic features for their frugality and their ability to prompt ironic interpretations, without the need to complete the full context-based interpretation, despite their lower reliability and even at the expense of accuracy. It was suggested that even though context incongruity re-

mains the most reliable cue to ironic intent, the route to irony may not always be context mediated. With communicative experience, Deliens and colleagues (2018) argue, communicators develop implicit knowledge about irony prosodic and facial cues, and as they gain maturity and confidence in communication, they may prefer to base their interpretation on these less costly, extralinguistic cues.

Apart from response time studies irony is also explored with the use of the eye-tracking method. While not placing extra cognitive demands on the participants, eye-tracking allows for the observation of the implicit reactions as well as a time-sensitive control of the reading behavior of the eye and provides a precise analysis of the cognitive process with a millisecond precision. At the same time, due to the absence of the extra demands imposed on the participant, it resembles the act of normal reading in a non-experimental setting (Kaakinen et al. 2014; Turçan and Filik 2016).

Evidence from eye-tracking studies provides solid evidence in testing irony reading (Filik and Moxey 2010; Kaakinen et al. 2014; Turçan and Filik 2016). In a set of two experiments Kaakinen and colleagues (2014) asked their participants to read stories consisting of target statements preceded by an ironic or a non-ironic context. The stories communicated either ironic criticism or literal praise. Additionally, participants were asked two questions about each story, one probing into text memory and the other into their inferences regarding the stories. Participants' eye movements were recorded. Eye fixations were grouped into first-pass (when reading the target for the first time) and second-pass (when going back to the target from a subsequent phrase) fixations. In addition, two first-pass measures were computed: progressive fixation time and first-pass rereading time. Results from progressive first-pass fixation times showed that reading ironic sentences was marginally longer than reading literal sentences. Additionally, rereading results revealed that participants tended to immediately reread ironic sentences more often than literal sentences. This indicates that they needed to make sure whether their understanding was correct. Also, readers tended to look back to ironic target sentences more than to the literal ones, but the look-back times to ironic target sentences were not significantly longer than to literal target sentences. These results demonstrate that the ironic meaning reading difficulty is visible during the first-pass reading and indicated that irony reading comes with a bigger cognitive cost. Moreover, the study showed that irony computation is not complete during the first-pass reading. Participants needed to look back to the target sentence to make sure they understood the meaning. This study, based on eye behavior, also provides support for the fre-

quently offered observation that when comparing irony to literal meaning irony tends to be more time-consuming relative to literal meaning, especially, when acknowledging that this study tested one specific type of irony, i.e., the more common, conventional type – ironic criticism – to compare it with its literal equivalent – literal praise.

In another experiment, Kaakinen and colleagues (2014) partially replicated the results obtained in the study described above. In this eye-tracking study, the authors focused on investigating potential individual differences in processing written irony and replicating Experiment 1 with a different participant sample. Similarly to Experiment 1, participants were asked to read ironic (ironic criticism) and non-ironic (literal praise) stories, and answer questions regarding text memory and inference making. In addition, participants were asked to complete a reading span test (*Working memory capacity*; WMC), the *Need for Cognition* test (NFC), and *Sarcasm Self-Report Scale* (SSS). The authors observed that the look-back times to context sentences in the ironic condition were marginally shorter than in the literal condition. Also, the duration of the first-pass rereading was longer in the ironic condition and the probability of making a look-back to the target sentence later was higher in the ironic condition. When the data from the two experiments were pooled the results showed that when reading ironic statements participants were more likely to initiate first-pass rereadings and look-backs to the target sentence relative to reading literal statements. What is more, they made shorter look-backs to the context in the ironic compared to the literal condition. Such a pattern of results demonstrates that irony processing is more effortful than literalness. Firstly, the authors suggest that the higher likelihood of participants to immediately reread the sentences may be a sign of the need to validate (double check) the ironic (unexpected) interpretation more than the literal meaning. Secondly, the fact that participants were more likely to look back to the ironic target sentences may have indexed their need to recheck their interpretation or search for an alternative one. Finally, the shorter look-back times to the context parts in the ironic stories as Kaakinen and colleagues (2014) interpret might be a sign that looking back in text focused more on the target sentence in the ironic condition compared to the literal condition. This suggests that irony processing entails increased rereading and requires reinterpretation processes after initial processing has taken place. Data from the individual differences measures showed that readers who scored higher on the WMC showed shorter first-pass progressive fixation times than readers who scored lower. What is more, participants with a higher WMC score needed less immediate rereading overall than participants with a lower WMC score. Moreover, partici-

pants with a high WMC score were more likely to reread ironic target sentences compared to literal target sentences during first-pass reading. This effect decreased as the WMC score got lower. Overall, participants needed less time for first-pass reading as the WMC score increased. The data from SSS and NFC showed that these measures did not contribute to the comprehension process of irony. The results concerning WMC point to the conclusion that participants with a high WMC score considered an ironic interpretation earlier, at first-pass reading stage. Moreover, this study shows that look-backs serve as a confirmation of a previously built expectation or a trigger to search for a new interpretation. It seems that look-backs are caused by the reader's need to re-examine the stimulus, but also suggest that they are necessary for the correct interpretation of sarcasm (Olkonien et al. 2018). Altogether, the two studies show that irony processing is burdened with extra effort compared to the processing of literal meaning (Kaakinen et al. 2014).

Similarly, more effortful irony processing relative to the literal meaning processing has been reported by Filik and Moxey (2010). In their eye-tracking study participants were reading written materials while their eye movements were recorded. Each written material consisted of four sentences. The first sentence provided a contextual background, which biased the following sentence (a quantified sentence) towards its ironic or literal interpretation. The second sentence was a quantified sentence with a positive (*many*) or a negative (*not many*) quantifier. The third sentence contained a plural pronominal reference to the reference set or the complement set. Finally, the fourth sentence finished the scenario. In order to clarify, let us consider an example. Sentences with positive quantifiers (e.g., *many*) tend to be followed by sentences with plural pronominal reference to the set of entities for which the predicate is true (the *reference set*; i.e., the diners who did finish their meal in the following example). For instance, the sentence: "Many of the diners finished their meal" would be followed by "They cleaned their plates and sat back happily". In turn, sentences with negative quantifiers (e.g., *not many*) tend to be followed by sentences with plural pronominal reference to the set of entities for which the predicate is false (the *complement set*; i.e., the diners who did not finish their meal in the following example). For instance, the sentence: "Not many of the diners finished their meal" would be followed by "They got a takeaway on the way home instead" (Filik and Moxey 2010). Processing pronominal references to the reference set seems to be facilitated after a positive quantifier, relative to the negative quantifier. However, processing pronominal references to the complement set is facilitated following a negative quantifier relative to the positive quantifier.

Participants' task was to read the materials for comprehension and answer a comprehension question regarding the materials (following one third of the trials). Results showed that ironically intended sentences (quantified sentences) were read longer compared to the non-ironic ones, due to more rereading necessary in the case of ironic sentences. These results might be taken to provide support for *the Standard Pragmatic Model* (Grice 1975) and *the Graded Salience Hypothesis* (Giora 1997). Namely, irony (which was unfamiliar in this study) obligatorily required more reading time to properly process the intended meaning. According to Filik and Moxey (2010), participants accessed the literal meaning of the read sentences first, and, in order to capture the ironic meaning, they needed to undergo subsequent computation that involved the context / sentence incongruence. Only when these two stages were complete, did the participants understand the meaning as ironic. This was not the case for the literal sentences. This interpretation, however, needs to be taken with caution, as it remains unclear why irony demands longer reading times. It may be a result of the two-stage process, or it may, merely, reflect the inherent incongruity, which literal sentences do not have. What is more, reference to sentences intended literally showed longer reading times for complement set reference after a positive quantifier and longer reading times for reference set reference after a negative quantifier. However, reference set and complement set reference were equally easy after positive and negative quantifiers in ironic sentences. These findings support the predictions of *the Graded Salience Hypothesis* (Giora 1997), which proposes that both literal and ironic meanings are accessible when processing irony.

Some evidence from eye-tracking studies suggests that familiarity of statements modulates the way irony and literalness are processed (Filik et al. 2014; Turçan and Filik 2016). Familiarity is a powerful phenomenon in language comprehension (Connine et al. 1990). It has been suggested that familiarity may provide an accurate measure of word frequency in the mental lexicon (Connine et al. 1990). Evidence from a lexical decision task demonstrated that highly familiar words were recognized faster and more accurately than words with lower familiarity (Connine et al. 1990). What is more, familiarity has a significant impact on the ease of non-noun compound (e.g., *chocolate plant*) comprehension (Tagalakis and Keane 2006). Tagalakis and Keane (2006) showed that familiar compounds were rated as sensible faster than unfamiliar compounds. It was suggested that familiar compounds were easier to understand than unfamiliar ones. Moreover, familiar compounds

were understood faster than the unfamiliar ones, demonstrating that familiarity facilitates comprehension of compounds.

Filik and colleagues (2014) tested the role of familiarity in irony processing and asked their participants to read ironic and non-ironic materials which were either familiar or unfamiliar. Participants' eye movements were recorded in three measures: first-pass reading time (all fixations in a region until the region is left, a measure of early text processing), regression path reading time (the sum of fixations from the time when the region is first entered until the moment when a saccade crosses the right region boundary, a measure of early processing difficulty and reinspecting the text in order to deal with the difficulty) and total reading time (the sum of all fixations in a region, a measure of overall processing). Results from the critical region (containing the disambiguating target word biasing the interpretation towards irony or literalness) showed that when unfamiliar materials were compared, participants made longer gazes (first-pass reading times) at ironic than non-ironic items, while the familiar materials did not differ. This, according to Filik and colleagues (2014), suggests that in the case of unfamiliar irony, participants experienced difficulty immediately upon reading the critical word, but they did not experience such a difficulty when reading ironic items which were familiar. Similarly, participants' total reading times were longer for ironic unfamiliar items than non-ironic items, while the familiar ironic and non-ironic items did not differ. Eye-tracking data from the post-critical region (the remainder of the target sentence) showed similar results. For unfamiliar materials, ironic items required longer reading times than non-ironic items in first-pass reading times, regression path reading times and total reading times. Familiar ironic and non-ironic materials did not differ. These results, according to the authors, substantiate the predictions of the *Graded Salience Hypothesis* and show that unfamiliar (non-salient) ironic statements are more difficult than unfamiliar literal statements. In contrast, familiar irony does not pose such a difficulty. These results provide further support for the facilitating nature of familiar stimuli. When unfamiliar ironic utterances were juxtaposed with their unfamiliar literal counterparts the differences were pronounced, and the difficulty of irony was obvious. When familiar ironic and non-ironic utterances were compared no difficulty was observed for irony. Filik and colleagues (2014) suggest more research is needed to explore similarities and differences of different kinds of figurative language and to address the reasons of familiar irony processing facilitation. In my view, it is possible that even with its inherent incongruity incessantly present, when irony gets familiarized, and the ironic statements become

part of the mental lexicon, irony processing may not pose extra difficulty when compared to its literal equivalents.

Similarly, Turçan and Filik (2016) tested the roles of context and utterance properties in irony processing. In the first experiment, participants were asked to read scenarios while their eye movements were recorded. Each scenario consisted of five sentences and described an interaction between two characters. The first sentence introduced the two speakers and the situation. The second sentence differed between explicit and implicit conditions. In the explicit condition, this sentence provided an explicit expectation of the speaker concerning the other character. In the implicit condition this sentence did not provide any expectations. The third sentence provided the outcome of the second speaker's behavior and differed in the literal and sarcastic conditions. In the literal condition this sentence fulfilled the expectation mentioned in the previous sentence. In the sarcastic condition this sentence frustrated the expectation mentioned in the preceding sentence. The fourth sentence contained the final comment. In the literal condition the meaning of the speaker's words was literal (literal praise), and in the sarcastic condition, the meaning of the speaker's words was opposite to their intention (ironic criticism). The fifth sentence wrapped up and concluded the scenario. All final comments were unconventional, that is they were unfamiliar to the participants. 25% of the scenarios were followed by a comprehension question. The scenarios were divided into three analysis regions. The precritical region (two words preceding the critical region), the critical region (the disambiguating word which biased the target sentence towards its sarcastic or literal interpretation), and the postcritical region (the rest of the target utterance). Three measures of the eye behavior were analyzed such as first-pass reading time, regression path reading time and total reading time. In the precritical region, shorter regression path reading times were recorded for scenarios containing explicit expectations relative to scenarios with implicit expectations. This indicates that even prior to encountering the disambiguating word, participants needed to reread the context when there were no expectations cued more than the contexts with explicitly cued expectations. In the critical region literal utterances were read faster than the sarcastic ones. This result was taken to reflect a longer time needed to understand sarcasm, in line with *the Graded Salience Hypothesis* (Giora 1997) and *the Standard Pragmatic Model* (Grice 1975). What is more, the amount of expectations did not seem to offer a processing advantage. In the postcritical region the literal comments were read faster when the context cued expectation explicitly compared to when the context remained implicit. Moreover,

when the context explicitly cued expectations literal sentences were read faster than the sarcastic ones. These results seem to be in line with the predictions of the modular accounts (Giora 1997; Grice 1975) by demonstrating that irony required more time to process than literalness. In the second experiment, Turçan and Filik (2016) aimed at replicating the results of the first experiment and addressing the role of utterance properties in sarcasm processing. Specifically, in Experiment 2 they explored reading patterns of familiar and unfamiliar sarcastic utterances embedded in explicit and implicit contexts. Materials used were the same as in Experiment 1, only this time they consisted of familiar and unfamiliar scenarios. The scenarios were divided into the same three analysis regions as the materials in Experiment 1. Results showed that in the precritical region familiar utterances were read faster when the context cued the expectations explicitly compared to implicit contexts. There were no differences in reading times for unfamiliar utterances between explicit and implicit contexts in this region. This shows that at this early stage, prior to the understanding the scenarios as literal or sarcastic the context influenced the reading of familiar utterances, but not the unfamiliar ones. Moreover, as revealed by the total reading times the literal comments were read faster than sarcastic comments in the precritical region. In the critical region, familiar utterances were read faster than the unfamiliar ones. As for literality, utterances meant literally were read faster than the utterances meant sarcastically. According to Turçan and Filik (2016), this suggests that sarcasm is more difficult to process than literalness, regardless of familiarity or contextual cues. What is more, regression path reading times showed that unfamiliar utterances took longer to read when they were embedded in the sarcastic context compared to the literal context, while familiar utterances did not differ whether they were intended as sarcasm or literalness. This shows that sarcastic comments are not always understood longer than literal ones. When they are familiarized, they can be read and understood as fast as literal meaning. Data from total reading times showed that literal utterances were faster to read than the sarcastic ones in both familiar and unfamiliar contexts. This shows that the familiarity of familiar sarcastic comments did not facilitate its processing at this stage, and sarcasm was processed similarly, regardless of familiarity. Both familiar and unfamiliar sarcastic utterances necessitated extra processing time relative to their literal equivalents. In the postcritical region the utterances in the literal condition were read faster (first-pass reading time) than the utterances in the sarcastic condition. What is more, data from regression path reading times and total reading times showed that the utterances in the literal condition were read faster than in the sarcastic con-

dition. In addition, familiar utterances took less time to read than the unfamiliar ones. In short, the parts of texts following the sarcastic comments were read more slowly than the parts of texts following the literal comments. This experiment showed that familiarity plays a role at initial processing stages of familiar sarcasm, but this facilitating effect gets muddled at later stages. Altogether, these studies (Turçan and Filik 2016) suggest that familiarity impacts the processing route of the sarcasm and streamlines sarcasm understanding.

Based on the behavioral and eye-tracking irony processing studies employing the literal / ironic categorization, discussed above, irony is more effortful to process than the literal equivalents. Behavioral studies in irony processing adopting the literal / ironic distinction predominantly point to the more difficulty of irony processing compared to literal meaning. While some studies suggest that under certain circumstances such as cuing an ironic expectation by providing speaker information (Ronderos et al. 2022), or with weakly marked context negativity (Ivanko and Pexman 2003) irony can be processed faster than literal meaning, most studies show that irony takes longer to process and is more effortful than literalness (Deliens et al. 2018; Filik and Moxey 2010; Giora and Fein 1999b; Giora et al. 1998; Giora et al. 2007; Kaakinen et al. 2014; Turçan and Filik 2016) when this dichotomous distinction is adopted. This may be due to the fact that irony may require the activation of literal and ironic meanings (Giora and Fein 1999a). Having discussed previous irony processing research which adopted the dichotomous categorization of stimuli, I now turn to the review of studies which tested irony in a broader, lexical valence-based spectrum of meanings.

2.2.2. Irony processing: The role of the lexical valence

In addition to the line of studies which assumed the literal / non-literal meaning distinction as the most fundamental aspect to explore and explain verbal irony, a different line of irony studies has been driven by the assumption that lexical valence is the pivotal aspect of ironic meaning, the one that is of key importance in exploring irony. This lexical valence-driven approach extended the simple literal / non-literal division in stimuli construction to include a wider range of lexical valence-based materials. Such an extension of tested stimuli was believed to shed new light on irony comprehension results with more nuanced observations stemming from the differential processing of positive and negative lexical valence. Emo-

tional valence of all sorts of perceptual cues and assigning value to the world around has already been recognized in neurocognitive research as a continuous brain activity (Damasio 2010). Barrett (2006) claims that people engage in a psychological process of valuation and judge incoming stimuli as helpful or harmful. Valenced core affect is a basic ingredient of emotional responding which is processed and evaluated as either good or bad, helpful or harmful and rewarding or threatening (Barrett 2006). It refers to the inherent attractiveness (positive valence) and / or aversiveness (negative valence) of a stimulus (Damasio 1994). Importantly, valence, as a special semantic feature is accessed before other aspects of semantic meaning are activated (Zajonc 1980, 1984). Barrett (2006) argues that by evaluating incoming stimuli and assigning valence, that is positive or negative value, a speaker manifests their relationship to the environment, an activity that communicators engage in while receiving or expressing irony as much as any other linguistic, and non-linguistic input (Sperber and Wilson 1986). By means of uttering an ironic comment, people implicitly express an attitude (Sperber and Wilson 1986). Consequently, it may follow that when expressing one's attitude towards the world through irony, an ironist evaluates and assigns valence to the comment. It is noteworthy that although valence is an intrinsic feature of stimuli when analyzed in a decontextualized setting, the same stimuli can be viewed differently if embedded in context (Bromberek-Dyzman 2014). Previous irony research has already demonstrated that one of the key features of irony is its emotional value, often categorized as lexical / semantic valence. Specifically, the double load of emotional meaning is what I believe is crucial to understand the nature of irony more extensively. On the one hand, ironic comments carry an evaluation expressed on the surface by the literal meaning, which literally communicates a praising comment (e.g., *What a great idea!* uttered with reference to a proposal that we do not like), and implicitly, or ironically convey the opposite, mocking, or critical intention. On the other hand, ironic comments may literally communicate a critical comment (e.g., *What a bad idea!* uttered with reference to a proposal that we really like), and ironically communicate the opposite, praising or complimenting intention.

This line of research that assumed lexical valence as the key to stimuli categorization, rather than limiting its interest to ironic and literal distinction, without distinguishing between the two types of irony (ironic criticism, ironic praise), encompasses both types of irony along with their literal counterparts. Studies testing irony processing show that when the comparison is built on these four types of evaluative meaning (two types of literal va-

lence: positive and negative, and two types of ironic valence: positive and negative) the processing of positively valenced utterances (literal praise, ironic criticism) is facilitated while the processing of negatively valenced (literal criticism) utterances is inhibited (Bromberek-Dyzman 2014). Positively valenced utterances, that is utterances with a positive literal meaning, are responded to faster and more accurately than utterances with a negative literal meaning (negatively valenced) (Bromberek-Dyzman 2014). Such a facilitatory nature of the positively valenced utterances may be explained by the *positivity offset* (Ito and Cacioppo 2005), according to which positive stimuli, in general, exhibit fast and smooth processing patterns. The inhibitory nature of the negatively valenced utterances, in turn, stems from the *negativity bias* (Ito and Cacioppo 2005), which is manifested by slow and intense processing patterns. Unkelbach and colleagues (2008) claim that the prioritized, faster processing of positive information can be accounted for by a high associative density of positive information in memory. The density results from positive information being more similar to other positive information. Negative information does not exhibit such a high density in memory and is much less interconnected than positive information. Increased density and interconnectedness of the positive information lead to faster processing, relative to the negative information (Unkelbach et al. 2008). In this section I present a review of studies which have considered target sentence valence as a key factor in constructing the ironic and non-ironic stimuli with two levels of lexical valence (positive, negative), while abandoning the more general literal / non-literal categorization.

In a series of experiments, Gibbs (1986) explored irony processing using a reading-time paradigm to illustrate how various pragmatic conditions and irony processing interplay. Throughout his seminal paper Gibbs (1986) uses the term *sarcasm*. According to Gibbs (1986) sarcasm achieves its purpose through bitterness, causticity which are directed against an individual. *Irony*, in turn, as if more generally, was defined as the use of words intended to convey something different from, usually the opposite of the literal meaning of an utterance. However, Gibbs (1986) claims that since irony is mostly used to express sarcasm, and that the two are closely connected, the paper and its findings concern irony. In the first experiment participants were asked to read stories which were followed by a paraphrase sentence of the target sentence in the story. The stories were divided into negative and positive contexts. For the stories with negative contexts, half of them concluded with a sarcastic remark (ironic criticism, e.g., “You’re a big help”), and the other half concluded with a non-sarcastic remark (literal criticism, e.g., “You’re not helping me”). For the stories

with positive contexts, half of them concluded with a literal remark (literal praise, e.g., “You’re a big help”), and the other half concluded with a simple acknowledgment (compliment, e.g., “Thanks for your help”). Upon reading the complete trial participants were supposed to make a true / false judgment of the paraphrase sentence. Reading times for target sentences and paraphrase judgments as well as paraphrase judgment accuracy were measured. Results showed that participants read sarcastic remarks faster than non-sarcastic remarks, suggesting that processing ironic meaning does not have to take longer than literal meaning. Simple acknowledgments were also processed faster than literal sentences, suggesting that conventional, common sayings can be understood faster than statements conveying literal praise. These results demonstrate that positively valenced statements are processed faster than negatively valenced ones. Moreover, participants made sarcastic remarks paraphrase judgments faster than both non-sarcastic equivalents and literal statements. When Gibbs (1986) analyzed the target sentence processing times and the paraphrase judgment processing times collectively the analysis showed that participants processed and made paraphrase judgments of the sarcastic remarks much faster than non-sarcastic and literal remarks. According to Gibbs (1986), this experiment indicates that processing ironic criticism does not require analyzing the literal meaning first, and ironic meaning afterwards. Further, it points to the crucial role of context. Namely, Gibbs (1986) suggests that relying on the contextual information regarding speaker’s intentions can guarantee arriving at the intended meaning directly, that is without having to consider the literal interpretation first, and only later, after rejecting the literal, arrive at the ironic interpretation.

In another experiment, Gibbs (1986, Experiment 3) further explored a broader range of statement types to inspect the asymmetric nature of sarcasm and the underlying question why ironic criticism seems more permissible than ironic praise. In the experiment participants were asked to read stories embedded in either a normative (negative) or a non-normative (positive) context, ending with either a sarcastic or a non-sarcastic target sentence, followed by a paraphrase sentence of the target and make a true / false judgment of the paraphrase sentence. Normative contexts (which concluded with either an ironic criticism or a literal criticism) echoed some sort of a norm, while the non-normative contexts (which concluded with either an ironic praise or a literal praise) did not provide any mention of a norm. The normativeness stems from *the Social Norm Model* (Gibbs 1986) and proposes that sarcasm comprehension which mentions (echoes) some social norm should be facilitated compared to sarcasm instances which do not mention a social norm. In addition,

Gibbs (1986) provided an example of a social norm which illustrated the mechanism. While the comments “You are a fine friend” meaning “You are a bad friend”, and “You are a terrible friend” meaning “You are a good friend” both echo social norms, they do it to a different extent. One social norm assumes that people should only compliment each other, and should not say anything, unless they have something nice to communicate. In a situation when a speaker echoes their interlocutor’s beliefs about such a norm, the speaker wishes their comment to be understood as sarcastic. Therefore, the positive comment “You are a fine friend” meaning “You are a bad friend” has a bigger potential to be taken sarcastically, rather than the negative comment “You are a terrible friend” meaning “You are a good friend”, since the first one echoes a widely accepted social norm of politeness. Results showed that participants processed ironic criticism (featuring a literally positive comment on the surface – positive valence in the comment sentence) faster than ironic praise (featuring a literally negative comment on the surface – negative valence in the comment sentence), and literal praise was processed faster than ironic praise. This pattern of results demonstrated, according to Gibbs (1986), that ironic statements are processed in a facilitated manner when they refer to (echo) some kind of a social norm, a general, yet implicit expectation. Additionally, literal praise was processed faster than the ironic (criticism) equivalent, and literal criticism. Taken together, literal praise was processed the fastest, followed by ironic criticism, literal criticism and ironic praise. The main conclusion drawn from these results suggests that literally saying something nice (praising) is understood faster than saying something nice sarcastically, or saying something negative, whether literally or sarcastically. Similarly, participants were faster to make a paraphrase judgment for remarks conveying ironic criticism than for the ones conveying ironic praise, and faster for remarks conveying ironic criticism than for the ones conveying literal criticism. When target sentence reading times and paraphrase judgments latencies were analyzed collectively the results showed that participants processed and made paraphrase judgments of ironic criticism faster than ironic praise and ironic criticism faster than literal criticism. In the non-normative contexts, the ones which did not build any expectations, however, participants processed and made paraphrase judgments of ironic praise slower than of literal praise. Altogether, Gibbs (1986) demonstrated that sarcasm may be processed with greater ease than its literal equivalents when it explicitly echoes a social norm, and since the implicit mention of a social norm is achieved by means of a negative context and concluded with a positive remark, ironic criticism processing is facilitated compared to ironic praise.

Gibbs (1986) showed that sarcasm comprehension relies on special pragmatic properties that ironic statements are imbued with, which may make them more memorable. Sarcasm is memorable for at least two reasons. Firstly, as Gibbs (1986) claims, sarcasm is more memorable than literalness because it is the specific purpose that an ironic utterance plays in an interaction. Secondly, sarcasm is more memorable than literal meaning because it is an important pragmatic element of the discourse and involves an echoic mention of a social norm. Further experiments in this set of studies by Gibbs (1986) were conducted to control for the memory for sarcasm. In Experiment 4, participants were asked to read stories which were sarcastic (ironic criticism), non-sarcastic (literal criticism), literal (literal praise), or communicated compliments. Next, participants were asked to read a different set of unrelated stories. Finally, they were given a recognition test, where they were supposed to determine which sentences they had read earlier. Results showed that participants recognized sarcastic remarks better than all three other sentence types. What is more, participants were more confident in making the recognition judgements of sarcastic remarks than the other sentence types. These data provide evidence for the hypothesis that sarcasm-imbued positively valenced remarks become embedded in memory more than non-sarcastic equivalents. Their long-lasting effect on memory is owing to their mention function, as Gibbs (1986) explains, whereby they invoke a putative belief, which, when juxtaposed with contradictory evidence results in a sarcastic comment.

In another experiment, Gibbs (1986, Experiment 6) tested the memory for sarcastic and literal statements using the broader statement type spectrum and found that ironic criticism was recognized more than literal praise, literal criticism and ironic praise. This experiment supported the evidence demonstrating that sarcasm is memorable, can be more memorable than literal meaning, and the extent to which it is embedded in memory depends on the fact whether it echoically mentions a previously held belief.

Dews and Winner (1999) employed the same conceptualization of irony as Gibbs (1986) encompassing stories which ended in a remark communicating ironic criticism, literal praise, ironic praise and literal criticism. In the first experiment, participants were asked to determine whether the speaker in the final remark meant something positive or negative and their response times and accuracy were measured. In this experiment, participants were asked to make a judgment about the intended meaning conveyed by the statement, therefore, a statement communicating ironic criticism (e.g., “This is good news” uttered when a person is displeased) would be evaluated as negative, because the intention is

to communicate a negative message. Accuracy data revealed a greater difficulty processing ironic criticism compared to literal praise statements, and a greater difficulty processing ironic praise compared to literal criticism statements. Data from response times showed that, generally, ironic meaning was processed longer than literal meaning, specifically, ironic criticism was processed longer than literal praise, and ironic praise was processed longer than literal criticism. Altogether, literal praise was processed the fastest, followed by ironic criticism, literal criticism and ironic praise. Such a pattern of results may suggest that the literal meaning of ironic statements interferes with the non-literal meaning and is processed before the intended, ironic interpretation is available. Moreover, this study showed that negatively valenced remarks took longer to process than the positively valenced ones. Interestingly, as Dews and Winner (1999) noted, the processing difference as measured by response times between the positively valenced remarks (ironic criticism and literal praise; 667 ms) was greater than the processing difference between the negatively valenced remarks (ironic praise and literal criticism; 461 ms). It was suggested that this discrepancy may have stemmed from the fact that ironic praise judgments may have been facilitated (processed faster) because of the advantageous processing of the positive intended meaning of these remarks, relative to the literal criticism, and the negative intended meaning it conveys. In a similar vein, ironic criticism judgments may have been made more slowly than literal praise judgments due to the negative intended meaning that ironic criticism communicates. These observations provide evidence suggesting that the difference between positively valenced statements is greater than the difference between negatively valenced statements. Furthermore, they show that the literal meaning of ironic statements is obligatorily processed.

The first experiment showed that the literal meaning of ironic remarks could not be bypassed and mandatorily participated in the meaning making process. In the second experiment, Dews and Winner (1999) tested the hypothesis whether the non-literal meaning of ironic remarks is mandatory to process. Participants were asked to read stories and judge the speaker's words for whether they were positive (ironic criticism, literal praise) or negative (ironic praise, literal criticism), while participants' response times and accuracy were recorded. At the end of the experiment participants were asked to complete a memory test which was administered to control for participants' attentiveness while reading and responding. In this experiment, participants were asked to make a judgment about the literal value of statements, therefore, a statement communicating ironic criticism (e.g., "This is

good news” commenting on a bad situation) should be judged as positive, as the literal meaning of the statement is positive. Results from the memory test showed that though some participants provided incorrect answers to nearly one third of the items, their reaction times were not significantly different from those participants’ answers who answered almost all items correctly. As a result, Dews and Winner (1999) did not consider the results of the memory test further. Accuracy results showed that there was no difference between making judgments about ironic or literal meaning. Response time data showed that participants were faster to make judgments about the literal meaning of literal praise than ironic criticism, which showed that the non-literal, ironic meaning of ironic criticism interfered with the literal meaning and the judgment making. Surprisingly, in the case of the negatively valenced statements, participants were faster to make judgments about the literal meaning of ironic praise (which is literal criticism) statements than literal criticism. This experiment demonstrated that the non-literal, figurative meaning of ironic criticism was obligatorily processed, as well. However, the non-literal, figurative meaning of ironic praise was not readily available. This finding could be explained by the fact that the negative words expressing the positive intent of ironic praise following a positive context scenario which create a sharp contrast probably led to the facilitated (faster) judgment of the literal meaning of ironic praise. When participants were supposed to judge the literal meaning of literal criticism, where the final remark was congruent with the preceding context (no sharp contrast), their slower reaction may have been caused by these statements not causing any arousal driven by good / bad distinction. Dews and Winner (1999) showed that literal meaning processing is obligatory and inescapable during irony computation. What is more, their findings revealed that in the case of ironic criticism, the more conventional type of irony, the non-literal, figurative meaning is also mandatorily processed. In the case of ironic praise, however, the less frequent and unconventional type of irony, the non-literal meaning may be processed not before or simultaneously with the literal meanings, but after the literal one. Most importantly, in line with what the present PhD dissertation offers to acknowledge on the conceptual and experimental level, Dews and Winner (1999) demonstrated that a simple, dichotomous literal / non-literal distinction does not accurately capture the wholeness and complexity of ironic statements. Instead, a more nuanced, and extensive distinction seems more appropriate as it allows for the observation of differences between negatively and positively valenced statements.

Kreuz and Link (2002) also examined asymmetrical nature of ironic statements, respecting the two levels of lexical valence in literal and ironic meanings. In the first experiment, participants were asked to read scenarios (literal praise, ironic criticism, literal criticism and ironic praise) and make judgments regarding their level of irony, while their reading times were recorded. Results from irony ratings showed that non-literal (ironic) statements were rated higher for irony conveyed than literal statements. Specifically, ironic criticism was rated higher for the perceived irony than ironic praise. Results from reading times showed that literal statements were read more quickly than ironic ones. The comparison of statements based on their lexical valence also showed significant differences. Precisely, ironic criticism was read similarly fast as both literal praise and literal criticism. Ironic praise, however, was read the most slowly of all statement types (slower than literal praise, literal criticism and ironic criticism). In the second experiment, where participants had to determine how much sense the statements made to them, results from the sense ratings showed that participants rated non-literal (ironic) statements as making less sense than the literal statements, and ironic criticism, as the canonical irony type, was rated as making more sense than ironic praise (the non-canonical irony type). Results from reading times revealed similar reading times for the literal and non-literal statements as well as for ironic criticism and ironic praise. Finally, in the third experiment, where the focus was on the appropriateness of statements, results from the appropriateness ratings showed that non-literal (ironic) statements were rated as less appropriate than literal statements, and, specifically, ironic criticism was rated as more appropriate than ironic praise. Regarding reading times, there were no differences in reading times between literal and non-literal, or ironic criticism and ironic praise. These experiments showed that the facilitated processing of ironic criticism is not an across-the-board phenomenon but may be task constrained. When participants' task was to determine the level of irony, they processed ironic criticism and ironic praise differently, in that the less frequent ironic praise was read longer than the more frequent and canonical ironic criticism. However, when the task focus was on other factors (sense, appropriateness), ironic criticism did not result in the facilitated processing times anymore. On top of that, these studies demonstrate the asymmetry of affect in irony and show that ironic criticism and ironic praise are perceived differently – ironic criticism evokes more pronounced reactions – being more ironic, more sensible, and more appropriate, than ironic praise.

Affect-asymmetrical perception of ironic utterances has also been observed in an irony rating study by Mauchand and colleagues (2019), where participants were asked to provide their judgment of friendliness of ironic comments in three tasks (requiring prosody-focus, linguistic content-focus and no-focus). In the most general task, when participants were not instructed to focus on any particular type of cues (no-focus) ironic criticisms and literal compliments (positively phrased utterances) were rated as more friendly than ironic compliments and literal criticisms (negatively phrased utterances), a result in line with the *Asymmetry of Affect hypothesis*. This observation further corroborates the finding that negativity found in the literal meaning of ironic compliments serves as a disturbing factor in arriving at the correct speaker's intention. What is more, Mauchand and colleagues (2019) emphasized the crucial role of context in irony processing but stressed the importance of prosody under specific circumstances. When participants were instructed to draw meaning from the content, based only on what the speaker said, and ignore the tone of voice, the effect of prosody was significantly reduced. In contrast, when they were not instructed to pay attention to any specific type of cues (content or prosodic) they relied on the speaker's prosody more heavily.

Previous research showed that the winking face (emoticon) is largely conducive to prompting ironic intent (Filik et al. 2016). In one study, Garcia and colleagues (2022) explored the role of the winking face emoji in irony comprehension in younger and older adults. In the experiment, participants were presented with short two-sentence (a context and a target comment) scenarios that could be understood as literal praise, ironic criticism, literal criticism or ironic praise. The scenarios could be either followed by a winking face emoji or not. After each comment participants were asked to answer two questions, one probing into their interpretation of the target comment, and the other looking into participants' perception of the comment as sarcastic. Results showed that when the comments were presented without an emoji, older participants exhibited more difficulty with sarcasm comprehension compared to younger participants. Such a result might be a reflection of a possible age-related decline in the ability to interpret sarcasm. However, when the comments were presented with a winking face emoji, older adults' sarcasm comprehension was greatly improved. This is where the use of a winking face emoji may come to aid, as it has been shown to facilitate sarcasm comprehension. Such a result demonstrates that the winking face emoji is a reliable cue to ironic intent, and an invaluable tool for bridging intergenerational communication gaps.

Studies testing a wider range of lexical valence-based materials containing both literal and ironic comments described above, suggest the privileged status of positively compared to negatively valenced statements (Bromberek-Dyzman 2014; Dews and Winner 1999; Gibbs 1986, Kreuz and Link 2002). Statements featuring positive lexical valence (both in their literal – praise, and ironic – criticism, guise) are typically processed faster than the negatively valenced ones (literal criticism, ironic praise). What is more, evidence provided points to the facilitated irony processing when a statement echoes a social norm (Gibbs 1986). Consequently, ironic criticism may be processed as fast as or faster than literal criticism and ironic praise (Gibbs 1986).

2.2.3. Irony processing: The role of intention valence

The expression of attitudes, evaluatively charged comments, has previously been recognized as an indispensable factor of irony communication and comprehension (Clark and Gerrig 1984; Kreuz and Glucksberg 1989; Kumon-Nakamura et al. 1995; Sperber and Wilson 1981, 1986). The expression of attitudes under the veil of irony carries an evaluative load, just in the same way as literalness (praise and criticism) carries evaluative load on the surface of the communicated meanings. In irony, however, the evaluative load is added on top of the literal, surface layer of the evaluative meaning. One may say that this makes irony a special case of evaluative meaning as it carries two levels of emotional meaning. One, on the literal surface level – the literal meaning, and the other, on the non-literal surface level – the implicit, implied meaning. While in the case of literal praise or literal criticism the communication and comprehension is relatively simple – one needs to understand the surface, literal level of meaning, in the case of irony, the comprehension necessitates processing a double evaluative meaning, the literal and the implicit. In addition, there is an inherent incongruity between these two dimensions of literal and ironic evaluation. The inherent incongruity of irony is built upon the conflict of the target comment and the preceding context, expectations, or norms. While the target comment makes clear what the lexical valence of the statement is, the lexical valence is quite distinct from the intention valence that such a statement communicates.

Prior research exploring irony labeled this evaluative load as either attitude (Bromberek-Dyzman 2014; Gibbs 1986; Sperber and Wilson 1986), valence (Bromberek-Dyzman

et al. 2022; Filik et al. 2016; Garcia et al. 2022), or evaluation (Dews and Winner 1995; Dews and Winner 1999). Such a diverse way of labeling the observed aspects of evaluative meaning suggests that in various domains the same concept is called differently. It seems that valence and its mechanism – evaluation – is a complex cognitive and affective process. The same naming diversity is also observed in irony research discussed up to this point – demonstrating different foci of irony, and different ways of labeling its components and constitutive cues. In this dissertation, in order to account for the different components and their different functions in ironic meaning making, I propose to draw a distinction between *lexical valence* embedded in linguistic meaning and *intention valence*, carrying the explicit or implicit, praising or critical intent. Lexical valence, generally, refers to the emotional aspect (positive or negative) of the lexical, linguistic surface form or words. Intention valence, on the other hand, encapsulates the communicative purpose of a statement that may boil down, in the case of evaluative, attitudinal comments, to criticism or praise. While in everyday, non-ironic communication the two concepts typically align – praise is expressed by means of positive valence, and criticism is expressed by means of negative valence – literally, when communicating irony there is a mismatch between these two levels. Previous studies have not made the distinction between lexical valence and intention valence quite consistently. In the present work, I intend to demonstrate that while the inclusion of a fuller, lexical valence-based array of meanings in study designs elucidated many uncharted territories in irony research which the rigid literal / non-literal distinction failed to account for, the distinction between lexical valence and intention valence should provide even more clarity and understanding of the processes underpinning irony meaning making. Based on the valence of the attitude, which I propose to call *intention valence*, literal and ironic statements can communicate a critical or a praising intention. While one can criticize literally by saying: “You’re so mean”, one can also criticize ironically by saying: “You’re so kind” when referring to a person who has just made a derogatory remark. In the same vein, praise can be delivered literally: “You’re so kind”, or ironically: “You’re so mean” as a response to flattery. Hence, the intention communicated via an ironic remark seems to be an essential dimension of irony, previously accounted for rather scantily or inconsistently. Importantly, being distinct from the dimension of lexical valence, testing irony processing from the vantage point of intention valence may provide novel insight into the nature of irony and its comprehension. In this section I present a review of studies which analyzed irony with the acknowledgment of the intention valence of the remarks.

Research demonstrates that irony enables the speaker to express such social functions which are impossible to impart by means of literal meaning alone (Dews and Winner 1995; Dews et al. 1995). In a series of rating studies Dews and colleagues (1995) explored the social consequences of using ironic criticism and ironic praise, in comparison to their literal equivalents. In the first experiment participants watched short scenes involving two characters having an interaction and were asked to rate the speaker's final remark for its humor and the speaker's status relative to the addressee. Results showed that ironic criticism was interpreted as funnier than literal criticism, and ironic praise was interpreted as funnier than literal praise. Moreover, the rating contrast between ironic and literal criticism was greater than the contrast between ironic and literal praise. As for the status rating, when speakers used criticism (either ironic or literal) they were perceived to have higher status than the addressee, but when they used literal or ironic praise, they were believed to have a lower status than the addressee. These results showed that speaking ironically entails humor, and ironic criticism does so even more than ironic praise. In the second study, participants read short stories featuring two characters, with each story concluding with the speaker making a comment on the addressee's actions. Half of the stories portrayed the speaker as the friend of the addressee and the other half portrayed the speaker as "someone", meaning there was no relationship between the interlocutors. Participants were asked to rate the final comment of each story for the degree of insult expressed. Results showed that ironic criticism was felt to be less negative than literal criticism, and ironic praise was felt to be more negative than literal praise. This evidence illustrates a muting function of ironic statements. Specifically, for criticism, choosing to speak ironically may lessen the critical blow, of literal, direct, confrontational criticism. When complimenting, ironic praise may attenuate the praise conveyed by literal praise. Dews and colleagues (1995) suggest the same mechanism may be responsible for both of these effects, namely, the literal meaning of an ironic utterance with its evaluative tone colors the speaker's intended meaning. Consequently, the same intention may be interpreted differently depending on whether it was delivered literally or ironically. Therefore, ironic criticism sounds less negative (because of the positive literal meaning), and ironic praise feels less praising (owing to the negative literal meaning). Altogether, this study provides evidence for the differential intended meanings provided by literal and ironic counterparts by showing that irony has the power to mitigate the blow of an insult. In the third experiment, Dews and colleagues (1995) explored the difference between criticism delivered ironically and literally. Partici-

pants read brief vignettes depicting an interaction between two people conveying criticism literally or ironically. Although this experiment did not test the full spectrum of intentions, I decided to include it in this section, as it makes an interesting contribution to the discussion of the critical intention. They were asked to rate the scenarios on a number of features (how critical, how angry, how in control the speaker was, how insulted, how defensive and how amused the addressee was, and the impact the comment would have on the presented relationship). Results showed that the ironic speaker was perceived as less critical than the literal speaker, and ironic remarks as less critical than the literal ones. What is more, the ironic speaker was rated as less angry than the literal speaker. The addressee, in turn, was rated as less insulted and less defensive when ironic criticism was uttered relative to literal criticism. The addressees were also seen as more amused by ironic than by literal criticism. Regarding the relationship, participants rated ironic criticism as exerting a less negative impact on the relationship than literal criticism. These studies show that irony equips the speaker with the ability to be funny and allows them to mitigate the seriousness of a literal criticism or a literal insult. It also enables the speaker to save the relationship, which could suffer from a literal criticism. As for compliments (praise), they sound more insulting than literal ones.

To account for these findings Dews and Winner (1995) proposed *the tinge hypothesis* which suggests that the evaluative tone of the literal reading of ironic statements tinges (colors) the final interpretation. The speaker intended meaning is a resultant of the constant interplay of the two surfaces. Results of two experiments provide evidence for the tinge mechanism. In the first study, exploring the hypothesis that expressing insult ironically mutes the amount of criticism perceived compared to literal insults, participants were asked to rate the level of criticism, annoyance and the way how the ironic comment may influence the speaker / offender relationship. Statements conveying an insult ironically were rated as less critical than those conveying an insult literally, and the ironic speaker was perceived to be less annoyed than the literal speaker. On top of that, the relationship was believed to experience a less negative impact by irony than literalness. In the second study, exploring the hypothesis that expressing compliments ironically mutes the amount of praise received compared to literal compliments, participants were asked to rate the level of praise, pleasure and the way how the ironic comment may influence the speaker / offender relationship. Participants rated ironic compliments as conveying less praise than literal equivalents and the ironic speaker was regarded to be less pleased than the literal speaker.

Finally, the relationship between the speaker-addressee was believed to be less positively affected by ironic than literal compliments. Therefore, these studies provide evidence for the tinging function of ironic statements, in that they mute, mitigate the level of critical (ironic criticism) or praising (ironic praise) intentions compared to their literal counterparts (literal criticism, literal praise) (Dews and Winner 1995; Dews et al. 1995).

In a set of two experiments, Filik and colleagues (2016) tested the predictions of *the tinge hypothesis* (Dews and Winner 1995) and investigated the role of textual devices such as emoticons and punctuation marks in irony comprehension. In the first experiment, participants were presented with scenarios which finished with a final comment which could be understood as literal criticism, sarcastic criticism, literal praise or sarcastic praise. The comments were followed by a wink emoticon (;-)), a tongue face emoticon (;-P), an ellipsis (...), an exclamation mark (!) or no punctuation. Participants were asked to answer two questions following each scenario, probing into how ironic participants thought the comment was and how participants thought the recipient of the comment would feel on a scale from very negative to very positive. Results from irony ratings showed that literal comments were rated as more sarcastic when they were followed by an emoticon than without it. Sarcastic comments irony ratings did not differ depending on the presence or absence of an emoticon. These results showed that emoticons such as a wink or a tongue face have the power of increasing sarcasm perception of literal comments, but not the already sarcastic ones. When the literal comments were followed by an ellipsis sarcasm perception increased but when the sarcastic comments were followed by an ellipsis sarcasm perception did not change. Moreover, an exclamation mark placed after comments did not influence sarcasm perception of either literal or sarcastic comments. A closer look at the two emoticons separately showed that a wink and a tongue face emoticon did not differ in their ability to increase sarcasm perception of any comment type. Importantly, however, both emoticons increased sarcasm perception of literal criticism more than the punctuation marks. Literal praise was rated as more sarcastic when followed by both emoticons and an ellipsis, compared to when followed by an exclamation mark. Similarly, sarcastic comments were rated as more sarcastic when followed by both punctuation marks (ellipsis and exclamation mark). Results from recipient's feelings ratings showed that both emoticons influenced the emotional impact ratings in the same manner. When literal comments were followed by any of the emoticons, criticism was perceived as less negative. When sarcastic comments were followed by any of the emoticons, criticism was perceived as less negative, and praise was

perceived as more positive. All comments followed by an exclamation mark were perceived as more positive. A look at the two emoticons separately showed that they did not differ in their ability to increase the positivity perceived. Interestingly, both emoticons had a bigger impact on the perceived positivity of literal criticism and sarcastic praise than the punctuation marks did. In addition, both emoticons and ellipsis decreased, but the exclamation mark increased the perceived positivity of literal praise. In the case of sarcastic criticism, the exclamation mark, the wink emoticon and the ellipsis all had a similar effect. The results of this experiment support *the tinge hypothesis*. In general, whether the comments were followed by a device or not, the intention to criticize delivered sarcastically was perceived as less negative than the same intention delivered literally, and the intention to praise delivered sarcastically was perceived as less positive than the intention to praise delivered literally. The only slight difference was observed for comments followed by a tongue face emoticon, where literal criticism did not significantly differ from sarcastic criticism.

In the second experiment, Filik and colleagues (2016) decided to make their scenarios look more ambiguous and reduced the number of devices following the comments. In this experiment comments were followed by either a wink emoticon, an ellipsis or a full stop. Additionally, the context in the scenarios in this experiment was reduced to make the final interpretation of the intention valence more ambiguous. This time participants were asked how sarcastic they thought the speaker of the comment was. Results showed that positive and negative comments (literal praise, sarcastic criticism, literal criticism, sarcastic praise) were perceived as the most sarcastic when followed by a wink, less sarcastic when followed by an ellipsis, and the least sarcastic when followed by a full stop. This result showed that the wink emoticon prompted the interpretation of a sarcastic intention more than an ellipsis or a full stop. In addition, this experiment provided additional evidence in support of *the tinge hypothesis* and confirmed that sarcastic criticism was perceived as less negative than literal criticism, and sarcastic praise was perceived as less positive than literal praise. Altogether, the evidence from the two experimental studies showed that emoticons exert a more significant impact on sarcasm comprehension and emotional perception than punctuation marks.

These studies provide support for *the tinge hypothesis* by demonstrating that the blow of intention valence is modulated depending on whether it is delivered ironically or literally. Research shows that ironic criticism is perceived as funnier, less negative than

literal criticism and ironic praise is perceived as funnier than literal praise. This shows that irony, in general, is a source of funniness. However, ironic praise is also seen as more insulting, and ironic criticism is seen as less insulting. This shows that the ironically conveyed intentions make a softer impact (Dews et al. 1995). Other evidence shows that wink and tongue face emoticons are able to enhance the perceived sarcasm of literal comments, but not sarcastic ones, which do not need extra, visual cues in the form of emoticons. What is more, the critical intention is perceived as less negative, and the praising intention less positive when delivered with an ironic undertone. These results provide support for *the tinge hypothesis* and the muting function of irony and show that irony has the power to lessen the impact of the communicated intention (Filik et al. 2016).

2.3. Conclusion

This chapter presented a review of behavioral studies on irony processing. The image that emerges from this review suggests that the manner in which irony is conceptualized, and the stimuli which were used to test irony greatly impact the obtained results and shape the interpretation of the phenomenon.

Evidence from irony processing studies which adopted the dichotomous stimulus distinction into literal and non-literal suggests that irony is more difficult to process than literal meaning (Deliens et al. 2018; Filik and Moxey 2010; Giora and Fein 1999a; Giora and Fein 1999b; Giora et al. 1998; Giora et al. 2007; Kaakinen et al. 2014; Turçan and Filik 2016). The evidence presented in this chapter shows that irony processing may necessitate the activation of the literal meaning before arriving at the intended, ironic meaning (Giora and Fein 1999a; Giora and Fein 1999b; Giora et al. 1998; Giora et al. 2007), and that context incongruity facilitates the comprehension (Ivanko and Pexman 2003).

