Study of the art of facial expressions in the emotion of irony

https://doi.org/10.56238/sevened2024.016-006

Carla Patrícia Hernandez Alves Ribeiro César[1], Raphaela Barroso Guedes-Granzotti[2], Claudia Sordi[3] and Kelly da Silva[4]

ABSTRACT
Irony, regardless of its subtype, is routinely used in human communication. Verbal, vocal, and non-verbal resources are used to express the irony. In this chapter, the objective is to present a literature review on using irony through facial expression. According to the results obtained, the face can express irony, highlighting the contradiction between oral speech and the facial expression itself, which helps the receiver understand that the speech is ironic. There are still scientific gaps on the subject, and more researchers must investigate the topic.

Keywords: Irony, Face, Emotion.

[1] Speech therapist, PhD, Professor of the Speech Therapy Course at the Federal University of Sergipe, São Cristóvão, Sergipe, Brazil.
[2] Speech therapist, PhD, Professor of the Speech Therapy Course at the Federal University of Sergipe, São Cristóvão, Sergipe, Brazil.
[3] Speech therapist, PhD, Professor of the Speech Therapy Course at the Federal University of Sergipe, Lagarto, Sergipe, Brazil..
[4] Speech therapist, PhD, Professor of the Speech Therapy Course at the Federal University of Sergipe, Lagarto, Sergipe, Brazil..

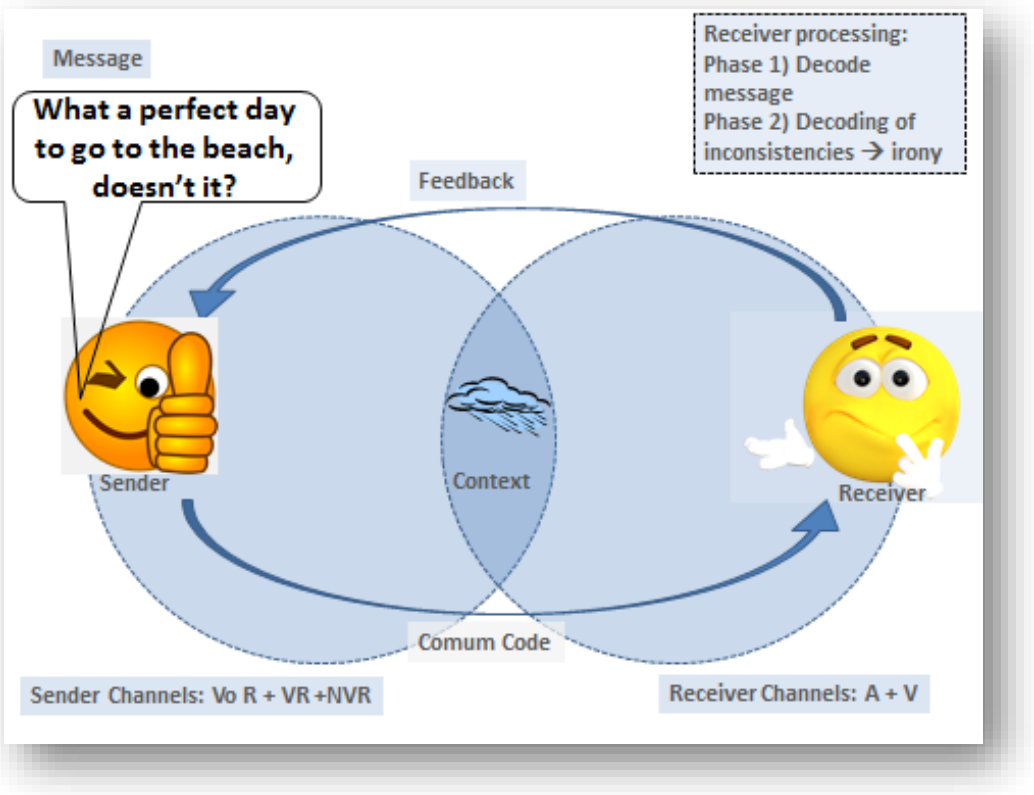
INTRODUCTION

The word irony is of Greek origin (eironeia) and means concealment (Costa, 2016) and is often used in communication, - in about 8% when the dialogue is between friends (Gibbs Jr., 2000).

