Cognition and Emotion

ISSN: 0269-9931 (Print) 1464-0600 (Online) Journal homepage: www.tandfonline.com/journals/pcem20

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To cite this article: Pilar Ferré, Isabel Fraga & José Antonio Hinojosa (2025) The interplay between language and emotion: a narrative review, Cognition and Emotion, 39:7, 1418-1445, DOI: 10.1080/02699931.2025.2549965

To link to this article: https://doi.org/10.1080/02699931.2025.2549965

Published online: 27 Aug 2025.

COGNITION AND EMOTION
2025, VOL. 39, NO. 7, 1418–1445
https://doi.org/10.1080/02699931.2025.2549965

Routledge
Taylor & Francis Group

REVIEW ARTICLE

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The interplay between language and emotion: a narrative review

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ABSTRACT

This review addresses the interface between language and emotion, focusing on three key aspects related to the emotion process. The first section is devoted to research on language as an emotional stimulus. In addition to a characterisation of emotional content, relevant studies on the acquisition of emotional words by children and adult speakers are reviewed. The second section reviews the literature on the influence of both the emotional content of verbal stimuli and the emotional state of the individual on language processing. The third section focuses on characterising the lexicon of emotion terms and also addresses the modulatory role of language in the understanding, experience, and regulation of emotions. The most influential theoretical frameworks are presented in each section. The findings reviewed illustrate the bidirectional nature of the language-emotion interface, with emotion affecting language and language affecting emotion. The concluding discussion highlights the benefits of a comprehensive approach that considers findings from different disciplines to adequately characterise the relationship between language and emotion.

KEYWORDS

Language; emotion; language-emotion interplay; psycholinguistics; affective science

Cognitive science and affective science developed separately for most of the twentieth century. Emotion researchers were interested in the study of basic and complex emotions, as well as the construction and regulation of emotions. Cognitive scientists, in turn, studied cognitive processes such as attention, memory, language, and thinking within an information processing framework that left no room for emotions and affective phenomena (Lai et al., 2024; van Berkum, 2019). This scenario has changed considerably in recent decades, with a sharp increase in studies about the interaction between cognition and emotion.

Interest in the intersection between the two topics took longer to spread to language than to other cognitive processes (van Berkum, 2019). One reason for this was the pervasive influence of the modular view of language, according to which the language system is an independent module in the brain that does not interact with the rest of the mental processes (Fodor, 1983). However, emotion and language are closely intertwined. This review aims to illustrate this close relationship by focusing on the involvement of language in different aspects of the emotion process.

There are four main theoretical approaches to emotion in psychology (Bąk, 2022): 1) The dimensional approach (e.g. Russell, 2003) proposes that emotional states can be defined in terms of a few dimensions: valence (i.e. the hedonic tone of an experience), arousal (i.e. the degree of activation elicited by the experience), and dominance (i.e. the subjective sense of control over the experience). 2) The

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basic emotions approach (e.g. Ekman, 1992) posits the existence of a small number of emotions with distinctive neurobiological and psychological properties that have been shaped by evolution to serve different adaptive functions (e.g. happiness, fear, anger, sadness, and disgust). 3) Appraisal theories (e.g. Scherer, 2005) conceive emotions as a set of responses triggered by the evaluation of a stimulus or event as being relevant to the organism. 4) Constructivist theories (e.g. Barrett, 2006) propose that emotions are psychological constructions that people create to make sense of their current states by integrating internal and external information with emotional conceptual knowledge.

An in-depth treatment of these theoretical approaches is beyond the scope of this article (see Scarantino & de Sousa, 2021, for a comprehensive review). What is more relevant for the purposes of this review is to highlight the common assumptions these approaches share about what an emotion is (Scherer, 2022; van Berkum, 2022) to identify the main questions that can be asked about the interplay with language.