In contrast, evidence from studies introducing a broader, lexical valence-based distinction suggests that positive lexical valence facilitates the processing compared to negative lexical valence (Bromberek-Dyzman 2014; Dews and Winner 1999; Gibbs 1986, Kreuz and Link 2002). What is more, irony processing may be facilitated when it echoes a positive social norm (Gibbs 1986), when participants share common ground (Kreuz and Link 2002), or with access to speaker information (Regel et al. 2010a). Moreover, statements expressed through positive lexical valence are perceived as friendlier than those with

negative lexical valence (Mauchand et al. 2019), and ironic criticism is generally perceived as more ironic, making more sense, and more appropriate than ironic praise (Kreuz and Link 2002). When scrutinizing how important for the exploration of the phenomenon of verbal irony is how the notion is conceptualized and how the stimuli are constructed, we notice the significant role that lexical valence has played in irony research so far. The importance of the role of lexical valence in irony research has often been only implicitly acknowledged. In the present thesis the construct of lexical valence is presented as a significant element in exploring and explaining irony comprehension.

Finally, irony communicates the intention to criticize or praise. Some studies acknowledged the role of intention valence communicated through ironic and literal statements. Evidence supports the muting function of irony by showing that irony lessens the blow of criticism and attenuates the pleasure of praise (Dews and Winner 1995). What is more, ironic criticism tends to be perceived as funnier (Dews et al. 1995), less critical (Dews and Winner 1995), and less negative (Dews et al. 1995; Filik et al. 2016) than literal criticism. In turn, ironic praise tends to be perceived as funnier (Dews et al. 1995), less praising (Dews and Winner 1995), and more negative (Dews et al. 1995) / less positive (Filik et al. 2016) than literal praise. Importantly, these results suggest that intentions communicated ironically mute the impact of the intention, that is criticism feels less negative when delivered ironically, and praise feels less positive when delivered ironically.

In the next chapter I turn to the presentation of the neurocognitive processes underlying irony comprehension. Specifically, chapter 3 provides a review of prior electroencephalographical (EEG) studies in irony processing.

Chapter 3: Irony processing: Electrophysiological evidence

3.1. Introduction

Behavioral measures such as reaction times, accuracy rates, and even eye-tracking (Deliens et al. 2018; Filik and Moxey 2010; Giora and Fein 1999a; Giora and Fein 1999b; Giora et al. 1998; Giora et al. 2007; Kaakinen et al. 2014; Turçan and Filik 2016) may be influenced by participants' strategic behavior and as such do not provide an insight into neurophysiological mechanisms underlying brain activities in response to the stimuli that entered the brain through any perceptual network (e.g. reading or hearing irony). These processes unfold over time (Caffarra et al. 2019), therefore, it makes sense to observe these processes beyond getting a single measure of behavioral response to a tested stimulus. In comparison to behavioral measures (response times, accuracy rates) electroencephalography (EEG) provides a much more direct and fine-grained image of the underlying cognitive processes. Behavioral measures such as response times and accuracy rate provide merely end-point outcomes which carry the risk of conflating multiple processing stages which comprise perception, making and signaling the decision, which can be affected by the motor execution. Because of its higher temporal granularity, EEG enables disentangling the numerous processes offering a millisecond precision. This high temporal accuracy allows for the exact identification of an effect as tested in the experimental procedure, even in the absence of a measurable behavioral response. EEG can show participant's covert neurocognitive activity and reveal such unidentifiable processes as shifts of attention, an increase or decrease of effort or error detection. In addition, EEG provides researchers with a dynamic evolution of the brain's activities as they occur over time opening the gate to a richer, more nuanced and more informative image of the neural activities.

In this chapter I turn to the EEG as a method in irony processing studies to present a more precise insight into irony processing electrophysiological mechanisms. Irony processing research can benefit greatly from EEG studies in that they allow to explore previously unaccounted for and impenetrable processes underlying irony meaning making. Commonly studied components of the event-related potentials (ERPs) in language processing studies include: P200, N400 and P600/LPP. These components can inform us about the neurocognitive mechanics behind irony processing. Evidence from ERP irony processing studies shows that irony evokes larger amplitudes of P200 (Regel and Gunter 2017; Regel et al. 2010a; Weissman and Tanner 2018), N400 (Cornejo et al. 2007; Shi and Li 2022; Filik et al. 2014) and P600/LPP (Caffarra et al. 2019; Filik et al. 2014; Pfeifer and Lai 2021; Regel et al. 2010a; Regel et al. 2010b; Spotorno et al. 2013; Weissman and Tanner 2018) when compared to literal meaning. The processes behind these observed amplitudes modulations vary but some consistent observations have been made. Generally, irony may trigger early recognition (Weissman and Tanner 2018), early semantic access (Regel and Gunter 2017) and early attentional processes (Regel et al. 2010a), as reflected by the increased P200 amplitudes. In addition, larger N400 amplitudes elicited by irony in comparison to literal meaning may reflect processing difficulty stemming from processing irony special characteristics such as being detached from context, its dichotomy, incongruity (Cornejo et al. 2007), low predictability (Shi and Li 2022), or enhanced difficulty caused by the necessity to integrate irony to a larger context while processing the less familiar irony – ironic praise (Filik et al. 2014). What is more, irony seems to require late comprehension processes which may illustrate pragmatic inferencing (Regel and Gunter 2017; Regel et al. 2010a; Spotorno et al. 2013), meaning reintegration (Regel et al. 2010a; Regel et al. 2010b) or late meaning reprocessing (Weissman and Tanner 2018) to name a few explanations. This shows that irony may be more or less cognitively demanding depending on the available contextual cues and comprehender's cognitive capacity. The late stage of processing – meaning integration – is the one most frequently studied in irony research and provides multiple interpretation avenues to account for irony and the phenomena inherently linked with it – incongruity, dichotomy, implicitness, and evaluative load. At the meaning integration stage, the multitude of processes connected with processing all the cues in various modalities and synchronizing them with the context makes it difficult to unambiguously determine what the observed effects mean. What is more, some evidence suggests that ironic praise (the less frequent, and less salient irony) processing resulted in meaning impediment

(greater N400) when ironic praise was compared to literal criticism, in the absence of such an effect for ironic criticism compared with literal praise (Caillies et al. 2019). In the later stage, however, ironic criticism (the more frequent, and more salient irony) has been found to require additional computation, which may reflect emotional content processing (Caillies et al. 2019). Yet, as mentioned above, the multiplicity of the neurophysiological processes in irony comprehension, due to its inherent complexity and reliance on linguistic as well as contextual, social and emotional cues necessitate substantially more research to disentangle the individual impacts of these numerous factors in order to explain the nature of irony.

In chapter 3, first, I briefly present the method of electroencephalography and define event-related potentials. Next, I describe what language processing studies tell us about the three components most commonly studied in irony processing research. After that, I present an in-depth review of irony processing EEG evidence. I finish the chapter with a section devoted to evidence from irony processing neuroimaging studies.

3.2. Electroencephalography

Electroencephalography (EEG) provides an opportunity to gain a clearer understanding of the critical moments during which information from various sources is integrated in language processing. It allows for the recording of temporal dynamics of cognitive processes which unfold simultaneously (Grecucci et al. 2019). EEG is a high-temporal resolution method enabling the identification of an actual brain response to a stimulus. It records brain activity in a non-invasive manner by placing electrodes embedded in a cap on the surface of the scalp. The recorded responses are called event-related potentials (ERPs) - measures of brain activity (Kemmerer 2015).

3.3. Event-related brain potentials (ERPs)

Before focusing on irony studies and, specifically, the ERP components tested in relation to irony, I would like to briefly outline the most relevant aspects of the method. The event-related potentials (ERPs) can be measured in a multidimensional manner according to their parameters, such as latency, amplitude, polarity and topography. The latency refers to the

moment in time, measured in milliseconds, and reflecting when a particular deflection of the waveform starts or peaks. The amplitude is the strength of the observed effect, provided in microvolts. The polarity informs us about whether the deflection of the waveform is positive-going or negative-going. Finally, the topography provides the distribution of an effect on the scalp (Kemmerer 2015). Three ERP components commonly studied in language processing research and predominantly explored in irony ERP processing studies are P200 (Regel et al. 2010a), N400 (Cornejo et al. 2007), and P600/LPP (Spotorno et al. 2013). Before I focus on ERPs in irony processing, I would like to offer some more general perspective on the ERP components and delineate general observations regarding the components. In the following sections I present a brief overview of each component by looking at their significance in language processing.

3.3.1. P1

This component has not been studied in irony processing research so far as it concerns aspects of visual perception more than the language. For the completeness of the review and the project I mention it here, as it has been analyzed in the present EEG study. The P1 is a positive-going brain potential which peaks at around 100 – 130 ms after stimulus onset (Thierry et al. 2009). This ERP component is associated with low-level perceptual processing (Thierry et al. 2009). Specifically, P1 reflects processes responsible for attention allocation. Therefore, researchers investigating electrophysiological correlates of irony processing, which relies on semantic and pragmatic processing have not analyzed this component when probing into irony mechanisms. Evidence suggests that with more attention allocated to a visual stimulus the amplitude of P1 increases. The amplitude of P1 is reported to be larger for stimuli which are attended to in the experimental procedure compared to those unattended ones (Clark and Hillyard 1996). Some evidence suggests that the amplitude of P1 is increased by the non-native language compared to the native language (Naranowicz et al. 2022).

3.3.2. N1

This component has not been studied in irony processing research, with the exception of one study, which did analyze N1 in irony (Pfeifer and Lai 2021). The N1 is a negative-going brain potential which peaks around 150-230 ms post stimulus onset (Martin et al. 2009). Research in irony processing demonstrates that at this early, low-level perceptual processing stage, literal meaning elicited increased N1 amplitudes compared to ironic meaning (Pfeifer and Lai 2021). Evidence from spatial attention studies demonstrates that attended stimuli evoke an enhancement in the amplitude of N1, relative to the unattended stimuli (Clark and Hillyard 1996). Some evidence suggests that larger N1 amplitudes are elicited by the non-native language compared to the native language (Naranowicz et al. 2022). What is more, evidence from studies on mood shows that N1 is sensitive to mood changes differently in L1 and L2. In L1, when in a happy mood, the amplitude of N1 was more negative over the left hemisphere than over the right hemisphere, but there was no lateralization in the sad mood condition. This effect, although reversed, was not significant in L2. These results demonstrate that the lateralization of word processing depends on the mood, and it is different in the native and non-native language (Kissler and Bromberek-Dyzman 2021).

3.3.3. P200

The P200 is a positive-going brain potential which occurs approximately between 150 – 250 ms with an amplitude peak at around 200 ms post stimulus onset. This ERP component is sensitive to various linguistic stimuli at an early processing stage (Boustani et al. 2021). Larger P200 amplitudes are elicited by strongly constrained sentences and expectancy for a particular word, where the amplitude is greater for expected items (Federmeier et al. 2005; Wlotko and Federmeier 2007). In addition, the P200 amplitude can be modulated by sentence context (Evans and Federmeier 2007), enriched sensory input (Boustani et al. 2021) or emotion (Carretié et al. 2001). Moreover, larger P200 amplitudes have been observed in response to semantically related word pairs (Landi and Perfetti 2007) and negative stimuli (Carretié et al. 2001). It has been assumed that P200 reflects higher-order attentional and language-related processes (Luck and Hillyard 1994).

3.3.4. N400

The N400 is a negative-going brain potential which occurs between 300 and 500 ms, with an amplitude peak at around 400 ms post stimulus onset and characterized by a centroparietal distribution. It was first reported by Kutas and Hillyard (1980), as reflecting semantically anomalous completions of sentences (semantic violations). It has been observed to be modulated by semantic features at the word (Holcomb and Neville 1990; Kutas and Hillyard 1989) and sentence (Kutas and Federmeier 2011) levels. The amplitude of the N400 has been observed to be sensitive to semantic expectancy and contextual constraint (Kutas et al. 2006). This component is elicited by semantically anomalous, improbable but sensible sentence completions, and varies depending on a word's expectancy, with larger amplitudes for unexpected sentence endings with low cloze probability (Kutas and Hillyard 1984; Kutas and Federmeier 2011). Moreover, larger N400 amplitudes have been reported to be elicited by negative words (De Pascalis et al. 2009). In addition, when processing words in the second language, negative words tend to reduce the N400 amplitude compared to negative words in the native language and compared to positive words in the second language (Jończyk et al. 2016). Language of operation seems to modulate the amplitude of N400, as well. Larger N400 amplitudes are elicited by sentences in L2 compared to sentences in L1 (Martin et al. 2013; Moreno and Kutas 2005). Originally, this component was reported to reflect semantic integration (Osterhout and Holcomb 1992, Van Berkum et al. 1999). More recently, it has been interpreted as a signature of semantic retrieval (Kutas and Federmeier 2011), lexical-semantic information retrieval (Brouwer et al. 2012), or semantic integration difficulty (Kutas et al. 2006; Kutas and Federmeier 2000).

3.3.5. P600/LPP

The P600 or the LPP (late positive potential) is a positive-going brain potential which occurs between 500 and 900 ms, with an amplitude peak at around 600 ms post stimulus onset, and a centroparietal distribution (Regel et al. 2010a). While some studies refer to this component as P600 other studies label it as LPP (late positive potential). It is noteworthy that, although using two different names, the brain potential under discussion refers to similar events. Previous studies have reported a P600 effect for semantic thematic role viola-

tions (Hoeks et al. 2004) or semantic anomalies (Kolk et al. 2003). Gunter and colleagues (1997) reported that semantic and syntactic anomalies evoked the P600 effect. Apart from semantic and syntactic anomalies, it is also in the area of pragmatics that the P600 is observed for anomalous sentences (Kuperberg et al. 2003). What is more, some research suggests that L2 elicits larger LPP amplitudes than L1 (Naranowicz et al. 2022). It has been argued that this positive-going brainwave is a reflection of late inferential processes based on information from pragmatic conventions, conversation rules and expectations that people have about interlocutors (Caffarra et al. 2019). Regel and colleagues (2010b) claim that the P600 effect reflects pragmatic or conceptual comprehension processes, during which information from various sources is integrated. It has also been suggested that since increased P600 amplitudes have been observed in response to various types of linguistic information (syntactic, semantic, pragmatic), this brain potential may be an index of more general language processes.

3.4. Electroencephalographic studies in irony processing

Electroencephalographic studies on irony processing have mainly focused on the biphasic comprehension cycle as reflected in the N400/P600 waveform and the P200 component to a smaller degree. There is some evidence of early brain activity evoked by irony processing as observed in the increased P200 amplitudes (Regel and Gunter 2017; Regel et al. 2010a; Weissman and Tanner 2018). While some studies report an increased N400 amplitude elicited by ironic statements (Cornejo et al. 2007; Caffarra et al. 2019; Caillies et al. 2019; Filik et al. 2014; Shi and Li 2022), others do not (Amenta and Balconi 2008; Regel et al. 2010b; Spotorno et al. 2013). As regards the P600/LPP, study results have consistently pointed to increased P600/LPP amplitudes in response to irony (Caffarra et al. 2019; Caillies et al. 2019; Filik et al. 2014; Pfeifer and Lai 2021; Regel et al. 2010a; Regel et al. 2010b; Spotorno et al. 2013). In the following sections I review previous irony ERP studies and provide evidence regarding P200, N400 and P600/LPP. First, I discuss evidence from studies which adopted the literal / non-literal approach, and then I move on to the review of studies which adopted the valence-based distinction.

3.4.1. Irony processing: Literal vs. ironic

In this section I review previous ERP irony processing studies which adopted the literal / non-literal stimulus distinction paradigm.

3.4.1.1. P200

Regel and colleagues (2010a) explored the frequency of irony occurrence effect on the interpreters' perception and comprehension of irony. In two sessions they had participants read stories with two speakers having conversations. They manipulated the frequency of irony usage between the speakers, so that one speaker was predominantly ironic (70%), while the other speaker was predominantly literal (70%) in their comments. This manipulation was employed in the first session of the study and its potential consequences for irony processing were tested in the second session where the proportion of both speakers using ironic comments was exactly the same. Namely, both speakers used irony in 50% of their comments, and literal comments in 50% of their comments. Electrophysiological results showed that when the speakers' amount of ironically intended comments was unequal, in the first session, ironic statements elicited slightly P200 amplitudes in comparison to literal statements. When both speakers used the same amount of irony (in the second session), utterances congruent (expected) with the speaker's communicative style resulted in larger P200 amplitudes. Such results demonstrate that the pragmatic knowledge about a speaker communicative style, manipulated as the frequency of using irony in the first session, influences participants' perception, expectations and further their ability to categorize utterances accordingly as either ironic or literal at a very early processing stage – 200 ms post target word presentation. This study demonstrated that when the speakers' amount of irony use was balanced, and both speakers used the same amount of irony and literal language (50% irony, 50% literal - in the second session), each speaker's preferred type of comments elicited an increased P200 amplitude. Specifically, when the comment was congruent with the speaker's communicative style, that is when the ironic speaker spoke ironically, and the non-ironic speaker spoke literally, interpreters' comprehension processes were affected at early stages of the comment processing. When participants learned of the speakers' communicative styles in the first session, they built their expectations of how a particular

speaker communicates and anticipated the same to occur during the second session. These results show that people use speaker-specific information completely unconsciously at a very early processing stage. This study showed that the very frequency of irony occurrence can modulate the way irony is processed.

In a different set of studies Regel and Gunter (2017) further investigated the impact of cueing communicative intentions on ironic and literal language processing. In the first experiment they asked participants to read context and target sentence literal and ironic meaning sets. The stimuli were divided into two categories, cued and uncued. In the cued condition half of the target sentences contained critical words in quotation marks (both literal and ironic). After each item participants were asked to complete a comprehension task, in which they were asked about the item's meaning by choosing a *yes* or *no* response. Electrophysiological results showed that larger P200 amplitudes were observed in response to ironic sentences compared to literal ones regardless of whether the cues were present or not. This early ERP modulation may reflect initial semantic analysis processes upon processing critical words in figuratively intended scenarios. The authors suggested that the semantic information in this study may have overridden the significance of the additional contextual information provided by the quotation marks, in the cued condition. Therefore, in the second experiment, Regel and Gunter (2017) further probed into the effects of cueing on irony processing. The experiment featured two separate blocks. In the first block, both ironic and literal items were uncued (without quotation marks). In the second block, only ironic items were cued (with quotation marks). Results showed that when irony was uncued, it elicited increased P200 amplitudes compared to literal statements. When irony was cued, no P200 was observed. These results demonstrate that making sense of ironic statements, when apart from the verbal and contextual information no extra cues (e.g. quotation marks) are added, may necessitate early semantic analysis in order to retrieve the word's semantic meaning matching the required (ironic or literal) interpretation.

In a set of three experiments Weissman and Tanner (2018) explored the role of emojis in irony processing. In the first experiment participants were reading short sentences followed by an emoji, serving as a kind of visual comment suggesting an emotional reaction to the preceding sentence. The critical emojis used were either a smile, a frown or a wink emoji. There were three conditions, depending on the sentence and emoji pairing: (1) match, where the valence of the sentence and the valence of the emoji matched (i.e., positive sentence + smile, negative sentence + frown), (2) mismatch, where the valence of the

sentence and the valence of the emoji mismatched (i.e., positive sentence + frown, negative sentence + smile), and (3) irony condition, where both positive and negative sentences were followed by a wink emoji. Participants were asked to read the sentence accompanied by the respective emoji sets. One-third of the items were followed by a comprehension question to ensure attention to the reading task and to enable verification whether the items were understood as they were intended. Results showed that sentences followed by mismatching and ironic emojis evoked larger P200 amplitudes compared to the sentences followed by matching emojis, and sentences followed by ironic emojis (i.e., winking) evoked larger P200 amplitudes compared to the sentences followed by mismatching emojis. However, it was noted that many participants may not have understood some of the sentences followed by a wink (ironic) emoji as ironic. In order to account for this possibility, in the second experiment, Weissman and Tanner (2018) alerted participants to the potential irony occurrence, by informing them that the sentences accompanied by the emoji sets might have communicated sarcasm. This time, the obtained results showed larger P200 amplitudes elicited by sentences followed by ironic emojis. It turned out that a brief, explicit mention of sarcasm in the instructions preceding the experiment significantly affected how participants perceived the winking emojis, by improving participants' irony recognition. Since participants were subject to "double" cuing, by means of the winking emoji, and priming (alerting participants to the presence of irony), it may be postulated that explicitly mentioning the potential occurrence of irony captured participants' attention and compelled them to search for ironic meaning in the presented sentence / emoji sets. It is worth noticing that the inclusion of the ironic alert in the instructions prior to the experiment may have generated an ironic state of mind in participants. Such an additional notification may have built the expectations of irony, which have been shown to have a huge impact on irony processing (Bromberek-Dyzman et al. 2021). This could have led to the facilitation in irony recognition and comprehension in these experiments. In the final experiment, Weissman and Tanner (2018) explored the potential confound stemming from the emoji-to-condition mapping and used only negatively valenced sentences, which resulted in the match condition (negative sentence + a frown emoji), a mismatch condition (negative sentence + a smile emoji) and irony condition (negative sentence + a wink emoji). Results revealed larger P200 amplitudes elicited by negative sentences followed by an ironic emoji. One possible explanation of this effect suggested by Weissman and Tanner (2018) was that the P200 component may be an index of early recognition of irony, a result previously observed in irony ERP

studies (Regel and Gunter 2017). Another potential explanation could be that the wink emoji, in the ironic condition, was more stimulating visually and attracted more attention than the other two emojis. What is more, this result of ironic meaning (a negative sentence followed by a wink emoji) eliciting a larger P200 amplitude may be linked to the evidence from irony behavioral studies where this type of sentence (a negative sentence used ironically – ironic praise) resulted in a more difficult processing, that is longer processing time, than literal criticism (a negative sentence used literally, here as match) (Dews and Winner 1999; Gibbs 1986).

Prior irony processing ERP evidence regarding the P200 is scant. Yet, some studies that, specifically, used some extra cuing manipulation to irony, either frequency-based anticipation or emojis, have demonstrated that irony processing may trigger early-stage processes underlying initial recognition of irony (Weissman and Tanner 2018), early semantic analysis and word meaning retrieval (Regel and Gunter 2017) or attention to speaker-specific information (Regel et al. 2010a). More studies are needed to further probe into the brain's responses and to allow researchers to better understand the mechanisms at work during the early stages of irony processing. Irony, as a cognitively demanding communicative phenomenon, has attracted more attention in the later stages of the comprehension process.

3.4.1.2. N400

Previous irony ERP studies provide mixed results concerning the N400 component. Depending on the experimental procedures, studies have reported a considerable variability in the N400 component when study participants were responding to irony.

Cornejo and colleagues (2007) explored the role of different coherence categorization strategies in irony processing. In the experiment, participants were auditorily presented with the context describing the situation by a narrator followed by a target sentence presented visually on the screen. The stimuli were stories which ended with a target sentence. The same target sentence was biased towards its literal, ironic or nonsensical interpretation based on the preceding context. The task was to determine whether the target sentence was coherent or incoherent in connection to the preceding context. Participants were assigned to one of the two groups. In one group, participants were asked to judge the coherence based

on analytic factors such as formal aspects of language. Specifically, participants were urged to consider the sentence meaning and whether it was congruent with the preceding story. In the other group, they were to make the judgment on the basis of holistic factors such as conventional adequacy of the sentence in daily use. Specifically, participants were prompted to consider whether the sentence would make sense in real life, and whether they could understand what the speaker meant. Interestingly, the study revealed varied results of irony processing depending on the strategy that participants were asked to employ. When participants were asked to categorize sentences as coherent or incoherent based on formal aspects of language (analytic strategy), the N400 component appeared to be greatly reduced. Conversely, when the categorization of sentences as coherent or incoherent depended on the conventional adequacy of the sentences in daily use (holistic strategy), ironic (together with nonsensical) utterances elicited increased N400 amplitudes. While reading and looking for coherence analytically, semantic processing seems to be detached from the global comprehension processes and their adequacy in the context. Yet, more holistic search for coherence draws from the preceding context and the semantics of the stimulus, which is why any departure from the congruity of the utterances with the context (or semantic incongruity for the nonsensical utterances) resulted in larger N400 amplitudes. Such a discrepancy in the results demonstrates that the processing of irony depends on the cognitive strategy (task) that is used when participants are making sense of what they have heard or read. This study demonstrated the significance of the task-related strategy on irony processing and that the N400 component may not be an all-or-nothing neurocognitive marker of irony processing, but, instead, may be sensitive to task demands and be modulated by these specificities.

Filik and colleagues (2014) explored the differences in processing familiar and unfamiliar irony, as I have already discussed in chapter two when discussing eye-tracking evidence. Now, I would like to refer to different aspects of this study focusing on the electrophysiological findings. Participants were auditorily presented with two-sentence materials. The first sentence provided contextual background to the second, the target sentence, which included a statement uttered by one of the characters. This is yet another study which followed the binary conceptualization of ironicity and literalness. Namely, the target sentences were intended either as ironic or literal. Half of the materials were constructed in such a way as to convey irony which was familiar (e.g., Peter lost all his money at the casino. “Well aren’t you lucky,” Dave said to him.), and its literal familiar counterpart (e.g., Peter trebled his money at the casino. “Well aren’t you lucky,” Dave said to him.). The

other half was supposed to impart unfamiliar irony (e.g., Sophie was forever eating junk food and Fred had never seen her eating any fruit or vegetables. “Never known anyone so healthy,” he commented.), and its literal unfamiliar counterpart (e.g., Sophie was forever eating fruit and vegetables and Fred had never seen her eating any junk food. “Never known anyone so healthy,” he commented.). Prior to the study the materials were tested in order to determine the familiarity in a rating study, where participants were asked to rate each item for how familiar participants were with experiencing the items ironically. The materials used predominantly conveyed ironic criticism, with only a few items conveying ironic praise. The valence variable was not included in the study design. Results demonstrated that unfamiliar ironic utterances elicited an N400 effect relative to control, non-ironic unfamiliar utterances, while familiar ironic utterances do not elicit such an effect (Filik et al. 2014). The authors interpret this result as a semantic processing difficulty connected with making sense of unfamiliar irony. Namely, the increased N400 amplitudes elicited by unfamiliar ironic statements may reflect the difficulty stemming from integrating the critical word with the bigger discourse, or the retrieval of conceptual knowledge from semantic long-term memory. Filik and colleagues (2014) suggested that the increased amplitudes of the N400 mark the cognitive hardship resulting from meaning making while integrating incoming words with the preceding context.

Increased negativity for irony as reflected by larger N400 amplitudes for ironic statements has also been observed in a recent study by Shi and Li (2022). In this study, participants were asked to read two-sentence context stimuli followed by target sentences in their L1 (Chinese). The trials were constructed as to pair each target sentence with three different context types. This resulted in three unique conditions: predictable literal, unpredictable literal, and ironic. Each target sentence was followed by a comprehension question, inquiring whether the participant agreed with the evaluation expressed in the targets sentence. Results demonstrated larger N400 amplitudes in response to irony compared to predictable literal meaning, and in response to unpredictable literal condition compared to predictable literal condition. Surprisingly, there were no differences in the amplitude of the N400 between the ironic and unpredictable literal conditions. Accounting for these results, these authors suggest that the observed larger N400 for irony may be the outcome of low irony predictability. Moreover, since in irony, the literal and the ironic meanings are incongruent, the increased amplitudes of the N400 elicited by ironic statements may suggest that the literal meaning required additional processing.

Several other studies have conversely reported the absence of an N400 effect related to irony relative to literal utterances (Amenta and Balconi 2008; Regel et al. 2010b), Spotorno et al. 2013). Amenta and Balconi (2008) argue that the absence of a statistically relevant N400 effect demonstrates that irony is not analogous to a semantic anomaly, as its intended meaning is not recovered after the detection of an incongruity between an utterance and its context (Amenta and Balconi 2008). It has also been argued that the fact that the N400 was not obtained for irony indicates that the semantic integration of ironic utterances is not more cognitively taxing than the semantic integration of literal utterances (Regel et al. 2010b). According to Amenta and Balconi (2008), this calls for the rejection of *the Standard Pragmatic Model* (Grice 1975) and the corroboration of the hypothesis that irony computation involves contextual and nonverbal information working collectively. In my view, the experimental design used in this study may have influenced the observed results. For instance, the number of participants in this experiment was 12, which could be a little too low to make strong claims about irony processing in general and to extrapolate these results to the entire society due to a non-representative sample of participants. Increasing the number of participants would be advisable to make more legitimate claims about the process explored.

Spotorno and colleagues (2013) also do not report an irony-related N400 effect, which the authors take to reflect the fact that the surface level inconsistency is not critical in irony processing. While the N400 effect did not emerge in this study, Spotorno and colleagues (2013) performed a Time Frequency Analysis (TFA) and found that ironic utterances elicited synchronization in the gamma band between 280 and 400 ms post onset. According to Spotorno and colleagues (2013), these results evidence early integration processes in the comprehension and, therefore, support the parallel-constraint-satisfaction model (Pexman 2008), an approach according to which various streams of information (semantic meaning, pragmatic meaning e.g., context, prosody, social aspects) get incipiently and immediately integrated in order to form the speaker's intended interpretation. It is noteworthy that irony researchers usually look for processes underpinning irony processing at a later processing stage (P600/LPP). What is more, sometimes using a different method, that is Time Frequency Analysis (TFA), which enables characterizing how a signal's frequency components change over time allows to capture the processes at this early level.

Regel and colleagues (2010a) reported that an irony-related N400 effect did not emerge in Session 1 (in the learning phase, when participants were reading stories where

one speaker used irony frequently, and the other speaker used irony rarely), a result in line with Spotorno and colleagues' (2013) finding of no N400 irony-related effect. This lack of N400 effects for irony in Session 1 in Regel and colleagues' (2010a) study most likely reflects the lack of predictions in the study participants based on which they could interpret the intended meanings of both speakers. There was no influence of the speaker's communicative style on semantic information processing as the participants were still acquiring cues to the speakers' preferred – direct or indirect – manner of communication (literal or ironic communicative preferences). Instead, Regel and colleagues (2010a) observed larger N400 negativity elicited by the non-ironic speaker's turns. However, when participants implicitly acquired information about the speakers' communicative styles, and even though the amount of ironic and literal comments delivered by the speakers was levelled out in session 2, Regel and colleagues (2010a) report a slightly increased irony-related negativity in the 300-500 ms time window for the non-ironic speaker compared to irony used by the ironic speaker. This may be interpreted as an indication that participants have already formed expectations as to how the two speakers would express their intentions (literally or ironically), and they may not have expected the increase in ironicity in the non-ironic speaker (bearing in mind that the non-ironic speaker was only slightly ironic in Session 1). For the ironic speaker in Session 2, however, a larger N400 negativity was observed for the literal utterances. This may indicate that participants formed reliable expectations during the acquisition phase in Session 1, and they did not expect the ironic speaker to become less ironic and more literal in Session 2. Specifically, these results demonstrate that the predominance of irony initially expressed by the ironic speaker (70% of the time) created a high expectation for such a communicative style by that speaker, so that when the irony anticipation was unfulfilled during the second session and both speakers used the same amount of irony and literalness (both 50% of the time), a larger N400 amplitude was observed in response to literal meaning by the ironic speaker and for irony by the non-ironic speaker.

The evidence regarding the N400 component presented so far provides rather mixed patterns of results and suggests that the N400 should not be assumed to be modulated by irony indiscriminately. The conditions accompanying the frequency of irony use and other cues connected with more global cognitive processes underlying irony comprehension play a meaningful role in modulating the presence or the lack of N400 effects. In fact, the N400-related irony modulations were observed when processing decontextualized ironic statements and their inherent incongruity (Cornejo et al. 2007), or ironic statements with low

predictability (Shi and Li 2022) and integrating incoming words with the context while processing unfamiliar irony (Filik et al. 2014). Therefore, more studies are invaluable to better understand the cognitive, context-related and societal expectations giving rise to processing complexities of irony in verbal interaction.

3.4.1.3. P600/LPP

An ERP component more commonly explored in irony processing studies and more often observed in response to irony is the P600 or the LPP. Most typically, the amplitude of the LPP has been reported to be greater for ironic compared to literal meanings (Regel et al. 2010a; Regel et al. 2010b; Spotorno et al. 2013; Caffarra et al. 2019).

In their study investigating the analytical and holistic comprehension strategy, Cornejo and colleagues (2007) observed larger LPP elicited by ironic statements when participants were searching for coherence based on the holistic strategy. This might be a reflection of an increased demand for cognitive closure. In the analytic strategy condition, larger LPP amplitudes were elicited by literal statements, while nonsensical and ironic statements revealed reduced amplitudes. This effect, interesting as it is, might have been caused by the experimental procedure itself. Namely, it might be a consequence of the experimental manipulation as generated by the infrequency of literal statements occurrence relative to ironic and nonsensical statements combined. Under the analytic strategy both the nonsensical and ironic statements were categorized as incoherent. This makes the literal condition an infrequent one.

In a study by Regel and colleagues (2010a), the authors reported an irony-related P600 effect. In their study, which tested how the frequency of irony presence impacts the patterns of irony recognition, participants completed two experimental sessions. In Session 1, they were learning about each speaker's communicative style, and in session 2, their knowledge about those styles was tested. They found that, when the speakers' use of irony was unequal (Session 1 – 30% vs. 70%), ERPs showed an irony-related P600 elicited by the non-ironic speaker's (the one who used irony infrequently) comments. However, both types of comments (ironic, literal) uttered by the ironic speaker elicited a P600 effect. Interestingly, when both speakers' use of irony was balanced (in Session 2), only ironic utterances expressed by the ironic speaker elicited larger P600 amplitudes. This result demon-

strates, that having the pragmatic knowledge about a speaker's communicative style (merely based on the frequency of irony occurrence in Session 1) helps to integrate such extralinguistic information with the context and the semantic meaning of the statement itself. It is probable that such a pragmatic knowledge about the speaker helps predict and integrate the communicative cues so that they generate or reduce the amplitude of P600. However, ironic statements did elicit visibly marked late positive enhancements, which were interpreted as a P600 effect. This late irony-related positive-going larger amplitude most likely reflects pragmatic inferencing processes underlying intense meaning making for ironic stimuli which inherently feature the context / comment incongruity. Consequently, this incongruity, an inherent irony feature, demands more meaning-making processing which is reflected by the P600. Regel and colleagues (2010a) showed that the occurrence of increased P600 amplitudes in response to irony was largely dependent on the extralinguistic, contextual information, namely the knowledge about the speaker communicative style, and the expectations which this knowledge generates. This knowledge further modulates the ease or effort of irony processing.

In a set of studies, Regel and colleagues (2010b) explored the neurocognitive processes underlying irony processing using a cross-modal design combining auditory and visual presentation of the experimental stimuli, with participants performing two different tasks: a comprehension task and a passive reading task. In the first experiment, they investigated the time course and the manner of the integration of contextual information from the auditory modality in irony presentation. Participants were auditorily presented with discourses consisting of a context background and a target sentence, which was either literal or ironic. Irony and literalness occurred with equal probability in this experiment (50%). They were instructed to listen attentively to the discourses and complete a comprehension task, by deciding whether the statement presented visually on the screen reflected the preceding context. The comprehension task checked the participants' attention to the presented materials. Additionally, the prosody of the spoken discourses was manipulated, so that there were four conditions: irony-biasing context and target sentence with normal prosody, irony-biasing context and target sentence with ironic prosody, non-irony-biasing context and target sentence with ironic prosody and non-irony-biasing context and target sentence with normal prosody. Results revealed larger P600 amplitudes elicited by discourses biasing the target sentence towards an ironic interpretation compared to the literal interpretation, regardless of the prosody manipulations. The authors argued that the observed increased

P600 amplitudes in response to irony may have reflected pragmatic and conceptual comprehension processes and late integration of semantic and extralinguistic information. Alternatively, Regel and colleagues (2010b) suggested that the P600 modulation may have been caused by the task constraints, which, although not highly demanding, may have compelled participants to focus more intensively on the stimuli in order to complete the task. In the second experiment, Regel and colleagues (2010b) investigated whether the observed effects of irony in the first experiment were specifically due to irony, and not the presentation mode. Additionally, in the second experiment the probability of irony occurrence was reduced to reflect the naturalness of irony presence in the real world. Specifically, irony occurred less frequently than literal language. In the experiment the stimuli were presented visually, and the participants were asked to complete two experimental blocks, a task-dependent one and a task-independent one to allow the comparison of ERPs with and without the task constraints. In the first block participants were asked to read the stimuli for comprehension and complete a recognition test afterwards (to ensure attentiveness). In the recognition task participants were asked to recognize items which were presented in the experiment. In the second block, after each trial participants were asked to complete a comprehension task, the same as in the first experiment. In the comprehension task participants were asked to decide whether a test statement reflected the meaning conveyed the meaning of the stimulus. Results showed that larger P600 amplitudes were elicited by irony relative to literal meaning, and this effect was unaffected by the task constraints. This experiment added to the growing body of evidence demonstrating that the P600 component is sensitive to irony processing and suggested that it is insensitive to the task constraints. In addition, these experiments provide support for the observation that the amplitudes of the P600 reflect pragmatic knowledge processing rather than task constraints. Moreover, the two experiments showed that the P600 effect was not affected by the modality of stimulus presentation. Therefore, it did not affect the brain patterns as captured by the EEG method whether participants were reading or receiving the stimuli in the auditory modality. It suggests that the P600 component is a reliable marker of irony processing, and that it is invariably enhanced by irony occurrence, regardless of whether it is read or heard.

The late pragmatic inferential processes in irony have been observed by Spotorno and colleagues (2013) who showed that when processing irony, individuals engaged in a continued combinatorial analysis, which was indexed by the late positivity. Participants were presented with written, literal and ironic, stories and were asked to read them for compre-

hension and answer comprehension questions related to the presented stories. Results showed that when reading ironic stories, the P600 amplitudes increased compared to the literal stories. It was argued that this effect may have reflected pragmatic inferential processing and continued combinatory analysis of various incoming resources. In addition, the observed increased P600 amplitudes probably indexed the integration of linguistic stimulus and all the incongruous preceding information.

Filik and colleagues (2014), in their study explored the role of familiarity in irony processing and its electrophysiological markers and observed that a greater positive-going waveform reflecting the P600 effect was elicited by ironic sentences relative to literal controls. This study demonstrated that the P600 effect was evoked by both types of ironic utterances regardless of the familiarity – a significant result indicating that familiarity (or unfamiliarity) is trumped by the constitutive feature of irony, namely its incongruity between the context and the comment. This result suggested that familiar and unfamiliar irony relied on similar ongoing cognitive processes at this later processing stage (unlike at the earlier, semantic processing stage – N400). As familiar ironic sentences did not elicit increased N400 amplitudes (described in the previous section), Filik and colleagues (2014) suggest this is unlikely that the observed increased P600 amplitudes for irony, in general, reflect meaning reanalysis, as no reanalysis should be necessary if the mismatch was not recognized for the familiar ironic sentences (no increased N400 for familiar irony). If, however, some meaning reanalysis was responsible for the observed P600 effect, there must have been some other processes at play as well. Potentially, the observed late positivity amplitude modulation may have indexed the on-going pragmatic processing, which should be expected for both familiar and unfamiliar irony alike. Another explanation for the observed increased P600 amplitude for irony is that the modulation may be a sign of the ongoing conflict between literal and figurative meanings of irony statements. It is also possible that ironic statements accounting for 25% of the total stimulus pool (together with literal and filler items) led to the weak expectation of irony occurrence. Since irony, as presented in this study design, may have been unexpected, participants reactions to the infrequent and unexpected ironic statements may have elicited the more positive P600 amplitudes.

In a set of two experiments, discussed previously in relation to the P200 component, Regel and Gunter (2017) investigated the effects of cuing ironic intentions on the processing of ironic statements. The cued stimuli were accompanied by quotation marks at-

tached to the target word in the target sentence. In the first experiment, where some of the stimuli were cued (50% cued) and some other were uncued, it was observed that larger P600 amplitudes were elicited by ironic statements compared to literal statements regardless of the cueing influence. This P600 modulation most likely indexed pragmatic reanalysis. As for the cueing manipulation, enhanced P600 positivity was observed for cued relative to uncued sentences. The authors suggest this effect might be connected with inhibition processes underlying the retrieved but interpretation-irrelevant content. The cueing did not affect the ironic or literal interpretations, though. To further probe into the role of cueing intentions, in the second experiment, where both ironic and literal statements were uncued (block 1), and then only ironic statements were cued (block 2), Regel and Gunter (2017) observed that ironic statements elicited larger P600 amplitudes regardless of whether they were cued or not. These experiments demonstrated that irony processing evokes increased P600 amplitudes and this effect is stable for ironic meaning, regardless of whether the ironic intention is additionally marked by means of punctuation marks or not. Generally, this study showed that the irony-related P600 effect, reflecting late inferential processes, may occur independently and in separation from the preceding semantic integration difficulty, indexed by larger N400 amplitudes, which was not observed in this study.

Weissman and Tanner (2018) who explored brain responses to emoji-induced irony (as described in section 3.4.1.1.) consistently observed larger P600 amplitudes in response to irony in a series of three experiments. They argue that irony enhanced by emojis evoked similar brain responses as irony expressed by words. The P600 may not be exclusively sensitive to word-related pragmatic phenomena but may also be modulated by linguistically relevant ideograms. This multimodal presentation of irony resulted in an increased demand for cognitive processing and integration. Specifically, processing ironic trials (a positive / negative sentence + a wink emoji, or a negative sentence + a wink emoji) necessitated later reprocessing of the sentence meaning, which suggests that the P600 is not specific to grammatical processing, but a more general domain.

The LPP can also be sensitive to emotionally loaded situations. Pfeifer and Lai (2021) asked participants to read context stories which were either ironic or literal. The level of the emotional impact was manipulated in that the context either communicated high (literal: *Max is helping Jenny with her computer when he accidentally spills a glass of water over the open computer. Jenny says: How clumsy of you!;* ironic: *Max is helping Jenny with her computer when he accidentally spills a glass of water over the closed com-*

puter. Jenny says: *How considerate of you!*) or low (literal: *Max is helping Jenny with her computer when he accidentally spills a glass of water over the closed computer. Jenny says: How clumsy of you!*; ironic: *Max is helping Jenny with her computer when he accidentally spills a glass of water over the open computer. Jenny says: How considerate of you!*) emotion. Larger LPP amplitudes were observed for stories communicating ironic meaning but only in the high emotion condition. This finding was also interpreted as a manifestation of irony requiring late semantic integration. As emotionally arousing contexts were used in the experiment, participants' attention may have been attracted early on. During the final segment (target comment) processing participants may have needed extra cognitive resources for the target comment integration with the initial segment. Alternatively, Pfeifer and Lai (2021) propose that the LPP reflects mental state processing. As processing mental states of characters in high emotion contexts may have been more cognitively taxing, the mental effort may have been reflected in the heightened brain response at this stage. Finally, it was suggested that the increased LPP amplitudes for irony in the high emotion contexts may have indexed negative emotion processing. Indeed, the stories used in the experiment described solely negative events and concluded with either a negatively valenced comment (literal criticism) or a positively valenced comment (ironic criticism). This study shows that irony required more mental state processing and emotional processing when participants were reading scenarios imbued with emotions.

The ERP studies reviewed above consistently show that irony processing entails late processes. Specifically, increased late positivity amplitudes elicited by irony may reflect a heightened demand for cognitive closure (Cornejo et al. 2007), pragmatic inferential processes (Regel and Gunter 2017; Regel et al. 2010a; Spotorno et al. 2013), the reintegration of semantic with pragmatic (extralinguistic) meaning (Regel et al. 2010a; Regel et al. 2010b), pragmatic (Filik et al. 2014; Regel et al. 2010b) and conceptual comprehension processes (Regel et al. 2010b), ongoing combinatory analysis of various streams (Spotorno et al. 2013), the integration of linguistic information with the preceding information (Pfeifer and Lai 2021; Spotorno et al. 2013), the ongoing conflict between literal and figurative meanings of ironic statements (Filik et al. 2014), the low probability of irony occurrence (Filik et al. 2014), pragmatic reanalysis (Regel and Gunter 2017), later reprocessing of the sentence meaning (Weissman and Tanner 2018), late semantic integration (Pfeifer and Lai 2021), mental state processing (Pfeifer and Lai 2021) and negative emotion processing (Pfeifer and Lai 2021). Such a multitude of processes which may be reflected by the

P600/LPP suggests that irony is a complex communicative phenomenon which evokes late electrophysiological activity.

In line with the observations made in this thesis that the mixed results observed in prior irony research may stem from how irony was conceptualized by researchers in their studies, and the previously proposed discussion of studies based on how they conceptualized irony, this chapter follows the same organization. In the previous sections I was describing EEG results from studies which compared literal and ironic meaning. In the next sections I discuss valence-based EEG evidence with a division of the stimuli into ironic criticism, ironic praise and their literal equivalents.

3.4.2. Irony processing: The role of lexical valence

In this section I review evidence from previous ERP irony studies which implemented lexical valence-based stimulus selection to further explore whether the electrophysiological method corroborates behavioral findings regarding the key role of the lexical valence in irony processing patterns. As far as I am aware there is only one EEG study on irony processing which used the valence-based stimulus selection (Caillies et al. 2019).

3.4.2.1. N400

Caillies and colleagues (2019) explored the neurocognitive processes underpinning the asymmetrical nature of ironic utterances pronounced with either a sincere or ironic prosody. The experimental conditions included literal praise, ironic criticism, literal criticism and ironic praise. The sincere and ironic prosodies were used as a tool to bias the meaning of the sentences towards either an ironic or a literal interpretation. Participants were asked to listen to the sentences presented auditorily and answer a comprehension question probing into the speaker intention presented visually. Results showed greater mean N400 amplitudes in response to ironic statements ending in a negative adjective (ironic praise) relative to literal statements ending in a negative adjective (literal criticism). For statements ending in a positive adjective the results diverged with literal praise eliciting greater N400 amplitudes than ironic criticism. The fact that ironic praise, but not ironic criticism, elicited

greater N400 amplitudes in comparison to their literal-intention equivalents could be due to the fact that praising irony is unconventional, as saying bad things to other people, and consequently, alluding to bad, negative conventions is less conventional than saying good things, and alluding to positive conventions. What is more, the effects of prosody seemed to have played a role. Prosody affected the N400 amplitude differently and depended on the emotional information conveyed by means of intonation. It was suggested that the sentence-prosody incongruity impeded the meaning construction when the sentences achieved their meaning by means of negative adjectives. Specifically, the incongruity may have rendered the retrieval of the negative adjectives from memory more difficult than the retrieval of the positive adjectives. Since the incongruity inherent in ironic statements impeded processing more in the less conventional irony type, Caillies and colleagues (2019) suggested that when a sentence ended in a positive adjective and was pronounced with an ironic prosody (ironic criticism), participants had a better understanding of what the speaker meant, compared to when a sentence ended in a negative adjective pronounced with an ironic prosody (ironic praise). The better reception of irony expressed via criticism than via praise, apart from the positive valence of the words in ironic criticism, also stems from the fact that ironic criticism refers to positive social norms, which are generally accepted, unlike ironic praise which refers to negative social norms which are less acceptable, or even unacceptable. As a result, when ironic praise was compared with literal criticism it enhanced the amplitude of the N400. The irony which referred to positive social norms (ironic criticism) did not cause this enhancement, as it was perceived as equally acceptable as literal praise. In sum, the authors argue that the N400 can be modulated by the emotional load of ironic statements.

3.4.2.2. P600/LPP

As regards the P600 component Caillies and colleagues (2019) observed that ironic criticism (the canonical, more conventional type) processing evoked enhanced P600 amplitudes. The larger P600 amplitudes in response to ironic criticism were observed in comparison to literal praise. When ironic praise and literal criticism were compared (the same negative lexical valence), greater P600 amplitudes were observed in response to literal criticism, which is intriguing since both literal criticism and ironic praise are communicated by

means of negative adjectives on the surface level. Yet, the P600 amplitudes were more pronounced for the literally intended criticism than for ironically intended praise. This suggests that literal criticism may be more absorbing and demanding in terms of attention resources than ironic criticism. These results show that in both comparisons the criticism (literal and ironic) elicited larger P600 amplitudes than the praise (literal and ironic). These results provide evidence for the negativity bias by showing that negative valence, in this case intention valence, is more difficult to process. In the same study, Caillies and colleagues (2019) observed an irony-related N400 effect evoked in response to ironic praise. Taken together, the authors suggested that the neurocognitive processes behind each ERP component studied in their experiment were affected by the emotional aspect of ironic statements communicated particularly strongly by the negativity of one of the meaning layers. Specifically, the negativity is communicated explicitly on the word level in ironic praise, therefore, more enhanced N400 amplitudes were observed for this type of irony, while for the ironic criticism the negativity is expressed implicitly on the connotation level, resulting in greater P600 amplitudes observed for this type of irony (Caillies et al. 2019).

3.4.3. Conclusions of the irony processing EEG studies

The aforementioned studies have largely focused on the N400 and P600/LPP effects, with a few studies also looking at an earlier ERP component – P200. Most of these studies tested irony processing against literal meaning processing (Cornejo et al. 2007; Filik et al. 2014; Pfeifer and Lai 2021; Regel and Gunter 2017; Regel et al. 2010a; Regel et al. 2010b; Shi and Li 2022; Spotorno et al. 2013; Weissman and Tanner 2018). These studies show that irony may attract attention and initiate early semantic analysis as observed on the P200 amplitude (Regel and Gunter 2017; Regel et al. 2010a; Weissman and Tanner 2018). Irony tends to be more cognitively taxing than literal meaning at the semantic processing stage (Cornejo et al. 2007; Shi and Li 2022; Filik et al. 2014). What is more, irony processing necessitates more pragmatic inferential computation and meaning reanalysis than literalness (Filik et al. 2014; Pfeifer and Lai 2021; Regel et al. 2010a; Regel et al. 2010b; Spotorno et al. 2013; Weissman and Tanner 2018). When lexical valence was accounted for, ironic praise elicited greater N400 amplitudes than literal criticism, in the absence of such a mod-

ulation elicited by ironic criticism compared to literal praise. At the later stage, ironic criticism required more unification than literal praise, in the absence of such an effect elicited by ironic praise compared to literal criticism (Caillies et al. 2019). These results show that probing into a broader statement type range with praise and criticism expressed ironically and literally sheds new light on the neurocognitive processes underlying irony processing at both stages of the N400/LPP biphasic process.