There are several theories that explain this. According to the classical theory, it is considered a figure of language, expressed by indirect negation. In salience gradation theory, irony is most often used with polysemic words, which have several meanings, and are better understood when there is greater familiarity, frequency of use and understanding of the context of a given word. It is also considered as an act of non-sincere speech, not pragmatic sincere, but which expresses the psychological state of the speaker, and can be understood as an intentional act and violation of the main rule of a speech, that is, of expressing the truth. Other theories that explain the Echoic Mention, is when someone informs something to an interlocutor and, by inference, uses a statement from what he heard or from the Pretension, that is, when there is a conscious desire to make it an ironic attitude. Despite the different theoretical assumptions that explain it, the literature agrees that for irony to be properly interpreted, it is context-dependent (voice, gestures, etc.) and requires two stages of processing, one requiring interpretation of the message, for later (Attardo, 2000), as can be visualized in the diagram below (Diagram 1).

The sender, when using communication with messages intentionally different from a certain fact, as in sarcasm and irony, uses different processes: consistency between the statement and the context. The listener must analyze the statement and the fact, retain the information in his working memory, compare the compatibility between the fact and what has been expressed by different sources and finally detect the inconsistency in the information. At this stage, the listener should analyze the reasons why there are inconsistencies between the facts and what was said, i.e. if it was a mistake of the sender or if its use was intentional, in this way, the listener will make an inference or a judgment of the senders' intention (Ackerman, 1981).

Diagram 1. Diagram of a two-stage verbal irony process.



Legend: R Vo = Vocal Resources (prosody, intonation, rhythm, vowel duration, pitch, loudness etc.); RV = Verbal Resources (articulation of the spoken word); RNV = Non-Verbal Resources (gestures and facial expressions); A = Hearing and V = Vision.

Another important aspect to be emphasized is the influence of the ironic attitude, which depends on both the listener's understanding and its complexity, if more or less explicit (Burgers, Van Mulken, Schellens, 2012), since the sender, using the irony, does it consciously and wants the interlocutor (receiver of the message) to interpret it.

In general, irony expresses an affirmative thought by the negative side, covering and revealing a double intention of the message evidencing, non-explicit subtexts, dichotomies and ambiguities (Costa, 2016).

It is perceived as a secondary emotion and as it implies a content in speech that is different from what one wishes to express (Cheang and Pell, 2008), shows incongruity between what was 'thought' and 'reality' (Alavarce, 2009), it may be a lie to some authors (Duarte, 2006) or not, since their intention is explicit (Tabernero, 2016).

Researches that analyze facial expressions and facial micro-expressions, the latter seen as facial muscle contractions that represent a particular emotion, but produced very quickly (Freitas-Magalhães, 2014), may help in this, since the area has little scientific production in this sense, unlike linguistics, which has advanced significantly in the analysis of ironic speeches. Here are the different forms of irony.

FORMS OF IRONY

There are several forms of irony, according to the literature, which are described in the table below.

Table 1. Types of irony, with definitions endorsed by the authors.

Types of irony	Definition	Author (s) / (year)
Anti-phrase	When exaggerated ideas are exalted or affectionate use is made of offensive terms.	Pires (1981)
Asteica	Subtle and delicate use of ironic criticism to disguise a compliment, which uses rhetoric and is considered a positive irony	Attardo (2000)
Cosmic or Infinite	It is the difference between human desire and reality.	Moisés (2004)
Criticism	Social form of communication, and in this type of irony, the emotional valence differs from the situation and the literal meaning. Its use is used to criticize something, establishing a negative valence of emotion, that is, it evokes a negative attitude towards an object. Positive sentence is used to convey a negative meaning.	Dews et al. (1996), Attardo (2000), Agostino *et al*. (2016)
Direct	When a comment is the opposite of what it really means and whoever does the irony makes an affirmative sentence *.	Dews *et al*. (1996)
From destiny	It corresponds to situational / behavioral irony - used in poetry, in which the author does not infer irony, but the reader interprets it, that is, when there is a distinction between intention and result of action and verbal, that used through word / speech that differs from the fact, used in everyday situations.	Moisés (2004).
Dramatic	Who knows the content is the audience, while the actor ignores it - used in the Dramatic Arts.	Moisés (2004).
Ironical praise	Of rarer use, it is expressed by a negative message to convey a positive meaning.	Dews et al. (1996)
Euphemism	When pleasant words are used to express something unpleasant.	Sacconi (2008)
Hyperbole	When one makes use of non-literal expression of exaggeration of a thought or of the reality of a situation.	Gibbs Jr. (2000)
Indirect	When something is the opposite of what has been said, but the speech used by the one who makes the irony makes a	Dews *et al*. (1996)

	suggestion and not an affirmation *.	
Humorous	Subtle and indirect commentary that has entertaining and comical intention about a certain non-pleasurable situation or unpleasant person.	Gibbs Jr (2000)
Sarcasm	When one makes use of words or expressions in a pejorative tone, although with the use of positive words, with the intention of assaulting, offending and hurting.	Gibbs Jr. (2000)
Socratic or Rhetoric	Used in the pedagogical environment, the speaker knows the subject, but questions it as if he did not know it, that is, the speaker makes an issue and, according to Gibbs Jr, such a question may imply either humor or a critical assertion.	Gibbs Jr. (2000), Moisés (2004).
Undervaluation	Unlike hyperbole, when one makes use of non-literal minimization expression of a thought or the reality of a situation.	Gibbs Jr (2000)