The four theoretical frameworks agree that an emotion episode is a multi-componential process that is triggered by a stimulus, such as an event or situation, that is perceived as relevant to one's concerns; that this appraisal triggers a set of responses including several organismic components, characterised by physiological reactions (e.g. changes in heart rate), behavioural responses (e.g. changes in facial expressions), cognitive responses (e.g. changes in attention) and action tendencies (i.e. a strong motivation to do something); that when this process is accessible to consciousness, it results in a particular feeling that can be categorised and verbally labelled; and that there are complex dynamic interactions between all the components (Scherer, 2022; van Berkum, 2022).

Several questions can be asked about the involvement of language at different points in this process (van Berkum, 2022). This review is focused on three of these issues: 1) language as an emotional stimulus, capable of eliciting an emotional response, 2) the influence of emotion on language, and 3) emotion labelling. These are not the only relevant themes (see van Berkum, 2022, for other interesting questions). However, these topics have been widely studied. Furthermore, they illustrate the bidirectional nature of the language-emotion relationship, as some of the phenomena examined speak to the influence of language on emotion and others to the reverse. In addition, these topics demonstrate the need to approach the interplay between language and emotion from different disciplines, such as affective science, psycholinguistics, and linguistics, among others.

This work aims to contribute to the understanding of the cognition–emotion interface by focusing on language. Due to the breadth of the topic, this cannot be a systematic review. Instead, we provide a general overview of the main themes of interest and lines of research as well as an update of the most important findings and theoretical proposals. The article is divided into three sections, devoted to the three topics mentioned above, and includes a final discussion. To limit the scope of the review, we focus primarily on words, as this is the linguistic unit that emotion researchers interested in language and linguists and psycholinguists interested in emotion have given most attention. However, work with sentences and texts is also reviewed when relevant, and other aspects are referred to at some point in the review (e.g. prosody). Finally, a note on terminology: We use "emotion" in a broad sense to include both the intense and short-lived emotional process described above and other affective phenomena, such as moods and affective evaluations (Scherer, 2005). This approach is necessary to cover the relevant literature in the field.

1. Language as an emotional stimulus

Language has a great power to evoke emotions. Strong physiological responses may be elicited by emotionally charged words (Iacozza et al., 2017; Toivo & Scheepers, 2019). Relatedly, reading literary texts can provoke intense affective experiences (Jacobs, 2017). Furthermore, some types of language seem to be particularly suited to conveying emotionality (e.g. figurative language, Desai et al., 2024, this issue). It is noteworthy that neuroimaging studies show a similar activation of emotion-related brain areas in response to emotional verbal and non-verbal (e.g. pictorial) stimuli, although there are some differences due to the symbolic nature of language (Nummenmaa & Saarimäki, 2019). In a related vein, words and facial expressions can trigger rapid processing of emotional content, just as quickly for words as for faces (Juuse et al., 2023). These findings suggest that linguistic stimuli have a similar potential as non-linguistic stimuli for eliciting emotions. In this context, a relevant question is what constitutes the emotional content of language

and how it is acquired, two topics that are addressed in this section.

1.1. What is emotional content in language?

Emotional content can be defined as the affective information encoded and perceived in language (Soriano, 2022). Every aspect of language conveys emotion (Majid, 2012). This section first discusses some work carried out in the fields of morphology, phonology, phonetics and prosody, and then focuses on semantics.

Linguistic units smaller than words, such as morphemes and phonemes, can express emotions. Indeed, there are morphological markers that denote positive/negative concepts, such as ameliorative/pejorative suffixes (e.g. the Spanish suffix "*ato*", *niñato*, presumptuous and immature young person). Other morphemes can have affective connotations. In particular, diminutive suffixes often have a positive meaning (Ponsonnet, 2018). In line with this, speakers perceive words as less negative when they contain diminutive suffixes (e.g. the Spanish suffix "*ito*" makes the word *enfermito*, little sick person, less negative, Hinojosa et al., 2022). Likewise, diminutives facilitate the acquisition of positive valence in computational models (Lapesa et al., 2017).