3.5. Neuroimaging studies in irony processing

Although this dissertation is focused on the behavioral and electrophysiological evidence related to irony processing, for the completeness of the picture of the phenomenon of verbal irony, in this section I present a brief overview of neuroimaging studies investigating irony processing. These studies help us understand which brain regions are engaged in irony processing.

Evidence from neuroimaging irony processing studies shows that the brain regions underpinning irony processing are largely overlapping with the regions responsible for the mentalizing capacity (Shibata et al. 2010; Spotorno et al. 2012; Uchiyama et al. 2006; Uchiyama et al. 2012; Wakusawa et al. 2007). Wakusawa and colleagues (2007) presented their participants with pictures depicting daily communicative situations and asked to perform two tasks. In the situational task, they were asked to determine whether the presented utterance was situationally appropriate and in the literal task, they were asked to determine whether the presented utterance was a literally correct description of a situation. Results showed that the right temporal pole was activated during irony processing regardless of the task constraints. In addition, when performing the situational judgment task (but not the literal task), the medial orbitofrontal cortex was activated. It was suggested that the identified regions showing irony-related activation overlapped with the cortical regions connected with the Theory of Mind.

Similar brain regions revealed activation in another study where participants were asked to read sarcastic, non-sarcastic and contextually unconnected scenarios and underwent functional magnetic resonance imaging (Uchiyama et al. 2006). The activated brain regions when detecting sarcasm included the left temporal pole, the superior temporal sulcus, the medial prefrontal cortex, and the inferior frontal gyrus. This study evidenced that

sarcasm detection activates the neural circuits similar to the ones underpinning mentalizing. Moreover, the same neural substrates which are involved in reading sentences were activated during sarcasm comprehension.

The emotional aspect of ironic meaning has been showed to activate a separate region in the brain. Uchiyama and colleagues (2012) presented their participants with short stories followed by a target sentence. Participants were required to classify the target sentence as one of the following: metaphor, sarcasm, literally coherent or literally incoherent. When sarcasm was processed increased activation was observed in the left amygdala, a region dedicated, among other functions, to monitoring social behavior, and especially, emotional contours – visual and auditory – as exhibited by human behaviors. The fact that the left amygdala showed increased activation when processing sarcasm illustrates that irony processing involves the brain region responsible for the representation of other people's emotional status. Additionally, the anterior rostral medial frontal cortex was activated when processing sarcasm. The latter is a key node of mentalizing, which provides further evidence that the neural circuit of sarcasm and the Theory of Mind might be, at least partially, overlapping.

In another reading study Shibata and colleagues (2010) asked their participants to read short scenarios and inquired explicitly whether the final sentence in each scenario expressed irony or literal meaning. The analysis of the brain regions calculated by subtracting the literal meaning condition from the ironic sentence condition revealed that the increased activation in response to irony was observed in the right medial prefrontal cortex, the right precentral, and the left superior temporal sulcus. These results point to the previously mentioned observation, that irony processing and the mentalizing capacity are strongly connected. The fact that the two processes activate similar brain regions suggests that both irony and mentalizing involve higher-order cognitive operations.

In sum, neuroimaging studies in irony processing demonstrate that processing implicit meanings such as ironic intentions relies on mechanisms participating in Theory of Mind, rather than on mechanisms responsible for linguistic processing alone. Specifically, these mechanisms may be involved in the interaction of the literal meaning and information relevant in a particular context (Wakusawa et al. 2007).

3.6. Conclusion

Evidence from EEG irony processing studies discussed in this chapter have primarily analyzed the biphasic processing cycle reflected by the N400 and P600/LPP modulations. Several studies have also analyzed an earlier component – P200. Results show that under certain circumstances irony elicits larger P200 amplitudes (Regel and Gunter 2017; Regel et al. 2010a; Weissman and Tanner 2018), which may be a reflection of an early recognition, early semantic analysis and the retrieval of meaning or attention activation. Some studies have found increased N400 in response to irony (Cornejo et al. 2007; Shi and Li 2022; Filik et al. 2014) probably indexing contextual incongruity or semantic processing difficulty. Other studies have not found N400 effects (Amenta and Balconi 2008; Regel et al. 2010b; Spotorno et al. 2013). A great body of research shows that irony elicits larger P600/LPP amplitudes (Caffarra et al. 2019; Filik et al. 2014; Pfeifer and Lai 2021; Regel and Gunter 2017; Regel et al. 2010a; Regel et al. 2010b; Spotorno et al. 2013; Weissman and Tanner 2018), possibly indicating pragmatic inferential processing or various meaning reanalyses. What is more, Caillies and colleagues (2019) observed that ironic praise revealed larger N400 amplitudes than literal criticism, and literal praise revealed larger N400 amplitudes than ironic criticism. In addition, ironic criticism elicited larger P600 amplitudes than literal praise, and literal criticism elicited larger P600 amplitudes than ironic praise. These results suggest that the negativity embedded in either the target word (N400 for ironic praise) or the preceding context (P600 for ironic criticism) may have caused the N400 and P600 modulations. What is more, evidence from neuroimaging studies on irony processing demonstrates that the neurophysiological circuits operating irony comprehension overlaps with the Theory of Mind capacity which may suggest that irony is a social construct, and its comprehension largely depends on one's social skills (Wakusawa et al. 2007).

Despite a great body of EEG research in irony processing, there are still many limitations. The picture that emerges from the EEG irony studies shows inconsistent data patterns, which indicates that the essence of irony has not yet been grasped and more studies are needed. The observed differences may likely stem from differences in the conceptualization of irony – as a non-literal meaning and, therefore, compared to literal meanings, or a communicative strategy relying on communicating either praising or critical intent. Other possible explanations concern the task, the design, participant populations or other procedure related aspects. The overarching assumption that underpins my thesis is that how re-

searchers construct irony has had a significant impact on the obtained results. The review of relevant research shows that two different assumptions as to what is irony have driven the research so far. On the one hand, if the researchers operationalize irony as a non-literal, figurative means of communication, it is compared with literal meaning. On the other hand, if the researchers operationalize irony as an implicit means of communicating praise or criticism, they compare ironic praise and ironic criticism with literal praise and literal criticism. The exclusion or inclusion of a narrower or a broader approach affects the type of stimuli used for testing, and consequently, impacts the obtained results. Any firm conclusions are impossible to be made at the moment as more research is necessary to validate these results. While most irony EEG studies construed irony as a binary construct and compared irony with literalness (Amenta and Balconi 2008; Cornejo et al. 2007; Filik et al. 2014; Pfeifer and Lai 2021; Regel and Gunter 2017; Regel et al. 2010a; Regel et al. 2010b; Shi and Li 2022; Spotorno et al. 2013; Weissman and Tanner 2018), only one study included a broader range of statement types based on lexical valence (Caillies et al. 2019) while participants were listening to ironic praise, ironic criticism, literal praise and literal criticism. Therefore, it is indispensable for future research to further probe into the lexical valence-based construction of irony and literalness in other modalities. What is more, while these EEG studies have largely contributed to the body of irony processing research they have focused on L1 irony processing. Crucially, irony understanding flourishes in linguistic and cultural contexts. With the rise of the role of bilingualism, and more and more people speaking more than one language, it seems right to include bilinguals in study designs and explore irony processing in L2. Therefore, in chapter 4 I look at bilingualism and its influence on irony processing.

Chapter 4: Irony and bilingualism

4.1. Introduction

Monolingual irony research as I have already pointed out is split across two distinct standpoints, a direct and indirect framework. These two approaches result from the manner of conceptualizing the very phenomenon of irony, which can be construed as one side of a literal / non-literal dichotomy or which can feature an emotional load and through positive and negative lexical valence express a critical or a praising attitude. It appears that the manner of conceptualization of irony, whether as one side of a coin called literal / non-literal dichotomy or two sides of the valence-based quadripartition has a huge impact on the results of empirical studies. Some researchers conceptualized irony as a figure of speech (indirect access), a type of figurative language, which contains two meanings, literal and non-literal, both of which must be obligatorily processed (Giora 1997; Giora and Fein 1999a; Giora and Fein 1999b; Giora et al. 1998; Giora et al. 2007). In this framework irony was generally compared with literal meaning. On the other hand, researchers conceptualized irony as a frame of mind (direct access), where the surrounding context plays a crucial role (Gibbs 1986; Gibbs 1994). In this framework irony was diversified into lexical valence-based statement types where ironic criticism, ironic praise, literal criticism and literal praise were compared. The differences in the empirical evidence suggest that when irony is compared to literal meaning, and most commonly that meant comparing literal praise and ironic criticism, which featured the same, positive words, the literal meaning processing is facilitated, smoother, and faster relative to irony (Giora 1997; Giora and Fein 1999a; Giora and Fein 1999b; Giora et al. 1998; Giora et al. 2007). When, in turn, irony and literalness were broadened to include positive and negative words, ironic criticism resulted in a facili-

tated processing compared to the other irony type (praise) and literal criticism (Gibbs 1986; Kreuz and Link 2002).

At this stage of irony research and two major conceptualizations of irony in empirical approaches, the 21st century with its globalization led to the extension of irony research to include irony comprehension in the second language (L2). Given that bilingualism has become a norm, rather than an exception (Grosjean 2021), and irony is a common pragmatic communicative tool used by people all around the world (Gibbs 2000), communicators are faced with communicative interactions involving the recognition of an ironic intent in the foreign language on a daily basis. This creates new challenges for irony processing research, which, apart from native speakers' L1 skills and abilities to grasp irony, needs to address the non-native speakers' L2 skills and abilities to infer irony and interpret implicit meaning. This new approach has brought new challenges and opened a multitude of new research avenues. Specifically, when studying bilinguals' L2 and L1 it appears that the participants' socio-cognitive profile and their mentalizing skills such as Theory of Mind capacity contribute to the process of irony meaning making. Research suggests that successful irony processing in L2 largely depends on cognitive maturity (Banasik-Jemielniak and Bokus 2019), L2 proficiency (Bromberek-Dyzman et al. 2021; Ellis et al. 2021) and communicative experience (Tiv et al. 2023). With the increase in bilingual research in irony investigators began to acknowledge individual differences, such as Theory of Mind, executive functions, L2 proficiency, and the age as well as the manner of L2 acquisition, and their impact on the process of irony comprehension.

Therefore, in chapter 4 I discuss the relationship between irony processing and bilingualism. I start with the introduction of the notions of bilingualism and Theory of Mind. This is followed by an attempt at showing the relationship between bilingualism, Theory of Mind and executive control. The notion of executive control is then defined. Next, I present the process of irony comprehension in children, the link between irony and Theory of Mind, and the role of L2 proficiency in irony processing. Finally, I discuss previous irony processing research in the context of bilingualism. Following the same division as in Chapters 2 and 3, studies are discussed based on how the authors conceptualized irony, whether they classified the tested statements into literal and ironic, or the broader spectrum based on the lexical valence.

4.2. Bilingualism

Language users engage in bilingual communication in the modern world more than ever before, as bilinguals (those who use two or more languages on a daily basis) account for the majority of the world's population (Grosjean 2021). Before I move on further, let us consider who a bilingual is. A rather general definition put forward above includes a great variety of speakers. Commonly, bilingualism is thought to be the native-like control of two languages (Bloomfield 1933). Achieving native-like proficiency in the foreign language is rare and difficult, therefore Haugen (1969, as cited in Grosjean 2022) proposed a more inclusive view of bilingualism which sees it as being able to produce complete, meaningful utterances in the foreign language. An even more open-ended approach classifies as bilingual anyone able to function in each language based on their needs in their everyday lives (Grosjean 1989). The last one seems to capture the most commonly applied definition in bilingualism research nowadays which is "the regular use of two or more languages or dialects in everyday life" (Grosjean 2021). In the modern world where more and more people speak more than one language, speakers are faced with a challenge much more daunting than just being to communicate in the foreign language, but being able to communicate efficiently and effectively, with all, implicitly communicated, inconspicuous, and often ambiguous communicative intentions. Grosjean (2010) recognized several factors which seem to capture the definition, or rather a description of bilinguals. It needs to be considered which languages a bilingual knows and which they actually use. The influence that one language may have on the other is also important, as languages which are closer to one another may impact one another. Importantly, whether a language is still being acquired, or restructured due to the influence of another language is worth considering, too. What is more, in order to present a bilingual, it seems worthwhile to analyze the age of acquisition of each language, the order of acquisition, the manner of acquisition (in a natural setting, formally, a combination of both), and the pattern of language use over the years (Grosjean 2010). Based on the age of acquisition we can classify bilinguals into early, simultaneous, sequential and late (Butler 2013). In addition, language proficiency is yet another characteristic of bilingualism. Proficiency can be measured globally or, more specifically, in each language skill (speaking, listening, reading, writing) (Grosjean 2010). Based on the proficiency in two languages bilinguals can be divided into balanced and dominant (Butler 2013). Moreover, it might be important to consider the functions of each language of a bi-

lingual. Specifically, the context, the purpose and the extent to which each language is used should be considered (Grosjean 2010). Based on the functional ability bilinguals can be classified as receptive or productive (Butler 2013). Essentially, language mode, that is the state of activation of the languages of a bilingual (depending on the situation, interlocutor, and topic) may be taken into account, as well (Grosjean 2010). Finally, biculturalism can also modulate the nature of bilingualism. Whether a bilingual is in contact with two or more cultures or whether they remain in one culture can shape the type of a bilingual they are (Grosjean 2010).

4.2.1. The Theory of Mind

The ability to transmit, recognize and interpret communicative intentions is of paramount importance in our day-to-day functioning. It is also a natural property of human cognition (Garfield et al. 2001). This ability is not innate and the mechanisms subserving the acquisition of this property are typically researched through the concept of Theory of Mind. The Theory of Mind capacity is acquired through socializing and is enhanced by acquiring knowledge about people and interactions with them (Garfield et al. 2001). The capacity which has been referred to as *the Theory of Mind* (Garfield et al. 2001), *mentalizing* (Frith and Frith 2003), *intentional stance* (Frith and Frith 2003) and *social cognition* (Channon et al. 2005; Shamay-Tsoory et al. 2005) stands for “the cognitive achievement that enables us to report our propositional attitudes, to attribute such attitudes to others, and to use such postulated or observed mental states in the prediction and explanation of behavior” (Garfield et al. 2001). Sperber and Wilson (2002) suggest that mind-reading, the inferential attribution of intentions, involves “the attribution to the agent of beliefs and desires that would make her observed behaviour rational given its actual or likely effects.” The ability to recognize other people’s mental states is essential for any act of communication, and concerns literal language comprehension, and figurative language comprehension like irony in the same way. This special capacity makes it possible for communicators to perceive the implicitly conveyed intentions and act upon them. Before I look at the relationship between irony and the Theory of Mind, the link between bilingualism and the Theory of Mind needs to be addressed.

4.2.2. The influence of bilingualism on Theory of Mind and executive control

Bilingualism, that is having two language systems in one brain and managing them dynamically based on the situational needs, switching between them, often in the same act of communication, has been found to impact the Theory of Mind (Rubio-Fernández and Glucksberg 2012) and executive functions (Bialystok 2017) significantly. Studies report that children from different countries (cultural/linguistic environments) follow parallel developmental trajectories of Theory of Mind, and especially understanding what others mean to communicate, but reveal differences in the timing of this development (Liu et al. 2008; Wellman et al. 2001). This shows that there is a link between cultural (probably linguistic) environment and the development of Theory of Mind. Such a cultural influence on the Theory of Mind which has the power of shaping one's ability to recognize others' mental states suggests that the Theory of Mind module could be facilitated by exposure to the second language (Schroeder 2018). Indeed, extant research shows that bilingualism has a beneficial effect on mental state reasoning which is at the core of the Theory of Mind component and promotes its development (Diaz and Farrar 2017; Goetz 2003; Javor 2016; Schroeder 2018;).

For instance, Goetz (2003) explored the influence of an individual's linguistic knowledge such as being a speaker of a particular language or being a bilingual in the Theory of Mind development. In this study, Goetz (2003) compared three- and four-year-old monolinguals of English and Mandarin Chinese, and three- and four-year-old Mandarin Chinese-English bilinguals and how they performed on a number of Theory of Mind tasks. Results showed that 4-year-olds performed significantly better than the 3-year-olds, pointing to age related maturation in (cognitive) domain specific manner. When bilinguals were compared with monolinguals, the bilinguals exhibited an advantage over the monolinguals, demonstrating bilingual individuals' advantage over monolingual counterparts. Goetz (2003) suggested that this bilingual advantage may have multiple roots. Firstly, it may be due to a metalinguistic advantage that bilinguals may enjoy which may be conducive to developing representational abilities. Secondly, bilinguals may be better able to control conflicting representations which may result in better inhibition abilities. Thirdly, the advantage may be caused by a better sociolinguistic awareness of interlocutors' linguistic knowledge.

Rubio-Fernández and Glucksberg (2012) explored the possibility that bilingual adults may be better at false-belief reasoning (reasoning about other people's beliefs) than monolingual adults. Participants were given two tasks (*the Sally-Anne Task* and *the Simon Task*, which contained elements of the Stroop Task) probing into their false-belief reasoning (*Sally-Anne Task*) and the level of executive control (*Simon Task*). During the *Sally-Anne Task* participants' eye movements were recorded and revealed that bilinguals were better at suppressing the egocentric bias which was visible in a bigger number of bilingual participants' visual fixations at the correct item compared to the monolingual participants. What is more, bilinguals made faster first fixations on the correct item than monolinguals, which demonstrated a better performance of the bilingual group. Response time data did not reveal differences between monolinguals and bilinguals. This may suggest that response times may not be the most reliable measure in this context and are less sensitive than eye-tracking measures in capturing the monolinguals' and bilinguals' differences. Results from *the Simon Task* showed that bilingual participants suffered less interference than the monolingual participants, which attested to the advantageous performance of the bilinguals over the monolinguals. This study found that adult bilinguals are less susceptible to their own perspectives' influence when reasoning about other people's mental states. These results show that knowing more than one language and using these languages on a daily basis promotes a more robust development of the Theory of Mind and a more flexible ability to take perspectives, and attribute intentions to others in a more default manner. This has enormous consequences for recognizing irony and uncovering implicit communicative intentions in general.

Schroeder (2018) conducted a meta-analysis of studies which compared monolingual and bilingual children's performance on false belief and other Theory of Mind tests. The results of the meta-analysis point to a beneficial role of bilingualism in mental state reasoning. Schroeder (2018) distinguishes three main sources of the bilingual advantage in the Theory of Mind ability. These include executive functioning, metalinguistic awareness and socio-pragmatic awareness. According to the executive functioning account bilingualism improves executive functioning (Bialystok and Viswanathan 2009; Rubio-Fernández and Glucksberg 2012), which, in turn, predicts some Theory of Mind capability (Devine and Hughes 2014). The executive functions in the form of attentional control could be employed to downregulate (suppress) one's own mental state and to upregulate (enhance) someone else's mental state. In addition, inhibitory control (which is subsumed under ex-

ecutive functions) seems to be better in bilinguals (Schroeder 2018). The metalinguistic awareness is reflected in bilinguals' understanding that one concept may have two labels or more – as is the case with multilinguals, which can be helpful in comprehending that people can have different mental states in relation to the same stimulus (Kovács 2009; Schroeder 2018). On the metalinguistic awareness account bilingualism is claimed to improve metalinguistic awareness (Bialystok 1988; Goetz 2003), which, in turn, contributes to the development of the Theory of Mind (Doherty 2000). The socio-pragmatic account regards the bilinguals' advantage and stems from their awareness that some speakers share only one of their languages (monolinguals) and other speakers share both of their languages (bilinguals) (Schroeder 2018; Goetz 2003; Rubio-Fernández and Glucksberg 2012). Understanding that other people have mental states can be manifested by the ability to take perspectives. Research shows that bilingual children are better at perspective-taking than monolingual counterparts, which is crucially intertwined with the Theory of Mind component (Fan et al. 2015).

4.2.3. Executive control

Executive control consists of several cognitive skills (Bialystok et al. 2012). It subsumes several skills and components, but the degree to which the components develop and how independent of each other they are, remains an open question (Bialystok and Viswanathan 2009). Miyake and colleagues (2000) offered a division of executive control capacity into three cognitive processes: updating (working memory), inhibition and shifting. Firstly, working memory refers to information updating and monitoring and the ability to retain and use information in a simultaneous fashion. Working memory has been showed to have a facilitatory influence on irony comprehension by adults (Antoniou and Milaki 2021) and pragmatic meaning in general by children (Antoniou et al. 2019). Secondly, inhibition refers to the ability to suppress irrelevant responses and information. This particular skill has been found to play a pivotal role in how fluently bilinguals switch between languages and it is claimed to be connected with an enhanced inhibitory control. Inhibiting the non-target languages, and activating the target language in a rapid manner, regardless of the modality (when reading, listening or speaking), is an ongoing cognitive process enabled by the Theory of Mind faculty (Kovács 2009). Thirdly, shifting, also called switching, refers to the

mental ability to shift between tasks, operations or mental sets. This ability is also referred to as attention switching or task switching. Shifting refers to the disengagement of a task which is irrelevant at a particular moment and the consequent engagement of a relevant task. More specifically, when a new operation needs to be attended to (e.g., a new task during an experiment) it may be necessary to supersede interference from a task previously performed (Miyake et al. 2000). Research shows that bilingual children experience earlier onset of executive functions development compared to monolingual children (Bialystok 2001; Kovács 2009).

4.2.4. Bilingual experience and pragmatic meaning comprehension

As the available research shows, given that bilingualism contributes to the development of the Theory of Mind, and the Theory of Mind module is crucially necessary for irony recognition and comprehension, bilingual individuals might be better cognitively equipped for understanding veiled, implicit pragmatic meanings such as irony. Previous research suggests that bilinguals have an advantage in understanding nonliteral language such as conventional metaphors (Sundaray et al. 2018) or pragmatic functions such as utterances violating conversational maxims (Siegal et al. 2009) compared to monolinguals. Antoniou (2019) postulates that multilinguals' cognitive benefits may result in a comparable or even better pragmatic performance compared to monolinguals provided they possess a high L2 proficiency. Antoniou (2019) further suggests that bilinguals possess a single, general pragmatic system which does not work in any language specifically and develops and works similarly as in monolinguals. This general pragmatic system is language independent and underpins linguistic use in any language one knows. This model assumes a high level of proficiency in the non-native language as a necessary component of achieving the native-like pragmatic ability in the non-native language.

So far we have seen that bilingualism plays a crucial role in the development of the Theory of Mind and executive control. Owing to two linguistic systems in the brain bilinguals may be better at recognizing communicative intentions, a skill which underpins pragmatic meaning comprehension, and, particularly, irony.

4.3. Irony

In the following sections I discuss the relationship between Theory of Mind and irony comprehension, present an overview of the evidence from irony comprehension in children. Additionally, the role of L2 proficiency in L1 and L2 irony comprehension / processing is discussed.

4.3.1. Irony comprehension in children

Irony comprehension competence is a significant milestone in children's social cognition development (Peterson et al. 2012). Previous research suggests that the ability to understand ironic intentions develops with age. Some evidence shows that the ability to comprehend irony begins to emerge between the ages of five and six years (Dews et al. 1996; Harris and Pexman 2003), but Dews and colleagues (1996) showed that the performance of 5-year-olds is at a chance level and significantly improves as the child turns 6 years old. Other evidence suggests that children younger than 5 years old are able to understand ironic intent (Angeleri and Airenti 2014).

Angeleri and Airenti (2014) explored irony comprehension by younger children, aged 3 – 6.5 years old. The children were presented with puppet show scenarios communicating jokes, contingent irony, background irony and control stories. The puppet shows were told by two experimenters. Contingent irony was an ironic utterance delivered with a joking tone of voice, directly referring to something perceived by the interlocutors. Background irony was an ironic utterance, delivered with a joking tone of voice, which could only be comprehended by referring to shared knowledge. The choice of situations depicted in the background irony was determined by children's familiarity with these scenarios and their involvement in particular situations on a daily basis. Children were asked comprehension questions to determine their understanding of the scenarios. Results showed that children's performance in all age groups on jokes and control scenarios did not differ significantly. However, children in all age groups (3-, 4-, 5-, and 6-year-olds) were able to understand irony. Yet, children's irony comprehension ability improved with age. It is noteworthy, that even 3- and 4-year-olds demonstrated some ability to understand ironic intent. Specifically, they were good at understanding contingent irony and reasonable at

background irony comprehension. This study points to a potential explanation why researchers who study irony comprehension by children anchor these cognitive skills in different age brackets. Potentially, one of the factors that might play a pivotal role as a benchmark for irony comprehension is the availability of irony. Namely, children who are not exposed to ironic manner of communication do not stand a chance of developing irony understanding skills.

Banasik-Jemiłniak and Bokus (2019) asked monolingual Polish-speaking preschoolers, aged 4, 5, and 6 years old to perform a story comprehension task (Irony Comprehension Task – ICT). Half of the stories featured a character addressing another character using a counterfactual statement conveying irony, while the other half of the stories conveyed literal meaning. Some ironic comments made a reference to the addressee's behavior (targeted), while other ironic comments did not make a reference to the addressee's behavior (non-targeted). Additionally, some ironic comments featured symmetric dyads where a child addressed the comment at another child, and other ironic comments featured asymmetric dyads where an adult addressed the comment at a child. The children were presented with the ICT on a computer screen. Each trial consisted of pictures accompanied by auditory commentary. After a trial, a close-ended question with two response options was asked. The questions probed into children's understanding of the stories' intended meaning. The questions were auditorily played and accompanied by two answer options (two pictures, one depicting a literal interpretation, the other depicting an ironic interpretation) on a touchscreen. Results showed that children as young as 4 years old were able to correctly recognize the meaning of irony. They noticed that 4-year-olds differed from the other age groups in their ability to recognize irony in one aspect. The children in the youngest group understood irony more accurately when it referred to the addressee's action than when it did not. Therefore, it appears that their understanding was based on monitoring and comprehending the behavior of others and connecting it with others' states of mind – their underlying intentions. The understanding of irony among the older children did not differ in the two conditions. What is more, the youngest children (4-year-olds) understood irony more accurately in the asymmetric dyads (when an adult addressed the comment at a child) than in the symmetric dyads (a child addressed the comment at another child). The 5- and 6-year-olds understood irony in both conditions equally accurately.

In a different study, Banasik (2013) explored the developmental trajectories of irony processing in preschool children aged 4, 5, and 6 years old. In the study, participants were

presented with stories which communicated literal, or ironic meaning. Participants were asked to complete the Irony Comprehension Task and the Reflection on Thinking Test, as well as answer open-ended questions after each story. Results revealed that 4-, 5-, and 6-year-olds did not differ in irony comprehension but demonstrated differences on both measures of the Theory of Mind. Banasik (2013) posits that children's ability to distinguish real from hidden meanings of irony improves as their ability to talk about the mental states of people improves – an activity they can engage in on a daily basis.

Children may be able to detect irony and be aware that the ironic speaker means something else than the literal meaning of their words, but it is later that a child is able to appreciate irony, that is understand what the speaker means by using irony (Garfinkel et al. 2023; Harris and Pexman 2003; Pexman and Glenwright 2007). Garfinkel and colleagues (2023) showed that compared to their younger counterparts, children at the age of 8 years old were able to refer to interlocutors' emotions, intentions and metapragmatic functions. Pexman and Glenwright (2007) showed that their children participants were able to understand speaker beliefs of ironic criticism before understanding the speaker's intent to tease and the speaker's attitude. When comprehending ironic compliments, it was observed that understanding the speaker's beliefs emerged together with the understanding of the speaker's intention to tease. However, understanding the speaker's attitude expressed by means of ironic compliments emerged later. Similarly, Dews and colleagues (1996) showed that appreciating the funniness of ironic criticism comes with age. In their study, children in the youngest age group (5-6 years old) rated ironic criticism as funny less often than older children (8-9 years old) and adults did. However, Harris and Pexman (2003) reported that 7-8-years old children failed to recognize the funny aspect of ironic criticism and mostly rated it as somewhat serious. It was suggested that discrepancy may be due to the stimuli used (scenarios depicting employees and an employer or a customer – which is beyond a child's everyday experience), which children may not find humorous. The results seem to vary, and the capacity to appreciate the humorous aspect of ironic criticism is an emergent ability and continues to develop beyond the age of 8.

4.3.2. The Theory of Mind and irony comprehension

The relationship between language and its social impact is central to irony comprehension (Katz 2017). As I have already suggested, the ability to mentalize (Theory of Mind) has an influence on irony comprehension (Banasik 2013; Banasik-Jemielniak and Bokus 2019; Ronderos et al. 2022; Tiv et al. 2023). Greater mentalizing skills lead to more appropriate judgments of ironic comments (Tiv et al. 2023) and a higher probability of deriving ironic interpretations (Ronderos et al. 2022). It appears that the whole range of experiences coming from bilingualism, such as flexible social cognition or executive functions, may influence social and cognitive capacities (Tiv et al. 2020). Indeed, bilinguals might be better at recognizing communicative intentions, a fundamental activity when comprehending irony (Chelminiak 2025). Crucially, irony processing may be facilitated in L2 compared to L1 thanks to the ability to mentalize. Namely, irony may be processed comparably (similarly fast) in L1 and L2 owing to the mentalizing capacity (Bromberek-Dyzman et al. 2010). The mentalizing capacity tends to be better developed in bilinguals due to their enhanced executive command, and, especially, the constant control over the selection of the target language in a bilingual mind.

4.3.3. Irony processing and L2 proficiency

Prior studies point to a link between proficiency in the second language and the general use of irony, regardless of language (Kim and Lantolf 2016; Tiv et al. 2019). Consequently, there may be a relationship between bilingual experience and ironic language processing. Such a relationship means that the general perception of irony and irony use (regardless of the speaker's language) is nurtured and affected by bilingual language use and proficiency (Tiv et al. 2020). Tiv and colleagues (2020) investigated the impact of bilingual experience on L1 irony processing. In their study, bilinguals were reading scenarios for comprehension and deciding whether they made sense or not. Results showed that with increased global L2 proficiency, participants rated ironic statements as more sensible in their L1. What is more, in the same study, participants with high global L2 proficiency processed ironic compliments (praise) faster than participants with low global L2 proficiency in their L1. Other evidence suggests that L2 proficiency makes L2 irony comprehension more efficient

(Bromberek-Dyzman and Rataj 2016; Bromberek-Dyzman et al. 2010; Li and Jung 2023; Shively et al. 2008). Therefore, L2 proficiency seems to streamline irony processing not only in the foreign language, but also, interestingly, contributes to irony comprehension in the native language. This evidence adds to the observation that the pragmatic competence which bilinguals possess may be shared between languages. The skill to attribute meaning which goes beyond the linguistic content is governed by one general pragmatic system in the brain (Antoniou 2019). These pragmatic competences are not separate entities, each to be specialized in a different language. Rather, this is a single module which, in an incremental fashion, accrues new experiences, and is employed in each language, currently used. Therefore, bilinguals may benefit from one general module enriched by a wider scope of experiences, which enables the comprehension of pragmatic meanings such as irony in a privileged manner compared to monolinguals.

As I have indicated before this interesting bilingual advantage in ironic language interpretation may stem from the better developed mentalizing skills in bilinguals. Tiv and colleagues (2021) showed that language diversity was related to mentalizing. In detail, being immersed in a greater language diversity patterned with better mentalizing skills in a situation which required inferring a mental state in order to make sense of a character's behavior. Moreover, participants operating in their L2 were able to use more mentalizing capacity to make logical inferences than participants operating in their L1. Research shows that additional language learning improves mentalizing skills (Pyers and Senghas 2009), therefore, as one's L2 proficiency increases and their ability to infer mental states of their interlocutors improves, their sensitivity to irony and the ability to recognize the intended meaning behind irony may be boosted. In the following section I look at irony processing evidence in the context of bilingualism.

4.4. Irony processing in the non-native language

Extant irony processing research has addressed the question of the role of the foreign language in irony processing in studies which tested written irony in a reading task (Bromberek-Dyzman et al. 2010; Bromberek-Dyzman 2014; Bromberek-Dyzman and Rataj 2016; Ellis et al. 2021; Bromberek-Dyzman et al. 2021; Bromberek-Dyzman et al. 2022; Ellis et al. 2021; Li and Jung 2023; Shively et al. 2008; Tiv et al. 2020; Tiv et al. 2023), spoken

irony in a listening task (Bromberek-Dyzman et al. 2021; Caffarra et al. 2018; Caffarra et al. 2019; Cheang and Pell 2011; Peters et al. 2015; Puhacheuskaya and Järvikivi 2022), and spoken irony in an audio-visual setting (Bromberek-Dyzman et al. 2021; Shively et al. 2008). Presented evidence is predominantly based on the behavioral data (rating, response times, accuracy rates) with the exception of one ERP study which explored the role of accent in irony processing (Caffarra et al. 2019). Following the same division as already presented in Chapters 2 and 3, studies which made a simple classification of statements into literal and ironic are discussed first, followed by the section devoted to the studies which analyzed a broader sentence type range based on valence.

4.4.1. Irony processing in the non-native language: Literal vs. ironic

Seeking to find out whether L2 Polish-English proficient bilinguals show different speed and accuracy patterns in both their languages when reading ironic context-embedded comments, Bromberek-Dyzman and colleagues (2010) asked study participants to read stories in a congruent (positive context and positive comment - literal praise) and incongruent (negative context and positive comment - ironic criticism) condition. Participants were instructed to read and decide whether the target sentences in each story were favorable or unfavorable (emotive decision task). Participants completed a self-paced reading task, without a time limit regarding the stimuli display. Results showed that participants were significantly more accurate in their judgments of literal comments, and significantly less so in response to ironic comments. Surprisingly, participants accuracy rates in their L1 and L2 did not differ. Response times to ironic comments were significantly longer than response times to literal comments, which indicates that irony comprehension was more demanding than the comprehension of the literal comments. It appears that when participants are given unlimited time for online processing, they respond faster to literal than to ironic comments. Interestingly, this result was observed in both tested languages, participants' L1 and L2. It shows that L2 proficient participants demonstrated the same response and accuracy patterns for the processing of literal and ironic meanings. Namely, participants' response times and accuracy rates did not differ between languages. Altogether these results show that irony is more demanding to process than literalness as it necessitates more time and results in more errors compared to literal meaning in L1 and L2 alike. Crucially, this study shed light on a

potentially important factor – language proficiency – which may have an enormous impact on how bilinguals manage irony. Namely, processing differences in bilinguals' L1 and L2 may be attenuated when L2 proficiency is on a high level. Moreover, Bromberek-Dyzman and colleagues (2010) suggested that the absence of a language effect may have been caused by the experimental procedure and the fact that participants were allowed as much time as they needed to complete the reading / judgment task. When self-pacing the advancing of sentences the language effect may dissipate, but not the statement type effect. When given unlimited time for the response, and despite being instructed to respond as fast and as accurately as possible, participants tend to respond faster to trials communicating literal than ironic meaning. In my view, one plausible explanation of the observed results may go back to the way irony was conceptualized in this study. Specifically, since the authors employed the dichotomous categorization of irony (ironic criticism) and literalness (literal praise) irony processing resulted in longer processing times, in line with the studies which conceptualized irony in the same manner – comparing literal meaning with ironic meaning (Bromberek-Dyzman and Rataj 2016; Giora et al. 1998; Giora et al. 2007), and this effect was observed in both languages, showing that figurative meaning processing is more cognitively demanding relative to literal meaning.

In a follow-up study Bromberek-Dyzman and Rataj (2016) tested whether implementing a time-constrained setting in reading and responding would affect the response time and accuracy patterns in the same population of Polish-English bilinguals when they read ironic and non-ironic scenarios. When participants are allotted a limited amount of time for response (imposed response time window), it is possible to control for the speed and accuracy trade-off, and probe into the processing mechanisms under more restricted, and less strategic processing conditions. The experiment employed similar types of stimuli to Bromberek-Dyzman and colleagues' (2010) - literal praise was used with positive contexts (congruity) and ironic criticism was used with negative contexts (incongruity). Participants were told to read stories and determine whether the speaker made a praising or a critical comment (emotive decision task). Accuracy rates data revealed no significant differences for the literal comments in Polish and English, yet participants were significantly less accurate at responding to ironic comments in the non-native language compared to the native language. Moreover, ironic trials were responded to with lower accuracy than the literal ones in L2. Despite high L2 proficiency participants still experienced difficulty processing ironic stories in English. These results showed that under time constraints, in a lim-

ited response time paradigm, irony processing turned out to be more cognitively demanding than literal language did. Response time data did not reveal a language effect, but a trend to respond to L2 stimuli longer than to L1 stimuli was visible. These results demonstrate that participants were slower at responding to ironic than literal comments in both studied languages. These results further substantiate that irony is demanding to process regardless of the language of operation.

In a different set of studies, Bromberek-Dyzman and colleagues (2021) explored the influence of stimulus modality on irony processing. Bilingual participants either read, listened to or watched ironic and literal materials adapted from *House, M.D.* TV show, which resulted in three stimulus modalities tested: textual, auditory and audio-visual. In the textual modality, participants were asked to read scenarios and decide whether the final comment in each scenario was mocking or not. The procedure was the same in the auditory and the audio-visual modalities, only participants were listening to or watching the same scenarios. In the first study, bilingual participants were tested in their L1 (Polish), and in the second study bilingual participants were tested in their L2 (English). Data analysis was conducted on the two studies collectively. Accuracy rates results interestingly showed that participants gave more correct responses when they processed ironic than literal meaning. What is more, the modality of stimulus presentation modulated the response accuracy in that the remarks in the auditory and audio-visual modalities elicited more accurate responses compared to the textual modality. Response times results revealed faster responses to ironic than literal trials. The authors suggested that the more efficient processing of ironic (more accurate and faster) relative to literal meaning might have been a result of the stimuli used in the experiments. The scenarios, adapted from a popular TV show, were especially salient, imbued with witty humor and mockery, and created increasing anticipation of irony, which suggested an ironic interpretation. In other words, it is possible that the scenarios used were very effective in triggering the expectations of irony and facilitated the reception of irony compared to the literal meanings. Interestingly, this irony effect revealing faster processing of ironic meanings was observed especially in the auditory and audiovisual modalities, with similar response times for ironic and literal meaning in the textual modality. This result demonstrates the facilitatory nature of vocally and visually imbued modalities in irony cueing. Participants were faster at responding to the spoken than written word. The fact that when participants were reading the materials they responded with similar speed to the ironic and literal trials may indicate that irony processing does not demand extra effort

and may be processed similarly fast to literalness when participants are allowed to advance the text input at their own pace. Finally, the language of operation seemed to have played a role, too. Responses were, overall, faster in L2 than in L1. The language differences were also observed depending on the modality of stimulus presentation. When participants were listening to the materials in the auditory modality, they responded faster in L2 compared to L1. However, when participants were reading or watching the materials, no such difference was observed with participants responding similarly in both languages. The auditory modality faster processing in L2 may have been a result of the experimental design with the modality-distinction at its core. When participants were listening to the materials in L1, they were exposed to two voice streams, as the Polish version of the TV show featured a voice-over translation (original English in the background and translated Polish in the foreground). The two voice streams imposed over each other may have interfered and impeded the reception in the auditory and audiovisual modalities. This might have led to the processing slowdown in L1 in the auditory modality, but not in the audio-visual modality, where the visual content of the modality probably attenuated the interference. Overall, these two studies show that irony was processed faster and more accurately than literalness in both languages. This might have been driven by the use of the stimuli which created the anticipation of irony. Moreover, the modality of stimulus presentation modulated irony processing, showing that whether participants read, listen to or watch equivalent scenarios, the efficiency of irony processing differs.

Some evidence points to the non-native speakers' deficiency in irony processing when operating in the foreign language. Experimental evidence shows that irony comprehension competence by non-native speakers may be impaired due to resource unavailability and partial knowledge of meaning (Peters et al. 2015). Peters and colleagues' (2015) explored whether Arabic speakers of English used the same cues as English native speakers in order to make sense of sarcastic utterances when these were presented in the auditory modality in English. In three-sentence discourses Peters and colleagues (2015) manipulated the meaning of the target sentences in each of the four conditions. This resulted in the following conditions: positive context/sincere prosody (literal), negative context/sincere prosody (ironic), positive context/sarcastic prosody (literal), negative context/sarcastic prosody (ironic). The first sentence of the discourse introduced the first character with their goal. The second sentence described an event which was different in the positive (Positive Context) and negative condition (Negative Context). The third sentence was the other charac-

ter's comment and was stated in either a sincere or sarcastic prosody. Importantly, the target sentence was the same across all four conditions. At the end of each discourse, they were asked a comprehension question, that probed into the comprehension of a discourse and demonstrated whether the participant's interpretation was that of sarcasm or sincerity. Participants were asked to rate how sincere they perceived the sentences to be on a scale. It is noteworthy that when performing the task native English speakers used both contextual and prosodic cues (using the prosodic cues to confirm the ironic interpretation based on the contextual cues), but they preferred to base their final decision on the contextually derived information if prosody and context were incongruent. As far as the non-native participants were concerned, they depended on contextual cues exclusively. The Arabic speakers, then, did not rely on the auditory cues when making sense of the meaning. Peters and colleagues (2015) purport that the non-native ignorance of prosodic cues might be a consequence of speakers' native language (Arabic) habits, such as sparse or none prosody reliance in sarcasm interpretation. In order to arrive at the correct interpretation of an ironic utterance, non-native speakers relied on different cues than native speakers did. Specifically, non-native speakers are unable to make use of prosodic cues to the same degree as adult native speakers. Peters and colleagues (2015) claim that non-native speakers' irony detection competence deficiency may stem from the fact that they need to invest more processing resources in order to override an initial phonological pattern. This, in turn, may have an impact on their ability to detect such veiled, implicit content as irony.

Cheang and Pell (2011) investigated how indirect, veiled meanings such as sarcasm conveyed through prosody and uttered in a non-native language that participants are unfamiliar with are comprehended. Native speakers of English and Cantonese interpreted various pragmatic meanings such as sarcasm, sincerity, humor and neutral utterances in their native and non-native, unfamiliar languages (Cantonese for the L1 English participants and English for the L1 Cantonese participants). Participants' task was to listen to an utterance in their native and unfamiliar language and judge the attitude the speaker expressed. Results showed that in the majority of comment types, participants identified the attitudes significantly above chance levels in both native and unfamiliar languages. However, the identification of humor and sarcasm by L1 English participants in the foreign, unfamiliar language (Cantonese) and the identification of sarcasm by L1 Cantonese participants in the unfamiliar language (English) were at chance levels. These results suggest that the comprehension of sarcasm is distinctly different from other pragmatic meanings such as sincerity, neutrali-

ty and humor. Cheang and Pell (2011) emphasized the importance of extra-linguistic competence in the communication of attitudes, as much can be conveyed through the vocal cues. Essentially, the ability to identify sarcasm increases as the experience with the language rises. Indeed, native-like experience led to a better than chance identification, while the lack of the experience with the foreign language resulted in little ability to correctly identify sarcasm, which is a very unique form of expression (Cheang and Pell 2011). It is argued that the uniqueness of sarcasm stems from its dissimilarity to other pragmatic functions but also its linguistic experience dependence pointing to the fact that vocally marked conventions for signaling a sarcastic intent differ across languages. As Cheang and Pell (2011) observed, even though sarcastic utterances pronounced in English and Cantonese share some acoustic features, these prosodic markers may be insufficient to prompt sarcastic interpretation in foreign, unfamiliar languages.

There is evidence that with increasing L2 proficiency, performance in L2 irony processing may increase as well. Shively and colleagues (2008), for instance, examined L2 irony comprehension in an audiovisual setting. Participants in three L2 proficiency groups were divided into two groups. Participants in one group were assigned to a reading task, where they were asked to read movie scenes synopses, while participants in the other group were assigned to a video-enhanced task, where they were asked to read movie scenes synopses and watch a movie clip corresponding to the synopsis. After each trial (a synopsis or a synopsis + movie clip set) participants were asked questions, probing into their interpretation of the target comments, the tone of the comment, and whether they had seen the movie before. Results showed that as participants' L2 proficiency increased their recognition of irony increased as well. These findings demonstrate that with L2 experience irony detection ability improves. What is more, video-enhanced irony comprehension task did not produce more correct responses than the reading task. The study suggests that the cues embedded in an audio-visual clip are not indispensable to understand irony. Shively and colleagues (2008) suggested that L2 learners may have found it overwhelming to integrate visual and phonological input delivered at a fast speed, which might have led to the overburdening of their working memory capacity due to multiple sources of input (lexical, syntactical, prosodic). When asked to compute the meaning of the synopses presented, participants may have found it more cognitively taxing to watch the movie clips, imbued with the verbal cues as well as the visuo-spatial cues, compared to the reading only group. For some learners, an excessive number of cues prompting irony recognition may be unproductive or even

act as a hindrance to irony recognition. It was preliminarily suggested that advanced L2 learners can benefit from the cue-enriched modality (e.g. audiovisual) more than learners at a lower proficiency level. More proficient language users can allocate more cognitive resources to embrace a wider array of contextual cues, which lower proficiency learners are unable to do.

As previous studies described above show when comparing irony and literal meaning, irony processing is more difficult (processed longer, less accurate) compared to literal meaning in both L1 and L2 (Bromberek-Dyzman and Rataj 2016; Bromberek-Dyzman et al. 2010). Some evidence shows that when L1 irony processing is compared to L2 irony processing, the response times (Bromberek-Dyzman and Rataj 2016; Bromberek-Dyzman et al. 2010) and accuracy rates (Bromberek-Dyzman et al. 2010) are similar in both languages. Other evidence suggests that irony processing in L2 is less accurate than in L1, and less accurate than literal meaning processing in L2 (Bromberek-Dyzman and Rataj 2016). Still other evidence demonstrates that the modality of stimulus presentation may have an impact on the processing of meanings, with stimuli (both ironic and literal) presented auditorily resulting in faster processing in L2 (English) than in L1 (Polish) (Bromberek-Dyzman et al 2021). There is some evidence which shows that native and non-native speakers may use prosodic cues to a different extent when performing an irony task, with native speakers using both contextual and prosodic cues, and nonnative speakers relying on the contextual cues only (Peters et al. 2015). Additionally, prosodic cues did not facilitate irony recognition when participants were listening to sarcasm in an unfamiliar language (Cheang and Pell 2011). However, irony recognition performance can be facilitated with increased L2 proficiency (Shively et al. 2008).

4.4.2. Irony processing in the non-native language: The role of lexical valence

Evidence from rating studies points to differential comprehension of positively and negatively valenced ironic (and literal) expressions. Caffarra and colleagues (2018) examined irony interpretation and the role of indexical cues such as speaker accent on the process of irony comprehension. Native Spanish participants were auditorily presented with ironic and literal stories spoken in the native and non-native (British English) accent. The experimental stimuli used included ironic criticism and ironic praise together with their literal

counterparts (literal criticism and literal praise). Participants were instructed to rate the stories in terms of accent strength, intelligibility and irony. As for irony ratings, stories which communicated irony were rated as more ironic than the stories which communicated literal meanings. Interesting discrepancies were observed between stories featuring different valences. Specifically, ironic praise was rated as less ironic than ironic criticism. This difference was observed in both accent conditions (i.e., native and non-native accent), but the difference was more striking when the stories were spoken in the foreign accent. Interestingly, participants did not experience problems understanding statements conveying ironic criticism in any of the accents. This might imply that ironic criticism, the more frequent irony type, was also more expected, and, as a result, easier to recognize. However, ironic praise was rated as less ironic when uttered in the foreign accent than in the native accent. This, on the other hand, may suggest the opposite, namely that ironic praise, which is less frequent and, consequently, less expected, is more difficult to recognize, especially when uttered in a non-native accent. Moreover, literal praise and literal criticism were rated similarly in terms of irony, and the ratings did not differ across accents. In sum, these findings demonstrate how the speaker's accent affects the interpretation of irony in its less prototypical praising form (Caffarra et al. 2018). Precisely, this study showed that the accent affected the scores of the judgments of ironic praise, which was considered less ironic when uttered by non-native speakers. A result which accords with observations of the non-prototypical (praising) irony imposing a greater cognitive processing effort on interpreters (Caffarra et al. 2019; Caillies et al. 2019). When participants rated ironic praise uttered by foreign speakers, they were more likely to adopt a literal interpretation, report uncertainty and low levels of irony. One novel finding of this study is the impact of the speaker characteristics, such as speaker accent, on irony comprehension. Caffarra and colleagues (2018) showed that apart from the context, speaker-related cues conveyed by their accent can also largely modulate irony comprehension. What is more, this study provided additional evidence for the asymmetry of affect in irony, in that, the less frequent, less prototypical type of irony – ironic praise, was rated as less ironic, than the more frequent, and more prototypical ironic criticism. Finally, Caffarra and colleagues (2018) offered explanations for the asymmetric rating of ironic praise and criticism scenarios spoken by foreign speakers. Namely, they suggested that listeners may have approached the task with certain expectations regarding the non-native speakers. Native speakers may have some preconceived notions about foreign speakers being less pragmatically competent than native users of lan-

guage or lacking pragmatic competence to use low-frequency figurative expressions such as ironic praise. What is more, native speakers in the study may have predicted that non-native participants might have had an impaired ability to convey their intentions via sophisticated tropes. These predictions may have made participants in the study more wary of deriving intended ironic meanings from the uncommon ironic expressions, and more inclined to consider alternative interpretations when rating ironic praise as spoken by foreigners. Moreover, native listeners might have relied on their stereotypical knowledge about the speakers' identities, for instance, how (much) irony is used in English-speaking countries, which may have suggested a particular interpretation of the speakers' words.