* The author uses the following example to differentiate between direct and indirect irony: in a summer camp, children are being divided by classes that will be proposed and one of the children is a failure in diving. In direct irony, you could be told, "You're a funny diver," and in the indirect: "I think diving will be your favourite lesson."

For a better understanding of the subject, let us now look at the neurophysiological aspects of face perception and those involved in irony.

NEUROPHYSIOLOGICAL ASPECTS OF FACIAL PERCEPTION AND THOSE INVOLVED IN IRONY

Studies using magnetic resonance imaging have shown that during human development there is an increase in the extent of specialization of the cortex for the stimuli related to the face, and the perception of the face begins in early stages of life and is not completed until adolescence, It is evident that the processing of this information is different when cortical activity between children (with less specialization and confidence) and adults is compared (Rysewyk, 2010).

A recent study using functional and quantitative magnetic resonance imaging in 22 children (between 5 and 12 years of age) and 25 adults (between 22 and 28 years of age) found differential development of high-level visual areas involved in facial and spatial recognition. The development of specific and selective facial regions of the brain occurs, in greater concentration, in fusiform gyrus in children. With the development and nervous tissue specialization and the experience with the different faces and expressions the brain is specializing and the areas end up distinguishing between the recognition for the faces and the recognition of places in adult life. These results were validated by the authors with evaluation of post-mortem nervous tissue of ten cadavers. According to the

authors, a new model for the understanding of the improvement of the recognition and differentiation of faces from childhood to adulthood is emerging, whereby emerging brain function and behaviour result from cortical tissue proliferation (assuming the increase Myelin, dendrites, alterations in the iron-protein or glial and astrocytic structural perineuronal matrices) and not exclusively of apoptosis (Gomez et al., 2017).

Because irony is a voluntary emotional facial expression (EFE), it is important to emphasize that voluntary / deliberate facial expressions depends on the pyramidal tract, originating in the motor cortex and the spontaneous, the extrapyramidal tract whose origin occurs in the pre-motor area and subcortical regions (such as the basal ganglia), although there is evidence that the functional independence of these pathways is not total, as reviewed by McCabe et al. (2010).

Channon and Crawford (2000) found that patients with brain lesions in the left frontal lobe had relative losses in the understanding of histories, especially those involving non-literal statements in relation to those with lesions in the right frontal lobe and posterior lesions (temporal, parietal or occipital) to the left or right. Ratifying the above, Wakusawa et al. (2007) found that when the judgment of a certain ironic situation was made, the activated brain areas are the medial orbitofrontal cortex. However, for the production of irony, the right temporal lobe is activated.

Giora et al. (2000) assessed the comprehension of sarcasm and metaphors by adapting a battery of Gardner and Brownell's right hemisphere communication tests in 27 patients with lesions in the right hemisphere (RH), 31 in the left hemisphere (LH) and compared the results with the control group (CG, n = 21). The RH group tended to present lower scores for the understanding of sarcasm and higher scores in the understanding of metaphors when compared to the LH group. In addition, groups with neurological impairment evidenced significant impairments in understanding sarcasm when compared to the CG. There were no statistically significant differences in the interpretation of metaphors between the RH and CG groups, but there was a significant disadvantage for the RH group with regards to the RH and CG. Significant negative correlations were found between the test scores and the extent of the lesion to understand sarcasm in the mid and lower left frontal gyrus and to understand the metaphor in the left mid temporal gyrus and in the junction area of the superior temporal and left supramarginal gyrus. The extent of the lesion in the regions of the RH did not correlate with the performance of the test.