In the field of phonetics and phonology, the prevailing view in linguistics regarding the arbitrary relationship between sound and meaning (Hockett, 1959) has been challenged in recent decades (see Lockwood & Dingemanse, 2015, for a review). With respect to emotional content, there is evidence suggesting that there are affective sound symbolism effects (i.e. non-arbitrary mappings between specific phonemes and the emotional meaning of words) (Adelman et al., 2018; de Zubicaray et al., 2023). Based on the analysis of large sets of words in several languages, research on this topic has revealed statistical regularities indicating that certain phonemes tend to be over-represented in words expressing emotion. To give just a few examples, the phoneme /i/ occurs in many words that convey positive emotions (e.g. *friendly*), an effect that may be due to an overlap in the facial movements used to smile (i.e. the zygomaticus major) and also to articulate this phoneme (in English and Mandarin Pin yin, Sidhu et al., 2022; Yu et al., 2021). Similar associations have been found between fricatives (i.e. consonant sounds produced by forcing air through narrow spaces) and negative high-arousing words (e.g. in English and Spanish, the phoneme /s/ in the word *snake*; Calvillo-Torres et al., 2024, this issue), as the characteristic hissing sound of these phonemes resembles sounds produced by certain threatening animals. Furthermore, when pseudowords (i.e. sequences of letters that are orthographically and phonotactically legal in a given language but have no meaning) containing these systematic patterns of phonemes were created, individuals rated them as more arousing than pseudowords without these phonemes (Schmidtke & Conrad, 2024, this issue). A separate line of research has shown that even the patterns of articulation can influence the affective properties of words, as illustrated by the in–out effect (i.e. a more positive evaluation of words whose consonantal articulation positions move from the front of the mouth to the back, e.g. BADAKA, than the reverse, e.g. KADABA, Topolinski et al., 2024, this issue).

Research on affective sound symbolism points to the ability of speech sounds to convey affectivity, which is also illustrated by emotional prosody. Human speakers and listeners use acoustic cues such as intonation, rhythm, and voice quality to infer the emotional states of their interlocutors (Pell & Kotz, 2021). For example, a low pitch is commonly associated with sadness and a high pitch with fear and happiness (Scherer et al., 2011), although there is still no definitive description of the sound of specific emotions (Larrouy-Maestri et al., 2024). Recent studies have focused on individual differences. For instance, Xiao and Liu (2024, this issue) showed that native Chinese speakers were more accurate in perceiving emotional prosody (i.e. identifying the positive/negative nature of words and sentences) than non-native speakers. Dor et al. (2024, this issue) confirmed that older adults rely on prosody over semantics to a lesser extent than young adults to rate the emotion conveyed by sentences. These studies highlight the importance of considering the characteristics of the participants in this research field.

Focusing on semantics, emotional content or affective meaning refers to both denotation and connotation. That is, some words refer directly to emotional experiences or feelings (i.e. emotion-label words or emotion terms, such as *satisfaction* or *sorrow*), while others convey acquired emotional connotations that do not express specific emotional states (i.e. emotion-laden words, such as *money* or *gun*) (Altarriba & Basnight-Brown, 2011; Pavlenko, 2008). A subset of the latter type with an idiosyncratic

processing status are taboo words and insults, which evoke particularly strong emotions (see Sulpizio et al., 2024, this issue). Two main strategies have been used to describe affective meaning. The most common is based on the dimensional approach (Russell, 2003, see the Introduction) and characterises the emotional content of words in terms of valence and arousal (the dominance dimension has been used to a much lesser extent, Bąk, 2022). The distinction between good and bad (i.e. valence) is the most relevant affective dimension. It appears to be universal in language (Soriano, 2022) and is a key factor in the organisation of words in semantic memory (i.e. positive and negative concepts are associated with each other, Betancourt et al., 2023; Van Rensbergen et al., 2016). An alternative view of describing affective meaning is grounded in the basic emotions approach (Ekman, 1992, see the Introduction) and characterises the emotional content of words in terms of their relationship with a few discrete emotions (i.e. happiness, fear, anger, sadness, and disgust) (see Hinojosa et al., 2024 and Syssau et al., 2021, for more extended taxonomies).