Research shows that under certain circumstances speaker accent can impact irony comprehension, beyond the less frequent praising irony. Puhacheuskaya and Järvikivi (2022) asked English native speakers to listen to dialogs performed in English by Canadian English native speakers and Mandarin Chinese native speakers. The dialogs communicated ironic criticism, literal criticism, ironic praise or literal praise. Participants were instructed to rate the last statement in each dialog for the appropriateness, irony, offensiveness, and participants' certainty about their speaker intent judgment accuracy. Results indicated that both types of irony (critical and praising) were perceived as less ironic when uttered by foreign speakers compared to native speakers. It has been suggested that native speakers have lower expectations about non-native speakers' language use and consider their input less reliable (Lev-Ari 2015) which may be the reason for the lack of anticipation of ironic comments in a conversation and, consequently, overlooking and ignoring those ironic comments that non-native speakers actually make (Puhacheuskaya and Järvikivi 2022). Literal counterparts (praise and criticism) did not differ depending on what accent they were delivered in. The fact that ironic criticism and ironic praise were interpreted as less ironic when delivered in the foreign accent suggests that making pragmatic inferences when comprehending irony relies greatly on the contextual cues, such as expectations regarding the speaker's background, shared knowledge about communicative conventions or choices regarding explicitness and implicitness. Those statements which did not create any ambiguity (literal ones) were readily interpreted as literal, irrespective of the accent. When irony was taken into consideration, contextual cues such as speaker accent modulated the process. What is more, the valence of the statements had a huge impact on the comprehension manner. Ironic praise was rated as substantially less ironic than ironic criticism. As the authors indicated, ironic praise, and its negative surface form which violates social norms,

may have been harder to interpret than ironic criticism which, with its positive surface form, echoes social norms and desirable states of events. What is more, participants were less certain about their interpretations of ironic criticism when foreign-accented, and marginally less certain about their interpretations of ironic praise delivered by foreign speakers. In the appropriateness rating ironic praise was evaluated as less appropriate than ironic criticism in both accents. This adds to the earlier mentioned result concerning the decreased level of perceived irony in ironic praise and further fortifies the asymmetrical affect of ironic statements. Finally, participants perceived literal criticism to be more offensive than ironic criticism in both accents. This finding substantiates the previously observed muting function of irony; whereby ironic criticism is perceived as less insulting (Dews and Winner 1995; Dews et al. 1995). However, when literal criticism was comprehended participants felt it was more offensive when delivered with a native than foreign accent. In sum, this study found that both types of irony, ironic criticism and ironic praise were rated as less ironic when uttered in a foreign accent compared to the native accent. What is more, in line with the asymmetry of affect observed in irony, the less frequent, less common, non-canonical type of ironic statements (ironic praise) was deemed less ironic and less appropriate than the more frequent, more common, canonical ironic criticism. This effect showed a marginally more pronounced trend when uttered by foreign speakers.

Similarly, Tiv and colleagues (2023) showed that ironic criticism was rated as more appropriate and more ironic than ironic praise. In this study, residents of Montréal, Canada, a city unique for its multilingualism, with French being the only official language of the provincial government of Québec, English and French, being the two official languages in Canada, and other foreign languages commonly heard in the city, were tested to explore individual differences stemming from the bilingual setting in irony processing. Participants were asked to read and judge the appropriateness and irony of ironic criticism, ironic praise, literal criticism and literal praise. Results showed that participants' ratings of ironic criticism revealed higher perceived level of irony than ironic praise. Overall, irony ratings were also higher for both types of irony combined, compared to both types of literal statements combined. What is more, participants' mentalizing capacity seemed to have modulated irony perception ratings depending on the valence of the target sentences' words. Participants with a higher mentalizing score and neighborhood language diversity tended to rate ironic praise as more ironic than literal praise, ironic criticism as more ironic than literal criticism, and ironic praise as more ironic than ironic criticism. In the appropriateness

rating task, literal praise was rated as the most appropriate followed by literal criticism, ironic criticism and ironic praise. Importantly, appropriateness judgments of ironic praise (compared to literal praise) increased as their mentalizing ability and neighborhood language diversity increased. In the same manner, appropriateness judgments of ironic criticism (compared to literal criticism) increased as the mentalizing and neighborhood language diversity increased. Appropriateness ratings did not differ for ironic criticism and ironic praise. In short, with increased mentalizing capacity and neighborhood language diversity both types of ironic statements were considered to be more appropriate than their literal equivalents. This study provides further evidence substantiating the asymmetry of affect observed in irony comprehension (Caffarra et al. 2018; Puhacheuskaya and Järvikivi 2022). Moreover, it provides evidence that with increased mentalizing and living in a high language diversity neighborhood participants' perception of irony and appropriateness of ironic statements grow. What is even more significant, Tiv and colleagues (2023) showed that this positive influence of mentalizing and living in a multilingual, linguistically diverse areas affect ironic praise comprehension, making it more irony-imbued.

In another study, Tiv and colleagues (2020) investigated the role of the second language experience in irony comprehension in bilinguals' L1 in a reading task. Participants were asked to read short scenarios which communicated literal praise, ironic criticism, literal criticism and ironic praise and decide whether the last comment in each scenario made sense based on the context. Apart from online processing data, which are presented further in this section, the researchers collected offline sensibility rating data. Results of these offline ratings showed that ironic scenarios were rated as less sensible than literal ones. In line with the asymmetry of affect in irony, ironic criticism was rated as more sensible than ironic praise. Additionally, Tiv and colleagues (2020) found that individual differences such as L2 experience, specifically global L2 proficiency and L2 age of acquisition (AoA), modulated the sensibility perception, in that sensibility to veiled, subtly communicated ironic meanings increased. Interestingly, participants with high global L2 proficiency accepted ironic scenarios as more sensible than participants with low global L2 proficiency.

Evidence from online processing studies fortifies the observations made in the rating studies and points to the facilitated processing of positive valence compared to negative valence (Bromberek-Dyzman 2014). In a set of four experiments Bromberek-Dyzman (2014) studied the influence of affective attitude (operationalized as valence) on irony processing in the native and non-native language, employing three kinds of stimuli: communi-

cating unambiguous literal meaning (literal praise, literal criticism) and ambivalent meaning (ironic criticism). Two experiments, in a set of four, explored the attitudinal evaluative load influence on explicit attitudinal meaning processing (evaluative decision task). The other two experiments focused on the affective attitude in implicit evaluative processing (lexical decision task). In the first, self-paced experiment, results revealed a strong divergence between positive and negative attitude. Accuracy rates showed that in both languages literal praise and ironic criticism (which share the same comment sentence on the surface level) were processed with similar accuracy, and literal criticism processing revealed the most inaccurate responses. This result may indicate that literal criticism (and not irony) was most difficult to interpret. Attitudinal ambivalence (ironic criticism) and positive valence (literal praise) conditions evoked very similar response latency patterns and no significant differences, and the two differed significantly from the negative valence condition. Response time and accuracy rates patterns showed a facilitated processing of literal praise, followed by ironic criticism. The processing of literal criticism exhibited the most pronounced difficulties as observed in response time and accuracy data. These patterns were observed for both the native and the non-native languages. In the second experiment in which a response window paradigm was used (ISI = 0 ms, response time window: 1000 ms) results demonstrated a facilitated positive attitude processing and an inhibited negative attitude processing. This time, positive valence (literal praise) was processed the fastest and the most accurately, followed by ironic criticism and negative valence processed the longest and the least accurately. Response latency patterns were obtained for negative attitude (literal criticism) and ambivalence (ironic criticism) were similar. Similarly to the previous experiment, these results were observed for both studied languages. In the third experiment, which used a lexical decision task, implicit attitude processing was studied in a response window paradigm (ISI = 0 ms). The target word was displayed briefly, for 200 ms in Polish, and 300 ms in English. The participants had to decide whether the target was a word or not. Results showed that in both languages responses to positive valence were enhanced, responses to ambivalence (ironic criticism) were significantly delayed and the processing of negative valence was hindered. Accuracy rates showed that in L1 literal praise was processed most accurately, followed by ironic criticism and literal criticism. In L2, ironic criticism was processed most accurately, followed by literal praise and literal criticism. In experiment 4, in which time of the inter-stimulus interval was changed to 1s (ISI = 1000 ms; Polish target word display time: 200 ms; English target word display time: 300 ms), results

showed a facilitated (the fastest) positive valence processing and slower processing rates for the negative valence and ambivalence conditions. These results generated convergent patterns for the native and the non-native language. Accuracy rates showed that literal praise was processed the most accurately, followed by literal criticism and ironic criticism processed the least accurately in both languages. Overall, the foregoing experiments demonstrate that positive valence, studied here as literal praise and ironic criticism (the same target sentence), is processed faster than negative valence (literal criticism). Most importantly, these studies demonstrated the importance of distinguishing between the two-tier literalness / figurativity-based distinction, and a broader valence-based distinction as the driving factor in attitude processing. Bromberek-Dyzman (2014) suggests that the dichotomous literal / non-literal demarcation is less relevant for the understanding of irony than the attitudinal meaning. What is more, the language of processing did not seem to modulate the latency and accuracy rates, as both the native and the non-native languages demonstrated similar patterns in all experiments. Therefore, according to Bromberek-Dyzman (2014), this demonstrates that high proficiency in the non-native language might level out the differences in the processing of literal and ironic meaning in L2 when one explores the speed and accuracy patterns.

Ellis and colleagues (2021) explored processing differences between positive and negative literal and ironic (praise, criticism) statements in English native speakers (L1) and Chinese learners of English (L2). Participants were asked to read scenarios which concluded with a comment made by one of the characters. Their task was to determine whether the comment was positive or negative. Native speakers responded with higher accuracy to the scenarios communicating both types of irony (ironic criticism and ironic praise) and literal criticism than L2 learners. Regarding response times, while both groups of participants responded the fastest to the positive literal statements, ironic criticism was processed faster than the negatively phrased literal statements and ironic praise. However, native speakers of English exhibited a processing advantage over learners of English. The native speakers processed all types of statements (including the ironic ones) faster than the second language learners. Ellis and colleagues (2021) suggest that the native speakers' processing manner may imply that L1 speakers computed irony implicitly (subconsciously) in a one-stage process, while the L2 learners computed irony explicitly (consciously) in a two-stage process, requiring more time for processing the literal meaning, noticing the incongruity and seeking an alternative one. Moreover, both groups found ironic praise to be more difficult than iron-

ic criticism. L2 learners, who lack familiarity with both the familiar and unfamiliar type of irony, relied on explicit, conscious processing for both types. Ellis and colleagues (2021) suggest that L2 learners process both ironic criticism and ironic praise implicitly in a less efficient manner, which should result in an impeded (slower) processing.

Bromberek-Dyzman and colleagues (2022) investigated how the task that participants are asked to perform affects irony processing in bilingual Polish-English participants. In Experiment 1 participants were given a True/False task (T/F), and in Experiment 2 participants were given an Emotive Decision Task (EDT). Both experiments used the same set of stimuli (scenarios) – two types of criticism (literal criticism and ironic criticism), and two types of praise (literal praise and ironic praise). Each scenario consisted of 3 to 5 sentences. In the first experiment, participants were asked to read the scenarios and make a decision as to whether the target comment was true or false. Participants advanced the context sentences of the stories at their own pace, but the target was displayed one word/phrase at a time. Each story was followed by a true / false comprehension question, and the response time allowed was limited to 1800 ms. In the second experiment each story was followed by an emotive decision task, in which participants had to decide whether the target sentence conveyed criticism or praise, and the response time allowed was limited to 1500 ms. The response window was shorter in this experiment, as the question was identical in each trial, unlike in Experiment 1, where each trial featured a different question. Before the experiment participants were asked to make their decision based on the entire story, and not the final comment only. In this way they were encouraged to make more pragmatic, rather than merely linguistic decisions. In both experiments participants' response times and accuracy rates were recorded. Overall, results showed that participants responded faster to literal than ironic trials. What is more, faster response times were elicited by ironic criticism than ironic praise, and by literal praise compared to literal criticism. Regarding within-valence comparisons ironic criticism was processed faster than literal criticism, and literal praise was processed faster than ironic praise. Specifically, as for the task differences, participants responded faster to literal meanings in the T/F task than in EDT task. Interestingly, while in T/F task participants responded faster to literal than ironic meanings, in EDT they responded to both literal and ironic meanings similarly. Moreover, while the responses following ironic criticism were faster in EDT task than in T/F task, the responses following ironic praise were, on the contrary, faster in T/F task than in EDT task. Responses following literal criticism were faster in T/F task than in EDT task, but there were no differences

for the responses following literal praise in the two tasks. Further analyses showed that in EDT task, ironic criticism was responded to faster than literal criticism, and literal praise was responded to faster than ironic praise. In T/F task participants responded to literal criticism faster than to ironic criticism, and faster to literal praise than to ironic praise. Furthermore, in both EDT and T/F tasks participants responded to ironic criticism faster than to ironic praise, and faster to literal praise than to literal criticism. Generally, participants responded more accurately to literal than ironic meaning, and more accurately to criticism than to praise. Participants were more accurate responding to praise in T/F task than in EDT task, and similarly accurate responding to criticism in both tasks. Participants responded more accurately to criticism than to praise in both tasks. Accuracy rates revealed that participants were more accurate responding to literal praise than ironic praise, but there were no differences between literal and ironic criticism. Responses to ironic criticism were more accurate compared to ironic praise, and for literal praise than literal criticism. Responses following ironic criticism were more accurate in EDT task than in T/F task, but the responses following literal criticism were more accurate in T/F task than in EDT task. Moreover, participants responded more accurately to scenarios communicating ironic praise in T/F task than in EDT task, but there were no differences for responses following literal praise between tasks. Furthermore, in EDT task ironic criticism was responded to more accurately than literal criticism, and literal praise was responded to more accurately than ironic praise. In T/F task literal criticism was responded to more accurately than ironic criticism, and literal praise was responded to more accurately than ironic praise. Moreover, in both tasks participants responded to ironic criticism with higher accuracy than to ironic praise. In addition, literal praise generated higher accuracy than literal criticism in EDT task, but there were no differences between literal praise and literal criticism in T/F task. These experiments showed that the efficiency (accuracy and response time) of irony processing is modulated by the task constraints. In a task involving determining whether a statement is true or false, participants needed more time to process ironic than literal meaning, and their decisions were less accurate regarding irony than literalness. This demonstrates a facilitated processing of literal meanings compared to irony, which is processed more slowly and less accurately. In a task demanding determining whether a statement conveys praise or criticism, participants responded faster and more accurately to positively valenced comments (literal praise and ironic criticism) than to negatively valenced comments (literal criticism, ironic praise). In sum, these results demonstrate privileged (faster

and more accurate) processing of positively valenced statements (literal praise, ironic criticism) relative to negatively valenced statements (literal criticism, ironic praise) and corroborate previously observed similar findings (Bromberek-Dyzman 2014).

Li and Jung (2023) also tested the full spectrum of lexical valence-based ironic and literal meanings in the bilingual context investigated Cantonese L2 English speakers with a special focus on L2 proficiency and use. Participants were asked to read stories in four meaning conditions (literal praise, ironic criticism, literal criticism, ironic praise), decide whether the final comment was positive or negative and complete a true / false task. In addition, Li and Jung (2023) analyzed participants' thought processes during irony comprehension in L2. After the main experimental session participants were asked to complete a recall test probing into their thinking towards interpretation of the experimental stimuli during the main experimental session testing irony processing. The participants were asked to explain their reasoning behind each decision they had made in the experiment. Participants' response times and accuracy rates were recorded. Participants' L2 proficiency was determined based on their English scores on the Hong Kong Diploma of Secondary Education. Following the score analysis participants were divided into an intermediate or an advanced group. Regarding their thought processes, most frequently, participants listed the incongruity between the context and the comment sentences, which cued their interpretation of the stories as deviating from the literal meaning and signaling something opposite to what the context itself suggested. Ironic praise seemed to have posed bigger comprehension problems, as participants reported difficulty understanding the contrast when something good and positive concluded with a negative word. Based on participants' post-study reflections, it was observed that the valence of the target adjective in the comment sentence was a commonly used predictor pointing to an ironic interpretation. Participants explicitly communicated that reading a negative story ending in a positively valenced word gave rise to their ironic interpretations. Commenting on ironic praise, participants were less inclined to accept it as irony, since talking about good situations in negative words seemed strange to them. Li and Jung (2023) suggested that three factors which were instrumental in irony comprehension were the incongruity between the context and the comment, the valence of the words embedded in target comments and the L2 learners' familiarity (or frequency) with the situations described. Further results showed that both advanced and intermediate learners were more accurate in their responses to ironic criticism than ironic praise, and more accurate in their responses to literal praise than ironic praise. The fact that ironic

praise was more difficult to understand than ironic criticism may have resulted from participants' expectations of ironic situation arising in negative contexts, which is the case in ironic criticism. Regarding response times, in both proficiency groups participants responded faster to literal praise than literal criticism and faster to ironic criticism than ironic praise. In addition, participants needed less time to respond to literal praise than ironic praise. When processing criticism-imbued items, ironic criticism and literal criticism items did not seem to differ significantly, however, a trend was observed for ironic criticism to be processed faster than literal criticism. This pattern of results further fortifies the commonly observed tendency of positively valenced stimuli to be processed faster than negatively valenced stimuli (Bromberek-Dyzman et al. 2022 in the Emotive Decision Task experiment). It shows that the valence of words used to convey praise or criticism, literally or ironically, may be a more significant contributor to the final processing outcome than the rigid, binary literal / non-literal distinction. What is more, L2 proficiency seemed to have played a significant role in the way participants processed the meaning of the stories, as participants with higher L2 proficiency (advanced group) responded faster than participants with lower L2 proficiency (intermediate group). Interestingly, the L2 proficiency advantage was not observed in the accuracy results. Li and Jung (2023) suggest that one explanation for this outcome may be the fact that ironic praise may have mitigated the significance of L2 proficiency in the response accuracy. I take this explanation to indicate that the difficulty connected with processing ironic praise, the type of irony, which does not refer to positive social norms, but invokes negative norms, and is less frequently used, less salient and less conventional, may have been challenging even for participants with higher L2 proficiency. Another reason, according to the authors, may be the stimuli presentation mode, that is response window paradigm, which compelled participants to respond as fast as possible, and may have led to the potential speed-accuracy trade-off effect. Furthermore, it was suggested that in the case of accuracy rates and the observed attenuated L2 proficiency advantage, it may have been L2 use which modulated the results. Specifically, participants who declared spending more time using their L2 in speech daily performed better in accuracy rates than participants who spent less time using their L2 in speech on a daily basis. A logical assumption seems to be that learners who speak in their L2 more should be more likely to encounter language situations which involve an ironic mode of thinking.

Similar valence effects were observed in a study with bilingual participants, living in a linguistically diverse region (Tiv et al. 2023). Tiv and colleagues (2023) aimed at ex-

amining the relationship between the mentalizing capacity, living in a linguistically diverse neighborhood and irony processing. In the experiment, balanced bilingual participants (English-French bilinguals living in Montreal, Canada) were asked to read short stories in English intended as ironic criticism, literal criticism, ironic praise or literal praise, while their response times were recorded. Additionally, participants completed a mentalizing task to evaluate individual differences in the capacity to make inferences of other people's mental states. Results showed that participants responded the fastest to literal praise, both ironic criticism and literal criticism revealed similar response times, with no statistical difference, and ironic praise was processed the most slowly. The response time data partially reinforce the positive valence processing priority; however, they point to potential processing similarities between ironic criticism and literal criticism in certain contexts.

Irony processing research in bilingual populations may play a pivotal role in understanding the mechanisms underlying irony processing in the native language. Research shows that second language experience has an influence on irony processing in the native language. In one study, Tiv and colleagues (2020) explored the role of the second language experience in irony processing in the first language. Bilingual participants, native English speakers, were presented with scenarios in English, which communicated literal compliment, ironic criticism, literal criticism, ironic compliment or anomalous meaning (fillers). Their task was to read the scenarios and decide whether the final statement in each scenario made sense on the basis of the preceding context. Participants' response times were recorded. Results showed that literal compliments were processed faster than ironic compliments, but ironic criticism and literal criticism were processed similarly. Plus, ironic criticism was processed faster than ironic compliments. Additionally, individuals with high L2 proficiency processed ironic compliments faster than individuals with low L2 proficiency. Collectively, these results demonstrated that ironic praise (here *compliment*) is processed in a facilitated manner as L2 proficiency increases. Moreover, this study demonstrated that second language experience has an impact on irony processing in the first language. On top of that, these results partially mirror previously observed positively valenced scenarios processing priority and response times convergent rates for ironic criticism and literal criticism (Tiv et al. 2023).

Recently some EEG studies have also started exploring irony processing in the context of bilingualism. Caffarra and colleagues (2019) investigated irony processing in the auditory modality using EEG. Caffarra and colleagues (2019) investigated the role of the

native and foreign accents in irony processing by using ERPs. In their study, participants were auditorily presented with stories in Spanish. The stories consisted of a few sentences of context, a target sentence and a sentence following the target sentence. The context biased the meaning of the target sentence towards one of the following meanings: literal praise, literal criticism, ironic criticism or ironic praise. Half of the stories were spoken by a native speaker of Spanish, and the other half was spoken by a foreign speaker with a foreign accent (British). One-fourth of the stories were followed by a comprehension question to ensure participants' attention to the stories they were listening to. Although not explicitly conceptualized as such, in the ERP analysis, Caffarra and colleagues (2019) grouped the conditions based on the intention valence they communicated. Results showed that stories with positive contexts (literal praise, ironic praise) elicited greater N400-like negativity compared to stories with negative contexts (literal criticism, ironic criticism). Additionally, an analysis on positive and negative contexts separately revealed that ironic praise elicited greater N400-like negativity than literal praise, but only when spoken in the native accent. This finding shows that ironic praise (a non-prototypical brand of irony), a compliment veiled in a non-literal (negative) meaning, due to its less frequent, less familiar and less prototypical nature, induces initial semantic difficulties in meaning construction. What is intriguing is the absence of the same effect in response to ironic praise uttered by non-native speakers. Caffarra and colleagues (2019) suggest that the reasons may be twofold. First, when listening to foreign-accented speech, native speakers' anticipatory processes might have been disrupted, resulting in an attenuation of the N400 effects. Second, native speakers' perception of the non-native speakers may be stereotypical, in that, they do not expect second language speakers to communicate their subtle, implicit meanings in such an indirect manner as irony, a conclusion in line with previous behavioral evidence (Caffarra et al. 2018). Previous evidence points to the differences in ironic praise comprehension depending on the accent (native vs. non-native) with which it is delivered. Ironic praise is considered less ironic when spoken with a foreign accent (Caffarra et al. 2018; Puhacheuskaya and Järvikivi 2022).

Moreover, Caffarra and colleagues (2019) observed increased P600 amplitudes elicited by ironic stories compared to literal ones. The context polarity played a role at a later stage. Within 1000 – 1500 ms time window ironic stories elicited increased positivity. Separate analyses on positive and negative contexts, showed that this effect was significant for positive contexts (literal praise, ironic praise), but not for negative contexts (literal criti-

cism, ironic criticism). Moreover, the effect was marginally significant for stories uttered in the foreign accent, compared to the native accent. These results demonstrate that irony processing expends more cognitive resources and requires extra inferential processing compared to literalness. As observed in the later window (1000 – 1500 ms), positive contexts and foreign accent processing demanded even more pragmatic effort, suggesting that ironic praise uttered in a non-native accent was more effortful to process, and that the inferential processing originated at the P600 was longer-lasting for ironic praise spoken by foreigners. The observed additional inferencing when processing ironic praise suggests that ironic praise (and literal praise) is more difficult to understand and necessitates greater inferential processing costs than ironic criticism (and literal criticism).

Evidence presented so far demonstrates that ironic criticism is perceived as more ironic than ironic praise (Caffarra et al. 2018; Tiv et al. 2023). Additionally, ironic praise (Caffarra et al. 2018; Puhacheuskaya and Järvikivi 2022) and ironic criticism are considered less ironic when uttered in the foreign than in the native accent (Puhacheuskaya and Järvikivi 2022). Ironic criticism is also rated as more ironic than ironic praise by balanced bilinguals (Tiv et al. 2023). Moreover, ironic praise elicits larger N400 amplitudes than literal praise when delivered in the native accent, but not when foreign-accented (Caffarra et al. 2019). Regarding processing times in L2, irony (especially ironic criticism) is processed more slowly than literal equivalents, when compared to positively valenced (literal praise) utterances, but irony (ironic criticism) can be processed faster than literal statements, when compared to negatively valenced (literal criticism) statements (Bromberek-Dyzman 2014; Bromberek-Dyzman et al. 2022; Ellis et al. 2021; Li and Jung 2023), or when compared to ironic praise (Bromberek-Dyzman et al. 2022; Ellis et al. 2021; Li and Jung 2023). What is more, some evidence suggests that balanced bilinguals process ironic criticism faster than ironic praise (Tiv et al. 2023). It appears that in order to probe into cognitive mechanisms underlying irony processing, it is indispensable to consider the fuller, more inclusive and nuance-sensitive range of meanings. Only then can the lexical valence / irony differences be properly acknowledged, which remain unaccounted for when the dichotomous ironic / literal paradigm is used. On the other hand, in the dichotomous literal / non-literal paradigm, the results, rather consistently, point to the more demanding processing of ironic (criticism) than literal (praise) meanings. This may, however, be concealing the hidden factor – attitude, or valence, as has previously been shown, which when not measured influences irony comprehension, but remains unacknowledged.

4.5. Conclusion

In this chapter irony research from the bilingualism point of view was presented. The influence of bilingualism on Theory of Mind and executive control has been discussed. Moreover, the chapter presents some evidence from irony comprehension studies on children, and the role of Theory of Mind in the process of irony meaning making. Finally, I reviewed extant irony processing research in the area of bilingualism. In short, some evidence from the studies, which compared ironic and literal meaning as a dichotomous distinction presented in this chapter shows that irony processing is more demanding (longer and less accurate) than literal meaning in both L1 and L2 (Bromberek-Dyzman et al. 2010). Between languages, irony in L1 seems to be processed as fast (Bromberek-Dyzman and Rataj 2016; Bromberek-Dyzman et al. 2010), and as accurately (Bromberek-Dyzman et al. 2010) as irony in L2. However, some evidence points to different cognitive capacities and reliance on diverse strategic behaviors in the native and non-native language users when comprehending irony, in that L2 users tend to be less sensitive to prosodic cues, and rely, to a greater extent, on the contextual, and semantic cues (Peters et al. 2015). What is more, sarcasm detection remains unfeasible in an unfamiliar language (Cheang and Pell 2011). In studies which used valence-based set of stimuli, some evidence suggests less accurate (regarding ironic criticism, ironic praise, and literal criticism) and slower (regarding ironic criticism, ironic praise, literal praise and literal criticism) processing of L2 learners than native speakers. Evidence from the studies which adopted the broader lexical valence-based stimuli selection shows that ironic praise tends to be rated as less ironic than ironic criticism (Caffarra et al. 2018; Li and Jung 2023; Tiv et al. 2023), especially when foreign-accented (Caffarra et al. 2018). Lexical valence seems to modulate the process in that positively valenced statements are processed faster than the negatively valenced ones in L2 (Bromberek-Dyzman 2014; Bromberek-Dyzman et al. 2022; Ellis et al. 2021). Ironic criticism tends to be processed faster than ironic praise (Tiv et al. 2023). Simultaneously, evidence suggests that speaker information conveyed through their accent can have a significant impact on irony comprehension (Caffarra et al. 2018). Importantly, L2 proficiency seems to be of utmost importance in irony comprehension, as it significantly facilitates the process (Shively et al. 2008).

4.6. Conclusion of Part 1

Before future research discovers new approaches to test irony, which may better explain its comprehension, it is indispensable to systematize the current evidence regarding how irony has been conceptualized – as a literal / non-literal dichotomy and as a lexical valenced-based attitude-imbued meaning. Future research should address these questions in both languages of bilinguals. In order to precisely investigate the mechanisms underpinning irony comprehension neuroimaging and electrophysiological methods should be employed to identify the effortfulness or effortlessness connected with processing irony. In Part 1 of the present dissertation, I have presented extant evidence regarding irony processing from both monolingual and bilingual studies. In Part 2 I now turn to the presentation of my EEG study conducted to test the hypotheses which I propose based on the current state of knowledge. First, I describe norming studies conducted to validate the experimental stimuli. Second, I report the EEG experiment, which is the first EEG study on irony processing in bilinguals' L1 and L2. Third, I offer a discussion of the obtained results.

Part 2: Empirical study: Electrophysiological correlates of irony processing in Polish-English bilinguals

Chapter 5: Norming studies¹

5.1. Introduction

This chapter presents three norming studies which were conducted in order to validate the materials prepared for the experimental study described in Chapter 6. These norming studies were designed to measure the degree of irony and cloze probability of the experimental stimuli. In this way, I wished to ensure that the materials were experimentally suitable and psychologically relevant in order to reduce the likelihood of experimental confounds in the EEG data as well as strengthen the interpretability of the results. The reasoning behind conducting the norming studies is twofold. Firstly, well-normed materials strengthen the experimental control by ensuring that the observed behavioral and EEG effects can be linked to the manipulated variables in the experiment, rather than to random, unaccounted for, differences between the stimuli. Secondly, the norming of the stimuli enables the selection of items based on participant judgements, which contributes to the quality of the final set of stimuli.

Each of the three norming studies is described with respect to its motivation, design, participant sample, and results. The first norming study (Norming study 1: Irony judgment of ironic criticism) was conducted to evaluate the level of irony of the materials from the ironic criticism category. The second norming study (Norming study 2: Irony judgment of ironic praise) was conducted to evaluate the level of irony of the materials from the ironic praise category. Irony is a cardinal variable in the present study, and a complex pragmatic phenomenon, therefore it was of the utmost importance that the experimental stimuli be well normed in terms of this property. Specifically, subjective ratings were required to ensure that the experimental stimuli were perceived as ironic. This con-

¹ The studies presented in this chapter have been described in Chelminiak et al. (under review in *Brain and Language*) “Irony is more cognitively taxing in the second language and more effective in the first: Evidence from event-related potentials”.

nects norming studies more directly to the EEG hypotheses. Norming studies on irony are a standard procedure in irony processing studies. Previous research on irony processing relied on independent irony norming studies to ensure stimulus validity (Bromberek-Dyzman et al. 2021; Bromberek-Dyzman et al. 2022; Regel and Gunter 2017; Spotorno et al. 2013). Finally, the third norming study (Norming study 3: Cloze probability) was conducted to validate semantic-pragmatic plausibility of the materials. Previous research on irony processing relied on independent cloze probability norming studies to ensure stimulus validity (Caillies et al. 2019; Regel and Gunter 2017; Regel et al. 2010a).

5.2. Norming study 1: Irony judgment of ironic criticism scenarios

The goal of the first norming study was to evaluate the degree of irony of the materials from the ironic criticism category (sentences with a positively valenced adjective).

5.2.1. Participants

Participants were students at the Faculty of English, Adam Mickiewicz University in Poznań, Poland. In order to minimize cognitive fatigue and create relatively short questionnaires, the study was divided into four questionnaire sets. Questionnaire 1A was completed by thirty-three participants ($N = 33$, 26 women, 5 men, one person identified themselves as non-binary, and one undeclared; $M_{\text{age}} = 23.85$, $SD = 5.72$, $\text{min} = 18$, $\text{max} = 43$). Questionnaire 1B was completed by thirty-one participants ($N = 31$, 25 women, 4 men, one person identified themselves as non-binary and one undeclared; $M_{\text{age}} = 24.03$, $SD = 5.95$, $\text{min} = 18$, $\text{max} = 43$). Questionnaire 2A was completed by thirty-three participants ($N = 33$, 24 women, 8 men, one person identified themselves as non-binary, $M_{\text{age}} = 22.39$, $SD = 2.61$, $\text{min} = 18$, $\text{max} = 28$). Questionnaire 2B was completed by thirty-four participants ($N = 34$, 26 women, 7 men, one person identified themselves as non-binary, $M_{\text{age}} = 22.32$, $SD = 2.60$, $\text{min} = 18$, $\text{max} = 28$).

5.2.2. Materials

Materials consisted of 181 original stimulus items. Each item consisted of three sentences and featured two interlocutors having an interaction. The first sentence was a narrative sentence introducing the situation. The second sentence was the first speaker's turn, while the third and last sentence was the second speaker's turn - the target comment. Each questionnaire contained 45 ironic items and 10 filler items, with the exception of Questionnaire 1B which contained 46 ironic items.

5.2.3. Procedure

In the norming study participants were asked to read all the materials carefully and determine the irony of the final comment in each scenario. Specifically, participants were asked to decide how ironic a particular comment was and choose one of the following: not at all ironic (0), somewhat ironic (1), ironic (2) or very ironic (3), and indicate their response on a four-point Likert scale.

5.2.4. Results

The item inclusion threshold was set at 2.0 which means that all items evaluated as ironic or very ironic were eligible for inclusion. The total of 164 items received the score of 2 or higher. The final stimulus set consisted of items in English and Polish, therefore, the final list of stimuli items was constructed based on the irony judgment score and translation equivalence. The final list consisted of 60 items ($M_{\text{irony judgment score}} = 2.52$, $SD = 0.14$, min score = 2.24, max score = 2.82). The ratings were significantly different from 0 ($t(59.0) = 142.0$, $p < .001$), which means that they were rated as ironic.

5.3. Norming study 2: Ironicity judgment of ironic praise scenarios

The second norming study was aimed at evaluating the degree of irony of the materials from the ironic praise category (sentences with a negatively-valenced adjective).

5.3.1. Participants

Forty-five participants participated in the study ($N = 45$, 36 women, 8 men and 1 person declined to provide their gender; $M_{age} = 22.24$, $SD = 1.81$, $min = 19$, $max = 28$). Participants were students at the Faculty of English, Adam Mickiewicz University in Poznań, Poland. As in Norming study 1, the materials were distributed across four questionnaires (Questionnaire English 1, Questionnaire English 2, Questionnaire Polish 1, Questionnaire Polish). Each questionnaire was completed by 11 participants (except for Questionnaire English 1 which was completed by 12 participants).

5.3.2. Materials

Materials consisted of 60 stimulus items. Each item consisted of three sentences and featured two interlocutors having an interaction. The first sentence was a narrative sentence introducing the scene. The second sentence was the first speaker's turn, while the third and last sentence was the second speaker's turn and the target comment. Each questionnaire contained 15 ironic items and 3 filler items.

5.3.3. Procedure

Participants were asked to read all materials carefully and determine the degree of irony of the final comment in each scenario. Participants were asked to decide if a particular comment was not at all ironic (0), somewhat ironic (1), ironic (2) or very ironic (3) and indicate their response on a four-point Likert scale.

5.3.4. Results

Results showed that the items were evaluated as ironic ($M_{\text{ironicity judgment score}} = 2.35$, $SD = 0.40$, min score = 1.42, max score = 3.0). The irony ratings were significantly different from 0 ($t(59.0) = 46.1$, $p < .001$).

5.4. Norming study 3: Cloze probability

The third norming study was conducted in order to validate semantic-pragmatic plausibility of the materials. This study was aimed at ensuring that the stimuli differed in predictability as intended.

5.4.1. Participants

All participants were students at the Faculty of English, Adam Mickiewicz University in Poznań, Poland. As in Norming studies 1 and 2 the study was divided into six questionnaire sets (Polish 1, Polish 2, Polish 3, English 1, English 2, English 3). In total, one-hundred twenty participants participated in the study. Each questionnaire was completed by 20 participants (Polish 1: $N = 20$, 18 women, 1 man, one person identified themselves as non-binary, $M_{\text{age}} = 21.05$, $SD = 2.63$, min = 18, max = 28; Polish 2: $N = 20$, 12 women, 7 men, one person identified themselves as non-binary, $M_{\text{age}} = 20.85$, $SD = 1.69$, min = 19, max = 25; Polish 3: $N = 20$, 16 women, 3 men, one person identified themselves as non-binary, $M_{\text{age}} = 21.35$, $SD = 1.84$, min = 18, max = 25; English 1: $N = 20$, 14 women, 5 men, one person identified themselves as non-binary, $M_{\text{age}} = 21.65$, $SD = 2.11$, min = 20, max = 28; English 2: $N = 20$, 13 women, 5 men, one person identified themselves as non-binary and one person declined to provide their gender, $M_{\text{age}} = 21.20$, $SD = 1.91$, min = 18, max = 25; English 3: $N = 20$, 12 women, 6 men, two people identified themselves as non-binary, $M_{\text{age}} = 20.70$, $SD = 1.56$, min = 18, max = 24).

5.4.2. Materials

Materials consisted of 240 stimulus items. Each questionnaire contained 40 ironic items and 13 filler items.

5.4.3. Procedure

Participants were asked to read all the materials carefully and determine whether the penultimate word (adjective) in each sentence was probable in the given context and specify how probable it was. Participants were asked to indicate their responses on a five-point Likert scale with 1 indicating “improbable” and 5 indicating “very probable”.

5.4.4. Results

Results showed that the items were evaluated as semantically and pragmatically plausible ($M_{\text{cloze probability rating}} = 3.00$, $SD = 1.46$, min score = 1.00, max score = 5.00). The cloze probability ratings were significantly different from 1 ($t(239.0) = 21.2$, $p < .001$), which means that the stimuli were perceived as plausible.

5.5. Conclusion

Here I reported three norming studies conducted to validate the experimental materials in the EEG study presented in the following chapter. Collectively, these norming studies established that the stimuli were interpreted in the intended way, as ironic and contextually plausible, and, therefore, were suitable for experimental use. Specifically, the first and second norming studies demonstrated that participants reliably rated the materials in the ironic criticism and ironic praise condition as ironic. The third norming study established that the items were perceived as semantically and pragmatically plausible.

By validating these significant properties, these norming studies minimized the risk of confounds and conducted to the interpretability of the EEG data. Particularly, the

norming studies ensured that any electrophysiological effects observed in the recorded EEG could be attributed to the experimental manipulations, and not stem from unintended, stimuli variability. All in all, the norming studies demonstrated that the tested materials were pragmatically robust, that is worked as intended in communicative terms. The tested and validated materials served as the basis for the EEG experiment reported in chapter 6.

Chapter 6: The electrophysiological study testing irony processing in Polish-English bilinguals²

6.1. Introduction

Based on what the previous research has showed about irony processing, it appears that the nature of irony so far remains impenetrable (for a review cf. Bromberek-Dyzman 2012; Bromberek-Dyzman 2024; Chełminiak 2025). A constitutive aspect of irony is its inherent incongruity (Gerrig and Goldvarg 2000; Ivanko and Pexman 2003). However, the mechanisms underlying irony processing remain elusive. The goal of the present dissertation is to determine how the conceptualization of irony in previous research and have impacted the patterns of results obtained and the explanations of the nature of irony. The manner of irony conceptualization is a crucial if not the most crucial aspect of irony research, as depending on how it is construed, different patterns of results are generated. When irony was conceptualized in a dichotomous manner, and the literal meaning (most commonly literal praise) was compared with ironic meaning (most commonly ironic criticism) (Deliens et al. 2018; Filik and Moxey 2010; Giora and Fein 1999a; Giora and Fein 1999b; Giora et al. 1998; Giora et al. 2007; Kaakinen et al. 2014; Turçan and Filik 2016), irony was processed more slowly and less accurately than literal meaning and necessitated the processing of the literal meaning (Giora and Fein 1999a; Giora and Fein 1999b; Giora et al. 1998; Giora et al. 2007). When irony was conceptualized as an affectively loaded type of attitudinal meaning, and compared with a wider range of statements, based on the valence (positive, negative) of the target comment (positive: ironic criticism, literal praise; negative: ironic praise, literal

² The study presented in this chapter has partially been described in Chełminiak et al. (under review in *Brain and Language*) “Irony is more cognitively taxing in the second language and more effective in the first: Evidence from event-related potentials”.

criticism) (Bromberek-Dyzman 2014; Dews and Winner 1999; Gibbs 1986; Kreuz and Link 2002), in some situations, irony (ironic criticism) was processed as fast or even faster than literal meaning and ironic praise (Bromberek-Dyzman 2014; Dews and Winner 1999; Gibbs 1986; Kreuz and Link 2002). Hence, the two approaches produced strikingly different results. In the present study, my goal has been to explore irony processing with all its affective aspects in the form of the emotional load of the target sentence. Specifically, in the present study I aimed at uncovering the electrophysiological correlates of ironic criticism, ironic praise, literal criticism and literal praise processing. While working on the project it began more and more visible that irony combines two dimensions of evaluation. On the one hand, lexical valence, which refers to the surface level of the message. For instance, in the case of literal praise the surface and the only meaning is the literal approval expressed via positive valence. In irony, the evaluation has two levels, the explicit and the implicit one. For instance, in the case of ironic praise the surface meaning is a literal disapproval – a literal criticism, and the intended meaning is ironically communicated praise. Therefore, irony communicates, as if, two intentions. One is literal, and not intended, and the other one is ironic, the intended one. Both intentions are related to the attitude layer. This led me to assume that lexical valence and intention valence should be distinguished and acknowledged as separate components. While in the prior studies valence refers to the surface meaning of the comments, intention captures the underlying motive of an utterance. Intention valence refers to the implicit, intended meaning, communicated via the clash of the preceding context and the target comment which follows. The outcome of these two segments coming together is what I call Intention Valence in this study. Both of these levels of attitudinal meaning (lexical valence, intention valence) are absolutely crucial for the understanding of irony. Therefore, in the present study, apart from accounting for the lexical valence of the target comment in the stimuli, I exploratorily analyzed the underlying intention valence of ironic and literal messages. What is more, given the rise in the interest in bilingual irony processing research, this study examines the mechanisms of irony processing by exploring the electrophysiological correlates in bilinguals' L1 and L2. Bilinguals, who enjoy better mentalizing skills and actively juggle their two languages, may be better at irony comprehension than their monolingual counterparts. Importantly, to the best of my knowledge, this is the first EEG study on irony processing in bilinguals' L1 and L2.

In chapter 6 I report the study conducted for the purpose of this dissertation. I start with the research questions and hypotheses driving the study. In the following sections I

describe the methodology (participants, stimuli, design, procedure, pilot studies, data acquisition, data preprocessing and data analysis) and results of the study (behavioral results and electrophysiological results).

6.2. Research questions and hypotheses

The goal of the experiment was to answer a range of questions resulting from the irony research in general, and bilingual research on irony:

- i. Is irony processing more effortful than literal meaning processing?
- ii. Is irony processing more effortful than literal meaning in the non-native relative to native language?
- iii. Is negative valence of target adjectives (embedded in target sentences) more taxing to process than comments with positively valenced adjectives?
- iv. Is the lexical access to negatively valenced meanings impeded in L2 compared to L1?
- v. Is criticism expressed literally and ironically more demanding to process than praise expressed literally and ironically?
- vi. Is criticism expressed literally and ironically, and praise expressed literally and ironically processed differently depending on the language of operation?

Following from the research questions and based on previous electrophysiological research on irony in L1 and valence in L1 and L2 I have formulated the following hypotheses. The hypotheses concern the ERP components and the modulations of the amplitudes. Based on the modulations of each amplitude we are able to interpret the effect that these amplitudes reflect.

Regarding Language (L1 Polish, L2 English)

- i. N400: I hypothesize that processing sentences in L2 English will be more cognitively effortful than in L1 Polish. I therefore predict increased N400 amplitudes for L2 English compared to L1 Polish (Martin et al. 2013; Moreno and Kutas 2005).

- ii. LPP: I hypothesize that sentences in L2 English will require more reanalysis. I therefore predict increased LPP amplitudes in L2 compared to L1 (Naranowicz et al. 2022).

Regarding Ironicity (Ironic, literal)

- i. P200: I hypothesize that ironic sentences will require more early semantic analysis and more attention than literal sentences. I therefore predict larger P200 amplitudes for ironic compared to literal meaning (Regel and Gunter 2017).
- ii. N400: I hypothesize that ironic sentences will be more cognitively demanding compared to literal sentences. I therefore predict increased N400 amplitudes for ironic meaning compared to literal meaning (Cornejo et al. 2007).
 - a. I hypothesize that ironic sentences will be more cognitively demanding compared to literal sentences in L1. I therefore predict increased N400 amplitudes elicited by target words in ironic compared to literal statements in L1 (Cornejo et al. 2007).
 - b. In L2, I hypothesize that ironic sentences will be even more cognitively demanding compared to literal sentences. I therefore predict even larger N400 amplitudes for ironic than literal meaning. This hypothesis is based on the behavioral evidence from irony processing, which suggests that irony is more difficult in L2 than in L1 (Bromberek-Dyzman and Rataj 2016; Ellis et al. 2021).
- iii. LPP: I hypothesize that ironic sentences will require more reanalysis than literal sentences. I therefore predict increased LPP amplitudes in response to ironic meaning compared to literal meaning (Caffarra et al. 2019).
 - a. I hypothesize that ironic sentences will require more reanalysis than literal sentences in L1. I therefore predict increased LPP amplitudes elicited by target words in ironic compared to literal statements in L1 (Caffarra et al. 2019).

Regarding Lexical Valence (Positive, negative)

- i. N400: I hypothesize that negatively valenced sentences (literal criticism and ironic praise) will be more cognitively demanding than positively valenced sentences. I therefore predict increased N400 amplitudes for negatively valenced adjectives

compared to positively valenced adjective (Bromberek-Dyzman 2014; Bromberek-Dyzman et al. 2022)

- a. I hypothesize that the access to the negative content of the negatively valenced sentences will be suppressed compared to the positive content of positively valenced sentences in L2. I therefore predict reduced amplitudes for negative valence compared to positive valence in L2 (Jończyk et al. 2016).

6.3. Methodology

6.3.1. Participants

A total number of forty-five Polish-English bilinguals participated in the experiment (36 women, 8 men and 1 person declined to provide their gender; $M_{age} = 22.24$ years, $SD = 1.81$, range = 19-28). All participants were native Polish speakers and advanced L2 speakers of English (CEFR C1/C2), who use English in speaking and writing on a regular, daily basis. Before participants were invited to undergo the experimental session, they were first screened for their foreign language proficiency (LexTALE lexical decision test, link: <http://www.lextale.com/>, Lemhöfer and Broersma 2012), their language history probing into L1 and L2 age of acquisition (Language History Questionnaire 3.0; Li et al. 2019) and Empathetic Sensitivity (Skala Wrażliwości Empatycznej; Kaźmierczak et al. 2007) data to gather information about participants' emotional sensitivity. LexTALE (Lemhöfer and Broersma 2012) is a test which allows for measuring language proficiency and determining participants' language command in a short time. The test consists in making a decision whether the presented string of letters is an English word or a nonword (lexical decision task; link: <http://www.lextale.com/>). The results showed that participants were proficient users of L2 English ($M_{LexTALE \text{ score}} = 88.13$, $SD = 8.66$, min score = 61, max score = 100).

The participants had normal or corrected-to-normal vision, and no reported sight impairment. What is more, participants reported no history of neurological disorders (e.g. autism spectrum disorder, bipolar disorder), head injury (e.g. brain concussion) or taking brain affecting pharmaceuticals (e.g. antidepressants or psychoactive drugs). None of the

participants wore dreadlocks or irremovable headpieces. The participants were 2BA, 3BA, 1MA and 2MA English students at the Faculty of English at Adam Mickiewicz University in Poznań, Poland. Participants were rewarded for their participation in the study with a gift card worth PLN 180. Before taking part in the study, all participants signed an informed consent form.

6.3.1.1. Language History Questionnaire data

In the questionnaire part of the study participants were asked to complete Language History Questionnaire 3.0 (Li et al. 2019), which is a tool for collecting information about formal and informal experiences in learning foreign languages. It also allows for determining language dominance, proficiency and immersion (link: <http://lhq3.herokuapp.com/>).

Participants were late bilinguals ($M_{AoL2A} = 6.95$ years old). Detailed data on L1 and L2 age of acquisition broken down into language skills is provided in Table 1.

Table 1. Mean age of Polish (L1) and English (L2) acquisition broken down into language skills and mean number of years of using Polish (L1) and English (L2). The table presents mean values (M), and the standard deviations (in brackets).

Language skill	Polish (L1)	English (L2)
Listening	0 (0)	6.00 (1.92)
Speaking	0.07 (0.45)	7.18 (2.55)
Reading	5.00 (1.71)	7.18 (1.80)
Writing	5.47 (1.78)	7.44 (1.87)
Overall	2.63	6.95
Number of years using the language	21.04 (4.21)	15.53 (2.86)

Almost all participants ($N = 44$) declared having acquired L2 English through school instruction, a great majority of participants ($N = 39$) acquired L2 English through self-instruction, and a few ($N = 7$) participants acquired L2 English via natural contact. Data from mean ages of the start of using and/or learning L1 Polish and L2 English show that participants started using L1 Polish much earlier ($M_{age} = 7.92$) than L2 English ($M_{age} = 13.44$). Detailed data on the mean age of start of using and/or learning L1 Polish and L2 English in specific environments is provided in Table 2.

Table 2. Mean age of the start of using and/or learning Polish (L1) and English (L2) in specific environments. The table presents mean values (M), and the standard deviations (in brackets). The number of respondents is provided at the end (N).

Environment	Polish (L1)	English (L2)
At home	0.77 (1.22), N_{44}	9.71 (5.58), N_{17}
With friends	3.64 (1.72), N_{45}	13.67 (3.72), N_{45}
At school	6.13 (1.56), N_{45}	9.09 (4.18), N_{45}
At work	16.53 (4.46), N_{36}	19.13 (1.98), N_{32}
Language apps (e.g. Duolingo, Say It Right)	11.33 (7.05), N_9	16.58 (3.39), N_{36}
Online games	9.11 (3.34), 36	12.44 (3.61), N_{32}
Overall	7.92	13.44

Participants rated their language learning ability relatively high with a straight majority evaluating this ability as good ($N = 20$) or very good ($N = 19$). Detailed data on the self-rating of language learning ability is provided in Table 3.

Table 3. Number of people self-rating of language learning ability.

Very poor	Poor	Limited	Average	Good	Very good	Excellent
0	0	1	4	20	19	1

Moreover, participants rated their language skills quite high in both their native (L1) and non-native (L2) language. Receptive language skills (listening, reading) were rated higher than productive language skills (speaking, writing) in both native and non-native languages. Detailed data on the self-rating of language skills in Polish (L1) and English (L2) is provided in Table 4.

Table 4. Number of participants self-rating their language skills in Polish (L1) and English (L2).

	Very poor		Poor		Limited		Average		Good		Very good		Excellent	
	Polish	English	Polish	English	Polish	English	Polish	English	Polish	English	Polish	English	Polish	English
Listening	0	0	0	0	0	0	0	0	1	7	12	27	32	11
Speaking	0	0	0	0	0	1	1	1	3	10	18	30	23	3
Reading	0	0	0	0	0	0	0	0	1	8	9	24	35	13
Writing	0	0	0	0	0	0	2	2	2	13	15	23	26	7

Participants spent twice much time daily on various activities in English (L2) ($M_{\text{number of hours}} = 1.68$) compared to Polish (L1) ($M_{\text{number of hours}} = 0.88$). Detailed data showing mean num-

ber of hours spent daily on specific activities in Polish (L1) and English (L2) is presented in Table 5.