Wang et al. (2006) evaluated the irony comprehension of 24 subjects (12 adults with mean age of 26.9 years and 12 children aged nine to 14 years) with cartoon figures while listening to short stories that ended with a potentially ironic observation and were asked to decide whether the speaker was being sincere or ironic (sarcastic). Both children and adults were instructed to pay attention either to the speaker's facial expression or to the voice inflection of the message accompanied by the test scenes. The results showed that both children and adults activated similar global networks,

including frontal, temporal and occipital cortices bilaterally. Specifically, children recruited the lower left frontal regions more strongly than adults and showed reliable activity in the prefrontal cortex, while adults did not. In contrast, adults activated the occipitotemporal regions more strongly than children. In the condition of "sincere discourse", both groups showed significant activities in the frontotemporal and occipital areas in relation to rest. However, adults exhibited the typical left lateral activation pattern of language processing while children recruited a more bilateral network, similar to that activated under irony conditions. In addition, despite the lack of ambiguity in the speaker's intention in this condition, the activity also activated, but to a lesser extent, the pre-frontal cortex in children. When the task was to pay attention to the facial expression during the ironic discourse, there was greater neural activity in the visual cortex and when the attention was directed to prosody in the superior temporal gyrus, respectively. In general, children involved the medial prefrontal cortex and left lower frontal gyrus more strongly than adults, while adults recruited fusiform gyrus, extra striate areas, and amygdala more strongly than infants. The greater involvement of the prefrontal regions in children may support the integration of multiple clues to reconcile the discrepancy between the literal meaning and the intended meaning of an ironic observation. This shift from the development of a dependency in frontal regions to later occipitotemporal regions may reflect the automation of basic reasoning on mental states.

Spotorno et al. (2012) used functional magnetic resonance imaging to compare the comprehension of 20 healthy subjects from 18 target sentences with ironic or literal contexts. They demonstrated that the Mind Theory (ToM) network becomes active while a participant is understanding the verbal irony, especially of the medial prefrontal cortex, posterior and ventral areas (from Brodmann area 6 to 9), lower frontal gyrus Bilateral (Brodmann's areas: 45, 46, 47), the bilateral temporoparietal junction (Brodmann's areas: 40), the left insula, the right later dorsal fronto parietal cortex (Brodmann's area: 8) and the right middle temporal gyrus Brodmann: 21). In addition, they demonstrated that the ToM activity is directly related to the processes of language comprehension.

Matsui et al. (2016) evaluated the understanding of prosody and context sarcasm in 21 adults using magnetic resonance imaging. In order to do so, vignettes containing short stories were presented to the participants, whose characters had performed good or bad acts, followed by positive statements from their relatives. Thus, participants were asked to judge the degree of sarcasm used in the compliment, which was either accompanied by positive or negative affective prosody. They found a correlation between the context and prosody, with activation of the frontal and frontal portion of the left inferior frontal gyrus, corresponding to Brodmann's area 47. The incongruity between negative prosody and praise activated the insula bilaterally, extending into the lower right frontal gyrus, lower cingulate cortex, and brainstem. They concluded that the lower left frontal gyrus

(BA 47) is involved in the integration of the context of the discourse and the statement with affective prosody in the understanding of sarcasm.

Obert et al. (2016) investigated the neural basis of irony processing by delivering short sentences of ironic and literal speech to 23 healthy young adults who underwent functional magnetic resonance imaging to assess the neural effect of two parameters: degree of irony and enjoyment of the mood. The results revealed the activation of bilaterally inferior frontal gyrus (GFI), the posterior left temporal gyrus, the medial frontal cortex and subcortical regions, as the left caudate nucleus during the irony processing. The degree of irony was shown to be associated with the activation of bilateral frontal and subcortical areas and that these regions were also sensitive to mood. The activation of the bilateral GFI was, therefore, responsible for the processing of humour and reflected the processes of detection and resolution of incongruity. In addition, the activation of subcortical structures may be related to the processing of social event rewards.

Since there is not only one form of irony, let us see how literature classifies it, as follows.

THE FACE OF IRONY

Facial expressions usually accompany oral discourses and vocal resources in order to ratify what one wishes to express. However, is this what happens during the production of ironic discourses? We don´t believe so, since when the emotions are distorted - as in the case of irony, there are differences between the time of maintenance of the expression, being that in these cases, it tends to remain longer than when compared to the facial expressions that represent emotions according to Miguel and Primi (2014).

González-Fuente, Escandell-Vidal, and Prieto (2015) found that 70% of subjects who made ironic speeches demonstrated audio-visual resources and their use favoured the understanding of irony. They checked the lexical-syntactic clues produced during the speech, the face in general (smile, laughter, frown or neutral expression), eyebrow movements (raised or furrowed), eyes (closed, contracted and exaggerated), the eye movements (towards the interlocutor or the material and the deviation of the gaze), the mouth (lips stretched, protruded, with elevation or lowering of the labial commissures), head movements (nod of head forward, of rotation), arms and hands. In addition to vocal resources (pitch, loudness, prosody, vocal quality, syllable duration, in milliseconds and speech elocution rate - measured by speech time divided by the number of syllables). For that, friendly subjects, arranged in pairs, discussed two videos presented, these discussions were recorded. Among the ironic manifestations, the jocose was the most frequent (34%) and the most vocal clues were: the use of emphases, sentences with interrogative configurations (ascending inflection), prosodic breaks / pauses and longer duration of syllables. In general, the audio-visual clues in the most ironic speeches that stood out were the face in general and the head, with the greatest change in

the direction of the gaze (deviation of the gaze during the ironic speech) and smile and / or laughter during the ironic statement, movements (inclination and lateral movements), stretched lips and raised eyebrows.