Based on the theoretical assumptions of the above models, human ratings on the variables of interest have been collected, leading to the development of normative datasets that provide validated stimuli for research (e.g. Hinojosa et al., 2024; Warriner et al., 2013; see also Pinheiro et al., 2017; and Kaakinen et al., 2022, for the few attempts to use the same approach with supra-lexical linguistic units, such as sentences and texts, respectively). Given the time-consuming nature of this method, researchers have developed more automated strategies, such as extrapolating the affective values of words from other words with which they are associated (Van Rensbergen et al., 2016) or tend to co-occur (Recchia & Louwerse, 2015). Recently, large language models have been used to infer the affective values of words (Martínez et al., 2025). These are promising avenues for facilitating the affective characterisation of words on a large scale.

It should be noted that the idea of a coded meaning, stored in the mental lexicon and based solely on the word itself, does not account for the full richness of emotional meaning. There is ample evidence that the context has a crucial influence. For example, people's assessment of the affective properties of a particular noun (e.g. *mother*) depends on the adjective (*loving mother* vs. *angry mother*, Liu et al., 2013) or pronoun (*my mother* vs *his mother*, Herbert et al., 2011) that precedes it. Affective evaluations also depend on individual differences in terms of age (Grandy et al., 2020) and gender (Soares et al., 2012), which can be considered as part of the context (Sereno et al., 2015; but see Rocabado & Duñabeitia, 2024, this issue, for null effects of another contextual factor, weather). In addition, the affective properties of individual words only partially explain the affective ratings of the entire sentences (Lüdtke & Jacobs, 2015) or texts (Hsu et al., 2015) that contain them.

Apart from the role of context, it is worth noting that the notion of a fixed word meaning stored in the lexicon corresponds to abstract symbolic theories of meaning, which assume that knowledge resides in a semantic memory system that is separate from the brain's modal systems for perception, action, and emotion. Thus, meaning arises from the combination of non-perceptual (amodal) abstract symbols that have an arbitrary relation to entities in the world (Anderson et al., 1997). As an alternative, grounded or embodied theories posit that word meaning is derived from perceptual, motor, linguistic, and emotional experiences (Barsalou, 2008; see Meteyard et al., 2012, for a review). Given the role that these theories assign to the body and to emotion, they seem more appropriate for characterising emotional content. Apart from that, recent proposals distinguish between coded and communicated meaning, which includes aspects such as the referent of the word in a particular communicative context, how the utterance is produced, and the speaker's intention (van Berkum, 2019), highlighting the importance of considering pragmatics for defining emotional content (Vergis, 2023).

In sum, the emotional content of language comes from different sources and involves all linguistic and para-linguistic levels (prosody, phonology, morphology, semantics, syntax, and pragmatics, Majid, 2012). Some of these may provide more fine-grained distinctions than others (e.g. morphemes and semantics may be more appropriate for conveying valence and specific emotions, respectively, Foolen, 2012). In any case, these sources do not act in isolation, as evidenced by the facilitation of processing when the information they express is congruent (e.g. when semantics and prosody are consistent, see Dor et al., 2024; Telli & Bilge, 2024; and Xiao & Liu, 2024; all in this issue). The literature reviewed shows that much research has been conducted to define the emotional meaning of the words themselves. The increasing interest in studying contextual, conversational, and pragmatic aspects will

undoubtedly lead to a richer and more realistic picture of the affective content of language (see van Berkum, 2020; Vergis, 2023, for reviews).