Table 5. Mean number of hours spent daily on specific activities in Polish (L1) and English (L2). The table presents mean values (M), and the standard deviations (in brackets). The number of respondents is provided at the end (N).

Activity	Polish (L1)	English (L2)
Watching TV, VOD platforms (e.g. Netflix)	0.56 (0.66), N ₄₅	1.84 (1.26), N ₄₅
Listening to the radio, podcasts	0.34 (0.53), N ₄₄	0.81 (1.06), N ₄₂
Reading for pleasure	1.00 (1.15), N ₄₅	1.27 (1.30), N ₄₅
Reading for school/work	0.74 (1.05), N ₄₃	2.00 (1.13), N ₄₅
Using social media/Internet	1.93 (1.12), N ₄₅	2.36 (1.51), N ₄₅
Writing for school/work	0.70 (1.08), N ₄₃	1.80 (1.32), N ₄₅
Overall	0.88	1.68

When asked about human interactions, participants' evaluations revealed longer average time spent daily talking to various groups of people in their native Polish (L1) ($M_{\text{number of hours}} = 2.01$) compared to English (L2) ($M_{\text{number of hours}} = 1.19$). Detailed data showing mean number of hours spent daily talking to various groups of people in Polish (L1) and English (L2) is presented in Table 6.

Table 6. Mean number of hours spent daily talking to various groups of people in Polish (L1) and English (L2). The table presents mean values (M), and the standard deviations (in brackets). The number of respondents is provided at the end (N).

Group	Polish (L1)	English (L2)
Family members	1.71 (0.89), N ₄₅	0.16 (0.52), N ₄₅
Acquaintances/friends	2.91 (2.49), N ₄₅	1.69 (1.44), N ₄₅
Schoolmates/fellow students	2.09 (1.47), N ₄₅	1.91 (1.29), N ₄₅
Colleagues/roommates	1.32 (1.55), N ₄₄	1.00 (1.45), N ₄₃
Overall	2.01	1.19

I also asked participants to estimate how often they use their Polish (L1) and English (L2) in various daily life situations. It turns out that even though participants think in both languages quite often, it is their native language that they use to think more often in. Similarly, when talking to oneself, expressing emotions, dreaming, performing mathematical calculations, remembering numbers and praying, the native language seems to be the more obvious choice. Detailed data showing how often participants use their native (L1) and non-native (L2) language in various everyday situations is provided in Table 7.

Table 7. Number of participants who use Polish (L1) and English (L2) in the following situations.

	never		rarely		sometimes		regularly		often		usually		always	
	Polish	English	Polish	English	Polish	English	Polish	English	Polish	English	Polish	English	Polish	English
Thinking	0	0	0	3	2	12	4	5	9	18	25	7	5	0
Talking to yourself	1	1	1	4	4	12	7	3	10	17	20	8	2	0
Expressing emotions (e.g. exclamations, swearing, showing feelings)	0	1	2	1	3	14	4	7	10	14	23	8	3	0
Dreaming	0	6	0	10	6	10	2	5	10	11	16	3	11	0
Mathematical calculations (e.g. counting, calculating tips)	0	29	1	11	1	4	0	0	1	1	7	0	35	0
Remembering numbers (e.g. phone numbers, ID numbers)	0	22	1	12	0	8	0	0	4	3	13	0	27	0
Praying	15	37	4	6	1	2	0	0	0	0	5	0	20	0

6.3.1.2. Empathetic Sensitivity data

In order to measure our participants' empathetic sensitivity, we used a questionnaire by Kaźmierczak and colleagues (2007; *Skala Wrażliwości Empatycznej*) modeled on *Interpersonal Reactivity Index* by Davis (1980). This questionnaire allows for determining the level of engagement in communication (empathy) and interpreting statements. This data can provide information on study participants' empathy skills such as the ability to recognize and interpret intentions. These skills are invaluable in irony meaning making.

The questionnaire provided data on three factors: empathetic care, perspective taking and personal distress. The results showed that our participants' empathy skills were on an advanced level. Participants scored pretty high on empathetic care ($M = 3.95/5$, $SD = 0.21$; an example statement: *I tend to feel affection and care towards people who are less successful than me*) and perspective taking ($M = 4.02/5$, $SD = 0.30$; an example statement: *Before I judge someone's behavior I try to understand their reasons*), but demonstrated slightly lower sensitivity to statements about their personal distress ($M = 3.29/5$, $SD = 0.50$; an example statement: *I feel frightened and lost in difficult situations*).

6.3.1.3. Conclusions of the questionnaires

The questionnaires described above provided participants' profiles regarding their language proficiency, language history and empathetic sensitivity. Specifically, participants were highly proficient in L2 English as showed in the *LexTALE* test (Lemhöfer and Broersma 2012). The data from the Language History Questionnaire 3.0 (Li et al. 2019) showed that participants were late, sequential Polish-English bilinguals and they acquired language in a formal setting through classroom instruction. In addition, participants used English as a second language on a daily basis for a variety of activities. Moreover, the data from the Empathetic Sensitivity questionnaire (Każmierczak et al. 2007) revealed that participants' empathy skills were high.

6.3.2. Stimuli

The present study used four types of stimuli used: ironic criticism, ironic praise, literal praise and literal criticism. The stimuli were short scenarios, each consisting of three sentences. Each scenario described an interaction between two speakers. The first sentence was a context which set the situation for the described interaction. The second sentence was the first speaker's turn. The third and the last sentence was the other speaker's turn – a response, a comment to what the first speaker said (see Table 8). This sentence in all interactions was the target comment that carried the intended ironic or literal meaning. In each item the target comment consisted of five words. The fourth word was an adjective (target word), and the fifth word was a noun. The target adjective (the fourth word) was the key word. The length of the target word was controlled for ($M_{\text{Target word length Polish}} = 9.13$ letters, $SD = 2.62$; $M_{\text{Target word length English}} = 7.75$ letters, $SD = 2.91$).

Table 8. Example stimuli used in the experiment.

Literal Praise	Ironic Praise	Literal Criticism	Ironic Criticism
Julian is whispering to Diane's ear during a concert.	Julian szepcze Dianie do ucha w trakcie koncertu.	Anna zgubiła swój ulubiony kubek do kawy.	Anna has lost her favorite coffee mug.
Julian: The musicians are in sync.	Julian: Muzycy są ze sobą dobrze zgrani.	Paweł: Niechący go zbiłem.	Paul: I have broken it accidentally.
Diane: Such a gifted band.	Diana: Cóż za kiepski zespół.	Anna: To jest okropna wiadomość!	Anna: This is amazing news!

There was a total of 240 items used per participant. This number was equally divided into two languages (120 items were presented in English and 120 items were presented in Polish). In each language there were four types of scenarios presented: 30 ironic criticism scenarios, 30 ironic praise scenarios, 30 literal praise scenarios and 30 literal criticism scenarios. Specifically, items in all four categories shared the same first sentence (context). There were two variants of the second sentence per item, one describing a positive situation (ironic praise, literal praise), and one describing a negative situation (ironic criticism, literal criticism). Finally, there were two variants of the third sentence per item, one with a positive adjective (literal praise, ironic criticism), and one with a negative adjective (literal criticism, ironic praise). In the experiment, there were two variants of each scenario used, one in English, and one in Polish to obtain a full rotation of conditions across languages. Specifically, the scenarios which appeared as literal praise scenarios in Polish, also appeared as ironic praise in English. Analogically, the scenarios which appeared as literal criticism scenarios in Polish, also appeared as ironic criticism in English. The scenarios which appeared as ironic criticism in Polish also appeared as literal criticism scenarios in English. Finally, the scenarios which appeared as ironic praise in Polish also appeared as literal praise scenarios in English. In this way a complete uniqueness of the scenarios was ensured across languages. For the complete list of the stimuli see Appendix A (Polish), and Appendix B (English).

6.3.3. Design

The study conformed to a 2 (Ironicity: literal, ironic) by 2 (Lexical Valence: positive, negative) by 2 (Language: Polish, English) experimental design, with an additional factor Intention Valence (criticism, praise) treated exploratorily due to insufficient statistical power.

6.3.4. Procedure

The experimental procedures presented below were approved by the Ethics Committee for Research Involving Human Participants at Adam Mickiewicz University in Poznań (Reso-

lution no. 10/2020/2021; see Appendix C). The study consisted of two parts. The first part was the questionnaire study (described earlier), and the second part was the proper experiment – the electrophysiological study. In the following sections the experimental procedure is described.

6.3.4.1. Part 1: The questionnaire study

Participants were seated in a dimly lit and sound-attenuated booth in the Psychophysiology of Language and Affect (PoLA) laboratory at the Faculty of English, Adam Mickiewicz University in Poznań, Poland. Prior to the experiment participants were asked to complete four questionnaires: a personal information form (prepared on the basis of including and excluding factors, in order to eliminate the risk of feeling discomfort by the participants), LexTALE (Lemhöfer and Broersma 2012), a Language History Questionnaire 3.0 (Li et al. 2019), and the Empathetic Sensitivity questionnaire (Polish: Kaźmierczak et al. 2007, based on Interpersonal Reactivity Index, Davis 1980). The results of the questionnaire study are described in earlier sections.

6.3.4.2. Part 2: The electrophysiological experiment

Having completed the questionnaires described above participants were invited to participate in the proper experiment. The experiment involved two sessions, i.e., the practice session and the experimental session. The goal of the practice session was to instruct and familiarize participants with the experimental procedure and prepare them for the experimental session. Participants were tested individually. Instructions and stimuli were displayed on a computer screen, with black characters appearing on a silver-gray screen. Next, participants were informed about their task during the experiment, general instructions were given to the participants, stressing the importance of reading all the interactions carefully and refraining from blinking during stimulus presentation.

The experimental procedure was initiated by a green fixation cross presented in the middle of the screen for 2000 ms announcing the beginning of a trial. In the experiment participants were asked to read short scenarios carefully and answer a comprehension ques-

tion at the end of some scenarios. The first sentence of each scenario (Context) was presented on the screen for the amount of time calculated by multiplying 350 ms (average time used for processing a word) by the number of words in the sentence. This was followed by a black fixation cross presented in the middle of the screen for 500 ms and the second sentence (Interaction). The second sentence was presented in a fast word-by-word presentation, with one word at a time appearing on the screen for 300 ms. Each word was followed by a blank screen appearing on the screen for a specific amount time (a randomly distributed inter-stimulus-interval ranging from 150 ms to 250 ms). This was followed by a black fixation cross presented in the middle of the screen for 500 ms and the third sentence (Target Sentence). The third sentence was also presented word-by-word with each word at a time appearing on the screen for 300 ms, and every word followed by a randomly distributed ISI. The last word of each target sentence was followed by a green fixation point (inter-trial interval) displayed for 2000 ms which introduced the next trial. In each language block 25% of the items ($N = 30$) were followed by a comprehension question. The use of the comprehension questions was to ensure participants' attention during the task. A question was displayed on the screen, with answer options *Yes* (for one half of the participants in the left-bottom corner and for the other half in the right-bottom corner) and *No* (analogically for one half of the participants in the right-bottom corner and for the other half in the left-bottom corner). The comprehension questions were displayed on the screen for the amount of time calculated by multiplying 350 ms by the number of words in the question and adding 2000 ms. During this time participants were expected to respond by pressing "z" or "/" keys on the keyboard to indicate "Yes" or "No" response. Allocation of keys to responses was counterbalanced across participants. Response times were measured from the onset of the answer screen until a participant pressed one of the response keys. Every 10 trials there was a short break which lasted 15 seconds. During that time participants were asked to rest their eyes. The end of the break was signaled by a bell sound. Participants were notified about the possibility to resume the experiment before the end of the break. After the first language block there was a longer break which lasted 5 minutes and participants were notified about the possibility to proceed to the second block before the end of the break. The order of the language blocks was counterbalanced (see Fig. 1).

The practice session consisted of 8 trials (2 ironic criticism items, 2 ironic praise items, 2 literal positive items and 2 literal negative items). Half of the items were presented in English, and the other half were presented in Polish. The experimental session consisted

of 240 trials (60 ironic criticism items, 60 ironic praise items, 60 literal positive items and 60 literal negative items). Half of the items were presented in English, and the other half were presented in Polish.

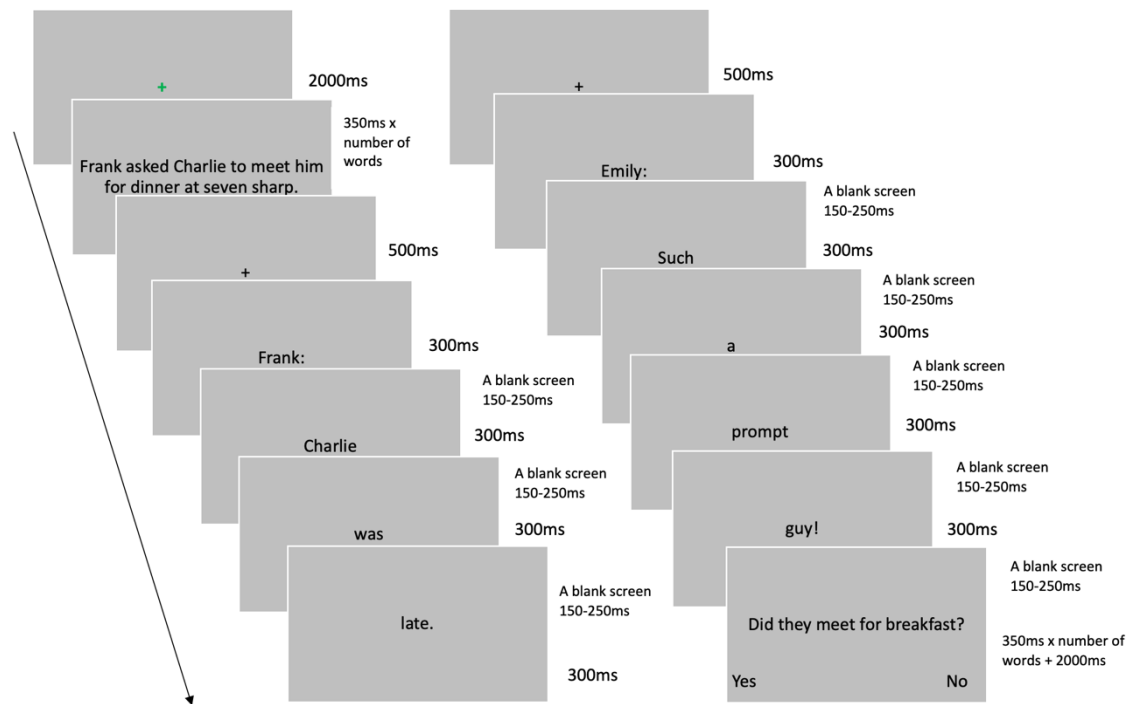


Fig. 1. Experimental procedure.

6.3.5. Pilot studies

Before data collection started, I conducted two pilot studies to assess the feasibility of the experimental procedure. The first pilot study tested the experimental procedure. Two participants ($N = 2$) were invited to participate in this pilot study to test the experimental procedure, stimulus presentation, and fine-tune stimulus timing. In addition, this pilot study was conducted to inspect the functionality of the equipment and ensure that the task in the experimental procedure was clearly specified and understandable. The procedure in the experiment was exactly as described above. Participants were rewarded for their participation with a gift card worth PLN 180. As a result of this pilot study, I modified the instructions of the experimental procedure to make them clearer.

The second pilot study tested the experimental procedure and the EEG apparatus. Three participants ($N = 3$) were invited to participate in this pilot study. Apart from the same goals as in the first pilot study, this pilot study was conducted to fine-tune EEG recording settings such as to verify whether the triggers linked with a particular stimulus were sent correctly and recorded appropriately on the encephalogram. The procedure in the experiment was exactly as described above. Participants were rewarded for their participation with a gift card worth PLN 180. As a result of this pilot study, I modified the instructions of the experimental procedure to make them clearer.

6.3.6. Electroencephalographical (EEG) data acquisition

At the beginning of the experiment, all participants had their head's size measured in order to choose the appropriate size of an elastic cap. First, the cap was fitted, after which the electrolytic gel was applied and the electrodes were inserted into the electrode holders. The electrodes were connected with wires to an instrument that amplified the brainwaves and recorded them on computer equipment. The electroencephalogram (EEG) was recorded at 2048 Hz from 64 Ag/AgCl electrodes embedded in an elastic cap at the standard International 10/20 positions using a BioSemi ActiveTwo amplifier (BioSemi B.V., Amsterdam; for the certificate see Appendix D). Instructions and stimuli presentation as well as behavioral data collection were controlled by E-Prime 3.0 software.

6.3.7. Electroencephalographical (EEG) data preprocessing

Data preprocessing and analyses were performed in EEGLAB (v14.1.1; Delorme and Makeig 2004) in Matlab R2023b (The MathWorks, Inc.). Continuous (offline) EEG data were downsampled to 512 Hz, high-pass filtered at 0.3 Hz and low-pass filtered at 20 Hz by means of Hamming windowed sinc FIR filter (*pop_eegfiltnew* in EEGLAB). Next, continuous data were trimmed automatically to remove long breaks in the recording (7000 ms without triggers, with a 1000 ms buffer on each side). Bad channels were identified by means of *clean_rawdata* function in EEGLAB (Mullen et al. 2015; channel correlation criterion = 0.75) and supplemented by visual inspection ($M_{\text{rejected}} = 1.96$, $SD = 1.93$, $\min =$

0, max = 9). After that, the re-referencing of the data to the activity of all channels (global average reference) was performed. In the next step, Adaptive Mixture Independent Component Analysis (AMICA; Palmer et al. 2008) was run in EEGLAB. AMICA decomposition was reviewed by means of ICLabel (Pion-Tonachini et al. 2019). Then, independent components such as ocular artefacts, bad channel activity and / or line noise were removed from the data ($M_{\text{rejected}} = 2.04$, $SD = 0.52$, min = 1, max = 4). Next, continuous EEG data were cleaned by means of the function *pop_clean_rawdata* (burst criterion = 50). Removed channels were then interpolated applying spherical interpolation. Last but not least, continuous, artefact-free EEG data were later epoched from -200 to 900 ms in reference to the onset of the target word, baseline-corrected to the pre-stimulus interval (-200 to 0), and submitted for further ERP analysis using ERPLAB (Lopez-Calderon and Luck 2014).

6.3.8. Behavioral data analysis

Behavioral data will be analyzed by means of 2 (Irony: literal, ironic) by 2 (Language: Polish, English) ANOVA, 2 (Lexical Valence: positive, negative) by 2 (Language: Polish, English) ANOVA, and exploratorily 2 (Intention Valence: criticism, praise) by 2 (Language: Polish, English) ANOVA.

6.3.9. Electroencephalographical (EEG) data analysis

For the analysis of event related potentials, the following components were chosen: the P200, the N400 and the LPP. The P200 was analyzed in the 155-255 ms time window at 5 midline electrodes (Fz, FCz, Cz, CPz, Pz; Boustani et al. 2021). This component was selected for the analysis as it reflects early attention and language-related processes. The N400 was analyzed in the 300-500 ms time window at 9 electrodes centered on Cz (FC1, FCz, FC2, C1, Cz, C2, CP1, CPz, CP2; Jończyk et al. 2016; Jończyk et al. 2024; Naranowicz & Jankowiak 2025). This component was selected for the analysis as it reflects lexico-semantic processing. The LPP was analyzed in the 500-900 ms time window at 6 centroparietal electrodes (C1, Cz, C2, CP1, CPz, CP2; Jończyk et al. 2024). This component was chosen for the analysis as it reflects meaning integration and reanalysis. In addi-

tion, early visual ERP components (The P1 and the N1) were analyzed to check for early processing effects. The P1 was analyzed in the 55-155 ms time window at 6 electrodes (O1, O2, PO3, PO4, PO7, PO8; Jończyk et al. 2016; Naranowicz et al. 2022). The N1 was analyzed in the 155-255 ms time window at 4 electrodes (PO7, PO8, P9, P10; Naranowicz et al. 2022). Each component will be analyzed by means of 2 (Ironicity: literal, ironic) by 2 (Language: Polish, English) ANOVA, 2 (Lexical Valence: positive, negative) by 2 (Language: Polish, English) ANOVA, and exploratorily 2 (Intention Valence: criticism, praise) by 2 (Language: Polish, English) ANOVA. Additionally, in the exploratory analysis, a three-way analysis will be conducted with 2 (Ironicity: literal, ironic) by 2 (Language: Polish, English) by 2 (Intention Valence: criticism, praise) ANOVA. This will be further unpacked to conduct separate analyses in Polish and English by means of a 2 (Ironicity: literal, ironic) by 2 (Intention Valence: criticism, praise) ANOVA.

6.4. Results

The results of the study are presented in the following sections. First, behavioral results are presented, followed by electroencephalographical results.

6.4.1. Behavioral results

Behavioral data collected during the experiment were response times and accuracy rates in response to the comprehension questions.

6.4.1.1. Response times

Data from response times revealed a large main effect of Language (L1, L2), independently of the other factors (Lexical Valence, Ironicity) analyzed in two-by-two ANOVAs, $F(1,44) = 16.44$, $MSE = 53567.10$, $p < .001$, $\eta^2_p = .27$, 95% CI [0.08, 0.46]. Participants responded faster to comprehension questions in L1 ($EMM = 1684$ ms, 95% CI [1594, 1774]) than in L2 ($EMM = 1824$ ms, 95% CI [1713, 1934]).

The 2 Ironicity (ironic, literal) x 2 Language (L1, L2) ANOVA showed a large interaction, $F(1,44) = 67.81$, $MSE = 16584.44$, $p < .001$, $\eta^2_p = .61$, 95% CI [0.42, 0.73]. Post-hoc Bonferroni corrected pairwise comparisons demonstrated that participants responded faster to the comprehension questions following ironic ($EMM = 1647$ ms, 95% CI [1560, 1734]) than literal ($EMM = 1730$ ms, 95% CI [1630, 1830]) statements in L1; $t(44) = -3.28$, $p = .002$, $d = 0.49$. The opposite pattern was observed in L2 where participants responded faster to the comprehension questions following literal ($EMM = 1710$ ms, 95% CI [1607, 1813]) than ironic ($EMM = 1943$ ms, 95% CI [1818, 2068]) statements, $t(44) = 8.36$, $p < .001$, $d = 1.25$). In addition, a main effect of Ironicity was observed, whereby participants responded faster to the comprehension questions following literal ($EMM = 1720$ ms, 95% CI [1625, 1815]) than ironic ($EMM = 1795$ ms, 95% CI [1697, 1893]) statements, $F(1,44) = 16.43$, $MSE = 15364.60$, $p < .001$, $\eta^2_p = .27$, 95% CI [0.08, 0.46] (Fig. 2).

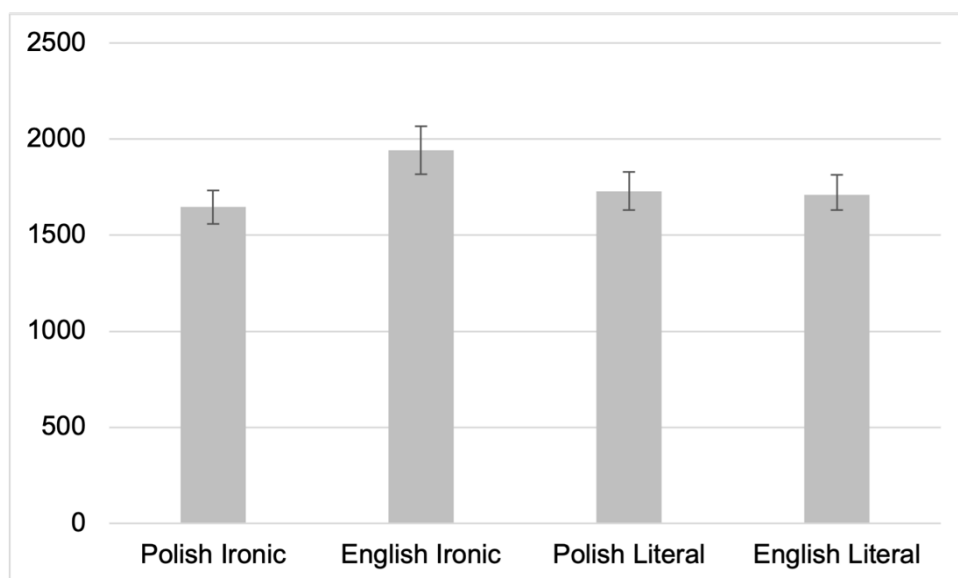


Fig. 2. Mean response times to comprehension questions following Polish ironic, English ironic, Polish literal and English literal items. Error bars represent 95% confidence intervals.

The 2 Lexical Valence (positive, negative) x 2 Language (L1, L2) ANOVA revealed a large two-way interaction, $F(1,44) = 48.94$, $MSE = 12877.06$, $p < .001$, $\eta^2_p = .53$, 95% CI [0.32, 0.67]. Post-hoc Bonferroni corrected pairwise comparisons demonstrated that participants responded faster to questions following sentences with positively ($EMM = 1589$ ms, 95% CI [1498, 1681]) than negatively ($EMM = 1778$ ms, 95% CI [1682, 1873]) valenced words in L1; $t(44) = -7.65$, $p < .001$, $d = 1.14$. The opposite pattern was observed in L2 where participants responded faster to questions following sentences with negatively (EMM

= 1799 ms, 95% CI [1690, 1909]) than positively ($EMM = 1848$ ms, 95% CI [1733, 1963]) valenced words, $t(44) = 2.47$, $p = .017$, $d = 0.37$ (Fig. 3). What is more, a main effect of Valence was observed, with participants responding faster to comprehension questions following sentences with positively ($EMM = 1719$ ms, 95% CI [1622, 1815]) than negatively ($EMM = 1789$ ms, 95% CI [1694, 1884]) valenced words, $F(1,44) = 23.55$, $MSE = 9365.77$, $p < .001$, $\eta^2_p = .35$, 95% CI [0.14, 0.53]).

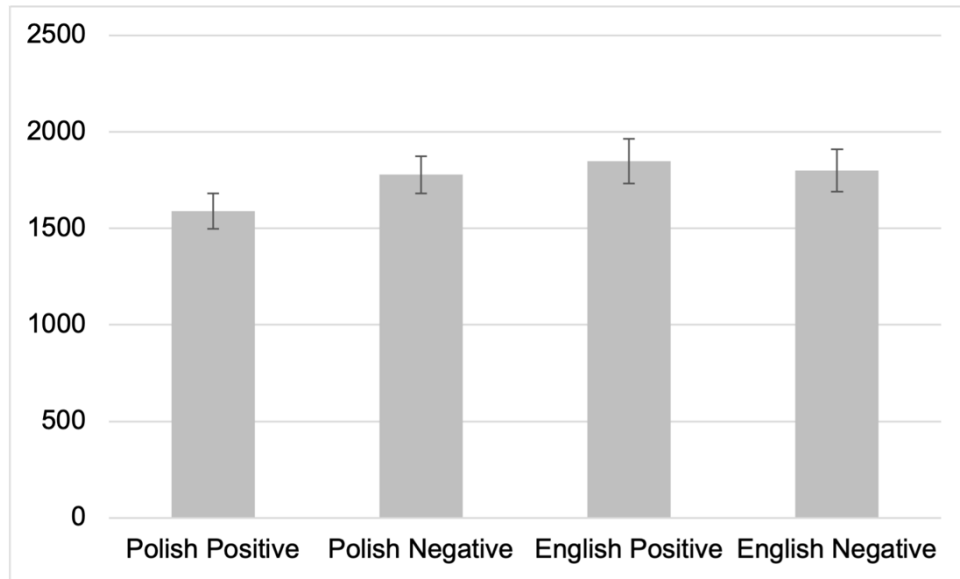


Fig. 3. Mean response times to comprehension questions following Polish Positive, Polish Negative, English Positive and English Negative items. Error bars represent 95% confidence intervals.

Due to the fact that Intention Valence was not a factor from the beginning of the study design, and only later appeared as a potentially important aspect of irony I decided to conduct exploratory analyses with Intention Valence. In the exploratory analysis, the 2 Intention Valence (praise, criticism) x 2 Language (L1, L2) ANOVA showed an interaction, $F(1,44) = 4.38$, $MSE = 16201.49$, $p = .042$, $\eta^2_p = .09$, 95% CI [0.00, 0.28]. Post-hoc Bonferroni corrected pairwise comparisons demonstrated that the difference in response times between criticism and praise did not reach significance in Polish ($p = .128$) or English ($p = .117$) (Fig. 4).

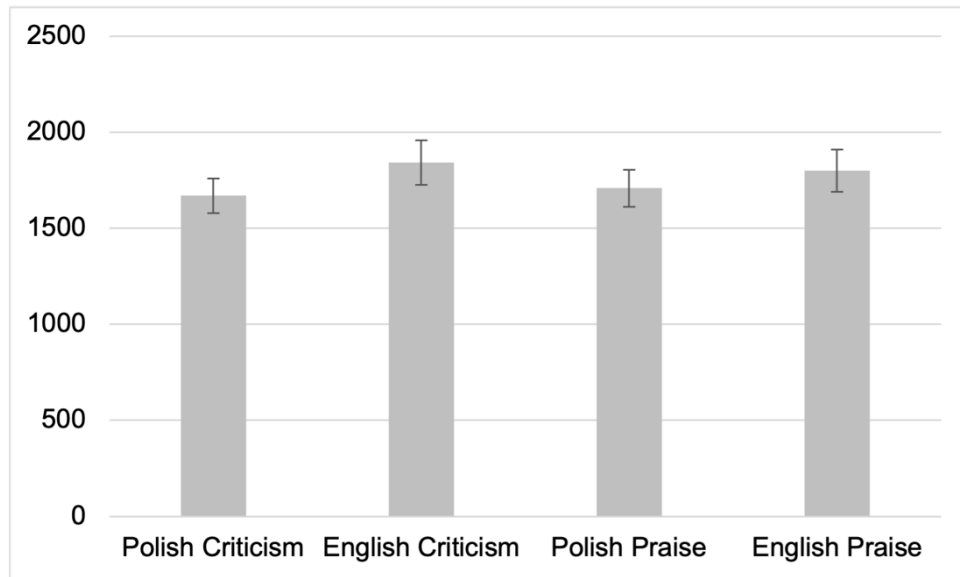


Fig. 4. Mean response times to comprehension questions following Polish criticism, English criticism, Polish praise and English praise items. Error bars represent 95% confidence intervals.

6.4.1.2. Accuracy

The analysis of the accuracy data showed a main effect of Language, independent of the other factors (Lexical Valence, Ironicity) analyzed in two-by-two ANOVAs, $F(1,44) = 14.16$, $MSE = 0.00$, $p < .001$, $\eta^2_p = .24$, 95% CI [0.06, 0.44], revealing that participants responded more accurately to comprehension questions in L1 ($EMM = 94\%$, 95% CI [0.91, 0.97]) than in L2 ($EMM = 91\%$, 95% CI [0.88, 0.94]).

The 2 Ironicity (ironic, literal) x 2 Language (L1, L2) ANOVA showed an interaction, $F(1,44) = 9.81$, $MSE = 0.00$, $p = .003$, $\eta^2_p = .18$, 95% CI [0.02, 0.38]. Post-hoc Bonferroni corrected pairwise comparisons showed that participants responded more accurately to comprehension questions following literal ($EMM = 95\%$, 95% CI [0.91, 0.98]) than ironic ($EMM = 87\%$, 95% CI [0.84, 0.91]) sentences in L2, $t(44) = -6.62$, $p < .001$, $d = 0.99$, but this was not the case in L1 ($p = .135$; ironic: $EMM = 93\%$, 95% CI [0.89, 0.97], literal: $EMM = 95\%$, 95% CI [0.92, 0.98]) (Fig. 5). In addition, the main effect of Ironicity was observed, showing more accurate responses to questions following literal sentences compared to questions following ironic sentences (ironic: $EMM = 90\%$, 95% CI [0.87, 0.94]; literal: $EMM = 95\%$, 95% CI [0.91, 0.98]), $F(1,44) = 31.17$, $MSE = 0.00$, $p < .001$, $\eta^2_p = .41$, 95% CI [0.20, 0.58].

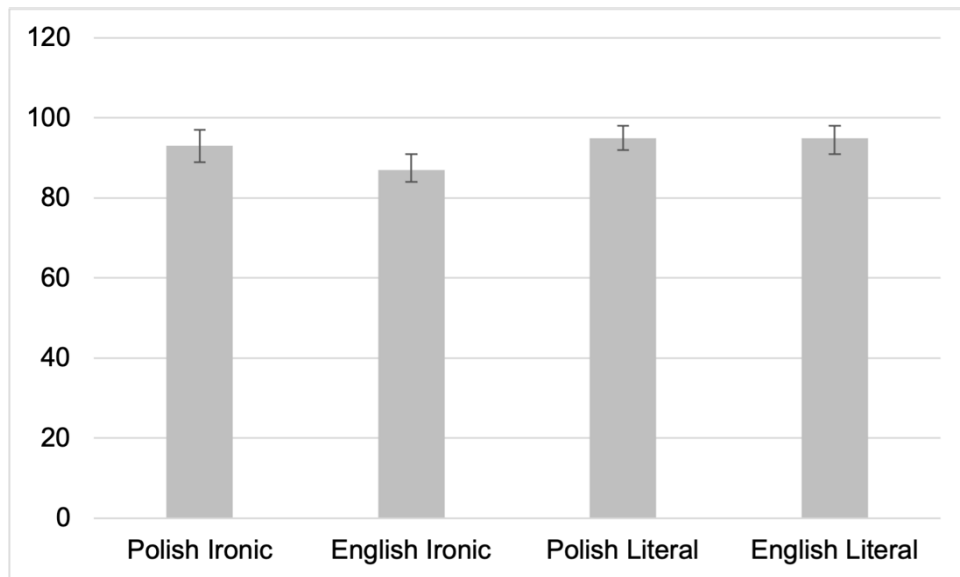


Fig. 5. Mean accuracy to comprehension questions following Polish ironic, English ironic, Polish literal and English literal items. Error bars represent 95% confidence intervals.

The 2 Lexical Valence (positive, negative) x 2 Language (L1, L2) ANOVA revealed a two-way interaction, $F(1,44) = 18.58$, $MSE = 0.00$, $p < .001$, $\eta^2_p = .30$, 95% CI [0.09, 0.49]. Post-hoc Bonferroni corrected pairwise comparisons showed that participants responded more accurately to comprehension questions following negatively ($EMM = 93\%$, 95% CI [0.90, 0.97]) than positively ($EMM = 89\%$, 95% CI [0.85, 0.92]) valenced sentences in L2; $t(44) = -4.29$, $p < .001$, $d = 0.64$, but this was not the case in L1 ($p = .125$; positive: $EMM = 95\%$, 95% CI [0.91, 0.98], negative: $EMM = 93\%$, 95% CI [0.90, 0.97]) (Fig. 6). The main effect of Lexical Valence was not observed ($p = .078$).

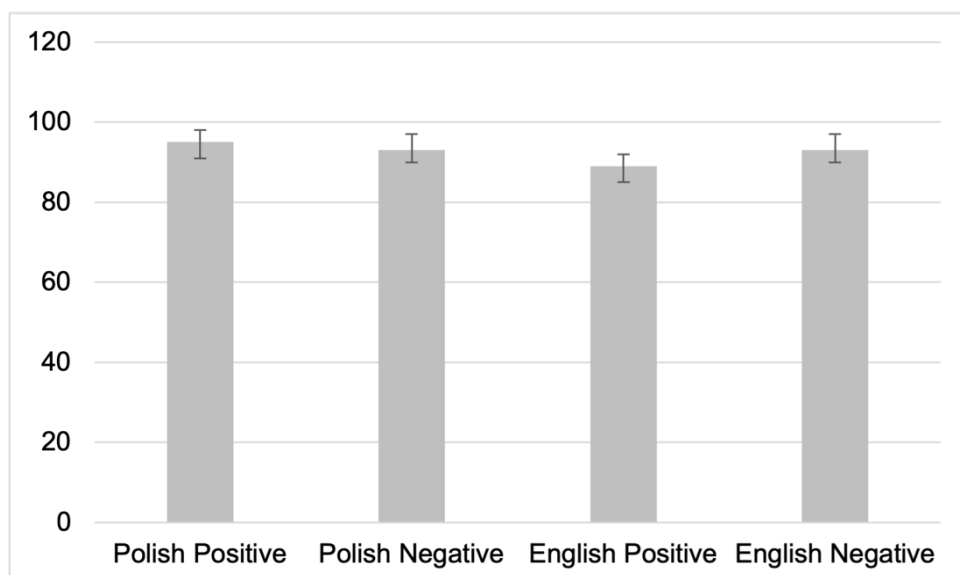


Fig. 6. Mean accuracy to comprehension questions following Polish positive, Polish negative, English positive and English negative items. Error bars represent 95% confidence intervals.

In the exploratory analysis, the 2 Intention Valence (praise, criticism) x 2 Language (L1, L2) ANOVA showed an interaction, $F(1,44) = 8.14$, $MSE = 0.00$, $p = .007$, $\eta^2_p = .16$, 95% CI [0.01, 0.35]. Post-hoc Bonferroni corrected pairwise comparisons showed that in L2 participants responded more accurately to questions following statements conveying praise ($EMM = 92\%$, 95% CI [0.89, 0.96]) than criticism ($EMM = 90\%$, 95% CI [0.86, 0.93]), $t(44) = -2.30$, $p = .027$, $d = -0.35$. The difference between praise and criticism in Polish did not reach significance ($p = .430$) (Fig. 7).

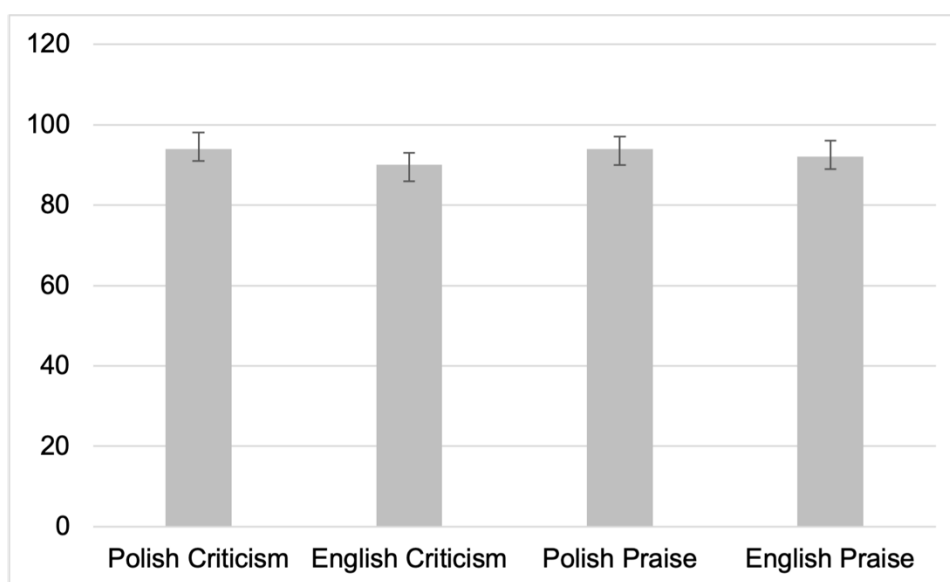


Fig. 7. Mean accuracy to comprehension questions following Polish criticism, English criticism, Polish praise and English praise items. Error bars represent 95% confidence intervals.

6.4.2. Electrophysiological results

6.4.2.1. P1

In all two-by-two ANOVAs - 2 Lexical Valence (positive, negative) x 2 Language (L1, L2), 2 Ironicity (ironic, literal) x 2 Language (L1, L2), 2 Intention (praise, criticism) x 2 Language (L1, L2), a main effect of Language was observed, $F(1, 44) = 12.43$, $MSE =$

0.75, $p < .001$, $\eta^2_p = .22$, 95% CI [0.04, 0.42]. Larger P1 amplitudes were elicited by L2 ($EMM = 1.29 \mu V$, 95% CI [0.75, 1.84]) than L1 ($EMM = 0.84 \mu V$, 95% CI [0.24, 1.43]) (Fig. 8). No other significant interactions or main effects were observed ($ps > .1$).

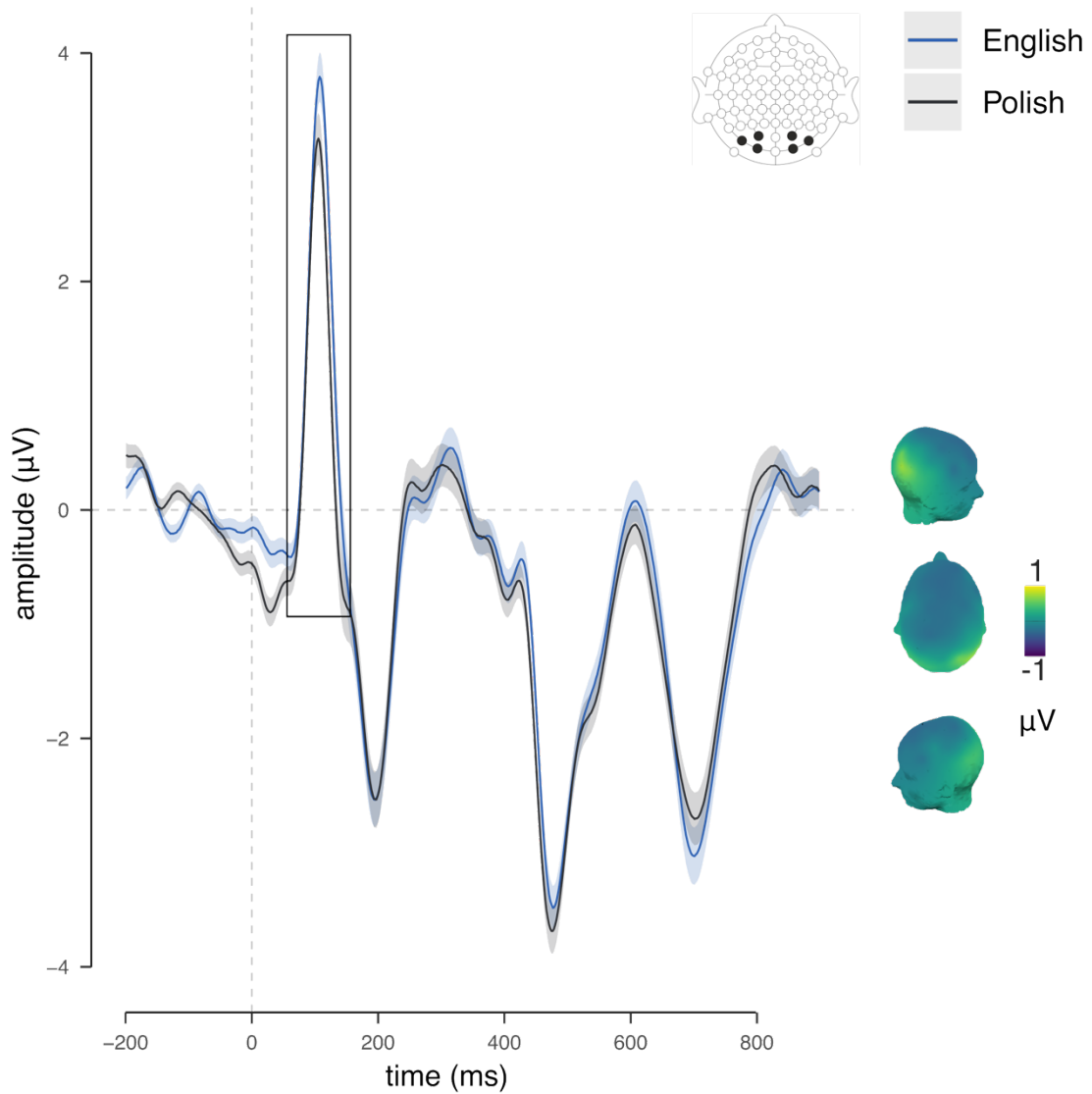


Fig. 8. Event-related potentials elicited by L1 Polish and L2 English at O1, O2, PO3, PO4, PO7, and PO8 electrodes. The graph illustrates the main effect of Language on the P1 amplitude. The ribbons around the waveforms depict 95% confidence intervals.

6.4.2.2. N1

In the 2 Lexical Valence (positive, negative) x 2 Language (L1, L2) ANOVA a main effect of Lexical Valence was revealed, $F(1,44) = 11.75$, $MSE = 0.87$, $p = .001$, $\eta^2_p = .21$, 95% CI

[0.04, 0.41]. Larger N1 amplitudes were elicited by sentences with negative target words ($EMM = -3.64 \mu V$, 95% CI [-4.31, -2.97]) than sentences with positive target words ($EMM = -3.16 \mu V$, 95% CI [-3.87, -2.45]) (Fig. 9).

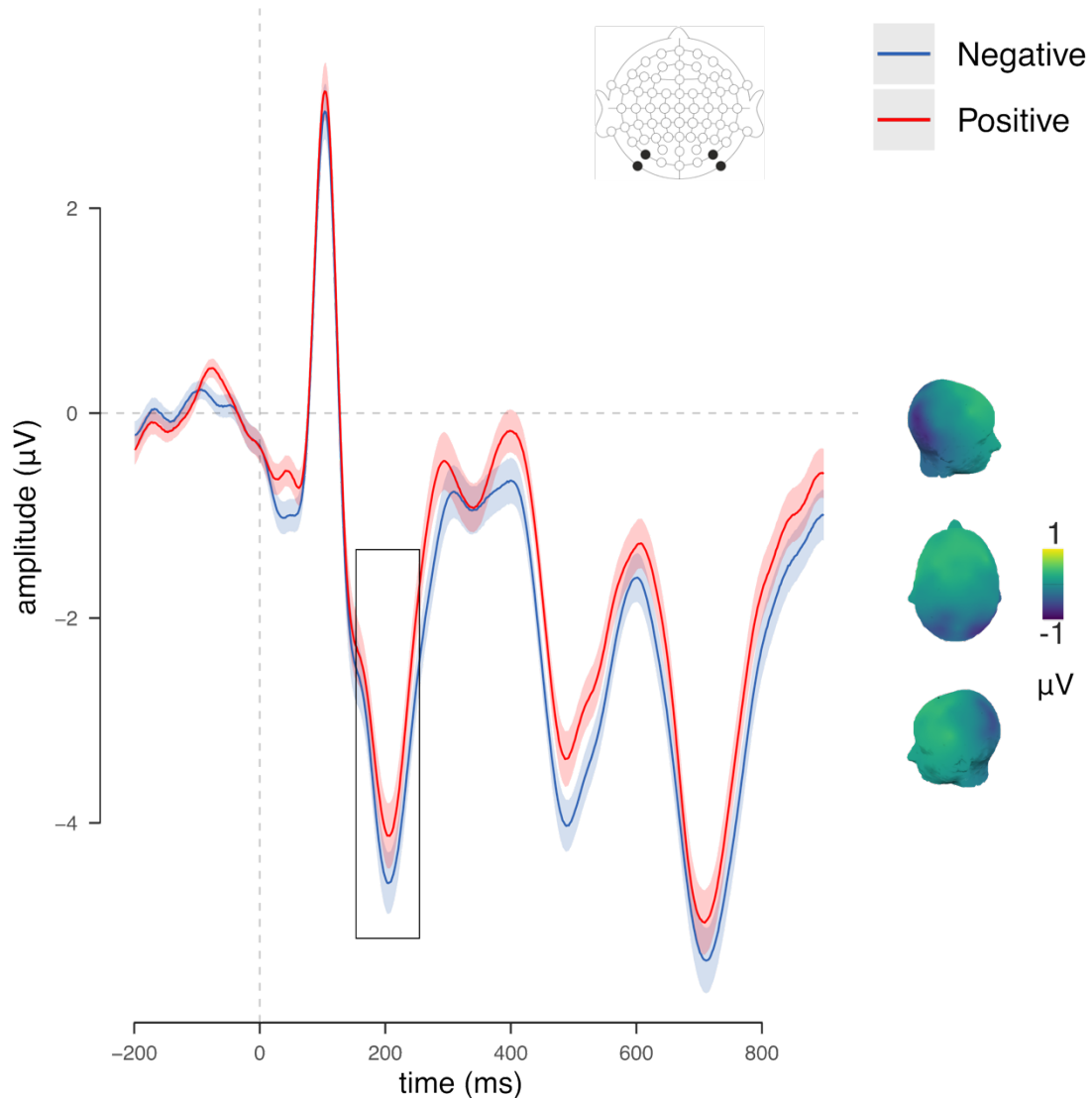


Fig. 9. Event-related potentials elicited by positive and negative words at PO7, PO8, P9 and P10 electrodes. The graph illustrates the main effect of Valence on the N1 amplitude. The ribbons around the waveforms depict 95% confidence intervals.

6.4.2.3. P200

The 2 Lexical Valence (positive, negative) x 2 Language (L1, L2) ANOVA revealed an interaction between Lexical Valence and Language, $F(1,44) = 5.11$, $MSE = 0.19$, $p = .029$,

$\eta^2_p = .10$, 95% CI [0.00, 0.29]. Post-hoc Bonferroni corrected pairwise comparisons showed that larger P200 amplitudes were observed in response to negative target words ($EMM = 1.48 \mu V$, 95% CI [1.14, 1.83]) compared to positive target words ($EMM = 1.25 \mu V$, 95% CI [0.89, 1.60]) in L2, $t(44) = -2.16$, $p = .036$, $d = 0.32$. This difference did not reach significance in L1 ($p = .570$; positive: $EMM = 1.36 \mu V$, 95% CI [0.98, 1.74]; negative: $EMM = 1.30 \mu V$, 95% CI [0.91, 1.70]) (Fig. 10). There were no main effects of either Language ($p = .751$) or Lexical Valence ($p = .262$) on the P200 amplitude.