The literature describes that irony can be expressed facially as both scorn and aversion (Wilson and Sperber, 2012).

Ekman, Friesen and Hager (2002) suggested the analysis of the face by checking the muscular units of action (AUs) in the upper and lower thirds of the face, by the Facial Action Coding System - FACS). Thus, we will present the literature findings from this division.

In the upper third of the face, especially in the eye region, there was a greater production of aversive look in the sarcasm, which is a kind of irony (Williams, Burns and Harmon, 2009). According to the literature (Ekman, Friesen, Hager, 2002, Freitas-Magalhães (1998)), there may be a change in the direction of the gaze (the deviation of the gaze during the production of the ironic discourse), according to González-Fuente, Escandell-Vidal, Prieto, 2011a, be Roberto and Luigi, 2015), correspond to AUs 61 and 62, characteristics of the emotion of contempt.

Another aspect reported in the literature refers to mixed facial expressions, a situation in which there may be contraction of the corrugator of the eyelashes, approaching the eyebrows at the moment of a smile, not showing at the moment neither happiness nor anger (Ekman, 2003). As Williams, Burns and Harmon (2009) cite an aversive look at ironic speeches and, in the aversion, according to Ekman (2003), the eyebrows may present a drop, this signal can be found during the production of the irony, being visible to AU4. However, González-Fuente, Escandell-Vidal, Prieto (2015) found elevated eyebrows during the production of ironic speech. Therefore, the AUs that may be involved in irony may be AU1 and AU2.

In the lower face, the literature cited the presence of smile in the irony (Freitas-Magalhães, 2009 and González-Fuente, Escandell-Vidal, Prieto, 2015) and/or laughter (González-Fuente, Escandell, Freitas-Magalhães (2011) pointed out that in the posed/falsified smile it involves consciousness on the part of the emitter, being activated cerebral structures such as the pre-motor cortex, the frontal and the zygomatic muscles (major and minor) and the orbicularis of the eyes and, in the true/genuine, the motor cortex, the amygdala and the orbicularis oculi muscle (central part).

In relation to the smile, according to Freitas-Magalhães (2009), this is one of the main organizers of the human psyche and can assume the voluntary, induced and dissimulated configuration, adding that "(...) is associated with positive feelings such as happiness, pleasure, amusement or friendship, but also expresses irony, sadness, dissatisfaction, disgust and embarrassment "(50). It would be similar to the false smile, according to the author, a situation in which it appears and disappears quickly, is exaggerated, "frozen" and asymmetrical, revealing mixed expressions and non-verbal indiscretions.

It should be emphasized that fake facial expressions can be detected because they generate conflict in the observer due to the overlap of emotions (Freitas-Magalhães, 2011).

So how do you differentiate it? By context. According to Freitas-Magalhães (2009), the context is one of the moderators studied in the display of smile, intensity and frequency mode.

The context may affect the judgment of emotional facial expressions, favouring their accuracy (Izard, 1998).

Head movement was also observed in the literature, with the visualization of head tilt or movements on the horizontal axis (Gonzáles-Fuente, Escandell-Vidal, Prieto, 2015). Thus, according to the FACS, the motion units involved could be 51, 52, 55, or 56.

Agostino et al. (2016) evaluated children and adolescents with figures and statements that represented truth, critical irony (negative valence), and emphatic (positive valence) praise - the latter two represent incongruity between the speech and the actual fact; Critical irony the intention of the message is negative and what was expressed does not correspond to the fact and in emphatic praise the intention of the message corresponds to the literal meaning but not to the situation with differences in the intonation of the sentences. Both are intended to affect the listener's emotional state (feeling bad or good, respectively for critical irony and emphatic praise), considered as indirect language. In the example of one of the authors' test figures the speech was incompatible with EFE - depicting irony - and, in this situation, they used illustration with head tilt to the right (corresponding to M56 of the FACS) associated with the eyebrow elevation of the (Corresponding to FACS R1) and contralateral side lip enhancement (corresponding to FACS L12).

Rockwell (2000) and Conz (2010) also reported that in irony there may be inexpressiveness, "rolling eyes" or "mockery", without describing what this characteristic would be, justifying research in this area.