1.2. How is emotional content acquired?

Given the evidence showing that emotion can be expressed at different levels of language, understanding how this affective content is acquired becomes a very relevant issue. In this section, we review different approaches to this topic, starting with research on the acquisition of emotion terms (i.e. emotion-label words) during development and their comparison with other types of words (concrete and abstract words). We then review studies conducted with adult learners of new vocabulary and with bilingual populations to illustrate the fundamental role played by the type of acquisition context in the affective properties of language.

The earliest affective distinction is between good and bad (see Aguert, 2022, for a review). Current evidence suggests that children have already acquired words to describe feelings such as *funny* or *scared* as early as 2–3 years old (Ridgeway et al., 1985). Their emotional lexicon also increases dramatically from early childhood to 11 years old (Baron-Cohen et al., 2010; Nook et al., 2020), although the use of emotion terms is still far from adult-like at 10–11 years of age (Grosse & Streubel, 2024, this issue). Data based on caregivers or children's reports suggest earlier acquisition of words conveying positive concepts (Baron-Cohen et al., 2010), which is consistent with findings from adults who estimate the age at which they learned specific words (i.e. the subjective age of acquisition, Hinojosa et al., 2016). Both linguistic and situational cues inform children about the meaning of new emotion terms (Shablack et al., 2020). In this regard, communicative interactions with caregivers play a crucial role in the acquisition of emotion vocabulary. Thus, infant-directed speech, or motherese, is considered an emotional form of speech (Saint-Georges et al., 2013). It is characterised by a wide use of words expressing positive feelings (Ponari et al., 2018), as well as by some idiosyncratic paralinguistic cues, such as specific bell-shaped intonation contours and higher overall pitch, to express positive emotions such as approval and comfort (Saint-Georges et al., 2013). These features match children's preferences and capture their attention, allowing them to observe adults' use of positive words to name people, objects, and events, thus facilitating the mapping between these labels and their referents (Hoemann et al., 2019).

From another line of research, some studies have compared the acquisition of emotion terms with other types of words. Declercq et al. (2019) reported that children learn concrete words first, followed by emotion terms, which in turn are acquired earlier than abstract words. Large-scale analyses of the subjective age of word acquisition also show that emotion terms are acquired earlier than abstract words (Muraki & Pexman, 2024, this issue; Ponari et al., 2018). These findings support grounded theories of meaning (Barsalou, 2008, see Section 1.1), which attribute a crucial role to embodied experience in language acquisition. Thus, concrete words are learned earlier than abstract words because only the former have clear sensorimotor referents, whereas the latter are mainly acquired through linguistic experience (Pexman, 2019). Emotion terms do not fit neatly as concrete or abstract words (or should be considered as a special type of abstract words) because, although they often do not have sensorimotor referents, they are associated with interoceptive experiences and are more embodied compared to abstract words (Borghi et al., 2022). In agreement with this, Muraki and Pexman (2024, this issue) found that emotional content is closely related to embodiment (assessed as the degree to which the meaning of a word involves the human body, Sidhu et al., 2014).

Grounded theories can also explain the emotional connotation of emotion-laden words (e.g. *party*). Word acquisition occurs in specific contexts and involves the association of the lexical label (i.e. the word form), sensorimotor referents, and emotional experiences. If the pairing is consistent, the word becomes positive or negative. Furthermore, the sensorimotor and the emotional experiences are reactivated in future encounters with the word (Fritsch & Kuchinke, 2013; Hofmann et al., 2010). This associative mechanism operates not only during development, but also throughout the speaker's lifetime. In fact, even pseudowords can acquire affective properties if they are embedded in positive or negative contexts (Dong et al., 2024; Lana & Kuperman, 2024), or consistently paired with emotion terms (Hoemann et al., 2021) and faces (Gu et al., 2023).