In the 2 Ironicity (ironic, literal) x 2 Language (L1, L2) ANOVA there was neither a main effect of Ironicity ($p = .920$), nor the interaction between Ironicity and Language ($p = .637$). In the exploratory analysis of the P200, the 2 Intention (criticism, praise) x 2 Language (L1, L2) ANOVA did not reveal a main effect of Intention ($p = .125$), or the interaction between Intention and Language ($p = .327$).

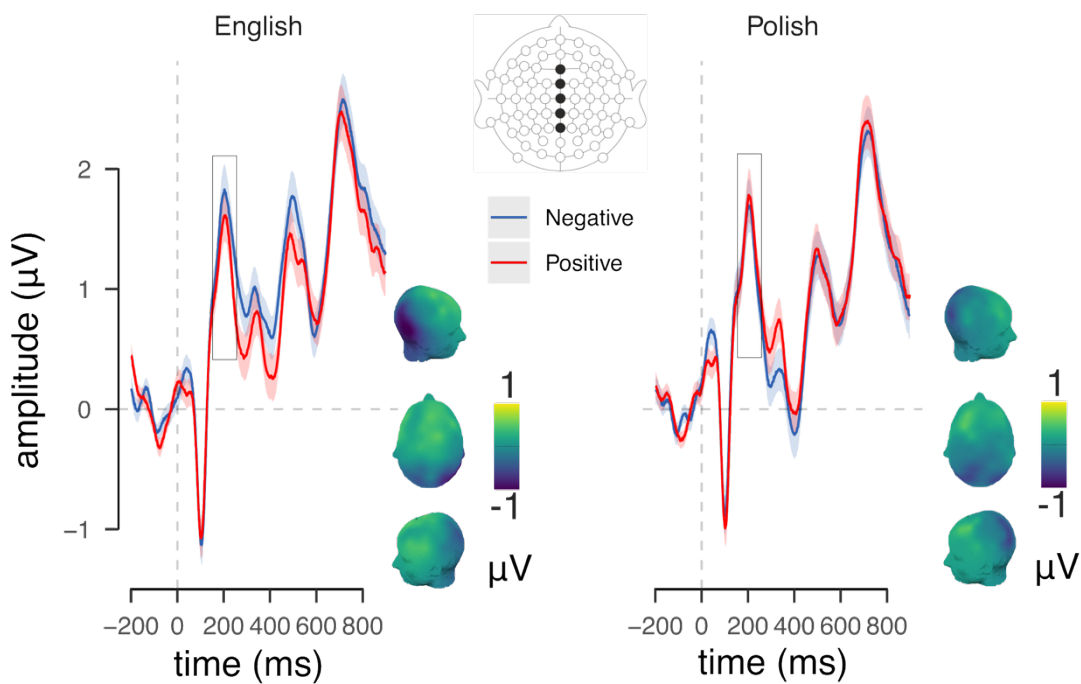


Fig. 10. Event-related potentials elicited by negative and positive target words in L2 English (left) and L1 Polish (right) at Fz, FCz, Cz, CPz and Pz electrodes. The graph illustrates the Valence by Language interaction on P200 amplitude. The ribbons around the waveforms depict 95% confidence intervals.

6.4.2.4. N400

Overall, a main effect of Language was observed, independent of the other factors analyzed in two-by-two ANOVAs, $F(1,44) = 12.79$, $MSE = 0.67$, $p < .001$, $\eta_p^2 = .23$, 95% CI [0.05, 0.42]. Larger N400 amplitudes were elicited in L1 ($EMM = 0.28 \mu V$, 95% CI [0.03, 0.54]) than in L2 ($EMM = 0.72 \mu V$, 95% CI [0.39, 1.05]) (Fig. 11).

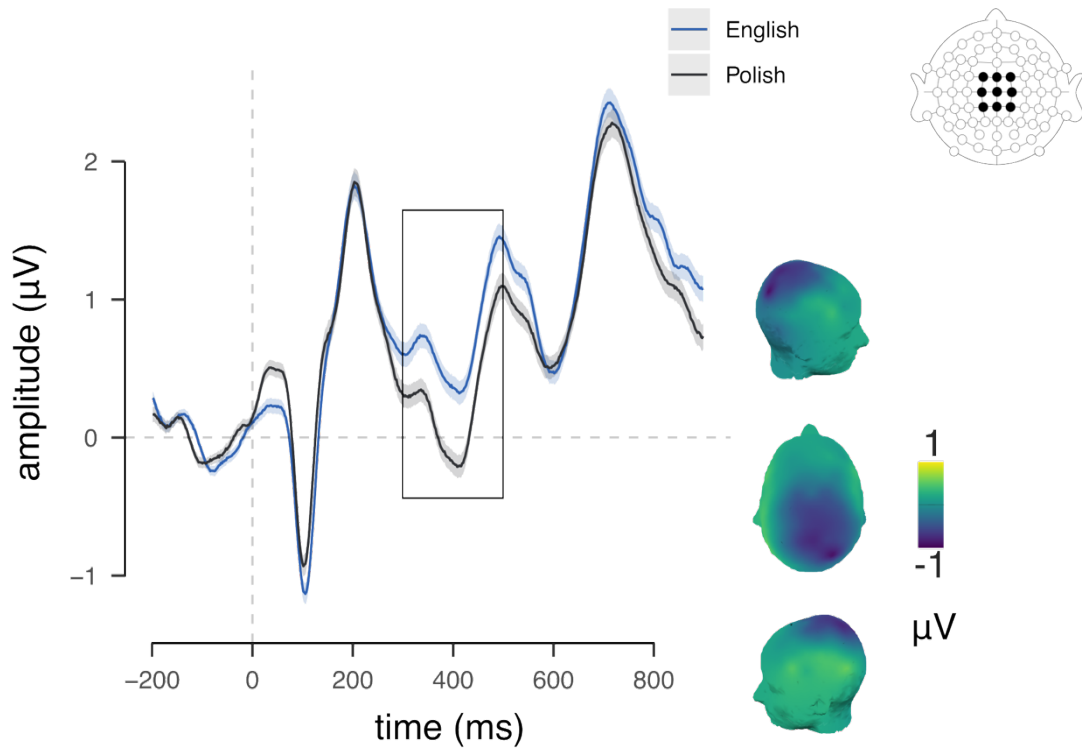


Fig. 11. Event-related potentials elicited by L1 Polish and L2 English at FC1, FCz, FC2, C1, Cz, C2, CP1, CPz, and CP2 electrodes. The graph illustrates the main effect of Language on the N400 amplitude. The ribbons around the waveforms depict 95% confidence intervals.

In the 2 Ironicity (ironic, literal) $\times$ 2 Language (L1, L2) ANOVA an interaction was observed, $F(1,44) = 5.87$, $MSE = 0.26$, $p = .020$, $\eta_p^2 = .12$, 95% CI [0.00, 0.31]. Post-hoc Bonferroni corrected pairwise comparisons showed larger N400 amplitudes in response to the target words in ironic sentences ($EMM = 0.56 \mu V$, 95% CI [0.22, 0.91]) than in literal sentences in L2 ($EMM = 0.88 \mu V$, 95% CI [0.54, 1.22]; $t(44) = -3.16$, $p = .003$, $d = 0.47$), but not in L1 ($p = .649$; ironic: $EMM = 0.31 \mu V$, 95% CI [0.01, 0.61]; literal: $EMM = 0.26 \mu V$, 95% CI [-0.00, 0.52]) (Fig. 12). In addition, larger N400 amplitudes were observed for the target words in literal sentences in L1 than in L2, $t(44) = 4.50$, $p < .001$, $d = 0.67$, but the interaction proved insignificant for the target words in ironic sentences, $p = .098$. What is more, the main effect of Ironicity did not reach significance, but it revealed a medium ef-

fect size, suggesting there might be a potentially meaningful trend (ironic: $EMM = 0.44 \mu V$, 95% CI [0.15, 0.72]; literal: $EMM = 0.57 \mu V$, 95% CI [0.30, 0.84]), $F(1,44) = 3.24$, $MSE = 0.25$, $p = .079$, $\eta^2_p = .07$, 95% CI [0.00, 0.25].

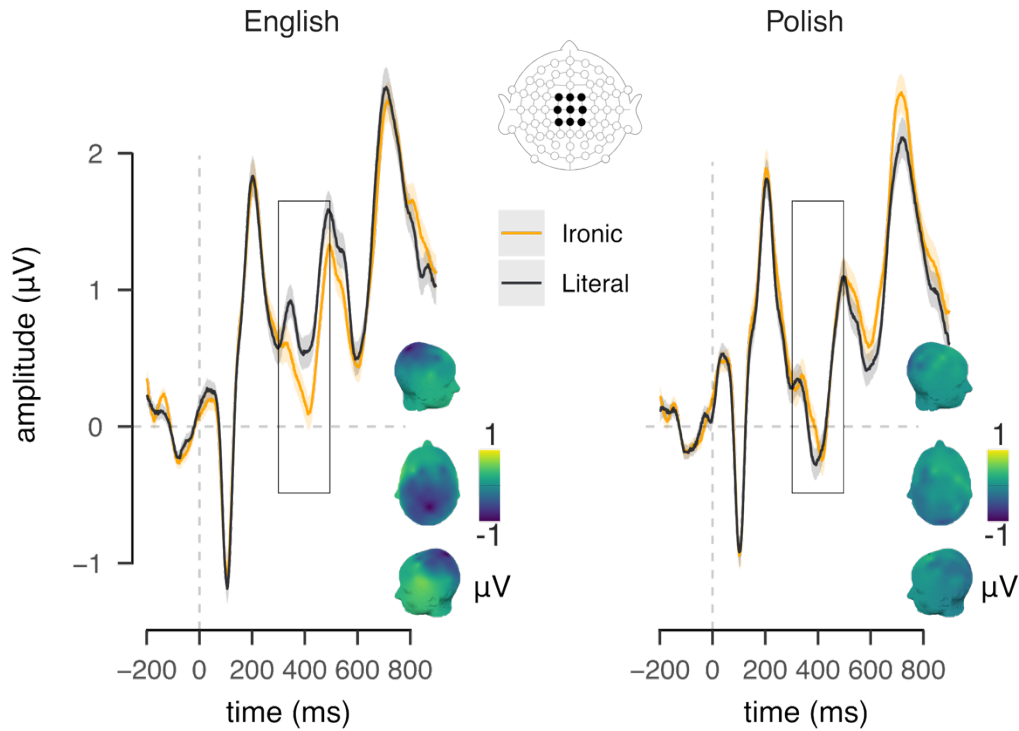


Fig. 12. Event-related potentials elicited by ironic and literal target words in L2 English (left) and L1 Polish (right) at FC1, FCz, FC2, C1, Cz, C2, CP1, CPz, and CP2 electrodes. The graph illustrates the Ironicity by Language interaction on the N400 amplitude. The ribbons around the waveforms depict 95% confidence intervals.

In the 2 Lexical Valence (positive, negative) x 2 Language (L1, L2) ANOVA an interaction was observed, $F(1,44) = 23.91$, $MSE = 0.16$, $p < .001$, $\eta^2_p = .35$, 95% CI [0.14, 0.53]. Post-hoc Bonferroni corrected pairwise comparisons showed that reduced N400 amplitudes were observed in response to negative target words ($EMM = 0.90 \mu V$, 95% CI [0.57, 1.23]) in comparison to positive target words ($EMM = 0.54 \mu V$, 95% CI [0.19, 0.90]) in L2, $t(44) = -3.98$, $p < .001$, $d = 0.59$. In L1, the pattern was reversed, reduced N400 amplitudes were observed in response to positive target words ($EMM = 0.40 \mu V$, 95% CI [0.11, 0.69]) relative to negative target words ($EMM = 0.17 \mu V$, 95% CI [-0.09, 0.43]), $t(44) = 2.33$, $p = .025$, $d = 0.35$ (Fig. 13). Moreover, Bonferroni corrected pairwise comparisons showed that

reduced N400 amplitudes were elicited by negative target words in L2 compared to L1, $t(44) = 5.28, p < .001, d = 0.79$. There were no differences elicited by positive target words between L1 and L2, $p = .298$. There was no main effect of Lexical Valence ($p > .1$).

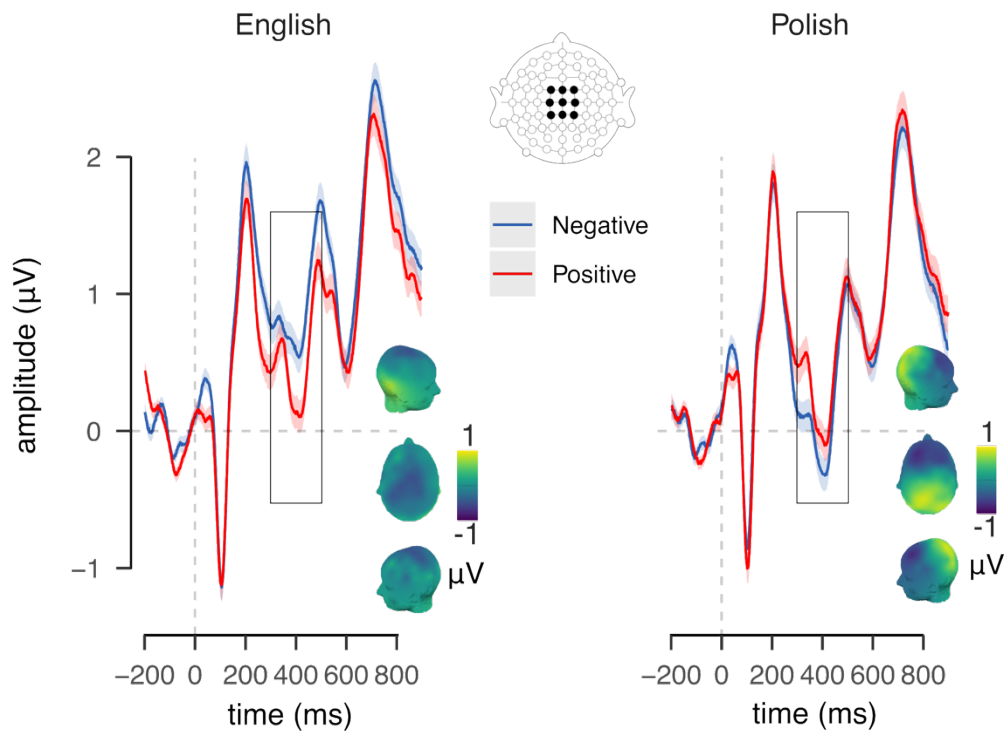


Fig. 13. Event-related potentials elicited by negative and positive target words in L2 English (left) and L1 Polish (right) at FC1, FCz, FC2, C1, Cz, C2, CP1, CPz, and CP2 electrodes. The graph illustrates the Lexical Valence by Language interaction on the N400 amplitude. The ribbons around the waveforms depict 95% confidence intervals.

Due to the fact that this study implemented a fully counterbalanced three-way experimental design, a potential three-way interaction of Language, Ironicity and Intention Valence was also explored. It is noteworthy, that owing to the insufficient statistical power, this analysis was only exploratory. Therefore, any significance obtained for the interactions should be treated with caution and needs validation in further studies.

The three-way exploratory 2 Ironicity (ironic, literal) x 2 Language (L1, L2) x 2 Intention Valence (criticism, praise) ANOVA showed an interaction, $F(1,44) = 23.91, MSE = 0.33, p < .001, \eta^2_p = .35, 95\% \text{ CI } [0.14, 0.53]$. This interaction was further unpacked to inspect L1 and L2 in separate analyses.

In the 2 Ironicity (ironic, literal) x 2 Intention Valence (criticism, praise) ANOVA an interaction was revealed in L1, $F(1,44) = 5.41$, $MSE = 0.46$, $p = .025$, $\eta^2_p = .11$, 95% CI [0.00, 0.30]. Post-hoc Bonferroni corrected pairwise comparisons showed that larger N400 amplitudes were evoked by the target words in sentences communicating ironic praise ($EMM = 0.16 \mu V$, 95% CI [-0.16, 0.48]) than in sentences communicating ironic criticism ($EMM = 0.46 \mu V$, 95% CI [0.10, 0.81]), $t(44) = 1.96$, $p = .056$, $d = 0.30$. There were no differences in the amplitude of the N400 between the target words in sentences communicating literal praise and literal criticism ($p = .247$). In addition, literal criticism revealed larger N400 amplitudes compared to ironic criticism, $t(44) = 2.03$, $p = .048$, $d = 0.30$. There were no differences in the N400 amplitudes elicited by literal praise and ironic praise ($p = .256$).

In the 2 Ironicity (ironic, literal) x 2 Intention Valence (criticism, praise) ANOVA a large interaction was revealed in L2, $F(1,44) = 15.85$, $MSE = 0.36$, $p < .001$, $\eta^2_p = .26$, 95% CI [0.07, 0.46]. Post-hoc Bonferroni corrected pairwise comparisons showed that larger N400 amplitudes were elicited by the target words in sentences communicating ironic criticism ($EMM = 0.35 \mu V$, 95% CI [-0.02, 0.73]) than ironic praise ($EMM = 0.77 \mu V$, 95% CI [0.41, 1.13]), $t(44) = -3.28$, $p = .002$, $d = 0.49$. In addition, larger N400 amplitudes were observed in response to literal praise ($EMM = 0.73 \mu V$, 95% CI [0.36, 1.10]) than literal criticism ($EMM = 1.03 \mu V$, 95% CI [0.67, 1.39]), $t(44) = 2.25$, $p = .029$, $d = 0.34$. Additionally, ironic criticism elicited larger N400 amplitudes than literal criticism, $t(44) = -4.43$, $p < .001$, $d = 0.66$. There were no differences in the N400 amplitudes in response to literal praise and ironic praise ($p = .728$) (Fig. 14).

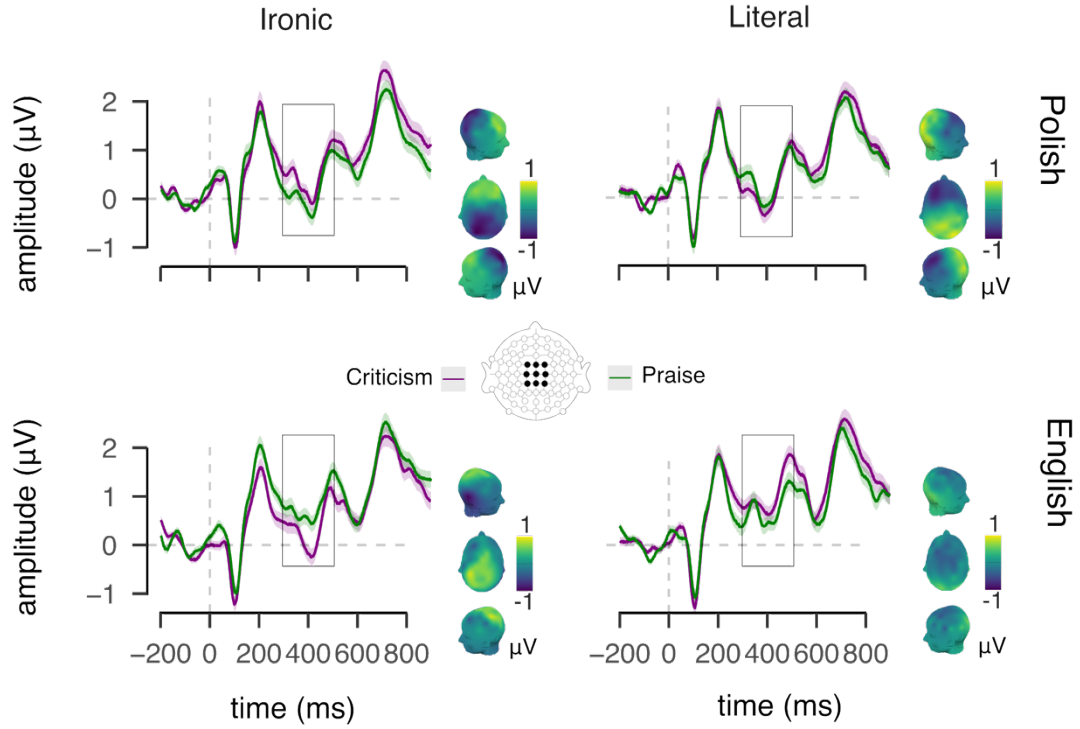


Fig. 14. Exploratory results: Event-related potentials elicited by critical and praising intention at FC1, FCz, FC2, C1, Cz, C2, CP1, CPz, and CP2 electrodes. The graph illustrates the Ironicity by Intention Valence interaction affecting the N400 in L1 Polish (top) and L2 English (bottom). The ribbons around the waveforms depict 95% confidence intervals.

6.4.2.5. LPP

The 2 Ironicity (ironic, literal) x 2 Language (L1, L2) ANOVA showed an interaction, $F(1, 44) = 9.56$, $MSE = 0.29$, $p = .003$, $\eta^2_p = .18$, 95% CI [0.02, 0.38]. Post-hoc Bonferroni corrected pairwise comparisons revealed larger LPP amplitudes in response to the target words in ironic sentences ($EMM = 1.28 \mu V$, 95% CI [0.91, 1.64]) than in literal sentences ($EMM = 1.0 \mu V$, 95% CI [0.67, 1.32]) in L1, $t(44) = 2.66$, $p = .011$, $d = 0.40$. This difference did not reach significance in L2 (ironic: $EMM = 1.19 \mu V$, 95% CI [0.83, 1.56]; literal: $EMM = 1.41 \mu V$, 95% CI [1.02, 1.79]), $t(44) = -2.00$, $p = .052$, $d = 0.30$, but the trend suggested the opposite direction to L1 (Fig. 15). Additionally, post-hoc pairwise comparisons revealed that in the target words in literal sentences larger LPP amplitudes were elicited in L2 than in L1, $t(44) = 2.64$, $p = .011$, $d = 0.39$, but the difference between languages did not reach significance in the case of the target words in ironic sentences, $t(44) = -0.55$, $p = .588$. There was no main effect of Ironicity ($p = .608$).

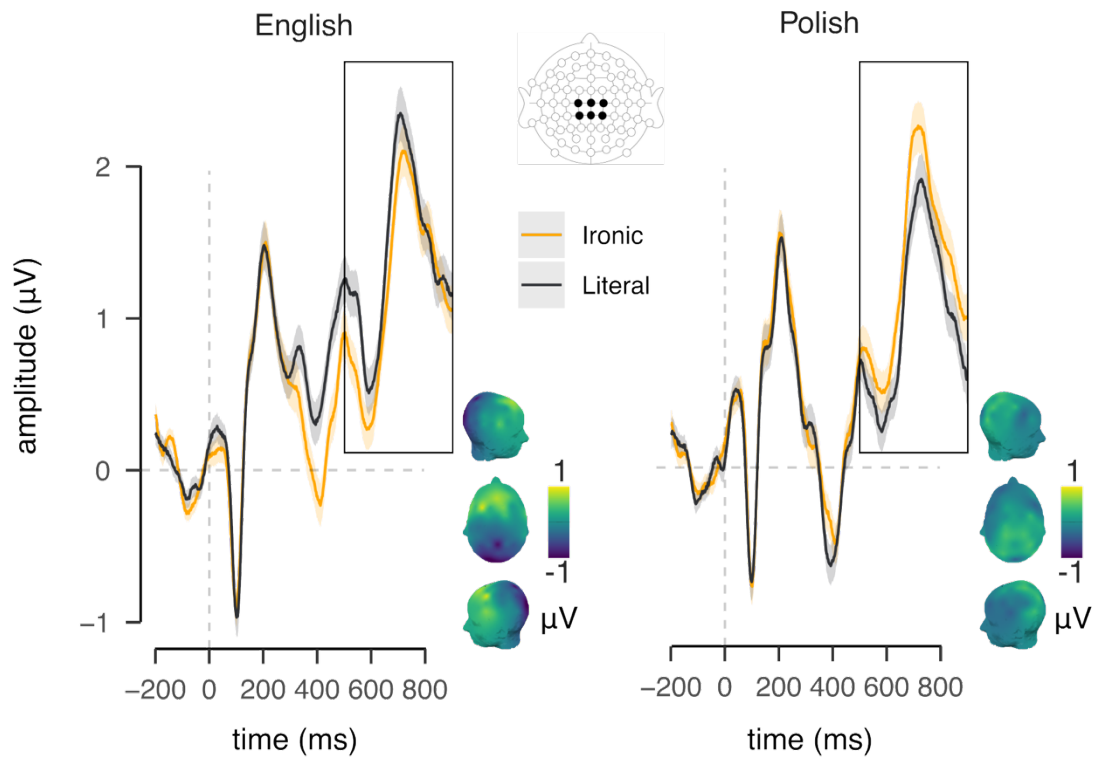


Fig. 15. Event-related potentials elicited by ironic and literal statements in L2 English (left) and L1 Polish (right) at C1, Cz, C2, CP1, CPz, and CP2 electrodes. The graph illustrates the Ironicity by Language interaction on the LPP amplitude. The ribbons around the waveforms depict 95% confidence intervals.

In the 2 Lexical Valence (positive, negative) x 2 Language (L1, L2) ANOVA there were no significant interactions between factors ($p = .072$, $\eta^2_p = .07$) or main effects of either Language ($p = .228$) or Lexical Valence ($p = .738$) on the LPP amplitude.

In the exploratory analysis of the LPP, the 2 Intention Valence (criticism, praise) x 2 Language (L1, L2) ANOVA revealed a main effect of Intention Valence, $F(1,44) = 7.44$, $MSE = 0.23$, $p = .009$, $\eta^2_p = .14$, 95% CI [0.01, 0.34]. Larger LPP amplitudes were observed in response to criticism ($EMM = 1.31 \mu V$, 95% CI [0.98, 1.65]) than praise ($EMM = 1.12 \mu V$, 95% CI [0.81, 1.43]) (Fig. 16). There were no other significant interactions or main effects.

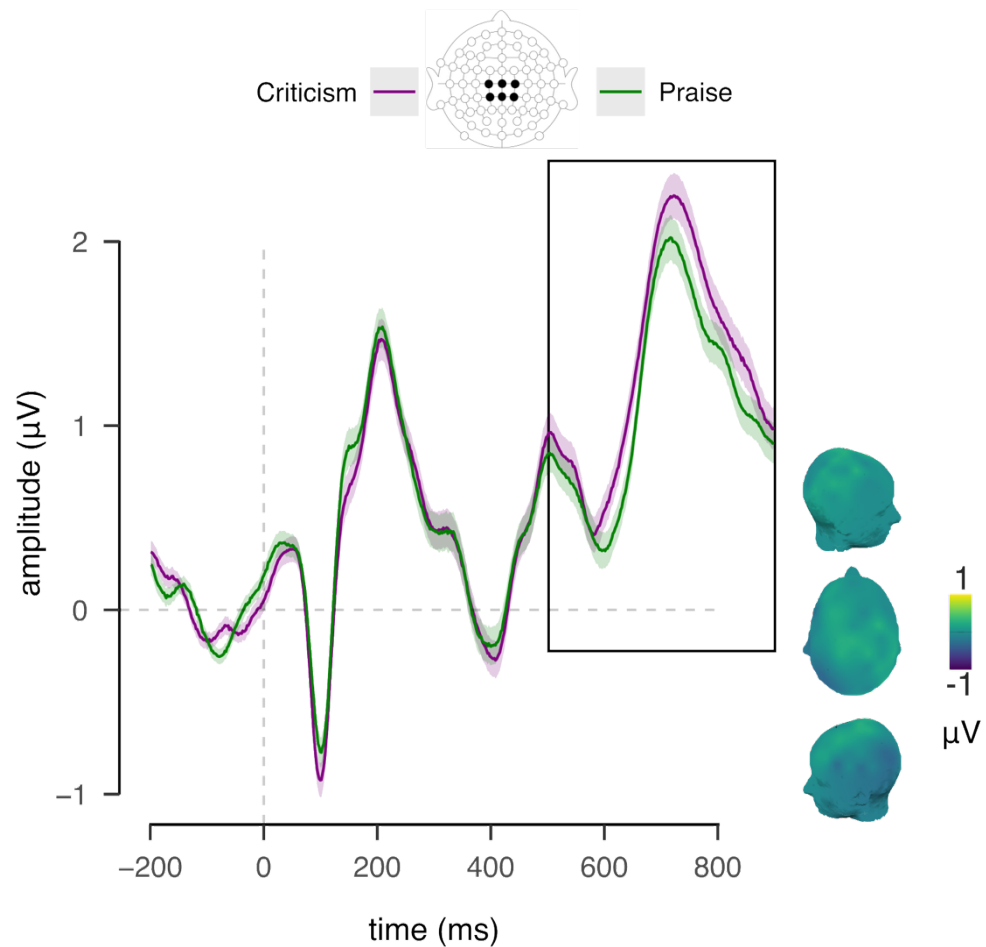


Fig. 16. Exploratory results: Event-related potentials elicited by critical and praising intention at C1, Cz, C2, CP1, CPz, and CP2 electrodes. The graph illustrates the main effect of Intention Valence on the LPP amplitude. The ribbons around the waveform depict 95% confidence intervals.

6.5. Conclusion

This chapter reported a study designed and conducted to explore and better explain the intricate nature of irony. The purpose of the study was to explore irony using electrophysiology to gain a more detailed and precise insight into the critical factors that are at play in irony: Language, Lexical Valence, and Intention Valence. Specifically, the present EEG experiment investigated how bilinguals process implicitly (ironically) and explicitly (literally) conveyed intentions by means of ironic criticism, ironic praise, literal criticism and literal praise in their L1 and L2. In the experiment 45 Polish-English bilingual participants read three-sentence scenarios communicating ironic criticism, ironic praise, literal criti-

cism, and literal praise in their L1 Polish and L2 English while their brain responses were recorded through EEG.

First, the results show that ironic statements elicited larger N400 amplitudes than literal statements in L2, but not in L1. This may indicate that participants found processing ironic meaning more cognitively taxing than literal meaning in their L2. In L1, processing ironic and literal meaning did not differ in terms of cognitive demands. On the contrary, at the later processing stages, irony processing elicited larger LPP amplitudes than literal meaning in L1, but not in L2. This, in turn, may reflect more effective processing of ironic meaning in the native language, relative to the non-native language, in which processing the literal and ironic meanings did not differ in the LPP time window. Regarding Lexical Valence, statements with negative words elicited larger P200 and N400 amplitudes in L2, but not in L1. The increased P200 amplitudes may be a reflection of increased attentional resources necessitated by negative words compared to positive words in L2. Reduced N400 amplitudes elicited by negative words in L2 may demonstrate that the semantic access to negative words in L2 is incomplete and suppressed during semantic integration and the meaning of the negative words in L2 may be accessed to a shallower extent. In the exploratory analysis with Intention Valence, larger N400 amplitudes were observed for ironic praise relative to ironic criticism in L1, while in L2 the effect was reversed. This shows that the less frequent, less conventional and less salient type of irony – ironic praise – was more cognitively taxing than the more frequent, more conventional and more salient type of irony – ironic criticism in L1. In L2, however, it was ironic criticism which elicited larger N400 amplitudes than ironic praise, possibly due to the suppressed semantic access to the meaning of the negative words which are imbedded in the statements communicating ironic praise. As a result, the amplitudes elicited by ironic praise with its negative words were reduced. These results should be interpreted with caution, as the analyses of Intention Valence in the present study were conducted exploratorily and need further validation. The results are discussed and interpreted in depth in the following chapter, where I will offer more extensive interpretations.

Chapter 7: Discussion

7.1. Introduction

In this PhD dissertation I sought to test and determine how the conceptualization of verbal irony modulates the cognitive and neurocognitive processes of irony comprehension. In addition, the present dissertation aimed at exploring these processes in bilinguals' L1 and L2 during irony comprehension by using electroencephalography. To the best of my knowledge, this is the first EEG study investigating irony processing in bilinguals' L1 and L2. Importantly, throughout the course of this dissertation, both in Part 1, where I presented the theoretical background of irony processing studies and in Part 2, where I reported the findings of my original study, the goal of the dissertation was to explore and test the peculiar nature of irony, which entails the said / meant dichotomy (Ironicity: ironic, literal) and the evaluative function (Lexical Valence: positive, negative). In the process of studying irony, I realized that previous empirical evidence may have been influenced by the paradigms used by investigators, and, especially, how irony was conceptualized in those studies. Specifically, the results may have been affected by irony being conceptualized as a figurative construct juxtaposed with the literal meaning or as a tool for expressing a wider, attitudinal, lexical valence-based meaning. Prior research predominantly investigated irony in relation to literal meaning, or irony and literalness while distinguishing the positive (literal praise, ironic criticism) and the negative (literal criticism, ironic praise) lexical valence of the literal meaning. In this dissertation I proposed that while this distinction is crucial and, quite probably, the reason of many disparities in evidence, there is another way of looking at irony and conceptualizing its nature. Through its said / meant and positive / negative valence dichotomies irony, ultimately, communicates the speaker's intended meaning

– the Intention Valence. While Lexical Valence refers to the positive or negative emotional tone of the literal meaning of words used to communicate irony or literalness, Intention Valence refers to the underlying communicative goal of that communicated irony or literalness. Depending on the valence of the literal meaning of words irony can convey criticism or praise. When communicating literally, in non-ironic settings the two properties – lexical valence and intention valence– are typically congruent. However, when communicating ironically, there is a mismatch between the emotional valence and the communicated intention. Therefore, in the present work I have attempted to show that in order to fully capture its peculiarity it appears appropriate to recognize this aspect of irony – Intention Valence.

In this final chapter, I discuss the findings of the present experimental study by looking at the three inherent aspects of irony (i) the said / meant dichotomy, (ii) the Lexical Valence (positive / negative), and (iii) the Intention Valence (praising / critical), and how they are modulated by the Language of operation (L1, L2).

7.2. The findings of the present electrophysiological study

In short, here, I would like to offer the main findings of the study. Then, I will turn to a more in-depth exploration of the findings in the forthcoming sections. The present EEG study showed that ironic statements elicited larger N400 amplitudes than literal sentences in L2, but not in L1. What is more, ironic sentences revealed larger LPP amplitudes than literal sentences in L1, but not in L2.

Regarding Lexical Valence, there was a main effect of Lexical Valence, showing larger N1 amplitudes for negative compared to positive valence. What is more, negative words embedded in comment sentences generated larger P200 amplitudes than positive words in L2, but there were no differences in the P200 amplitudes between positive and negative valence in L1. Negative words elicited reduced N400 amplitudes compared to positive words in L2, but larger N400 amplitudes than positive words in L1.

Regarding Intention Valence, the results showed a main effect of Intention Valence with larger LPP amplitudes elicited by criticism than praise. Additionally, when the analyses were divided into each language separately, larger N400 amplitudes were observed in response to ironic praise compared to ironic criticism, while there was no N400 amplitude difference between literal praise and literal criticism in L1. In L2, however, larger N400

amplitudes were observed in response to ironic criticism relative to ironic praise, and in response to literal praise relative to literal criticism.

Finally, the main effect of Language was observed on the N400 and P1 amplitudes. Larger N400 amplitudes were elicited by sentences presented in L1 compared to L2, and larger P1 amplitudes were elicited by sentences presented in L2 compared to L1.

Now, I turn to the discussion of the findings in more detail. I start with Ironicity as the key phenomenon in my dissertation.

7.2.1. Ironicity

The present study showed that ironic sentences elicited larger N400 amplitudes than literal sentences only in the L2. The same comparison did not reach significance in L1. Previous irony EEG research explored irony processing in L1 exclusively, and this is, to the best of my knowledge, the first EEG study to investigate irony processing in bilinguals' L1 and L2. The observed irony-related enhancement in the N400 amplitude relative to literal meaning in L2 may reflect increased cognitive effort required to process ironic meanings in the non-native language. Prior irony EEG research on monolinguals' L1 provides mixed results concerning N400 in irony processing in monolinguals. While there is some evidence demonstrating larger N400 amplitudes in response to ironic meaning processing (Cornejo et al. 2007; Filik et al. 2014; Katz et al. 2004; Shi and Lee 2022), other studies did not find such a modulation (Regel et al. 2010a; Regel et al. 2010b; Spotorno et al. 2013). It is noteworthy, that in these studies irony processing was most likely modulated by other variables in those studies designs' which did find an increase in the N400 for irony. For instance, larger N400 amplitudes were generated when participants were processing irony with a goal to search for coherence of the target comment with the preceding context based on the conventional fit of the comment as used in everyday life – holistic approach (Cornejo et al. 2007). Participants were explicitly told to determine whether the sentence would make sense in real life. However, when asked to determine the coherence of the comment based on the formal aspects of language and its congruency with the preceding context or the lack thereof – analytic approach – the amplitudes were greatly reduced. Cornejo and colleagues (2007) suggested that the N400 effect elicited by irony may have been caused by the lack of contextual information prompting an ironic interpretation. I argue that in the present

study, where participants were asked to read the scenarios for general comprehension, the two tasks (in Cornejo et al. 2007 and in the present study) may have been similar, and therefore the cognitive processes activated during such tasks may have been similar. However, I believe that the stimuli used in the present study provided sufficient contextual information to prompt an ironic reading of the scenarios. Another study which reported larger N400 amplitudes generated by irony compared familiar and unfamiliar ironic statements with their literal equivalents (Filik et al. 2014). While the N400 amplitudes generated by familiar ironic and literal statements did not differ, larger amplitudes were observed for unfamiliar ironic statements relative to their unfamiliar literal counterparts. Filik and colleagues (2014) argued this might reflect semantic processing difficulty when encountering a word incongruent with the context. Intriguingly, in the present study, the N400 irony effect only emerged in L2, but not in L1. Irony processing in L2 generated much deeper N400 amplitudes compared to literal meaning processing, suggesting that irony processing is more cognitively taxing than literalness in L2. Moreover, the amplitude generated by irony seems slightly delayed in comparison to the amplitude reflecting literal meaning processing which may suggest that irony processing may be slightly delayed and require slightly more time than literal meaning processing at least at this implicit stage of lexico-semantic access in L2. Larger N400 amplitudes in response to irony have also been observed when compared to predictable literal meaning, but not in comparison to unpredictable literal meaning (Shi and Li 2022). The authors speculated that the processing difficulty reflected by the N400 amplitude increase may result from the low predictability of irony. This, coupled with the results obtained by Filik and colleagues (2014) would suggest that whether ironic statements are predictable or familiar has an influence on the way irony is processed. When Shi and Li (2022) compared the amplitudes generated by both literal conditions (predictable and unpredictable), they observed that unpredictable literal sentences elicited larger N400 amplitudes than predictable literal conditions. Such a pattern of results suggests that the difficulty associated with irony processing may be caused by the unpredictability of semantic information embedded in the literal meaning of the ironic comment. In the present study, the observed N400-related difficulty may be an outcome of processing ironic meaning, which could be less familiar or less salient to the participants than literal meaning. In addition, the difficulty may have been enhanced by the language of operation – L2 – and less effective semantic integration in the non-native language. Even though participants in the present study demonstrated high L2 proficiency, their recognition of irony in

L2 was burdened with cognitive taxation stemming from processing meaning in the non-native language. This cognitive load does not seem to be the case in L1.

Surprisingly, the N400 amplitudes generated by ironic and literal meaning were similar in the native language, suggesting comparable cognitive effort when processing ironic and literal statements. This is a quite surprising result, given that the same comparison in L2 demonstrated larger N400 amplitudes in response to irony compared to literalness. Some previous research also failed to observe irony / literalness processing differences and ensuing difficulty at the N400 amplitude in L1. Regel and colleagues (2010a) did not observe increased N400 amplitudes elicited by the pragmatic manipulation in the part of the experiment during which participants were getting familiar with each speaker's communicative style and their tendency to use irony frequently or rarely. This lack of the observed N400 modulations was taken to reflect the absence of the impact of the communicative style on semantic information processing. In the second part of the experiment when speakers' communicative styles changed and each speaker used the same amount of irony and literal statements, ironic statements elicited reduced N400 amplitudes compared to literal statement uttered by the ironic speaker. At the same time, ironic statements uttered by the formerly non-ironic speaker generated slightly increased N400 amplitudes. This suggests that the pragmatic knowledge about the speaker communicative style may influence semantic meaning processing. These results may have been driven by anticipation effects, whereby irony spoken by a speaker known to be ironic was expected more than their literal statements, thus leading to the increased N400 amplitudes generated by literal statements. In the case of the non-ironic speaker, irony was less expected, thus increasing the N400 amplitude in response to irony. Regel and colleagues (2010a) suggest that these differences in the N400 amplitude may have been a result of participants' acquiring the knowledge about each speaker's communicative style, and not literal / ironic semantic differences. This would indicate that the N400 is modulated by the pragmatic knowledge, or an ironic state of mind created by enhanced expectations of ironic comments. Irony processing may not reveal larger N400 amplitudes as it may not entail semantic integration difficulty (Regel et al. 2010b; Regel and Gunter 2017) or semantic incompatibility (Regel et al. 2010b). This suggests that processing semantic information may not differ in the case of ironic and literal meaning. Even though the incongruence of the literal meaning and the preceding context lies at the heart of irony, the N400 amplitudes may remain unaffected by irony processing when it is pragmatically plausible and makes sense in a given communicative

context or a situation and achieves its figurative meaning without an enhanced cognitive effort. This study emphasized the enormous role of context in irony processing. The foregoing context has an enormous power of shaping the intended meaning, and even if the literal meaning of the target (ironic) comment contradicts the context it follows, the said context biases the interpretation toward a meaning which ultimately makes sense. Spotorno and colleagues (2013) proposed that the insensitivity of the N400 component to irony may mean that the mere surface level inconsistency is not a critical aspect of irony processing. It seems rather unlikely that in the case of the present study in L1 participants may have built some expectations of irony based on the frequency of irony occurrence, as the study design employed here did not allow for such a strategy. The distribution of ironic and literal scenarios was equal in both languages and care was taken to use as many literal as ironic stimuli (50/50). The explanation that irony processing may reveal semantic integration difficulty (Regel et al. 2010b; Regel and Gunter 2017) or semantic incompatibility (Regel et al. 2010b) seems more plausible in the case of the present study. Namely, in their native language participants may not have experienced the difficulty processing irony which they did experience in their L2.

In the LPP time window, ironic sentences elicited larger LPP amplitudes than literal sentences in L1. This result has previously been reported in irony EEG studies (Caffarra et al. 2019; Cornejo et al. 2007; Filik et al. 2014; Pfeifer and Lai 2021; Regel et al. 2010a; Regel et al. 2010b; Regel and Gunter 2017; Spotorno et al. 2013; Weissman and Tanner 2018). A great body of prior evidence supports this finding of increased P600/LPP amplitudes elicited by irony in comparison to literalness. Regel and colleagues (2010a) observed that when participants were learning about each speaker communicative manner, larger P600 amplitudes were elicited by irony uttered by the non-ironic speaker (using irony less frequently), but there were no differences between the amplitudes generated by irony and literalness by the ironic speaker. When speakers' communicative manners changed and they used ironic and literal communicative styles equally often, the amplitude of the P600 increased for irony uttered by the ironic speaker, but not by the non-ironic speaker. This suggests that the pragmatic knowledge acquired in the first session of the experiment affected the P600 amplitude in the second session for both types of speakers. Generally, the larger P600 amplitudes elicited by irony may reflect pragmatic information processing during which the speaker intended meaning is derived (Regel et al. 2010a; Regel et al. 2010b; Regel; and Gunter 2017), or processed on a conceptual level (Regel et al. 2010b). Moreo-

ver, it is suggested that the larger P600/LPP amplitudes in response to irony may reflect reintegration (Regel et al. 2010a), reanalysis (Pfeifer and Lai 2021; Regel and Gunter 2017), revision (Regel and Gunter 2017), reprocessing of the sentence meaning (Weissman and Tanner 2018), or later inferential (Regel and Gunter 2017; Spotorno et al. 2013) processes. During this late processing stage semantic and extralinguistic information is integrated (Regel et al. 2010b). What processes might be behind the P600 amplitude modulation has been nicely captured by Kuperberg (2007). Although Kuperberg (2007) explored syntactic processing, it seems to leave open room for a broader interpretation. According to Kuperberg (2007, language processing follows at least two processing streams which compete with each other. One is responsible for semantic memory-based mechanisms (N400), and the other is responsible for combinatorial mechanisms which assign structure to a sentence. It was suggested that the output resulting from the ongoing conflict of the two streams gives rise to a continued combinatorial analysis which is reflected by the enhancement of the P600. Kuperberg (2007) suggests that what might be analyzed in the combinatorial stage is “relationships between people, objects and actions to construct new meaning”. When making sense of irony, comprehenders need to construct a new meaning which is more nuanced and complex than the literal, lexical sum of the words. They need to leave the confines of the linguistic code and “combine” the contextual information in order to capture the wholeness of irony. The P600/LPP may be a reliable marker of irony processing as it is enhanced by irony regardless of statement familiarity (Filik et al. 2014).

Filik and colleagues (2014) observed that irony generally elicited larger P600 amplitudes, irrespective of whether the statement was familiar or unfamiliar. This is an interesting observation, as both statement types were processed differently at the N400 stage. It is argued that the P600 observed for irony does not reflect reanalysis processes as it would not be necessary for all ironic statements, as not all of them triggered a context / statement mismatch. I argue it is necessary to specify what reanalysis processes might have happened at this stage. It is suggested that in line with the indirect negation hypothesis (Giora 1995) irony draws attention to failed expectations. The two meanings of the target statement (literal and ironic) in conflict, the said and the meant, are retained and the difference between them is computed. Therefore, the observed LPP effect for irony in L1 may reflect this conflict. It seems a plausible explanation in the present study with irony eliciting larger LPP amplitudes in L1. Since irony processing in L1 was not cognitively taxing at the N400 stage relative to literal meaning, and the semantic integration of irony and literalness pro-

ceeded smoothly, it seems unlikely that the LPP enhancement reflects the reanalysis caused by the cognitively taxing semantic meaning processing of irony. Rather, the LPP enhancement may index reanalysis of the incongruity of the literal and ironic meanings, which is central to irony. It is possible that at this later processing stage in L1, the brain engaged in additional processing aimed at deriving the correct interpretation of the speaker meaning. Another potential interpretation is that having made some expectations of the speaker intention at the earlier stages of the N400 component, the brain initiates additional late inferential processes to confirm or disconfirm the previously formed predictions. The previously mentioned studies explored irony processing in its simple ironic / literal stimuli set. Even though in the present study Lexical Valence did not interact with Language on the LPP amplitude, it makes sense to acknowledge that the enhancement of the LPP in response to irony in this study, where a broader stimulus category valence-based set was used, has previously been observed (Caffarra et al. 2019).

Caffarra and colleagues (2019) who explored irony and literal meaning processing in its positively and negatively valenced variants reported larger P600 amplitudes elicited by irony. It was suggested that this late modulation reflected late inferential processes such as pragmatic conventions, conversation rules or expectations concerning the interlocutor. These late inferential processes would be necessary to discover the speaker intended meaning, an interpretation I subscribe to in the explanation of the present study results. The presence of the increased LPP amplitude induced by irony compared to literalness in L1 also shows that irony processing is more complete and more effective in L1, but not in L2, which may explain the continued reanalysis in the native language. Finally, it seems interesting that in the present study the N400 and LPP components were modulated differently by Ironicity. While irony elicited increased N400 amplitudes in L2, it increased the LPP amplitudes in L1. This is an interesting result, suggesting that irony processing may involve distinct neurocognitive mechanisms depending on the language context. On the one hand, semantic integration processes are more intensive in L2, on the other hand, pragmatic reanalysis is more prominent in L1.

Such a continued reanalysis was not observed in L2 as the difference between the LPP amplitudes elicited by ironic and literal sentences did not reach significance in L2. The LPP amplitudes generated by irony and literalness were similar. At the earlier processing stage (N400), irony processing in L2 was more cognitively taxing than literal meaning, and the semantic integration was less effective, which may have thwarted any potential further

reanalysis. Such a result shows that irony processing in L2 is less complete and less effective and does not necessitate the reanalysis that L1 irony processing does.

Finally, the present study failed to find P200 modulations by Ironicity. Several previous studies have found larger P200 amplitudes in response to irony (Regel and Gunter 2017; Regel et al. 2010a; Weissman and Tanner 2018). For example, in the study exploring the influence of the speaker communicative style on irony processing, Regel and colleagues (2010a) observed larger P200 amplitudes elicited by irony compared to literal statements.

7.2.2. Lexical Valence

In the present study, sentences featuring words with negative Lexical Valence elicited larger N1 amplitudes relative to positively valenced target words. This result on the component which reflects visual sensory processing (Kiefer et al. 2007) may suggest that negatively valenced words were more attention-grabbing at this early processing stage. From this it follows that the brain can differentiate between negative and positive stimuli before it attends to later semantic processing.

Moreover, at the further processing stage - 200 ms after the onset of the target word - statements with negatively valenced words elicited larger P200 amplitudes than statements with positively valenced words and only in the second language. It shows that in L2, words with negative Lexical Valence attract more attention than words with positive Lexical Valence in the early processing stages. Previously, increased P200 amplitudes have been observed in visual perception in response to negative stimuli such as pictures (Carretié et al. 2001). Carretié and colleagues (2001) explored the role of attention by presenting participants with pictures featuring positive or negative Lexical Valence. Increased P200 amplitudes were observed in response to negative pictures but not positive ones. Similarly, the negativity-bias, a pronounced response to negative content, was observed in a study exploring social and nonsocial semantic information (Fan et al. 2023). Participants were presented with word pairs in their L1 Chinese consisting of a prime word followed by a target word. Prime words were either person names or object names. Target words were either positive and negative personality traits used to talk about people (social information), or positive and negative words used to describe objects (nonsocial information). Participants' task was to determine whether the target word was positive or negative. Results

showed that larger P200 amplitudes were elicited by social words than nonsocial words. In addition, for the words from the social semantic information category, increased P200 amplitudes were generated by negative words relative to positive words following person-name primes, but there were no differences for the words following object-name primes. This finding suggests that words with negative Lexical Valence used to describe people can capture attention at an early perceptual stage, possibly a result of evolutionary adaptation reflecting a rapid, primitive reflex to detect, potentially life-threatening stimuli. In another study, Boustani and colleagues (2021) tested L2 sentence processing and compared participants' performance depending on the amount of sensory input that accompanied their stimuli (enriched with data from three or five senses). The authors observed larger P200 amplitudes when participants processed sensory-rich input compared to sensory-poorer input. With the increase in the sensory input of the stimulus, the brain may direct more attention to comprehend L2 sentences. In the present study, the observed increase in the P200 amplitudes generated by negative L2 words compared to the positive ones may reflect greater attention allocation to negative, attention-grabbing stimuli. The fact that this effect was not observed in L1 may suggest that positive and negative words in the native language required similar amounts of attention at this early processing stage. P200 is not commonly studied in language processing studies, and more studies are needed to broaden our understanding of the electrophysiological processes which this component reflects.