As noted, the EFE of irony still lacks further studies.

FINAL CONSIDERATIONS

Secondary emotions, such as irony, are also called complex, because they are combinations of the primaries and are considered as the awareness of the emotional state with somatic changes, being linked to previous experiences, that is, to acquired dispositions (Damasio, 1998). According to Tabernero and Politis (2013), basic emotions seem to be involved in the formation of secondary emotions, but the presence of double dissociations between tasks may indicate that their execution involves partially independent processes.

In addition to the above, secondary emotions depend on complex mental states, in which there is attribution of belief or intention, i.e. a mental cognitive state for the person (Baron-Cohen et al., 2001), as in the case of irony.

Thus, this secondary emotion is widely used in discursive situations, in different contexts such as in arts, in media communication (television, newspaper, radio, magazines, etc.) and everyday life (Pereira, 2015), as evidenced in preliminary research in a development phase (César, Freitas-Magalhães, 2017).

Irony can be used as the basis for the creation of an identity and as a survival strategy of oppressive ideologies (Cardeña, 2003), to diminish the force of a muting function or an implicit criticism (in the case of critical irony) or implicit compliment (in an ironic praise), or for use in mood situations, according to Dews et al. (1996).

As a figure of speech, it can be used as rhetoric, to express something different from what is actually thought, as well as to provoke laughter in humour (laughing at or with the other /world) and as a "powerful critical instrument" (Loureiro, 2007, p.14).

It is inferred that irony is an emotion of a more complex order for its decoding, since there is a need to understand the affective intention and, in its expression, requires of those who evokes it, a control of the social expression of false affection, as affirmed by Agostino et al. (2016).

As a mixed emotion, the hypothesis of its use is associated with a form of moral judgment.

Literature has described that emotional facial expressions (EFEs) evolved from a sensorial and adapted regulation of the use of facial muscles for the expression of moral judgment (Benitez-Quiroz, Wilbur and Martinez, 2016).

In this type of judgment the aforementioned, authors reported that there are the inclusion of expressions such as anger, aversion and contempt. At the moment when irony as EFE is expressed in a mixed way (hypothesized its expression with the mixed manifestation of happiness with aversion or contempt) and interpreted in a contextual way, it can be considered as a co-articulator of speech (Benitez-Quiroz, Wilbur and Martinez, 2016).

In addition, we emphasize the importance of emotional facial expressions being always analysed concomitantly to the context, because as affirmed by Righart and Gelder (2008), they favour the understanding of the EFEs and, we add here, irony.

REFERENCES

1. Ackerman, B. P. (1981). Young children's understanding of a speaker's intentional use of false utterance. *Developmental Psychology, 17*, 472–480.

2. Agostino, A., Im-Bolter, N., Stefanatos, A. K., & Dennis, M. (2016). Understanding ironic criticism and empathic praise: the role of emotive communication. *British Journal of Developmental Psychology*.

3. Alavarce, C. S. (2009). *A ironia e suas refrações: um estudo sobre a dissonância na paródia e no riso*. São Paulo: Cultura Acadêmica.

4. Arrais, K. C. (2013). *Correlatos do reconhecimento de emoções faciais com medidas fisiológicas do teste de controle postural em indivíduos com transtorno de ansiedade social* [tese]. São Paulo: Universidade de São Paulo de Ribeirão Preto.

5. Attardo, S. (2000). Irony as relevant inappropriateness. *Journal of Pragmatics, 32*(6), 793-826.

6. Baron-Cohen, S., Wheelwright, S., Hill, J., Raste, Y., & Plumb, I. (2001). The "Reading the Mind in the Eyes" test revised version: A study with normal adults, and adults with Asperger syndrome or high-functioning autism. *Journal of Child Psychology and Psychiatry, 42*(2), 241-251.

7. Benitez-Quiroz, C. F., Wilbur, R. B., & Martinez, A. M. (2016). The not face: a grammaticalization of facial expressions of emotion. *Cognition, 150*, 77-84.

8. Burgers, C., Van Mulken, M., & Schellens, P. J. (2012). Type of evaluation and marking of irony: The role of perceived complexity and comprehension. *Journal of Pragmatics, 44*(3), 231-242.

9. Cardeña, I. (2003). On humour and pathology: the role of paradox and absurdity for ideological survival. *Anthropology & Medicine, 10*(1), 115-142.

10. Channon, S., & Crawford, S. (2000). The effects of anterior lesions on performance on a story comprehension test: left anterior impairment on a theory of mind-type task. *Neuropsychologia, 38*(7), 1006-1017.