It follows from the above that words gain their affective meaning primarily through their acquisition in emotional contexts. That is, the environment in which words are learned and used determines their

emotional impact, according to the so-called *context of learning hypothesis* (Caldwell-Harris, 2014). This has direct implications for non-native languages. Second language (L2) words are typically learned in academic settings without sensorimotor and affective experiences; that is, they are often disembodied (Pavlenko, 2012): Although the speakers know that the meaning of these L2 words is emotional, they may not experience an affective reaction in response to them. This is the phenomenon of reduced emotional resonance (or emotional detachment) described in bilinguals (Dewaele, 2010). In support of this, L2 words tend to elicit a decreased psychophysiological response and less activation of emotion-related brain areas compared to L1 words (see Aguilar et al., 2024, for a review).

The literature reviewed suggests that words with emotional content have a privileged status in language acquisition, with communicative interactions with caregivers playing a key role. This facilitated acquisition is explained by the association of these words with emotional experiences that are absent in other types of words. These findings support grounded theories and suggest that association is the mechanism behind the acquisition of affective meaning. This mechanism is present throughout the individual's life, but if the context of acquisition does not provide emotional experiences, the words will be disembodied, as can happen when learning a foreign language.

2. The influence of emotion on language

The multi-component view of emotion described in the introduction includes cognitive responses as part of the reaction elicited by emotionally relevant stimuli. Changes in attention and memory have been extensively documented (see Yiend, 2010; and Talmi, 2013, for reviews). This section reviews changes in language processing and presents psycholinguistic research on the interplay between language and emotion. Most studies have focused on the emotional content of the verbal stimuli, while the influence of the emotion experienced by the individual has been investigated to a lesser extent. Both approaches are included here.

2.1. Effects of the emotional content of linguistic stimuli on language processing

This section is organised according to different levels of language structure: single words (lexical units), sentences, and texts (supra-lexical units). Single word research has been the majority in this area. It has focused much more on comprehension than on production (see Hinojosa et al., 2010; Rohr & Rahman, 2018, for exceptions), and visual word recognition has been the focus of attention. Therefore, we primarily review studies in this domain. Research has mostly followed a dimensional framework (Russell, 2003), comparing emotional and neutral words that differ in valence and arousal. Although the stimuli in these studies may be a mixture of emotion-label (emotion terms) and emotion-laden words, the common approach is to include only the latter.

Both valence and arousal have been shown to influence processing, although the effect is greater for valence than for arousal (Kuperman et al., 2014) and in comprehension tasks (e.g. the lexical decision task, LDT, in which participants are asked to decide whether strings of letters are real words or not) vs. production tasks (e.g. the naming task) (Kuperman et al., 2014). Positive words are recognised faster than neutral and negative words in the LDT (Haro et al., 2024; Kuperman et al., 2014; see also the articles of Hatzidaki & Santesteban, 2024; and Stoianov et al., 2024, both in this issue). Positive words are also produced to a greater extent in emotional verbal fluency tasks, where participants are asked to produce as many emotional words as possible in a limited amount of time (Lam & Marquardt, 2020). These findings agree with the general positivity bias in language, illustrated by the higher use of positive words in written linguistic corpora and naturalistic speech samples (Augustine et al., 2011; Dodds et al., 2015).

In contrast to the well-established positivity bias (Kauschke et al., 2019), the effects of negative valence on word processing are more contradictory. There are reports of an advantage (i.e. shorter reaction times, RT, Vinson et al., 2014), a disadvantage (Kuperman et al., 2014), and no differences (Kuchinke et al., 2005) for negative words compared to positive and neutral words, with a recent meta-analysis concluding that negative emotional content has no reliable effects on visual word recognition (Ferré et al., 2025). These inconsistencies may be partly due to the interaction between valence and arousal: Some studies have documented a facilitated processing for negative words only when arousal is high (Haro et al., 2024; Vieitez et al., 2021; but see Kuperman et al., 2014). This may be because negative valence and high arousal elicit congruent coping strategies

(avoidance), whereas negative valence and low arousal elicit incongruent coping strategies (avoidance and approach, respectively) (Robinson et al., 2004).