At the later lexico-semantic processing stage, processing sentences with negatively valenced words generated reduced N400 amplitudes relative to sentences with positively valenced words in the non-native language. This result supports prior studies that observed N400 attenuation for negative L2 words or sentences at the stage of lexico-semantic processing, providing evidence for a dampened emotional response in the second language (Jończyk et al. 2016). It may be due to the fact that semantic access to words with negative Lexical Valence in L2 may be incomplete and suppressed at the stage of semantic integration (Jończyk et al. 2016). Such an attenuated processing manner of negative Lexical Valence in L2 may suggest shallower processing of this type of stimuli (Chwilla et al. 1995). Jończyk and colleagues (2016) suggest that the reduced semantic processing of negative information in L2 may account for the observation that bilinguals prefer to express themselves and talk about traumatic events in L2, a language they perceive as emotionally detached. In another study, Jończyk and colleagues (2024) found reduced N400 amplitudes elicited by negative words when participants were preparing for word production their in

L2 rather than L1. This effect, in line with previous evidence (Jończyk et al. 2016; Wu and Thierry 2012) was taken to capture lower sensitivity and filtering of negative information when operating in L2, but this time in the domain of language production.

Note that in the present study this effect reversed in the native language. Larger N400 amplitudes were observed in response to sentences featuring negative rather than positive words. This result may suggest that in the native language semantic processing of positively valenced words is facilitated, while negative words require deeper lexico-semantic processing, possibly a consequence of greater emotional arousal. Previous research has shown that processing positive stimuli reduces the amplitude of the N400 and processing negative stimuli enhances it (De Pascalis et al. 2009; Herbert et al. 2008; Kiefer et al. 2007). These findings suggest that people may be naturally biased towards pleasant content which facilitates the integration of semantic information (Herbert et al. 2008). Attenuated N400 amplitudes elicited by positive words may reflect facilitated semantic integration of positive words compared to negative ones (De Pascalis et al. 2009).

7.2.3. Intention Valence

In the exploratory analysis with Intention Valence, larger LPP amplitudes were generated by criticism compared to praise. This suggests that when processing communicative intentions criticism is given more attention and retention due to the fact, that, in essence, criticism (expressed ironically by a positive word, and literally by a negative word) is negative at its core. Consequently, regardless of Ironicity, whether the message was literal or ironic, the communicative intentions (praise and criticism) were processed differently. It appears that when processing a critical intention either expressed literally by negatively valenced words, or implicitly, ironically expressed by positively valenced words, participants needed to re-evaluate the meaning more than they did in the case of the sentences conveying praise. Evidence demonstrates that negativity is processed more slowly (Unkelbach et al. 2008) and more thoroughly (Baumeister et al. 2001) than positivity. Unkelbach and colleagues (2008) suggest that positive information is organized more densely in semantic memory. Positive information also bears resemblance to other positive information. These characteristics help explain why positive information (or positive valence) is processed faster than negative information (or valence). Negative information is characterized by

lower similarity to other negative information in memory. What is more, negative information in the form of unpleasant experiences may cause long-term detrimental effects and the intensity of possible negative experiences (such as pain or discomfort) felt appears to be infinite. On the other hand, pleasant experiences are rather short-lived and the intensity of such experiences is limited. This shows that our cognition is wired differently for negative and positive events. Baumeister and colleagues (2001) propose that negative experiences such as losing money, experiencing abandonment or receiving criticism will exert a greater impact on the individual compared to positive experiences such as winning money, making friends or receiving praise. Bearing in mind the exploratory nature of this analysis in the present study, I suggest that the effect of Intention Valence (praise or criticism) may have overridden the effects of Lexical Valence at the stage of meaning reanalysis. Negative information delivered in the form of criticism may have demanded more reanalysis than praise in order to derive the correct intention interpretation. Previous research has found that negative stimuli increased the amplitudes of P200 (Carretié et al. 2001), probably showing an increased potential of negative content to mobilize attention, and LPP (Ito et al. 1998), suggesting the re-allocation of attention to negative information. It suggests the brain's propensity to dwell longer on negative content in order to properly reanalyze the stimulus and take the most optimal course of action when understanding the negative content (Baumeister et al. 2001). This neural mechanism is wired in the brain to enable protection of the organism from immediate harm (Pratto and John 1991). In turn, praise (or more generally, positive content) does not require such a reanalysis, as a more expected type of communicative intention, and, therefore, its processing is smoother and swifter. In the context of irony research, Caillies and colleagues (2019) observed that literal criticism elicited larger P600 amplitudes than ironic praise, and ironic criticism elicited larger P600 amplitudes than literal praise. The authors suggested that the figurative negative connotation of ironic criticism was harder to process than the figurative positive connotation of ironic praise. It is essential to remember that what they refer to as a *connotation* (the sentence preceding the target sentence where the expectation is created) is not exactly the same thing as what I refer to here as Intention Valence. However, the connotation is definitely where the Intention Valence is initiated and further completed in the target sentence. Importantly, let us not forget that these inconsistencies stem from the fact that the conceptualization of these brain processes and mechanisms is still at an early stage and many questions remain unanswered. What researchers do is conceptualize what happens and how it happens in the

brain during the processing of praising and critical stimuli at every stage of perception, comprehension and interpretation.

In the exploratory analysis controlling for Intention Valence, the analyses were divided into the native and non-native language and were performed separately. In the L1, ironic praise elicited larger N400 than ironic criticism. Prior research has found increased N400 amplitudes generated by ironic praise compared to literal praise (Caffarra et al. 2019), and increased N400 amplitudes generated by ironic praise compared to literal criticism (Caillies et al. 2019). The observed deeper amplitudes of the N400 for ironic praise compared to ironic criticism support previously reported evidence suggesting greater difficulty connected with processing ironic praise than ironic criticism. It may be caused by the unconventional nature of the target comment conveying ironic praise (using negative words to express praise), and the general idea of saying bad things to people. Similarly, ironic praise entailed more processing difficulty (N400-like effect) when it was spoken in a native accent, but not when it was spoken in a foreign accent (Caffarra et al. 2019). The fact that the non-prototypical irony revealed N400 modulations may suggest semantic difficulties. The fact that it was only observed when it was produced in the native accent suggests that when listening to foreigners speaking in their L2 with a non-native accent, native listeners have lower expectations, as if not expecting the L2 speakers to be able to use the non-prototypical type of ironic meaning. There were no differences between literal praise and literal criticism on the N400 amplitude in L1.

Interestingly, processing ironic praise and ironic criticism modulated the N400 amplitudes differently in L2, where ironic criticism revealed increased N400 amplitudes compared to ironic praise. I suggest this effect is linked with the suppressed access to the meaning of negative words in L2. Ironic praise elicited reduced N400 amplitudes likely due to the fact that negative words complete the ironic intention. Similarly, larger N400 amplitudes were observed for literal praise (positive words) compared to literal criticism (negative words) in L2. These results suggest that access to negative words in L2 is incomplete and suppressed at the semantic processing stage. Consequently, Lexical Valence supersedes Intention Valence, insofar as, the Lexical Valence-based effect of L2 suppressed negative access takes precedence over potential Intention Valence-based effects.

7.2.4. Language

The fact that larger P1 amplitudes were observed in the present study for L2 than L1 may suggest that processing words presented in the non-native language was more attention-grabbing than in the native language. The P1, a positive-going component tends to reflect sensitivity to the amount of attentional resources allocated to a particular stimulus (Smith et al. 2003). Therefore, the present result points to the more attention-grabbing processing of words in the foreign language.

Further, larger N400 amplitudes were observed for sentences in the native compared to the sentences in the non-native language. This may suggest deeper processing of sentences in the native compared to the non-native language. Jankowiak and colleagues (2017), tested different categories of metaphors in Polish-English bilinguals who read verb-noun word dyads which were either novel metaphors, conventional metaphors, literal expressions or anomalous expressions in Polish and English. The authors observed that L2 word dyads elicited reduced N400 amplitudes compared to L1 word dyads regardless of the type of the word dyad. This result might be a reflection of weaker semantic interconnectivity in L2 compared to L1 in the memory. Larger N400 amplitudes for L1 relative to L2 have been observed in the study on lexical semantic processing in L1 native speakers and L2 learners of English (Newman et al. 2012). In this study, participants read English sentences which were either semantically acceptable or contextually meaningless. Newman and colleagues (2012) proposed that the reduced N400 amplitudes elicited by sentences in L2 might be due to increased cost of semantic integration in lower-proficiency speakers. Moreover, it was suggested the observed N400 attenuation in L2 may reflect less efficient lexical access or poorer capability of predicting upcoming words in sentences by L2 language users. In addition, the onset latency of the N400 amplitude reflecting L1 processing started earlier than that of the L2 amplitude. Aparicio and colleagues (2012) investigated word processing in the three languages of French-English-Spanish trilinguals and observed that L1 words elicited earlier N400 amplitudes than both L2 and L3 words. It was suggested that the observed latency effect in terms of L1 reflected the special status of the native language. Likewise, Jankowiak and colleagues (2017) also observed a slightly delayed N400 response elicited by L2 items compared to L1 items. This effect was taken to reflect delayed activation of semantic representations in L2 caused by lower subjective frequency of L2 items in the non-dominant language, which leads to less automated processes under-

pinning lexico-semantic access in L2. An explanation which seems even more relevant for the observed results in the present study is that affective content, which irony is imbued with, may be more salient in the native language, which causes deeper processing and modulates the N400 amplitude. Similarly, Jończyk and colleagues (2016) observed larger N400 amplitudes elicited by L1 Polish compared to L2 English when participants were reading affectively salient sentences. This shows that Language modulated the N400 amplitude and demonstrates that native and non-native languages are processed differently, with affectively loaded stimuli being processed more deeply in the native language.

7.3. Comprehensive discussion of the current and previous research

7.3.1. Ironicity

The results presented in the electrophysiological study designed to test a range of hypotheses on irony processing in the native and non-native language show that irony processing in the native language does not impose any extra cognitive load compared to literalness, as reflected by similar N400 amplitudes generated by irony and literal meaning processing in the native language. This may suggest that the contextually embedded target sentences of the stimuli materials used in this study which were embedded in context created the expectations of irony and facilitated semantic processing of ironic intent. In other words, in the native language, irony did not seem to require more cognitive resources than the literal meaning during the semantic processing. In the later stage of meaning reanalysis, irony processing revealed more reanalysis than literal meaning, as reflected by the increased LPP amplitudes elicited by irony relative to literalness in L1. This finding suggests that irony processing is a complex procedure and demands more resources than processing literal meaning at the later stage of meaning making. The processing patterns of literalness and irony as observed on the LPP amplitudes suggest that the two types of meanings differed in their processing manners and that irony required more reanalysis. This may show that the types of ironic statements used in this study did not cue irony sufficiently. It is possible that ironic stimuli used in the present study were less salient (*The Graded Salience Hypothesis*; Giora 1997; Giora 1999; Giora et al. 1998), and, as a result, less expected than literal mean-

ing. In other words, participants reading the scenarios in the present study may not have built expectations of irony, therefore, their meaning was not readily accessible and required further computation in L1. Alternatively, it may be taken to mean that irony, as a more complex type of communicative meaning, is inherently imbued with more cognitive effort, as one has to process the situational / commentary incongruity in the process of meaning making. In sum, even though irony did not pose semantic processing difficulties it may have necessitated more reanalysis than literalness at the later stages stemming from the ironic / literal conflict inherent in irony. This effort stemming from additional reanalysis expended is ultimately rewarded with arriving at the intended interpretation, which makes the processing more effective and more complete in L1. What is more, it is hard to tell at the moment whether the additional reanalysis at the later stages of processing were caused by the incongruity inherent in irony, or the Intention Valence of the stimuli. It is possible that the intention communicated through ironic statements, due to its veiled delivery led to more difficulty when processing the statements.

Irony processing in the non-native language showed larger N400 amplitudes compared to literal meaning processing. I take this finding as an indication that irony processing is more cognitively taxing in the non-native language and demands more effort early on at the semantic access processing stage. Potentially, it might suggest that since the semantic processing stage revealed irony processing difficulty the participants did not engage in a subsequent meaning reanalysis. This suggests that irony processing in L2 may be more demanding, and consequently less effective and incomplete. Tentatively, bilinguals operating in L2 may not fully access the incongruity embedded in irony at the semantic access stage, and this, incomplete, access may lead to further consequences at the later processing stages. These later consequences may manifest as uncertainty in comprehension, vague comprehension and a requirement of more time to reassure themselves that the interpretation makes sense. These need more time, which, in the present experiment was limited, due to time constraints imposed. Some previous behavioral research showed that in L2 irony may be processed less efficiently than literal meaning (Bromberek-Dyzman 2014; Bromberek-Dyzman et al. 2022; Ellis et al. 2021). Other research shows that irony processing in L1 and L2 proceeds similarly (no statistically significant difference) with a trend toward slower processing in L2 (Bromberek-Dyzman and Rataj 2016; Bromberek-Dyzman et al. 2010). Ellis and colleagues (2021) suggested that what might be crucial in determining irony processing is the difficulty with identifying that a certain statement is overtly untruthful

and deriving an appropriate implicature. They proposed that familiarity with irony may ensure its automatic processing. Apparently, L2 learners were not familiar with irony (both criticism and praise). It was suggested that due to the lack of familiarity L2 learners may be unable to process irony implicitly and rely on more explicit mechanisms. In the present study, the observed larger N400 amplitudes in response to irony in L2 may suggest that participants did not find ironic statements familiar, already at the earlier stage of semantic processing. Alternatively, the bilingual participants may not have fully accessed the incongruous aspect of the processed meaning in the non-native language and, therefore, did not incline towards the ironic interpretation with the same amount of ease as they did in their native language. It could be that what was familiar enough to proceed undisturbed at semantic processing and come to fruition at the stage of reanalysis in L1, in the non-native language was unfamiliar and revealed dissimilar patterns at both stages. However, this interpretation needs to be taken with caution, and further research is invaluable in studying the notion of familiarity more directly. Alternatively, the observed differences between the native and non-native languages may stem from the accessibility of the incongruity of irony in both languages. Namely, in order to perceive and understand the incongruous nature of the two levels of ironic meaning, bilinguals may need more time in L2 than in L1, along with requiring more time to process ironic meaning (because of the said incongruity) than literal meaning.

7.3.2. Lexical Valence

The observed in the present study larger N400 amplitudes in response to negative Lexical Valence compared to positive valence in L1 suggest increased cognitive effort associated with the processing of the negatively valenced words (literal criticism and ironic praise). Previous behavioral irony processing studies found hindered processing of ironic statements featuring negative valence in L1 (Bromberek-Dyzman 2014; Dews and Winner 1999; Ellis et al. 2021; Gibbs 1986; Kreuz and Link 2002). The positive valence advantage along with facilitated processing and the negative valence disadvantage along with hindered processing may be caused by valence asymmetry. Gibbs (1986) studied the differentiated ironic and literal statements processing depending on the valence of the target comment as well as the preceding context. In the seminal paper Gibbs (1986) showed that the

embedding of target statements into a context varying in affective valence drastically changes the way the statement is processed. When the context is normative, that is, mentions a social norm (as is the case in ironic criticism, and literal praise), the processing of irony is facilitated, relative to when the context is non-normative and does not mention a social norm. Gibbs (1986) referred to the idea of the normative and non-normative contexts as *the Social Norm Model*, which suggests that sarcastic targets should be read faster when embedded in normative contexts compared to these in non-normative contexts, which supports the finding that sarcasm comprehension is connected with recognizing a social norm, which, through uttering an ironic remark, is echoically mentioned, as proposed by Sperber and Wilson (1986). This echoes findings reported in irony research showing that ironic criticism is read more quickly, is more ironic and more appropriate, and makes more sense than ironic praise (Kreuz and Link 2002).

Pratto and John (1991) explored behavioral measures of affective valence asymmetry. They observed that negative valence (undesirable traits) attracted more attentional resources, resulted in longer response times, and was remembered better than positive valence (desirable traits). These results provide support for the hypothesis of asymmetry in the automatic processing of evaluation. It was suggested that negative valence is processed longer than positive valence because negative valence automatically triggers vigilance and activates additional attentional resources. Electrophysiological evidence also shows that negative valence attracts more attention than positive valence (Smith et al. 2003). In a study on attention allocation, where participants were asked to evaluate positive and negative pictures, Smith and colleagues (2003) observed early differences between positivity and negativity. Negative pictures elicited larger P1 amplitudes than positive pictures. These results point to the negativity bias in attention allocation and an extremely fast categorization of stimuli based on valence. This, again, might suggest that the negative adjectives in the present study garnered more attention than the positive adjectives, which led to their deeper processing and a bigger cognitive load in L1.

Returning to irony processing studies, Bromberek-Dyzman and colleagues (2022) showed that it is the affective faculty (valence) and not the cognitive faculty (literal meaning) that has a crucial impact on attitudinal meaning processing. A series of behavioral studies demonstrates facilitated processing of positive valence (literal praise) and hindered processing of negative valence (literal criticism) (Bromberek-Dyzman 2014). As for the comparison of ironic and literal meaning, Bromberek-Dyzman (2014) showed that irony

(criticism) and literalness (criticism, praise) can be processed differently depending on the prime / target display timing condition. When the experimental procedure allowed for a self-paced presentation, ironic criticism was processed faster than literal criticism. When participants had to respond within a specified time window ironic criticism processing time was convergent with the processing time of literal criticism. More importantly, it is suggested that a more relevant approach to studying attitudes is through Lexical Valence, and not through the literal / non-literal dichotomy. When positive and negative valence was considered, Bromberek-Dyzman (2014) noticed striking consistencies across all experiments. Namely, unlike negative valence, positive valence was processed in a facilitated manner (faster, more accurate). It is important to remember that those studies did not include ironic praise, which may be seen as a limitation. This decision was driven by the fact that ironic praise comprehension rates collected in the norming study were too low for this condition to be included in the study. Nevertheless, those studies demonstrate the facilitated processing manner of positive valence, as compared to negative valence which is in line with the N400 results in the present study observed in L1. More generally, the results obtained by Bromberek-Dyzman (2014) fortify the originally observed patterns by Gibbs (1986), whereby norm-based contexts facilitate irony processing, and norm-less contexts do not. Bromberek-Dyzman and colleagues (2022) showed that both literal and ironic meanings which refer to positive social norms and communicate positive attitudes (literal praise, ironic criticism) were processed faster than literal and ironic meanings which refer to negative social norms and communicate negative attitudes (literal criticism, ironic praise).

The reversed pattern of results observed in this study in L2, with reduced N400 amplitudes elicited by negative Lexical Valence compared to positive Lexical Valence shows that Lexical Valence processing in the native and non-native language is disparate. As mentioned earlier, this may be the effect of the suppressed access to the semantic meaning of negative words in L2, a language more emotionally detached than L1 (Jończyk et al. 2016). Previous irony processing studies comparing valenced-based statements failed to observe L1 / L2 differences between the positively valenced literal and ironic statements and the negatively valenced literal and ironic statements (Bromberek-Dyzman 2014; Ellis et al. 2021). I suggest this may be a shortcoming of the methodology used, as behavioral measures may be insufficient or unable to detect these differences. Instead, exploring the ERPs in response to Lexical Valence-based stimuli enabled to observe such differences, that may have previously remained invisible.

7.3.3. Intention Valence

As I have already explained, I only noticed that Intention Valence may be a factor, therefore, useful to understand the mechanisms and processes of irony at the stage of data analysis. During this time of making sense of the obtained data, looking at it without prior assumptions, models or categories, Intention Valence appeared as an important aspect of irony.

When analyzing Intention Valence separately for L1 and L2, ironic praise revealed larger N400 amplitudes compared to ironic criticism in the native language. This suggests that ironic praise, the less frequent, less conventional, and less familiar irony type is more cognitively demanding than ironic criticism. Previous behavioral studies support this observation regarding the frequency of use. Gibbs (1986) suggests that ironic statements which explicitly echo beliefs, societal norms or previously stated opinions are processed faster than ironic statements with implicit echoes, or which do not mention any norms. The results observed in the present study in the exploratory analysis looking at Intention Valence and Ironicity suggest this was the case. The type of ironic statements which do not invoke directly available social norms (ironic praise) generated larger N400 amplitudes than those ironic statements which do invoke social (positive) norms (ironic criticism) in L1. This may suggest that ironic praise caused semantic processing difficulty because it does not refer to positive social norms, compared to ironic criticism, which does refer to positive social norms. Delivering praise ironically is not a commonly used way of communication. Kreuz and Link (2002) suggested that it is more typical to use irony to evaluate negative situations in a positive way (to criticize ironically), than to evaluate positive situations in a negative way (to praise ironically). Moreover, Bruntsch and Ruch (2017) proposed that ironic praise processing patterns may reveal more interindividual variance than ironic criticism processing patterns do. Though, while this exploratory analysis should be taken with caution, it does provide some preliminary support for the predictions about social norms and a basis for further exploration.

Evidence from behavioral irony processing studies also shows that ironic praise is more difficult to process than ironic criticism (Ellis et al. 2021). In their study, L1 English speakers processed literal praise the fastest, followed by ironic criticism, literal criticism and ironic praise. Moreover, participants were equally accurate at identifying literal praise, literal criticism and ironic criticism, but significantly less accurate at identifying ironic

praise. This suggests that participants' poorer performance on ironic praise was caused by their lower familiarity with this pragmatic function, which may have compelled participants to rely on explicit processing. Lower familiarity with delivering praising intention ironically, rather than literally, resulted in impeded processing.

7.3.4. Language

This study shows that late bilingual readers process irony differently in their L1 and L2. Apart from the differences regarding Ironicity per se, Lexical Valence and Intention Valence, the underlying mechanisms may be affected by individual differences, as well. Research shows that bilinguals may enjoy a better Theory of Mind capacity and may be better at recognizing communicative intentions than monolinguals (cf. Chełminiak 2025). Given that intention recognition is necessary for irony meaning making, bilinguals may be better at irony comprehension. The present study did not account for individual differences in participants Theory of Mind skills, but it remains an intriguing suggestion for further research. Furthermore, L2 proficiency seems to have a huge impact on irony processing. Bilinguals with a higher L2 proficiency process irony in their L2 faster than bilinguals with lower L2 proficiency (Li and Jung 2023; Shively et al. 2008). The level of success in irony comprehension is also linked to the age and manner of L2 acquisition. With the L2 acquired at an older age, past the critical period, and mostly in a classroom setting, with a large focus on literacy skills such as reading and writing, while largely neglecting the aural / oral skills, learners do not get to immerse in the interactions, that language users do when immersed in the language in more natural circumstances. In such a learning setting, learners are deprived of social interactions, so crucial for understanding pragmatic meanings and if they encounter instances of irony, it is probably in a reading form. In this way, their access to natural cues that irony is imbued with is absent or deficient. Consequently, lower exposure to an ironic mode of thinking is carried over to the weaker ability to recognize ironic intent. Moreover, if L2 learners acquire the language in a traditional classroom setting, when a prevalent focus on reading and memorizing, they may lack the comprehension skills needed for language communicated orally. Research shows that L2 learners may find it difficult to use prosodic cues when comprehending irony delivered auditorily (Peters et al. 2015). In general, L2 proficiency may have an impact on the ability to process irony in

L1 (Tiv et al. 2020). This suggests that there may be some general module governing irony processing in both languages of bilinguals, and points to some general communicative competence which is invaluable in irony processing. Evidence shows that executive functions may also be developed to a greater extent in bilinguals (Bialystok 2017), which may be an outcome of the ongoing need to resolve the coactivation of bilinguals' languages (Bromberek-Dyzman 2024). In sum, bilingualism positively impacts irony processing, but further research should address the role of individual differences such as the mentalizing capacity, L2 proficiency, L2 age of acquisition, L2 manner of acquisition and executive functions more directly.

7.4. Conclusion

The present study demonstrated differential processing of ironic and literal meanings in the native and non-native languages. Firstly, Ironicity, here defined as a feature of being ironic or literal, modulated the amplitude of the N400 in a different manner in L1 and L2. While in the non-native language ironic meanings elicited an enhancement of N400 amplitudes, suggesting greater difficulty connected with semantic processing and bigger cognitive taxation, no such effects were observed in the native language. In later stages, this effect reversed across languages, and ironic meaning necessitated meaning reanalysis compared to literal meaning in the native language, in the absence of such an effect in the non-native language. Secondly, in the L2, negative words elicited larger P200 amplitudes, which may indicate greater attention allocated to processing negative words in the non-native language (P200), in the absence of differences between positive and negative words in L1. What is more, negative words elicited reduced N400 in comparison to positive words in L2, with the opposite effect in the L1. This finding may reflect suppressed semantic processing of negative words in the non-native language, in line with the hypothesis of emotional dampening in the L2. In the native language, however, negative words were more cognitively taxing to process than the positive ones. Finally, remembering the exploratory nature of this analysis, the stimuli were differentially processed depending on what Intention Valence they conveyed. Larger LPP amplitudes were observed by criticism compared to praise, suggesting more reanalysis required for processing the critical intention compared to praise. In addition, the analysis of Intention Valence split by Language revealed interesting results.

In L1, increased N400 amplitudes were generated by ironic praise compared to ironic criticism, with the reversed effect in L2. While in L1, ironic praise was more cognitively taxing to process than ironic criticism, a result in line with previous evidence (Gibbs 1986; Bromberek-Dyzman et al. 2022; Caillies et al. 2019), the reversed results in L2, with greater N400 amplitudes elicited by ironic criticism, may reflect the suppressed access to negative words in the non-native language in the case of ironic praise.

These results show that irony was more cognitively demanding than literalness in L2, but not in the L1. However, at the later stage when the brain tended to reanalyze previously encountered meaning and reintegrate all contextual extralinguistic cues, reading statements in L1 necessitated more reanalysis compared to literalness, while no such processes visible in L2 – no need to reanalyze what did not complete the semantic access stage. In this way, I conclude that in L2 irony comprehension is less complete than in L1. Readers do not engage in the continued reanalysis at the later processing stage, when their processing of the semantic content reveals irony-driven difficulty. However, in L1 irony may require more reanalysis, that is verification, inspection and confirmation, that what was processed earlier is right in the given context – hence irony reanalysis and further comprehension is more complete in the native language.

What is more, the present study provides further support for *the Social Norm Model* (Gibbs 1986) by showing that negative Lexical Valence elicited larger N400 – more cognitive taxation – than positive Lexical Valence in L1. This shows that scenarios, which achieved their pragmatic effect (literal or ironic) by means of positive words (literal praise, ironic criticism), and mentioned positive social norms, were easier to understand than the scenarios which achieved their pragmatic effect (literal or ironic) by means of negative words (literal criticism, ironic praise), and did not refer to positive social norms. In addition, evidence from the exploratory analysis conducted in each language separately, showed that in L1 ironic praise generated larger N400 amplitudes than ironic criticism. This further substantiates the observation that the reference to positive social norms (ironic criticism) facilitates irony processing (Gibbs 1986).

Conclusion

Research presents that irony is a common pragmatic tool which is used to express meaning which goes largely beyond the literal value of their words (Dews et al. 1995). It is present in many areas of human life and is used in various kinds of verbal situations and interactions (Gibbs and Colston 2024). Irony is a contextual phenomenon, which achieves its full potential when embedded in context. A key feature of ironic expressions is their incongruity with the preceding context (Ivanko and Pexman 2003). A unique feature of irony is its complexity both as a tool for expressing implicit meanings and as a figurative mode of thinking (Gibbs 1994; Gibbs and Colston 2024). Moreover, irony serves as a vehicle for expressing an attitude (Sperber and Wilson 1986). Through the expression of attitudes, a speaker is able to evaluate an incoming stimulus. The evaluation is done on the positivity – negativity spectrum. Therefore, lexical valence is crucial in irony comprehension. Indeed, the recognition of the role of lexical valence in conceptualizing irony has demonstrated meaningful for the obtained results (Bromberek-Dyzman 2014; Gibbs 1986; Kreuz and Link 2002). In general, irony has been notoriously difficult to define due to its complexity and variety of concepts which contribute to irony. As a result, it seems that characterizing irony, rather than defining it, is best for capturing its wholeness with all its related phenomena. Therefore, in the present dissertation, I explored the phenomenon of irony to probe into the mechanisms underlying its comprehension.

Early research studied irony as a form of communicative aberration, a deviation from the communicative norm, which was the literal way of communication. Because of that, researchers focused on the serial aspect of irony processing and the question of the number of stages in the process, as well as the role of literal meaning. While some studies have found that irony processing is more difficult than literal meaning processing (Giora and Fein 1999b; Giora et al. 1998), other studies have found that irony processing does not

have to take longer, in fact it may take as long, or shorter than literal meaning processing (Gibbs 1986), provided that irony is embedded in a context which triggers the anticipation of ironic state of mind. These inconsistent results obtained from irony processing studies stem from the way researchers conceptualized the notion of ironic meaning. Researchers have made different assumptions about the way ironic meaning is construed. On the one hand, some researchers approached the notion of irony in a dichotomous paradigm, whereby they saw irony as a form of non-literal meaning, which was compared with its literal equivalents (Giora and Fein 1999b; Giora et al. 1998). On the other hand, other researchers assumed the attitudinal aspect of irony, whereby a speaker expresses their evaluation of a stimulus. The attitude can be either that of approval, enthusiasm and praise, or disapproval, contempt and criticism. The manner of irony conceptualization also affects the way experimental stimuli are constructed (comparing literal meaning with ironic meaning, or comparing lexical valence-based equivalents i.e., literal praise, literal criticism, ironic criticism and ironic praise), as well as predictions made. It seems that the key to the incongruity of the results lies in the choice of the stimuli used to test the experimental predictions. Hence, in this dissertation I aimed at demonstrating that these conflicting, to some extent, approaches adopted to study irony may be the reason why we observe such mixed results, and that they are rooted in the conceptualization of irony. When literal praise was compared with ironic criticism in the dichotomous literal / non-literal design, irony turned out to be more difficult than literalness (Giora and Fein 1999b; Giora et al. 1998). When, in turn, ironic and literal meanings were studied with a broader range of lexical valence-based statements it was observed that irony processing is facilitated when it refers to positive social norms (Gibbs 1986). Therefore, it seems only right to consider the more sophisticated, and nuanced set of statements as it may allow for more precise observations.

With the rise of the interests in bilingual research and with a view to exploring the neurocognitive mechanisms underlying irony comprehension by language users who may be better at recognizing communicative intentions thanks to operating two languages in one brain, in this dissertation I explored irony processing in bilinguals' L1 and L2. Irony processing studies in the context of bilingualism also provide mixed results. Some evidence points to a comparable irony processing in L1 and L2 (Bromberek-Dyzman and Rataj 2016; Bromberek-Dyzman et al. 2010; Bromberek-Dyzman et al. 2021), other evidence suggests a greater demand in L2 (Ellis et al. 2021; Peters et al. 2015). These results are further modulated by the valence of the statements analyzed, and suggest that ironic praise, the less conventional type of irony, is considered less ironic when produced by L2 speakers com-

pared to L1 speakers (Caffarra et al. 2018) or causes semantic processing difficulties when produced by L1 speakers (Caffarra et al. 2019). Moreover, processing positively valenced statements is facilitated relative to negatively valenced statements (Bromberek-Dyzman 2014, Bromberek-Dyzman et al. 2022; Ellis et al. 2021). These results show that exploring irony processing gives more precise results when the fuller, lexical valence-based stimuli selection is tested. In the present PhD dissertation, I intended to demonstrate that it is valuable to make a distinction between the lexical valence of the disambiguating target word, and the underlying, communicative intention valence.

The present PhD dissertation explored verbal irony processing in the context of bilingualism. In the present study, electrophysiological correlates of irony processing in L1 and L2 of highly proficient late bilinguals were measured while accounting for the lexical valence of the target word. Additionally, I controlled for the intention valence communicated in the context / statements interactions by means of irony and literalness.

The results of the present study showed that irony generated larger N400 amplitudes compared to literal meaning in L2, but not in L1. Moreover, in the later processing stage, irony induced larger LPP amplitudes compared to literal meaning in L1, but not in L2. Additionally, the words with negative Lexical Valence induced larger P200 amplitudes than the words with positive valence in L2, but not in L1. In the semantic processing stage, sentences with negatively valenced words induced reduced N400 amplitudes compared to the sentences with positively valenced words in L2, but this effect was reversed in L1, with larger N400 amplitudes generated by negative words compared to positive words. The exploratory analysis where I controlled for Intention Valence showed that criticism revealed larger LPP amplitudes than praise. Furthermore, ironic praise generated increased N400 amplitudes compared to ironic criticism in L1, but this effect was reversed in L2, where ironic criticism revealed increased N400 amplitudes compared to ironic praise. Additionally, literal praise elicited larger N400 amplitudes compared to literal criticism in L2.

This study showed that irony processing is more cognitively taxing than processing literal meaning in the non-native language, but the processing of the two types of meaning seems to proceed comparably in the native language. Irony processing appears to be more effective in L1, as it may necessitate more reanalysis than literal meaning processing. What is more, my results show that semantic access to the meaning of negative words in L2 is suppressed. These words tend to attract more attention in L2 as well. In sum, this study provides additional evidence for the increased cognitive demand when processing irony, but the additional reanalysis made may be rewarded in the form of a more complete under-

standing of irony. In L2, the process seems more difficult already at the semantic processing stage.

There are several limitations in the present study that need to be acknowledged. First, the study was conducted on late Polish-English bilinguals, which may limit the generalizability of the findings to broader linguistic contexts. Second, the balanced design employed in the present study, with stimuli characterized by binary oppositions (positive/negative Lexical Valence, praising/critical Intention Valence, ironic/literal context), while enabled the observations of ERP indices, does not include more sophisticated irony as present in everyday communication. Third, the exploratory analyses with Intention should be further tested and validated. Moreover, individual differences such as the ability to appreciate irony or cultural factors were not controlled for. Finally, other contextual cues (prosody, gestures, textual devices) could be incorporated and their influence on irony processing examined.

Regarding the implications for further research. First of all, future research should explore irony processing in different languages than English, which has predominantly been studied. The need to address the performance in other languages is driven by the necessity to explore whether the observed effects in previously tested languages (mostly English) can be extrapolated to other languages. Secondly, future studies should test irony in its broader range of statement types and include ironic remarks as they appear in everyday situations. Here, I explored ironic statements in their valence-based form with literal equivalents, adhering to a rigidly structured form. Future research could account for statements which do not follow such a structured form, and, consequently, even more closely reflect real life language. Thirdly, future research should explore the role of Intention Valence in irony processing, and its potential interactions with Ironicity in a properly controlled design. While this study showed that Intention Valence may affect irony processing, these analyses were conducted exploratorily and should be taken with caution. What is more, future research should address the role of individual differences in irony processing such as the mentalizing capacity, language experience and the whole range of bilingualism related properties such as L2 proficiency, age, and manner of acquisition, as well as executive functions and their effects in L2 irony processing.

Abstract

The present PhD dissertation addresses the role of conceptualization of verbal irony, particularly the choices in stimulus selection, in modulating the results and interpretations, pointing to behavioral and neurocognitive mechanisms of irony processing. Additionally, the dissertation explores these mechanisms in the native (L1) and non-native (L2) languages of Polish-English, highly proficient, late bilinguals. The results of the electrophysiological study designed to test neurocognitive underpinnings of ironic intent comprehension provide novel evidence to argue that irony processing is more cognitively demanding than literal meaning processing. Prior irony studies investigated irony processing with a focus on the serial aspect of the procedure. Namely, researchers explored irony placing special emphasis on the question whether irony, as a type of figurative meaning, proceeds in one stage, or two stages. Moreover, of similar interest to researchers was the question whether ironic meaning is more difficult to process than literal meaning. Previous research has provided mixed results. While some evidence suggests that irony processing is more demanding than literalness, other evidence suggests that, in certain circumstances, irony processing may be facilitated as compared to literal meaning. This incongruity in the results may be a consequence of the conceptual and methodological choices made concerning categorization of the stimuli used. One main line of research investigated irony processing while comparing it with literal meaning processing. The other major line of research introduced a broader range of statements accounting for the lexical valence of the critical words. The dissertation is situated at the intersection of these two approaches and aims to provide some evidence that, in fact, the two major lines of research are not contradictory. Instead, they investigated different aspects of irony and, consequently, yielded different results. As this project explored irony processing in the context of bilingualism it offers observations of how the very

nature of irony varies in L1 and L2. The present project focused on three factors, i.e., Language, Lexical Valence and Intention Valence and explored how they constrain irony comprehension dynamics. In the modern world, with more than a half of the population identifying as bilingual, being able to make sense of ironic meaning in L2 has become a necessity. Little is known, however, about the processing differences of irony in L1 and L2. While some behavioral studies suggest that irony processing may be comparable in L1 and L2, other studies point to the greater cognitive demands stemming from the processing of ironic meanings in L2 compared to L1. To the best of my knowledge this is the first EEG study on irony processing in bilinguals' L1 and L2. In the present study, I employed EEG methodology to investigate electrophysiological indices of irony (Ironicity) processing in bilinguals' L1 and L2 by means of event-related potentials (ERPs). At the same time, the Lexical Valence of the target comments was compared across the two languages. Though not as an experimental variable, since a fully counterbalanced design was used in the present study, I controlled for Intention Valence – the underlying communicative purpose of the speaker. During the course of the study, it became apparent that Intention Valence may be a significant factor in irony studies' designs. Although, I argue, the intention valence of an ironic remark is quite different from the lexical valence of the target comment, this distinction has not been made quite explicitly before. The study showed that ironic statements elicited larger N400 amplitudes compared to literal statements in L2, but not in L1. In the later processing stage, processing ironic meaning generated larger LPP amplitudes compared to the processing of literal meaning in L1, but not in L2. In addition, the words with negative valence revealed larger P200 amplitudes than the words with positive valence in L2, but not in L1. Moreover, in L2, sentences with negatively valenced target words generated reduced N400 amplitudes relative to the sentences with positively valenced target words. This effect was reversed in L1, where the words with positive lexical valence generated reduced N400 amplitudes compared to the words with negative lexical valence. In the exploratory analysis, with Intention Valence controlled for, criticism elicited larger LPP amplitudes than praise. In addition, increased N400 amplitudes were elicited by ironic praise compared to ironic criticism in L1. This effect was reversed in L2, where larger N400 amplitudes were observed in response to ironic criticism compared to ironic praise, and in response to literal praise compared to literal criticism. In essence, these results suggest that irony processing is more cognitively demanding than literal meaning processing in L2 (larger irony-related N400 amplitudes), but there are no differences between irony and

literalness processing in L1. What is more, as evidenced by the larger LPP amplitudes, irony processing may be more effective in L1, as it requires more reanalysis than literal meaning in the native language. In addition, the results show that semantic access to negative valence in L2 is suppressed and negative words attract more attention than positive words in L2. This study showed that irony processing in L2 is more difficult, but it also takes more reanalysis in L1. Once the effort connected with reanalysis is made, irony processing is more complete in L1.

Streszczenie

Niniejsza rozprawa doktorska dotyczy roli konceptualizacji ironii werbalnej, w szczególności jak dobór bodźców eksperymentalnych wpływa na wyniki i interpretacje, wskazując na behawioralne i neuropoznawcze mechanizmy przetwarzania ironii. Dodatkowo, rozprawa bada te mechanizmy w języku ojczystym (polski) oraz obcym (angielski) u późnych osób dwujęzycznych o wysokiej biegłości w języku drugim. Wyniki badania elektrofizjologicznego analizującego neuropoznawcze podstawy rozumienia intencji ironicznej pokazują, że przetwarzanie ironii jest bardziej wymagające poznawczo niż przetwarzanie znaczenia literalnego. Wcześniejsze badania ironii analizowały przetwarzanie skupiając się na aspekcie liczby etapów tego procesu. Ściślej, badacze kładli nacisk na ustalenie czy ironia jako rodzaj znaczenia figuratywnego, przetwarzana jest w procesie jedno- czy dwuetapowym. Ponadto, badacze próbowali ustalić czy znaczenie ironiczne jest trudniejsze do przetworzenia niż znaczenie literalne. Poprzednie badania pokazują różne wyniki. Podczas gdy niektóre badania sugerują, że przetwarzanie ironii jest bardziej wymagające niż przetwarzanie literalności, inne dowodzą, że w pewnych warunkach, przetwarzanie ironii może być łatwiejsze, niż przetwarzanie znaczenia literalnego. Taka rozbieżność w wynikach badań może wynikać z wyborów konceptualnych i metodologicznych w procesie kategoryzacji bodźców eksperymentalnych. Jeden z dwóch głównych nurtów badań przetwarza ironii porównując ją ze znaczeniem literalnym. Drugi, wprowadził szersze spektrum typów wyrażenia biorąc pod uwagę walencję leksykalną słów. Ta rozprawa doktorska leży na przecięciu tych dwóch podejść. Jej celem, jest pokazanie, że owe podejścia do badania ironii nie są ze sobą sprzeczne, a jedynie, badając różne aspekty ironii pokazały różne wyniki. W rozprawie zgłębiłam zagadnienie przetwarzania ironii w kontekście dwujęzyczności. Ściślej, oprócz zbadania jak mechanizmy przetwarzania ironii przebiegają w języku ojczystym oraz ob-

cym, rozprawa zgłębia jak język, walencja leksykalna oraz walencja intencji wpływają na dynamikę rozumienia ironii. We współczesnym świecie, gdzie ponad połowa populacji identyfikuje się jako dwujęzyczna, zdolność rozumienia ironii w języku obcym jest konieczna. Nadal mało wiemy o różnicach w przetwarzaniu ironii w języku ojczystym oraz obcym. Podczas gdy niektóre badania behawioralne pokazują, że ironia może być przetwarzana podobnie w języku ojczystym i obcym, inne badania wskazują, że przetwarzanie ironii w języku obcym powoduje większy wysiłek poznawczy w porównaniu do języka ojczystego. Niniejsze badanie jest pierwszym badaniem EEG dotyczącym przetwarzania ironii w języku ojczystym oraz obcym przez osoby dwujęzyczne. W przedstawianym w tej rozprawie badaniu zastosowałem metodę elektroencefalografii (EEG) by zbadać elektrofizjologiczne wskaźniki przetwarzania ironii w języku ojczystym oraz obcym osób dwujęzycznych na podstawie potencjałów wywołanych zdarzeniem (ang. Event-related potentials; ERP). Dodatkowo, walencja leksykalna badanych zdań została porównana w obu językach. Ponadto, walencja intencji została włączona do analiz. W trakcie przeprowadzania badania okazało się, że walencja intencji może być istotnym czynnikiem w badaniach dotyczących ironii. Pomimo, iż, jak próbuję tutaj dowieść, walencja intencji różni się od walencji leksykalnej słów użytych do jej wyrażenia, takie rozróżnienie nie zostało wcześniej eksplicytnie wskazane. Badanie pokazało, że zdania ironiczne wywołały większe amplitudy N400 w porównaniu do zdań literalnych w języku obcym, ale nie w ojczystym. Na późniejszych etapach przetwarzania, znaczenie ironiczne wywołało zwiększone amplitudy LPP w porównaniu do znaczenia literalnego w języku ojczystym, ale nie obcym. Dodatkowo, słowa o negatywnej walencji wywołały większe amplitudy P200 niż słowa o walencji pozytywnej w języku obcym, ale nie w ojczystym. W języku obcym, zdania ze słowami o negatywnej walencji wywołały zredukowane amplitudy N400 w porównaniu ze zdaniami ze słowami o walencji pozytywnej. W języku ojczystym ten efekt był odwrócony – słowa o pozytywnej walencji wywołały mniejsze amplitudy N400 w porównaniu ze słowami o walencji negatywnej. W analizie eksploracyjnej z czynnikiem walencji intencji, zdania komunikujące krytykę wywołały większe amplitudy LPP niż zdania komunikujące pochwałę. Dodatkowo, większe amplitudy N400 zostały wywołane przez ironię pochwalną w porównaniu do ironii krytycznej w języku ojczystym. W języku obcym zaobserwowano odwrotny efekt – większe amplitudy N400 zostały wywołane przez ironię krytyczną w porównaniu do ironii pochwalnej oraz przez literalną pochwałę w porównaniu do literalnej krytyki. Te wyniki pokazują, że przetwarzanie ironii jest bardziej wymagające poznawczo w porównaniu do

przetwarzania znaczenia literalnego w języku obcym (większe amplitudy N400 dla ironii), bez zaobserwowanych różnic w języku ojczystym. Co więcej, jak pokazały większe amplitudy LPP, przetwarzanie ironii jest bardziej efektywne w języku ojczystym, gdyż wymaga pogłębionej reanalizy w porównaniu do znaczenia literalnego. Wyniki pokazały także, że dostęp semantyczny do słów o walencji negatywnej w języku obcym jest wstrzymany, oraz że słowa o walencji negatywnej przyciągają więcej uwagi niż słowa o walencji pozytywnej w języku obcym. Badanie pokazało, że przetwarzanie ironii w języku obcym jest trudniejsze, ale wymaga więcej reanalizy w języku ojczystym. Jednak wraz z podjętym wysiłkiem poznawczym w reanalizie przetwarzanie ironii okazuje się bardziej kompletne w języku ojczystym.