11. Cheang, H. S., & Pell, M. D. (2008). The sound of sarcasm. *Speech Communication, 50*, 366-381.

12. Conz, J. (2010). *Ironia verbal: teorias e considerações*. Monografia [Licenciatura em Letras], Universidade Federal do Rio Grande do Sul, Porto Alegre, Brasil.

13. Costa, A. M. M. (2016). Dualidade e ironia em Esaú e Jacó. *Machado de Assis em Linha, 9*(18), 64-73.

14. Damásio, A. (1998). *O erro de Descartes: emoção, razão e o cérebro humano*. São Paulo: Schwarcz.

15. Dews, S., Winner, E., Kaplan, J., Rosenblatt, E., Hunt, M., Lim, K., McGovern, A., Qaulter, A., & Smarsh, B. (1996). Children's understanding of the meaning and functions of verbal irony. *Child Development, 67*, 3071-3085.

16. Duarte, L. P. (2006). *Ironia e humor na literatura*. Belo Horizonte: Editora PUC Minas, São Paulo: Alameda.

17. Ekman, P. (1999). Basic emotions. In T. Dalgleish & M. J. Power (Eds.), *Handbook of cognition and emotion* (pp. 45-60). New York: John Wiley & Sons.

18. Ekman, P. (2003). *Emotions revealed: understanding faces and feelings*. London: Weidenfeld & Nicolson.

19. Ekman, P., Friesen, W. V., & Hager, J. C. (2002). *Facial action coding system: investigator's guide* (2nd ed.). Salt Lake: Research Nexus eBook.

20. Fox, E., Yates, A., & Ashwin, C. (2012). Trait anxiety and perceptual load as determinants of emotion processing in a fear conditioning paradigm. *Emotion, 12*(2), 236-249.

21. Freitas-Magalhães, A. (2009). *A psicologia das emoções: o fascínio do rosto humano* (2ª ed.). Porto: Universidade Fernando Pessoa.

22. Freitas-Magalhães, A. (2011a). *O código de Ekman: o cérebro, a face e a emoção*. Porto: Universidade Fernando Pessoa.

23. Freitas-Magalhães, A. (2011b). Emotion: from the brain to the face and back. In A. Freitas-Magalhães (Ed.), *Emotional expression: the brain and the face* (pp. 1-40). Porto: FeeLab Science Books.

24. Freitas-Magalhães, A. (2014). *Micro-expressão e macro-expressão: vestígios e consequências*. Porto: FeeLab Science Books.

25. Gao, X., & Maurer, D. (2009). Influence of intensity on children's sensitivity to happy, sad, and fearful facial expressions. *Journal of Experimental Child Psychology, 102*(4), 503-521.

26. Gibbs Jr., R. W. (2000). Irony in talk among friends. *Metaphor and Symbol, 15*(1-2), 5-27.

27. Giora, R., Zaidel, E., Soroker, N., Batori, G., & Kasher, A. (2000). Differential effects of right-and left-hemisphere damage on understanding sarcasm and metaphor. *Metaphor and Symbol, 15*(1-2), 63-83.

28. Gomez, J., Barnett, M. A., Natu, V., Mezer, A., Palomero-Gallagher, N., Weiner, K. S., Amunts, K., Zilles, K., & Grill-Spector, K. (2017). Microstructural proliferation in human cortex is coupled with the development of face processing. *Science, 355*(6320), 68-71.

29. González-Fuente, S., Escandell-Vidal, V., & Prieto, P. (2015). Gestural codas pave the way to the understanding of verbal irony. *Journal of Pragmatics, 90*, 26-47.

30. Guimarães, M. J. (2001). Ironia: uma primeira abordagem. *Revista da Faculdade de Letras, Língua e Literaturas, 18*, 411-422.

31. Izard, C. E. (1998). Emotions and facial expressions: a perspective from differential emotions theory. In J. A. Russell & J. M. Fernández-Dols (Eds.), *The psychology of facial expression* (2nd ed., pp. 57-77). New York: Cambridge University Press.

32. Leime, J. L., Rique Neto, J., Alves, S. M., & Torro-Alves, N. (2013). Recognition of facial expressions in children, young adults and elderly people. *Estudos de Psicologia, 30*(2), 161-167.

33. Loureiro, I. (2007). Ironia(s) em Freud: da escrita à ética. *Ide, 30*(45), 13-19.

34. Matsui, T., Nakamura, T., Utsumi, A., Sasaki, A. T., Koike, T., Yoshida, Y., Harada, T., & Tanabe, H. C., & Sadato, N. (2016). The role of prosody and context in sarcasm comprehension: behavioral and fMRI evidence. *Neuropsychologia, 87*, 74-84.