Other factors may contribute to mixed findings. There are significant correlations between affective variables and several lexico-semantic variables. Positive words are used more frequently (Warriner et al., 2013), tend to be more familiar (Citron et al., 2014), and are acquired earlier in life (Martínez-Huertas et al., 2023, this issue, Sabater et al., 2023). In contrast, high-arousal words occur less frequently in language (Speed & Brysbaert, 2024), are learned later (Citron et al., 2014), and elicit richer perceptual experiences (Warriner et al., 2013). Finally, emotional (both positive and negative) and high-arousal words tend to be more abstract than their neutral and low-arousal counterparts (Ćoso et al., 2019). Proper control of these variables (e.g. frequency, age of acquisition, concreteness, etc.) is necessary to draw firm conclusions (Larsen et al., 2006).

Large-scale studies involving many participants and many words, often accompanied by statistical analyses that allow the effect of a given variable to be examined while controlling for the other influencing variables (i.e. linear mixed models, Baayen et al., 2008), have been an important step forward. These studies have confirmed the reliable influence of affective variables on word recognition (Haro et al., 2024; Kuperman et al., 2014). Some of them have also examined individual differences, demonstrating the effect of gender and personality traits, with women and extroverted people being more sensitive to valence effects than men and less extroverted people (Haro et al., 2024). Another strategy for investigating the genuine effects of emotional content, uninfluenced by other factors, is to create emotional pseudowords by pairing them with affective information (see Section 1.2). These stimuli behave similarly to existing emotional words in linguistic tasks: They are learned better (Lana & Kuperman, 2024) and recognised faster (Ferré et al., 2015) when they have been associated with an emotional (especially positive) meaning compared to a neutral meaning, suggesting that the effects cannot be explained by features of the stimuli other than their emotional connotation (see also Martínez-Tomás et al., 2025, for a review).

As we have seen, studies of emotional word processing have primarily focused on the dimensions of valence and arousal. However, the interest in other affective variables has grown in recent years. One line of research is based on the basic emotions approach (Ekman, 1992). These studies have reported processing differences in word recognition tasks between disgust-related words and fear-related words (a disadvantage for the former, Briesemeister et al., 2011; Ferré et al., 2018) and between fear-related words and anger-related words (an advantage for the latter, Huete-Pérez et al., 2019). These results are far from conclusive due to the paucity of research. However, given that they reveal differences between different types of negative words, these findings suggest that valence and arousal cannot fully explain the effects of emotional content in word processing.

Another line of research, focused on the distinction between emotion-label words (or emotion terms, e.g. *happiness*) and emotion-laden words (e.g. *party*), has reached similar conclusions. Emotion-label words exhibit greater processing advantages (Zheng et al., 2024) and an earlier emotion effect (Wang et al., 2019) compared to emotion-laden words, although findings are not entirely consistent (see also Tang et al., 2024, this issue, and Wu & Zhang, 2020, for a review). Altarriba and Basnight-Brown (2011) proposed the mediated account, arguing that emotion-laden words are a type of mediated emotion concepts, whose affective meaning can only be accessed indirectly through their association with emotion terms. This leads to slower RTs in tasks where emotional content facilitates performance, compared to emotion-label words. These findings, together with those from the basic emotions approach, although still limited, illustrate the usefulness of looking beyond valence and arousal to understand the influence of emotional content in word processing.

Much psycholinguistics research has been done with single words, as can be seen from the above. However, some authors have advocated for more ecological paradigms involving the presentation of words in context (e.g. Scott et al., 2012). The processing of emotional words embedded in sentences was investigated in the last decade by a number of studies that recorded eye movements while participants read (Knickerbocker et al., 2015; Scott et al., 2012; Sheikh & Titone, 2013). Emotional words (regardless of their positive–negative valence) were read faster than neutral words. In a recent paper, Yao et al. (2024, this issue) showed that the emotional advantage was greater for concrete words and for abstract words with high imageability (compared to those

with low imageability), due to their stronger links to the sensorimotor experiences that evoke these emotions.