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Appendix A: The list of the experimental stimuli in L1 Polish used in the experiment

Original Number	Context	Interaction	Target Sentence	Condition	Comprehension Question
1	Julia chciała kupić kurtkę na lato i razem z Anną wybrała się na zakupy.	Anna: Ile tutaj letnich ciuchów!	Julia: Cóż za szczęśliwa sytuacja!	Literal Praise	Czy one są na zakupach?
13	Laura jest na spotkaniu, na którym jej przełożony mówi o nowej polityce firmy.	Przełożony: Wprowadzimy dodatkowy wolny dzień.	Laura: Co za wspaniały pomysł!	Literal Praise	Czy ona jest na spotkaniu?
16	Ewa, która jest na diecie, wybrała się na imprezę z Sandrą.	Ewa: Odpuszczę sobie ciasto.	Sandra: Cóż za zdyscyplinowana dziewczyna!	Literal Praise	Czy one są na imprezie?
19	Samuel bawi się swoimi zabawkami, ale już pora spać.	Michał: Samuel posprzątał klocki Lego!	Kasia: Cóż za perfekcyjne zachowanie.	Literal Praise	
22	Emilia, która nie-nawidzi deszczu, wraca na piechotę do domu z Anną.	Anna: Spójrz jak słonecznie!	Emilia: Cóż za perfekcyjny dzień.	Literal Praise	
24	Paweł ugotował obiad dla Marysi, która przeszła ostatnio na weganizm.	Paweł: Wszystkie dania są wegańskie.	Marysia: Cóż za wspaniały obiad.	Literal Praise	
25	Marysia i Anna, spóźnione, są w drodze na pociąg.	Anna: Pociąg właśnie przyjechał.	Marysia: Cóż za szczęśliwy dzień.	Literal Praise	

26	Zofia, której syn ma wkrótce trudny egzamin, poprosiła go, aby dużo się uczył.	Syn: Uczyłem się intensywnie.	Zofia: Jesteś takim wspaniałym studentem.	Literal Praise	
38	Ewa i Krysia są na spotkaniu firmowym.	Krysia: Prelegent jest bardzo pewny siebie.	Ewa: Cóż za doświadczony mówca.	Literal Praise	Czy one są na balu?
76	Anna przedstawiła wczoraj Krysi i Michałowi swojego chłopaka.	Michał: Jej chłopak ciepło nas przywitał.	Krysia: Cóż za przyjazny facet.	Literal Praise	Czy ona przedstawiła swojego szefa?
33	Michał przypadkowo podejrztał stan konta bankowego kolegi i opowiada o tym Annie.	Michał: On ma milion złotych.	Anna: Cóż za bogaty człowiek!	Literal Praise	Czy on przeczytał listy kolegi?
2	Emilia ma dzisiaj urodziny i marzy o nowym BMW.	Michał: Kupiłem Ci najnowsze BMW!	Emilia: Cóż za nowiutki samochód!	Literal Praise	Czy ona marzy o nowym domu?
200	Chociaż Jan był niechętny, aby iść na wykład o poszukiwaniu pracy, na który zaprosił go Marek, w końcu się zgodził.	Jan: Znalazłem pracę moich marzeń.	Marek: Cóż za skuteczny wykład.	Literal Praise	
109	Zuzanna zamierza wziąć udział w loterii w swoim mieście i rozmawia z Filipem.	Zuzanna: Nagroda to milion złotych.	Filip: Cóż za kusząca nagroda!	Literal Praise	
23	Przyjaciel Ewy namalował jej portret.	Michał: Wyglądasz na portrecie świetnie.	Ewa: Cóż za utalentowany malarz!	Literal Praise	
199	Karolina wybrała się na film.	Karolina: Aktorzy byli naprawdę dobrzy.	Ania: Cóż za wspaniała obsada.	Literal Praise	
195	Joanna założyła nową sukienkę na Sylwestra.	Emilia: Twój brzuch wygląda płasko.	Joanna: Cóż za atrakcyjna dziewczyna.	Literal Praise	
202	Jakub i Grzegorz są w podróży samochodem i Jakub wybrał miejsce, w którym zatrzymają się na noc.	Jakub: Okolica wygląda bardzo przyzwoicie.	Grzegorz: Cóż za wspaniały wybór.	Literal Praise	
203	Marysia, która boi	Strażnik: Nie-	Marysia: Cóż za	Literal Praise	

	się niedźwiedzi, jest na kempingu i pyta czy ostatnio widziano tu niedźwiedzie.	dźwiedzi ostatnio nie było.	wspaniała sytuacja.		
210	Róża, która jest początkującą fotografką, zrobiła właśnie swoją pierwszą sesję zdjęciową.	Weronika: Jej zdjęcia wyszły cudownie.	Anna: Cóż za obiecująca fotografka.	Literal Praise	
205	Joanna musiała zrobić zakupy świąteczne, ale Maria była niechętna by jechać razem z nią z powodu tłumów ludzi.	Joanna: Centrum handlowe jest puste.	Maria: Co za wspaniały przypadek!	Literal Praise	
206	Paweł i jego klasa mieli właśnie egzamin ze statystyki.	Paweł: Ten egzamin to pestka.	Małgosia: Cóż za łatwy egzamin.	Literal Praise	
207	Szymon narzekał na nauczyciela, który zadaje zbyt dużo pracy domowej.	Szymon: Mam wiele zadań domowych.	Mama: Cóż za ogromne obciążenie.	Literal Praise	
209	Ryszard udał się do Urzędu Skarbowego, aby uzyskać informacje na temat nowych regulacji podatkowych.	Ryszard: Urzędnik przedstawił nowe regulacje.	Nikoła: Cóż za pomocna osoba.	Literal Praise	
211	Beata oznajmiła, że uwielbia lekkie jedzenie, więc Anna przegląda jej lodówkę.	Anna: Masz dużo warzyw.	Beata: Co za zdrowa dieta.	Literal Praise	
212	Adrianna i Jakub wybrali się w rejs po Karaibach.	Adrianna: Nasza kajuta jest bardzo komfortowa.	Jakub: Co za wspaniałe wakacje!	Literal Praise	
12	Beata i Michał spotkali się wczoraj z przyjacielem, który właśnie się rozwiódł.	Michał: Nie wspominałem o rozwodzie.	Beata: Co za taktowne posunięcie!	Literal Praise	
215	Daniel niechętnie uczestniczył w	Daniel: Wykład był fascynujący!	Grzegorz: Cóż za entuzjastyczna	Literal Praise	

	wykładzie na temat globalnego ocieplenia.		reakcja.		
218	Jakub oznajmił swojej mamie, że z pewnością zda egzamin z fizyki.	Jakub: Egzamin zdany!	Mama: Cóż za doskonałe przewidywanie!	Literal Praise	
220	Julia i Samuel jeżdżą na nartach po raz pierwszy.	Samuel: Jeździłem na trudnej trasie.	Julia: Cóż za ambitne zadanie!	Literal Praise	
41	Maria jest z Tomkiem, który wypatrzył pewną osobę przy barze.	Tomek: To nauczycielka, której powinniśmy uniknąć.	Maria: Cóż za straszne spotkanie!	Literal Criticism	Czy oni są w barze?
42	Alicja jest na spotkaniu z Krysią, której nie widziała od dłuższego czasu.	Krysia: Wyglądasz na bardzo zmarnowaną!	Alicja: Cóż za niemiły komentarz!	Literal Criticism	Czy one są na spotkaniu?
43	Siostra Emilii zaprosiła ją z Danielem na obiad.	Daniel: Ta lasagna była okropna!	Emilia: Ona jest kiepską kucharką.	Literal Criticism	Czy oni byli na obiedzie?
45	Małgosia chciała by pojechać do Australii na wakacje i jej mąż ma dla niej niespodziankę.	Mąż: Zostańmy na naszej działce!	Małgosia: Co za nieciekawy plan!	Literal Criticism	Czy ona chce pojechać na wakacje?
47	Paula ma ważne spotkanie i poprosiła Jana o pomoc w prasowaniu sukienki.	Jan: Niestety ją przypaliłem.	Paula: Co za nieudolny gest!	Literal Criticism	
48	Michał miał kontuzję kolana i już nigdy nie będzie mógł jeździć na nartach.	Michał: Mój przyjaciel podarował mi gogle narciarskie.	Sandra: Cóż za nieczuły kolega!	Literal Criticism	
49	Anna zgubiła swój ulubiony kubek do kawy.	Paweł: Niechcący go zbiłem.	Anna: To jest okropna wiadomość!	Literal Criticism	
50	Joanna umówiła się na wizytę z mechanikiem samochodowym, rozmawia z managerem zakładu.	Manager: Mechanik już wyszedł.	Joanna: Cóż za nieprofesjonalne podejście.	Literal Criticism	Czy ona umówiła się na wizytę u lekarza?
53	Jakub wybrał film wiedząc, że Kasia nie znosi thrillerów.	Jakub: Wybrałem nagradzany thriller.	Kasia: Co za niedobry wybór!	Literal Criticism	Czy on wybrał restaurację na

	rów.				wieczór?
54	Emilia i jej mąż właśnie przyjechali do USA i znajdują się przy odbiorze bagażu na lotnisku.	Mąż: Kochanie, nasza walizka się zgubiła.	Emilia: Co za fatalna linia!	Literal Criticism	Czy oni pojechali do Kanady?
56	Wiktoria i Robert grają w pokera w kasynie w Las Vegas.	Robert: Wygrałem jednego dolara.	Wiktoria: Cóż za nieimponująca suma!	Literal Criticism	Czy oni grają w brydża?
57	Laura spędziła wczorajszy wieczór grając w „Monopol” z przyjaciółmi.	Laura: Za każdym razem przegrałam.	Marcin: Jesteś taką marną graczką!	Literal Criticism	
58	Patrycja i Szymon wybierają film na wieczór.	Szymon: Obejrzyjmy krwawy horror.	Patrycja: Cóż za brutalny gatunek.	Literal Criticism	
63	Adrianna i Piotr wybrali się do galerii sztuki nowoczesnej.	Piotr: Ten obraz jest namalowany jednym kolorem.	Adrianna: Cóż za uboga gama!	Literal Criticism	
64	Kasia zrobiła obiad i czeka na Jana, który właśnie do niej dzwoni.	Jan: Kochanie, spóźnię się.	Kasia: Co za fatalna koordynacja!	Literal Criticism	
169	Ewa była na spotkaniu szkolnym, gdzie spotkała się z wieloma starymi znajomymi.	Ewa: Wszyscy byli tacy snobistyczni!	Marcin: Cóż za koszmarnie spotkanie.	Literal Criticism	
170	Sandra i jej współlokatorka zorganizowały przyjęcie na powietrzu, prognozy pogody przewidywały przejaśnienie.	Współlokatorka: Cały dzień padało.	Sandra: Cóż za nietrafna prognoza!	Literal Criticism	
171	Przed rozmową kwalifikacyjną Jana, Paweł udzielił mu wskazówki jak zrobić dobre wrażenie.	Jan: Przed rozmową upiłem się.	Paweł: Cóż za nieodpowiedzialna postawa!	Literal Criticism	
173	Laura i Ania wybrały się na wycieczkę po kasynach z nadzieją	Laura: Wszystkie nasze pieniądze przegrałyśmy.	Ania: Cóż za marny talent.	Literal Criticism	

	wygrania góry pieniędzy.				
219	Robert i Jan byli w podróży samolotem do Chicago, gdzie mieli spotkanie.	Robert: Wylądowaliśmy z opóźnieniem.	Jan: Co za niepunktualny lot.	Literal Criticism	
176	Daniel poprosił Kasię, aby wytłumaczyła mu zadanie rachunkowe.	Daniel: Kasia się tylko przechwala wiedzą ze statystyki.	Tymoteusz: Cóż za chępliwa dziewczyna.	Literal Criticism	
179	Kasia szuka czystego i cichego mieszkania i agent nieruchomości znalazł coś dla niej.	Kasia: Mieszkanie było ciemne i ciasne.	Robert: Cóż za okropne miejsce.	Literal Criticism	
182	Zuzanna i Antek przygotowywali przyjęcie z wyśmienitym jedzeniem z małym budżetem.	Zuzanna: Składniki były dużo droższe niż przewidywaliśmy.	Antek: Cóż za drogie gotowanie.	Literal Criticism	
183	To był pierwszy dzień Joanny w nowej pracy jako nauczycielka i przygotowała inspirujący wykład.	Joanna: Studenci o nic nie pytali.	Piotr: Cóż za niezaangażowana grupa.	Literal Criticism	
186	Marta kupiła używany samochód i poprosiła mechanika o wykonanie przeglądu.	Mechanik: Samochód potrzebuje nowego silnika.	Marta: To jest fatalna wiadomość.	Literal Criticism	
188	Franek poprosił Karola, aby spotkali się na obiad punktualnie o siódmej.	Franek: Karol przyszedł spóźniony.	Emilia: Cóż za niepunktualny facet.	Literal Criticism	
189	Józek obiecał, że nie powie nikomu o urodzinowym przyjęciu-niespodziance dla Anny.	Józek: Powiedziałem Annie o przyjęciu.	Mama: Cóż za fatalny pomysł.	Literal Criticism	
185	Uczniowie Anety byli niechętni na projekt grupowy.	Aneta: Ostatecznie go zbojkotowali.	Greta: Cóż za beznadziejna grupa.	Literal Criticism	
194	Beata nie mogła doczekać się za-	Profesor: Zadam Wam kilka czyta-	Beata: Cóż za nieprzyjemny	Literal Criticism	

	bawy w weekend bez pracy i czytania.	nek.	weekend.		
198	Alicja i Tymek pracują w opiece społecznej i są na wizycie w rodzinie, która podobno żyje w skrajnej biedzie.	Alicja: Jaki zniszczony dom!	Tymek: Cóż za okropne miejsce.	Literal Criticism	
66	Alicja i Michał nie mogli doczekać się wieczoru we dwoje, a ktoś puka do drzwi.	Michał: Hmm, to Twoi rodzice.	Alicja: Co za idealna pora!	Ironie Criticism	Czy ktoś puka do drzwi?
68	Greta i Tomek są w restauracji i Greta marzy o kremie z białych szparagów.	Kelner: Krem z białych szparagów się skończył.	Greta: To jest świetna informacja!	Ironie Criticism	Czy oni są w restauracji?
70	Alan i Marysia są w muzeum.	Alan: Ta rzeźba ma dziesięć centymetrów.	Marysia: Co za ogromna rzeźba!	Ironie Criticism	Czy oni są w muzeum?
72	Anna, Michał i Szymon grali w "Prawdę czy wyzwanie?"	Michał: Szymon we wszystkich pytaniach skłamał.	Anna: Cóż za szczerzy chłopak.	Ironie Criticism	
75	Michał wybrał się wczoraj na występ stand-up.	Michał: Komik we wszystkich zanudził.	Julia: Cóż za zabawny kabareciarz!	Ironie Criticism	
79	Grzegorz i Joanna szukają przytulnego i dobrze oświetlonego mieszkania.	Grzegorz: Jest tu bardzo ciemno.	Joanna: Cóż za przyjemne miejsce!	Ironie Criticism	
8	Nikola jest bardzo zmęczona i rozmawia z mamą.	Nikola: Cały dzień nic nie zrobiłam.	Mama: Co za pracowita dziewczyna!	Ironie Criticism	
82	Rodzice Pauliny wczoraj zaprosili ją i Tomka na parapetówkę.	Tomek: Twoi rodzice nie segregują śmieci!	Paulina: Cóż za ekologiczne podejście!	Ironie Criticism	
106	Anna i Tomek są na wakacjach i Tomek wygląda przez okno.	Tomek: Spójrz, kochanie, pada.	Anna: Co za cudowny dzień!	Ironie Criticism	Czy oni są w pracy?
84	Są urodziny Marcina i obiecał zorganizować imprezę.	Marcin: Impreza urodzinowa odwołana.	Sandra: Co za fantastyczny pomysł.	Ironie Criticism	Czy są jego imieniny?

85	Emilia i Robert spacerują po mieście.	Robert: Spójrz na te opustoszałe ulice!	Emilia: Cóż za radujące miejsce!	Ironie Criticism	Czy oni są w biurze?
86	Laura i Daniel jadą do supermarketu.	Daniel: Zostawiłem włączone żelazko.	Laura: Jesteś takim odpowiedzialnym facetem!	Ironie Criticism	Czy oni jadą do muzeum?
87	Karina ma za chwilę zostać poddana testowi na wykrywaczu kłamstw, ale nie jest jeszcze gotowa.	Urzędnik: Zacznijmy nasz test.	Karina: Co za wspaniała decyzja.	Ironie Criticism	
89	Grzegorz i Diana wyruszyli na szlak w górach wcześnie rano, aby uniknąć tłumów.	Grzegorz: Szlak jest zatłoczony!	Diana: Co za wspaniały zbieg!	Ironie Criticism	
92	Zuzia i Linda były na pogrzebie.	Zuzia: Tomek cały czas sobie żartował.	Linda: Co za stosowne zachowanie.	Ironie Criticism	
141	Hania i Michalina rozmawiają o swojej przyjaciółce, która jest supermodelką.	Hania: Zależy jej tylko na podziwie innych.	Michalina: Cóż za skromna dziewczyna.	Ironie Criticism	
142	Natalia i Kasia rozmawiają o swojej przyjaciółce.	Natalia: Gdy się jej zwierzam, udaje, że słucha.	Kasia: Co za szczerza dziewczyna.	Ironie Criticism	
143	Daniel i Paweł rozmawiają o prezencie swojej firmy, która jest multimilionerką.	Daniel: Nie poma-ga innym, dba tylko o siebie.	Paweł: Cóż za szlachetna postawa.	Ironie Criticism	
144	Julia i Piotr rozmawiają o swoim wujku, który jest alkoholikiem.	Julia: Gdy jest pijany, jest agresywny.	Piotr: Co za łagodny facet.	Ironie Criticism	
164	Po swoim pierwszym dniu w pracy, Karolina komentuje.	Karolina: Biuro jest słabo wyposażone.	Adam: Cóż za profesjonalne środowisko.	Ironie Criticism	
148	Jeremiasz opowiada Laurze o spotkaniu z Marią.	Jeremiasz: Bezdomni poprosili nas o jedzenie a Maria ich zignorowała.	Laura: Co za empatyczna kobieta.	Ironie Criticism	
149	Greta i Dawid rozmawiają o	Greta: Gdy nie dostaje natychmiast	Dawid: Co za cierpliwy nau-	Ironie Criticism	

	swoim nauczycielu i jego metodach.	odpowiedzi, krzyczy.	czyciel.		
150	Koleżanka Greta wykonuje dużo prywatnych połączeń z telefonu służbowego.	Greta: Gdy została przyłapana, zaprzeczyła.	Artur: Cóż za szczerą dziewczyna.	Ironie Criticism	
151	Aneta opowiada Patrycji o swojej przełożonej.	Aneta: Zawsze, gdy ją o coś pytam, odpowiada niechętnie.	Patrycja: Co za przystępna kobieta.	Ironie Criticism	
152	Jan opowiada swojemu bratu, Jeremiaszowi, co jego stary przyjaciel zrobił, gdy Jan wyjechał w interesach.	Jan: Spał z moją żoną.	Jeremiasz: Cóż za wspaniały facet!	Ironie Criticism	
155	Greta opowiada mężowi, Grzegorzowi, o przyjaciółce.	Greta: Ona cały czas się smuci.	Grzegorz: Cóż za szczęśliwa dziewczyna!	Ironie Criticism	
156	Anna jest prawniczką i opowiada o swoim koledze prawniku.	Anna: Kiedy udowodniłam, że nie ma racji, zaatakował mnie.	Mateusz: Co za profesjonalna odpowiedź.	Ironie Criticism	
11	Diana i Marek mają teraz bardzo pracowity okres w pracy.	Marek: Spóźniłem się ze wszystkimi terminami!	Diana: Jesteś takim oddanym pracownikiem!	Ironie Criticism	
191	Alan zadał swojemu profesorowi pytanie.	Alan: Jego odpowiedź była wymijająca.	Tymek: Cóż za kompetentny profesor.	Ironie Criticism	
165	Wiki wynajęła profesjonalnego fotografa, aby robił zdjęcia na imprezie.	Wiki: Robił zdjęcia smartfonem.	Tymek: Co za profesjonalne podejście.	Ironie Criticism	
94	Jakub rozmawia z przyjacielem, Tomkiem, o wypadku na drodze.	Jakub: Pewien kierowca ostrzegł mnie.	Tomek: Cóż za bezmyślny kierowca.	Ironie Praise	Czy oni rozmawiają o wypadku?
95	Sandra widziała swoją szefową na miejscu wypadku i rozmawia o tym z Jeremiaszem.	Sandra: Pomogła nieznanemu w trudnej sytuacji.	Jeremiasz: Cóż za niezwykła kobieta.	Ironie Praise	Czy oni rozmawiają o jej szefowej?
98	Dawid i Zuzia spodziewają się,	Dawid: Zaraz nam pomoże.	Zuzia: Cóż za niezwykły	Ironie Praise	Czy oni myślą, że za-

	że ich syn zaniesie walizki.		chłopak!		niesie walizki?
99	Kasia rozmawia z mężem, Markiem, o swojej wizycie u lekarza.	Kasia: Wizyta trwała dwie godziny!	Marek: Cóż za krótka wizyta!	Ironie Praise	Czy oni rozmawiają o wizycie u lekarza?
102	Robert chciałby dowiedzieć się więcej o projekcie, więc prosi Franka, aby go wprowadził.	Franek: Mogę Ci teraz pomóc.	Robert: Jesteś takim niezwykłym przyjacielem!	Ironie Praise	
104	Franek i Ewa uczestniczą w eleganckim obiedzie.	Franek: Strój Julii jest fantastyczny.	Ewa: Cóż za okropny wygląd!	Ironie Praise	
110	Katarzyna i Daniel są w restauracji i właśnie podano ich dania.	Katarzyna: To wygląda naprawdę przepysznie!	Daniel: Cóż za kiepska restauracja!	Ironie Praise	
74	Julia opowiada Annie o imprezie, na której była wczoraj.	Julia: Wyszłam nad ranem.	Anna: Co za nieudana impreza.	Ironie Praise	Czy ona opowiada o egzaminie?
112	Marek opowiada Mirce o obiedzie, zorganizowanym przez jego przełożonego.	Marek: Przełożony zapłacił za nas.	Mirka: Cóż za skąpy facet!	Ironie Praise	Czy on opowiada o operacji?
181	Pewien ojciec chwalił wyjątkowy talent rysowniczy swojego syna.	Jan: Jego rysunki były niesamowite.	Michał: Cóż za nieutalentowany chłopak.	Ironie Praise	Czy on opowiadał o swojej córce?
115	Julia i Patrycja są na wykładzie.	Julia: Profesor przytoczył wiele przykładów!	Patrycja: Cóż za bezużyteczny wykład!	Ironie Praise	Czy oni są w sklepie?
116	W czasie oczekiwania na pociąg Franek dzwoni do Pawła.	Franek: Pociąg przyjedzie punktualnie.	Paweł: Cóż za niesolidna kolej!	Ironie Praise	
118	Jerzy pracuje nad esejem.	Jerzy: Gdy skończyłem pisać zapisałem plik.	Mama: Cóż za niefortunny ruch.	Ironie Praise	
120	Lidia opowiada Mai o swojej diecie.	Lidia: Jem dużo owoców.	Maja: Cóż za niezdrowa dieta!	Ironie Praise	
59	Diana skończyła czytać książkę opartą na „Romeo	Diana: Opowiada historię kochanków, którzy otru-	Jacek: Cóż za niecodzienna opowieść.	Ironie Praise	

	i Julii”.	wają się nawzajem.			
122	Lidia i Kasia wybrały się wczoraj do restauracji.	Lidia: Czekaliśmy na posiłek pięć minut.	Kasia: To była powolna obsługa!	Ironie Praise	
123	Joanna ubiega się o nowy paszport i rozmawia z urzędnikiem w biurze paszportowym.	Urzędnik: To już wszystkie niezbędne dokumenty.	Joanna: To jest zła informacja.	Ironie Praise	
125	Julian szepcze Dianie do ucha w trakcie koncertu.	Julian: Muzycy są ze sobą dobrze zgrani.	Diana: Cóż za kiepski zespół.	Ironie Praise	
126	Marek pomaga Zofii z jej komputerem, który zaczął wolniej działać.	Marek: Wirus usunięty.	Zofia: Cóż za nieudolny ruch!	Ironie Praise	
167	Sara nie mogła doczekać się przyjemnego obiadu świątecznego z całą swoją rodziną.	Jacek: Wszyscy byli bardzo szczęśliwi.	Sara: Cóż za napięta atmosfera.	Ironie Praise	
129	Weronika uczestniczyła właśnie w wykładzie.	Weronika: Prelegent wszystkich aktywnie zaangażował.	Anna: Cóż za kiepski prezenter.	Ironie Praise	
132	Weronika i Anna rozmawiają o swojej koleżance.	Weronika: Jej mąż troszczy się o nią.	Anna: Cóż za okrutny mąż.	Ironie Praise	
133	Daniel rozmawia z Julią o Marku, który jest celebrytą.	Daniel: Wszyscy w mieście o nim słyszeli.	Julia: Cóż za niezłany człowiek.	Ironie Praise	
134	Marta i Paula rozmawiają o nowej polityce podatkowej.	Marta: Nowa ustawa wprowadza niższe podatki.	Paula: Cóż za straszne prawo!	Ironie Praise	
135	Tamara i Jerzy rozmawiają o swoim synu.	Tamara: Mógłby spędzać całe dnie ćwicząc.	Jerzy: Cóż za leniwy chłopak.	Ironie Praise	
136	Gdy Jan wychodził z biura, później niż zwykle, usłyszał krzyki o pomoc dobiegające z jednego z biur.	Jan: Natychmiast pomogłem.	Zuzanna: Jesteś takim tchórzliwym człowiekiem!	Ironie Praise	
137	Piotr pracuje jako	Piotr: Moi pacjenci	Alicja: Jesteś	Ironie Praise	

	dentysta.	nie czują bólu podczas zabiegu.	takim niedelikatnym dentystą.		
138	Karol ostatnio awansował kilkukrotnie.	Klara: Nigdy nikt go nie oszukał, aby awansować.	Tymek: On jest nieuczciwym facetem.	Ironie Praise	
139	Franek rozmawia z Dorotą o swoim kuzynie, który obiecał Frankowi pomóc z jego samochodem.	Franek: Zawsze ma czas mi pomóc.	Dorota: Cóż za niesolidny facet.	Ironie Praise	
140	Mateusz otrzymał właśnie diagnozę od swojego lekarza.	Mateusz: Przekazał diagnozę bardzo ostrożnie.	Joanna: Cóż za niedelikatny lekarz.	Ironie Praise	

Appendix B: The list of the experimental stimuli in L2 English used in the experiment.

Original number	Context	Interaction	Target Sentence	Condition	Comprehension Question
122	Lydia and Kate went to a restaurant yesterday.	Lydia: We were waiting five minutes for our meal!	Kate: That was quick service	Literal Praise	Did they go to a restaurant yesterday?
123	Joanna is applying for a new passport, and she is talking to a Passport Office officer.	Officer: You have all the required documents.	Joanna: This is great news.	Literal Praise	Did they go to a restaurant yesterday?
125	Julian is whispering to Diane's ear during a concert.	Julian: The musicians are in sync.	Diane: Such a gifted band.	Literal Praise	Are they at a concert?
126	Mark is helping Sophie with her computer as it has been working slower.	Mark: I have removed a virus.	Sophie: Such a brilliant move!	Literal Praise	
167	Sarah was looking forward to a pleasant holiday dinner with her entire family.	Jack: Everyone was very joyful.	Sarah: Such a relaxed atmosphere.	Literal Praise	
129	Veronica has just attended a lecture.	Veronica: The speaker made everyone actively engaged.	Anna: Such a great presenter!	Literal Praise	
132	Vera and Anna are talking	Vera: Her husband cares for her.	Anna: Such a loving husband!	Literal Praise	

	about their friend.				
133	Daniel is talking to Julia about Mark, who is a celebrity.	Daniel: Everybody in town has heard of him.	Julia: Such a popular person.	Literal Praise	
134	Marta and Paula are talking about a new tax policy.	Marta: The new bill introduces lower taxes.	Paula: Such a great bill!	Literal Praise	Are they shopping?
135	Tammy and George are talking about their son.	Tammy: He could spend all day exercising.	George: Such an active boy.	Literal Praise	Are they swimming?
136	As John was leaving the office late, he heard screams calling for help in one of the offices.	John: I helped immediately.	Susan: You're a brave man!	Literal Praise	Did he hear whispers?
137	Peter works as a dentist.	Peter: My patients never feel pain during the treatment.	Alice: You're a gentle dentist.	Literal Praise	Does he work as a cardiologist?
138	Charles has recently enjoyed a series of promotions.	Claire: He has never cheated to get promoted.	Tim: He's an honest guy.	Literal Praise	
139	Frank is talking to Dorothy, about his cousin, who promised to help Frank with the car.	Frank: He always has the time to help me.	Dorothy: Such a reliable guy.	Literal Praise	
140	Matthew has just been given a diagnosis by his doctor.	Matthew: He delivered the diagnosis carefully.	Joanna: Such a gentle doctor.	Literal Praise	
94	Jacob is talking to his friend, Tom, about an accident on the road.	Jacob: Another driver warned me.	Tom: Such a thoughtful driver.	Literal Praise	
95	Sandra saw her boss at an accident scene, and she is talking to Jeremy about it.	Sandra: She assisted a stranger in a difficult situation.	Jeremy: Such a helpful woman.	Literal Praise	

98	David and Suzie are expecting their son to carry suitcases.	David: He is going to help us.	Suzie: Such a helpful boy!	Literal Praise	
99	Kate is talking to her husband, Mark, about a doctor's appointment she had.	Kate: The appointment took two hours.	Mark: Such a long one!	Literal Praise	
102	Robert would like to learn more about a project, so he asks Frank to give him an introduction.	Frank: I can help you now.	Robert: You're a supportive friend!	Literal Praise	
104	Frank and Eve are attending an elegant dinner party.	Frank: Julia's outfit is fantastic.	Eve: Such a spectacular look!	Literal Praise	
110	Catherine and Dan are at a restaurant and their dishes have just been served.	Catherine: This looks really tasty.	Dan: Such an amazing restaurant!	Literal Praise	
74	Julia is telling Anna about a party she attended yesterday.	Julia: I left in the morning.	Anna: What a good party.	Literal Praise	
112	Mark is telling Mira about the dinner organized by his team leader.	Mark: Our team leader paid for us.	Mira: Such a generous guy!	Literal Praise	
181	A father praised his son's exceptional talent in drawing.	John: His drawings were stunning.	Mike: Such a talented boy.	Literal Praise	
115	Julia and Pat are at a lecture.	Julia: The professor gave many examples.	Pat: Such an informative lecture!	Literal Praise	
116	While Frank is waiting for his train, he is calling Paul.	Frank: The train is about to arrive punctually.	Paul: Such a reliable railway!	Literal Praise	
118	George has been working on an	George: When I finished writing I	Mom: Such a great move.	Literal Praise	

	essay.	saved the file.			
120	Lydia is telling Maya about her dietary regime.	Lydia: I eat plenty of fruit.	Maya: Such a healthy diet!	Literal Praise	
59	Diane has finished reading a book based on "Romeo and Juliet".	Diane: It tells a story of a couple poisoning themselves.	Jack: Such a traditional story.	Literal Praise	
141	Hannah and Michelle are talking about their friend, who is a super model.	Hannah: She only craves admiration from others.	Michelle: Such a vain girl.	Literal Criticism	Is she a super model?
142	Natalie and Kate are talking about their friend.	Natalie: When I talk to her, she pretends she listens.	Kate: What an insincere girl.	Literal Criticism	Are they talking about their friend?
143	Dan and Paul are talking about the CEO of their company, who is a multimillionaire.	Dan: She never helps others and only cares about herself.	Paul: Such a selfish attitude.	Literal Criticism	Are they talking about their CEO?
144	Julia and Peter are talking about their uncle, who is an alcoholic.	Julia: When drunk, he is aggressive.	Peter: What a violent guy.	Literal Criticism	Is he an alcoholic?
164	After her first day at work, Carol comments.	Carol: The office is poorly equipped.	Adam: Such an unprofessional environment.	Literal Criticism	
148	Jeremy is telling Laura about his meeting with Marie.	Jeremy: Homeless people asked us for food and Marie ignored them.	Laura: What an unsympathetic woman.	Literal Criticism	
149	Greta and David are talking about their teacher and his methods.	Greta: When he gets no immediate answer, he shouts.	David: What an impatient teacher.	Literal Criticism	
150	Greta's colleague makes tons of private calls from a company phone.	Greta: When she was caught, she denied.	Arthur: Such a dishonest girl.	Literal Criticism	Does her colleague dance at work?
151	Annette is talk-	Annette: Whenever	Patricia: What an	Literal Criti-	Are they

	ing to Patricia about her team leader.	I have a question, she answers reluctantly.	unapproachable woman.	cism	screaming?
152	John is telling his brother, Jeremy, what his long-time pal did when John was away.	John: He slept with my wife.	Jeremy: What a horrible guy!	Literal Criticism	Are they dancing?
155	Greta is telling her husband, Greg, about a friend.	Greta: She keeps being miserable.	Greg: Such a sad girl!	Literal Criticism	Are they arguing?
156	Anne is a lawyer and is talking about her colleague, also a lawyer.	Anne: When I proved him wrong, he attacked me.	Matt: What an unprofessional response.	Literal Criticism	
11	Diane and Mark are having a very busy time at work.	Mark: I have missed all deadlines!	Diane: You're a negligent worker!	Literal Criticism	
191	Alan asked his professor a question.	Alan: His answer was evasive.	Tim: Such an incompetent professor.	Literal Criticism	
165	Vicky hired a professional photographer to take pictures during a party.	Vicky: He was taking pictures with a smartphone.	Tim: What an unprofessional approach!	Literal Criticism	
66	Alice and Michael have been looking forward to an evening all to themselves but they hear a knock on the door.	Michael: Hmm, your parents are here.	Alice: What a terrible timing!	Literal Criticism	
68	Greta and Tom are at a restaurant and Greta is dreaming of white asparagus cream.	Waiter: There is no asparagus cream.	Greta: This is bad news.	Literal Criticism	
70	Alan and Mary are at a museum.	Alan: This sculpture is ten centimeters tall.	Mary: What a small sculpture!	Literal Criticism	
72	Anna, Michael and Simon played a game	Michael: Simon lied in all questions.	Anna: Such a dishonest guy.	Literal Criticism	

	of “Truth or Dare”.				
75	Michael went to stand-up yesterday.	Michael: The comedian made everyone bored.	Julia: Such a stiff entertainer.	Literal Criticism	
79	Greg and Joanna are looking for a cozy and well-lit apartment.	Greg: It is very dark in here.	Joanna: Such a unpleasant place!	Literal Criticism	
8	Nicky is very tired and talking to her mom.	Nicky: I have been doing nothing all day.	Mom: What a lazy girl!	Literal Criticism	
82	Paulina’s parents invited her and Tom over for a housewarming yesterday.	Tom: Your parents do not sort waste.	Paulina: Such an eco-unfriendly approach!	Literal Criticism	
106	Anna and Tom are on vacation and Tom is looking out of the window.	Tom: Look, honey, it is raining outside!	Anna: What an awful day!	Literal Criticism	
84	It is Martin’s birthday and he promised to throw a party.	Martin: I am canceling the party!	Sandra: What a bad idea.	Literal Criticism	
85	Emily and Robert are walking downtown.	Robert: Look at these desolate streets!	Emily: Such a depressing place!	Literal Criticism	
86	Laura and Daniel are on their way to the supermarket.	Daniel: I left the iron on.	Laura: You're an irresponsible guy!	Literal Criticism	
87	Karen is about to take a lie detector test, but she is not ready for it yet.	Officer: Let's start the test.	Karen: What a terrible decision.	Literal Criticism	
89	George and Diane are hiking in the mountains early in the morning to avoid people.	George: The trail is packed!	Diane: What a horrible coincidence!	Literal Criticism	
92	Suzie and Linda were at a funeral.	Suzie: Tom was cracking jokes all the time.	Linda: What an inappropriate behavior.	Literal Criticism	
169	Eve was at her	Eve: Everybody was	Martin: Such a	Ironic Criticism	Was she at a

	college reunion where she met many old acquaintances.	so snobby!	fabulous reunion.	cism	reunion?
170	Sandra and her roommate were having a cook-out and the forecast predicted clear sky.	Roommate: It was raining all day.	Sandra: Such an accurate forecast!	Ironic Criticism	Were they having a cook-out?
171	Before John's job interview, Paul gave him tips how to make a good impression.	John: I got drunk before the interview.	Paul: Such a responsible attitude!	Ironic Criticism	Did he have an interview?
173	Laura and Anna were on a gambling trip where they hoped to win a pile of money.	Laura: We lost all our money.	Anna: Such a top talent.	Ironic Criticism	
219	Robert and John were flying to Chicago for a meeting.	Robert: We landed late.	John: What a prompt flight.	Ironic Criticism	
176	Daniel asked Kate to explain the calculus to him.	Daniel: Kate only brags about her statistics knowledge.	Tim: Such a modest girl.	Ironic Criticism	
179	Cathy is looking for a clean and quiet apartment and the rental agent has found one.	Cathy: He showed me a dark and cramped apartment.	Rob: Such a delightful place.	Ironic Criticism	
182	Susan and Tony were preparing a gourmet meal party with a very small budget.	Susan: The ingredients were much more expensive than expected.	Tony: Such a cheap cooking.	Ironic Criticism	
183	It was Joanna's first day at her new teaching job and she had prepared a stimulating lecture.	Joanna: The students did not ask about anything.	Pete: Such an engaged group.	Ironic Criticism	Was it her last day at work?
186	Martha has bought a used	Mechanic: This car needs a new engine.	Martha: This is great news.	Ironic Criticism	Has she bought a new car?

	car and she has asked a mechanic for a check-up.				
188	Frank asked Charlie to meet him for dinner at seven sharp.	Frank: Charlie was late.	Emily: Such a prompt guy.	Ironic Criticism	Did they meet for breakfast?
189	Joseph promised not to tell anyone about Anna's surprise birthday party.	Joseph: I told Anna about the party.	Mom: Such an excellent idea.	Ironic Criticism	Were they planning a concert?
185	Annette's students were reluctant to do a group project.	Annette: Eventually, they boycotted the project.	Greta: Such an excellent group.	Ironic Criticism	
194	Betty was looking forward to a fun weekend with no work and extra reading.	Professor: There are several reading assignments.	Betty: Such a pleasant weekend.	Ironic Criticism	
198	Alicia and Tim are social workers and they are visiting a family they were told lived in abject poverty.	Alicia: What a dilapidated house!	Tim: Such a luxurious place.	Ironic Criticism	
41	Maria is out with Tom, who spotted someone at the bar.	Tom: That is the teacher we should avoid.	Maria: Such a great meet-up.	Ironic Criticism	
42	Alice is having an appointment with Christie, whom she has not seen for a long time.	Christie: You look very wasted.	Alice: Such a nice comment!	Ironic Criticism	
43	Emily's sister invited her and Daniel over for dinner.	Daniel: The lasagna was awful.	Emily: She's a master cook.	Ironic Criticism	
45	Maggie would love to go to Australia for holidays and her husband has a	Husband: Let's stay in our garden!	Maggie: What an exciting plan!	Ironic Criticism	

	surprise for her.				
47	Paula is having an important meeting and she has asked John for help with ironing her dress.	John: Unfortunately I have burned it.	Paula: What a helpful gesture!	Ironic Criticism	
48	Mike had a knee injury and can never ski again.	Mike: My friend gifted ski goggles to me.	Sandra: Such an empathetic friend!	Ironic Criticism	
49	Anna has lost her favorite coffee mug.	Paul: I have broken it accidentally.	Anna: This is amazing news!	Ironic Criticism	
50	Joanna has made an appointment with a car mechanic, and she is speaking to the manager.	Manager: The mechanic has left.	Joanna: Such a professional attitude.	Ironic Criticism	
53	Jacob has picked a movie knowing that Kate hates thrillers.	Jacob: I have chosen an award-winning thriller.	Kate: What an excellent choice!	Ironic Criticism	
54	Emily and her husband have just arrived in the USA and they are at the baggage claim at the airport.	Husband: Honey, our suitcase is lost.	Emily: What a great airline!	Ironic Criticism	
56	Victoria and Robert are playing poker at a casino in Las Vegas.	Robert: I won one dollar.	Victoria: Such an impressive sum!	Ironic Criticism	
57	Laura spent last evening playing Monopoly with her friends.	Laura: I lost every game.	Martin: You're an outstanding player!	Ironic Criticism	
58	Patricia and Simon are choosing a movie for tonight.	Simon: Let's watch a bloody horror.	Patricia: Such a soothing genre.	Ironic Criticism	
63	Adrianna and Peter are at a modern art gal-	Peter: This painting has only one color in it.	Adrianna: Such a wide range!	Ironic Criticism	

	lery.				
64	Kate has made dinner and she is waiting for John who is calling her.	John: Honey, I will be late.	Kate: What a perfect timing!	Ironic Criticism	
199	Carol went to see a movie.	Carol: The actors were really good.	Anna: Such a horrible cast.	Ironic Praise	Did she go to see a movie?
195	Joanna is wearing a new dress for New Year's Eve.	Emily: Your stomach looks flat.	Joanna: Such an unattractive girl.	Ironic Praise	Is she wearing a new dress?
202	Jake and Greg are on a roadtrip and Jake has picked a place to stay at for the night.	Jake: This neighborhood looks respectable.	Greg: Such a poor choice.	Ironic Praise	Are they on a roadtrip?
203	Mary, scared of bears, is camping and asking about recent bear sightings.	Keeper: There have been no bears recently.	Mary: Such a horrifying situation.	Ironic Praise	Is she scared of bears?
210	Rose, who is a beginning photographer, has just had her first photo shoot.	Vera: Her pictures were wonderful.	Anna: Such an unpromising photographer.	Ironic Praise	
205	Joanna needed to do her Christmas shopping but Maria was reluctant to go with her because of the crowds.	Joanna: The mall is empty.	Maria: What a terrible coincidence!	Ironic Praise	
206	Paul and his class have just had an exam in statistics.	Paul: The exam was a breeze.	Maggie: Such a hard exam.	Ironic Praise	
207	Simon complained about his teacher assigning too much homework.	Simon: I have many assignments.	Mother: Such a small workload.	Ironic Praise	Did he praise his teacher?
209	Rick went to the tax office to learn about new	Rick: The official presented new regulations.	Nicky: Such an unhelpful person.	Ironic Praise	Did he go to the post office?

	tax regulations.				
211	Betty said she loved light food, so Anna is looking into her refrigerator.	Anna: You have many vegetables.	Betty: What an unhealthy diet.	Ironic Praise	Does she love fat food?
212	Adrianna and Jake are on a cruise in the Caribbean.	Adrianna: Our cabin is very comfortable.	Jake: What a horrible trip!	Ironic Praise	Are they on a flight?
12	Yesterday, Betty and Mike met a friend who has just divorced.	Mike: I did not mention his divorce.	Betty: What a tactless move.	Ironic Praise	
215	Daniel, reluctantly, attended a lecture on global warming.	Daniel: The lecture was fascinating!	Greg: Such an unenthusiastic reaction.	Ironic Praise	
218	Jake told his mom he was sure he would pass his physics exam.	Jake: Exam passed!	Mom: Such an inaccurate prediction!	Ironic Praise	
220	Julie and Sam are skiing for the first time.	Sam: I skied on a difficult slope.	Julie: Such an effortless activity!	Ironic Praise	
1	Julia wanted to buy a summer jacket and went shopping with Anna.	Anna: So many summer clothes!	Julia: What a bad luck.	Ironic Praise	
13	Laura is in a meeting and her supervisor is speaking about a new policy in the company.	Supervisor: We will launch an extra free day.	Laura: What a terrible idea!	Ironic Praise	
16	Eve, who is on a diet, is at a party with Sandra.	Eve: I am skipping the cake.	Sandra: Such an undisciplined girl!	Ironic Praise	
19	Sam has been playing with his toys but it is bedtime.	Mike: Sam has cleared his Lego!	Kate: Such a terrible behavior.	Ironic Praise	
22	Emily, who hates it when it rains, is walking home with Anna.	Anna: Look, it is sunny!	Emily: Such a horrible day.	Ironic Praise	

24	Paul has just cooked dinner for Mary who has recently turned vegan.	Paul: All the dishes are vegan.	Mary: Such a horrible dinner.	Ironic Praise	
25	Mary and Anna are running late for their train.	Anna: The train has just arrived!	Mary: Such an unlucky day.	Ironic Praise	
26	Sophie, whose son is about to take a difficult exam, told him to study hard.	Son: I have been studying intensively today.	Sophie: You're a bad student.	Ironic Praise	
38	Eve and Christie are at a department meeting.	Christie: The speaker is very confident.	Eve: Such an inexperienced speaker.	Ironic Praise	
76	Anna introduced her boyfriend to Christie and Michael yesterday.	Michael: Her boyfriend greeted us warmly.	Christie: Such an unfriendly guy.	Ironic Praise	
33	Mike accidentally peeked at his colleague's bank account and he is talking to Anna about it.	Mike: He has one million dollars!	Anna: Such a poor guy!	Ironic Praise	
2	It is Emily's birthday today and she has been dreaming of a brand new BMW.	Mike: I have bought you the latest BMW!	Emily: Such an old car!	Ironic Praise	
200	Though John was reluctant to go to the lecture about job hunting Mark invited him to, he eventually agreed.	John: I found a dream job.	Mark: Such a fruitless lecture!	Ironic Praise	
109	Susan is going to take part in a lottery in her town and she is talking to Philip.	Susan: The prize is one million dollars.	Philip: Such a small prize!	Ironic Praise	
23	Eve's friend painted her por-	Mike: You look great in this portrait!	Eve: Such a bad painter!	Ironic Praise	

	trait.				
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Appendix C: Resolution of the Ethics Committee for Research Involving Human Participants



UNIWERSYTET IM. ADAMA MICKIEWICZA W POZNANIU
Komisja Etyczna ds. badań naukowych prowadzonych z udziałem ludzi

Poznań, dnia 30 czerwca 2021 r.

SNJL/195/2020/2021

Pan

Mgr Paweł Chelminiak

Zakład Pragmatyki Języka Angielskiego

Wydział Anglistyki UAM

w miejscu

Szanowny Panie,

Uprzejmie informuję, że dnia 21 czerwca 2021 r. Komisja etyczna ds. badań naukowych prowadzonych z udziałem ludzi UAM wydała pozytywną opinię o projekcie badawczym pt. "Rola antycypacji w przetwarzaniu ironii w języku ojczystym oraz obcym: Badania behawioralne oraz z wykorzystaniem potencjałów wywołanych" pod warunkiem dokonania korekty na podstawie uwag przesłanych do Pana w dniu 22 czerwca 2021 r. Pozytywna opinia dotyczy wniosku po dokonaniu korekty, złożonego przez Pana w dniu 28 czerwca 2021 r. (nr akt KE/9/2021).

Przesyłam w załączeniu oryginał Uchwały nr 10/2020/2021 Komisji Etycznej ds. badań naukowych prowadzonych z udziałem ludzi w wersji polskiej i angielskiej.

Z poważaniem,

Przewodnicząca

Komisji etycznej ds. badań naukowych prowadzonych z udziałem ludzi

prof. dr hab. Katarzyna Dziubalska-Kołaczyk

Załączniki:

1. Uchwała nr 10/2020/2021 Komisji Etycznej ds. badań naukowych prowadzonych z udziałem ludzi
2. Resolution No. 10/2020/2021 of the Ethics Committee for Research Involving Human Participants



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Uchwała nr 10/2020/2021

Komisji Etycznej Uniwersytetu im. Adama Mickiewicza w Poznaniu
ds. badań naukowych prowadzonych z udziałem ludzi
z dnia 21 czerwca 2021 roku

w sprawie projektu badawczego:

**Rola antycypacji w przetwarzaniu ironii w języku ojczystym oraz obcym: Badania
behawioralne oraz z wykorzystaniem potencjałów wywołanych**

Na podstawie § 4 ust. 5 Regulaminu Komisji Etycznej Uniwersytetu im. Adama Mickiewicza w Poznaniu ds. badań naukowych prowadzonych z udziałem ludzi (zarządzenie Rektora Uniwersytetu im. Adama Mickiewicza w Poznaniu nr 74/2020/2021) Komisja Etyczna Uniwersytetu im. Adama Mickiewicza w Poznaniu ds. badań naukowych prowadzonych z udziałem ludzi, zwana dalej Komisją, uchwala co następuje:

1. Na podstawie złożonego przez Pana mgr. Pawła Chełminiaka wniosku, Komisja opiniuje **pozytywnie** projekt badawczy: "Rola antycypacji w przetwarzaniu ironii w języku ojczystym oraz obcym: Badania behawioralne oraz z wykorzystaniem potencjałów wywołanych".
2. Uchwała została podjęta jednogłośnie i wchodzi w życie z dniem podjęcia.

Przewodnicząca

Komisji Etycznej ds. badań naukowych prowadzonych z udziałem ludzi

prof. dr hab. Katarzyna Dziubalska-Kołaczyk



Resolution No. 10/2020/2021
of the Ethics Committee for Research Involving Human Participants
at the Adam Mickiewicz University in Poznań
adopted on 21 June 2021

regarding the research project: Rola antycypacji w przetwarzaniu ironii w języku ojczystym oraz obcym: Badania behawioralne oraz z wykorzystaniem potencjałów wywołanych

With reference to § 4 (5) of the Regulations of the Ethics Committee for Research Involving Human Participants at Adam Mickiewicz University in Poznań (Ordinance No. 74/2020/2021 of the Rector of Adam Mickiewicz University Poznań), the Ethics Committee for Research Involving Human Participants at Adam Mickiewicz University in Poznań, hereinafter referred to as the Ethics Committee, approves the following:

1. On the basis of the application submitted by **Mgr Paweł Chelminiak**, the Ethics Committee grants an approval of the research project: Rola antycypacji w przetwarzaniu ironii w języku ojczystym oraz obcym: Badania behawioralne oraz z wykorzystaniem potencjałów wywołanych.
2. The resolution was adopted unanimously and comes into force from on the day of its adoption.

In addition, the Ethics Committee notes that the informed consent forms in Polish have been approved by the Ethics Committee and that any translation of these forms into languages other than Polish must not contain changes to their content.

Chair of the Ethics Committee

Prof. Katarzyna Dziubalska-Kołaczyk



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Appendix D: BioSemi certificate

ActiveTwo - Instrukcja użytkownika

Wersja: 3.2

Data utworzenia: 3 lipca 2008

Tłumaczenie na j. polski: 2018

Dystrybutor:
Neurostimulus Sp. z o.o.
NIP 9462683937
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20-341 Lublin
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1.1 Informacje wstępne

Niniejsza instrukcja opisuje sposób użycia i utrzymania/pielęgnacji systemu ActiveTwo do mierzenia biopotencjałów, którego producentem jest firma BioSemi. Prosimy o dokładne i kompletne zapoznanie się z tą instrukcją przed rozpoczęciem użytkowania systemu. W instrukcji zastosowano następujące ikony:

	Ostrzeżenie bezpieczeństwa Nie zastosowanie się do tych instrukcji może spowodować zagrożenie dla bezpieczeństwa osoby badanej lub osoby obsługującej aparaturę.
	Ważna informacja Nie zastosowanie się do tych instrukcji może doprowadzić do niespodziewanych skutków działania lub defektu systemu.
	Informacja typu "zaplecze teoretyczne" Ta informacja nie dotyczy bezpośrednio podstawowej obsługi aparatury, ale jest przydatna dla zrozumienia filozofii działania aparatury oraz możliwości jej naukowego zastosowania.

Dodatkowe informacje są dostępne na stronie producenta www.biosemi.com. W wielu miejscach tej instrukcji znajdują się odniesienia do dodatkowych komentarzy umieszczonych na stronie. Są one regularnie uaktualniane w reakcji na informacje zwrotne i pytania kierowane do nas przez użytkowników naszej aparatury. Dlatego też mogą się tam znajdować informacje i sugestie, które nie były uwzględnione na etapie tworzenia niniejszej instrukcji. W przypadku pytań, na które nie znaleźli Państwo odpowiedzi w instrukcji ani na stronie internetowej, prosimy o kontakt:

Neurostimulus Sp. z o.o.
ul. Kręta 2 lok. 4, 20-341 Lublin
tel. (+48) 514-722-090
e-mail: marta.ratomska@neurostimulus.pl

1.2 Oznaczenia na komponentach systemu

Ikony umieszczone na komponentach systemu:



Uwaga, zapoznaj się z dołączoną dokumentacją (IEC 348)

Przed użyciem elementów oznaczonych tym znaczkiem należy zapoznać się z tym podręcznikiem oraz odpowiednimi sekcjami informacyjnymi na stronie BioSemi.



Wypożyczenie typu Body Floating (BF) (IEC 878-02-03)

Elementy zawierające tę ikonę są wyposażone w izolację typu Body Floating (BF) zgodnie z definicją zawartą w międzynarodowej normie EN60601-1, punkt 2.2.25. Więcej informacji znajduje się w sekcji 1.5 tej instrukcji.



Certyfikat zgodności europejskiej (Conformité Européenne)

Ten znak jest deklaracją producenta, że oznaczone nim komponenty są zgodne z odpowiednimi wytycznymi i standardami określonymi przez dyrektywy unijne. Więcej informacji znajduje się w części 1.3 tego podręcznika.

1.3 Certyfikacja

System ActiveTwo posiada oznakowanie CE jako deklarację producenta, że system spełnia odpowiednie standardy stosowane do urządzeń elektromagnetycznych (dyrektywa UE nr 89/336/EEC) i bezpieczeństwa elektrycznego pod warunkiem użytku zgodnego z przeznaczeniem (tj. do systemu pomiaru biopotencjałów w zastosowaniach naukowych). Zastosowanie mają następujące standardy:

- kompatybilność EMC: EN61326 (1997) + A1 (1998) + A2 (2001)
- bezpieczeństwo elektroniczne: EN 60601-1 (1990) + A1 (1993) + A2 (1993) + A13 (1996)

Deklaracja zgodności dotyczy każdego komponentu systemu ActiveTwo.

Zgodność ze standardami została sprawdzona przez zewnętrzną instytucję kontrolującą (D.A.R.E consultancy, Woerden, Netherlands, www.dare.nl). Raporty z testów są udostępniane na żądanie.



Oznakowanie CE, jakie posiada system ActiveTwo, nie jest równoważne oznakowaniu CE, jakie posiadają urządzenia medyczne. Mimo tego, że system ActiveTwo jest zgodny z wytycznymi UE dotyczącymi bezpieczeństwa urządzeń elektrycznych, nie jest on zgodny z niektórymi wytycznymi dotyczącymi bezpieczeństwa elektrycznego wymaganego od urządzeń medycznych; system nie posiada też certyfikatu zgodności z niektórymi innymi wytycznymi odnoszącymi się do urządzeń medycznych, określonych w dyrektywie unijnej 93/42/EEC.