35. McCabe, D. L., Borod, J. C., Meltzer, E. P., Spielman, J., & Ramig, L. O. (2010). Masked facies in Parkinson's disease: emotional and motoric factors, neuropathology, Duchenne smiling, and treatment. In A. Freitas-Magalhães (Ed.), *Emotional expression: the brain and the face* (2nd ed., Vol. 2, pp. 3-41). Porto: Universidade Fernando Pessoa.

36. Miguel, F. K., & Primi, R. (2014). Criação de vídeos de expressões emocionais por meio de estímulos multimídia. *Psicologia: Teoria e Prática, 16*(1), 155-168.

37. Moisés, M. (2004). *Dicionário de termos literários* (12ª ed., rev. e ampl.). São Paulo: Cultrix.

38. Obert, A., Gierski, F., Calmus, A., Flucher, A., Portefaix, C., Pierot, L., Kaladjian, A., & Caillies, S. (2016). Neural correlates of contrast and humor: processing common features of verbal irony. *PloS One, 11*(11), e0166704.

39. Pereira, H. B. (2015). O estudo da ironia em sala de aula. *Todas as Letras - Revista de Língua e Literatura, 17*(3), 25-35.

40. Pierrehumbert, J. B. (2003). Phonetic diversity, statistical learning, and acquisition of phonology. *Language and Speech, 46*, 115-154.

41. Pires, O. (1981). *Manual de teoria e técnica literária*. Rio de Janeiro: Presença.

42. Righart, R., & Gelder, B. (2008). Recognition of facial expressions is influenced by emotional scene gist. *Cognitive, Affective, & Behavioral Neuroscience, 8*(3), 264-272.

43. Roberto, M., & Luigi, T. (2015). *A face e suas emoções*. São Paulo: Laços.

44. Rockwell, P. (2000). Lower, slower, louder: vocal cues of sarcasm. *Journal of Psycholinguistic Research, 29*(5), 483-495.

45. Rodrigues, S. I. C. (2013). *O papel da ansiedade traço no reconhecimento de expressões faciais emocionais e prosódia emocional* [dissertação]. Faro: Universidade do Algarve.

46. Rysewyk, S. V. (2010). Towards the developmental pathway of face perception abilities in the human brain. In A. Freitas-Magalhães (Ed.), *Emotional expression: the brain and the face* (2nd ed., Vol. 2, pp. 111-131). Porto: Universidade Fernando Pessoa.

47. Sacconi, L. A. (2008). *Gramática comunicativa Sacconi*. São Paulo: Nova Geração.

48. Snaith, R. P. (2003). The hospital anxiety and depression scale. *Health and Quality of Life Outcomes, 1*(1), 29-32.

49. Spotorno, N., Koun, E., Prado, J., Van Der Henst, J. B., & Noveck, I. A. (2012). Neural evidence that utterance-processing entails mentalizing: the case of irony. *NeuroImage, 63*(1), 25-39.

50. Tabernero, C. (2016). Con no sé qué vislumbres de ironía: indicadores y marcas de la ironía en el viaje del parnaso. *Alpha, 43*, 205-217.

51. Tabernero, M. E., & Politis, D. G. (2013). Reconocimiento de emociones básicas y complejas en la variante conductual de la demencia frontotemporal. *Neurología Argentina, 5*(2), 57-65.

52. Vieillard, S., & Guidetti, M. (2009). Children's perception and understanding of (dis)similarities among dynamic bodily/facial expressions of happiness, pleasure, anger, and irritation. *Journal of Experimental Child Psychology, 102*(1), 78-95.

53. Wakusawa, K., Sugiura, M., Sassa, Y., Jeong, H., Horie, K., Sato, S., Yokoyama, H., Tsuchiya, S., Inuma, K., & Kawashima, R. (2007). Comprehension of implicit meanings in social situations involving irony: A functional MRI study. *NeuroImage, 37*(4), 1417-1426.

54. Wang, A. T., Lee, S. S., Sigman, M., & Dapretto, M. (2006). Developmental changes in the neural basis of interpreting communicative intent. *Social Cognitive and Affective Neuroscience, 1*(2), 107-121.

55. Williams, J. A., Burns, E. L., & Harmon, E. A. (2009). Insincere utterances and gaze: eye contact during sarcastic statements. *Perceptual and Motor Skills, 108*(2), 565-572.

56. Wilson, D., & Sperber, D. (2012). Explaining irony. In D. Wilson & D. Sperber (Eds.), *Meaning and relevance* (pp. 123-146). New York: Cambridge University Press.

57. Zigmond, A. S., & Snaith, R. P. (1983). The hospital anxiety and depression scale. *Acta Psychiatrica Scandinavica, 67*, 361-370.