However, these studies still focused on the emotional words themselves, rather than on their influence on the processing of whole sentences and texts. This issue was addressed in a research line devoted to syntactic unification processes (i.e. grammatical rules for constructing sentence and discourse structures). A number of studies recorded behavioural (e.g. RT, accuracy) and/or brain responses to morphosyntactic errors (gender or number mismatches between word pairs) while speakers judged the grammaticality of sentences and phrases, finding a modulation by the emotional content of words (Hinojosa et al., 2014; Martín-Loeches et al., 2012; see also Bermúdez-Margaretto et al., 2024, this issue, for results in a non-native language). These studies illustrate the influence of emotion in establishing dependency relations between sentence constituents. Nevertheless, there are some conflicting findings (see Fraga et al., 2023), which may be partly explained by individual differences in the neural response to morphosyntactic errors (Fraga et al., 2021; Vieitez et al., 2024) or by the type of materials tested (e.g. the distinction between natural gender, which refers to the biological sex of the word referent, and arbitrary gender, a purely formal feature of the words, Vieitez et al., 2024, this issue).

Emotional content also impacts semantic unification processes (i.e. the integration of word meaning into a sentence or discourse representation) by facilitating the integration of words into emotional (Delaney-Busch & Kuperberg, 2013; Moreno & Vázquez, 2011) and neutral sentence contexts (Bayer et al., 2010; Martín-Loeches et al., 2012). However, there are discrepancies in the direction of the effects, with reports of an easier integration for both positive and negative words vs. neutral words (Delaney-Busch & Kuperberg, 2013), limited to positive words (Martín-Loeches et al., 2012), or easier for negative vs. positive words (Moreno & Vázquez, 2011).

In a different approach, Lüdtke and Jacobs (2015) used a sentence verification task to examine the global processing of emotional and neutral sentences. Participants were faster to decide whether a sentence made sense or not when it was positive, indicating a higher processing fluency. More recent research using texts has reported similar results. For example, Ballenghein et al. (2019) observed shorter reading times in positive (but not negative) texts vs. neutral texts. This effect was particularly evident when the texts were read from a personal perspective (Child et al., 2020) and when arousal was low (Usée et al., 2020). In fact, negative information can even lead to slower reading times compared to neutral information. For instance, readers spent more time in the central part of a suspense story when it was negative, relative to a neutral condition (Arfé et al., 2022). Likewise, horror texts were read more slowly than neutral and erotica texts (Ballenghein et al., 2023).

Apart from processing fluency, a critical aspect of text reading is comprehension. Emotional texts are understood better than neutral texts (Megalakaki et al., 2019), probably due to a higher degree of cognitive engagement (Ballenghein et al., 2019, 2023; Kaakinen & Simola, 2020). This effect seems to be mediated by the reader's affective experience. For instance, readers who reported a more positive affect while reading the text also showed better sentence integration (Smith et al., 2022), which demonstrates the positive benefit in comprehension (Ness-Maddox et al., 2023). The effects of negative content are less clear (see Lüdtke et al., 2021, for a review), and it appears that the aspect of comprehension being assessed also matters. Indeed, performance is better for positive texts on surface questions, which involve a shallow understanding; however, it is better for negative texts on inference questions, which entail a deeper understanding (Megalakaki et al., 2019).

Overall, the extant literature clearly supports the role of emotional content in language processing at both lexical (single words) and supra-lexical (sentences and texts) levels. Emotional words (mostly when they are positive) are processed faster both when they are presented in isolation and when embedded in contexts. Furthermore, emotional content influences several syntactic and semantic unification processes and facilitates reading and comprehension of texts. It is noteworthy that the large body of evidence accumulated on the modulation of language by emotion has not been paralleled by a similar level of theoretical development. Nevertheless, some explanatory mechanisms have been proposed, which are described below: A linguistic mechanism and a non-linguistic mechanism.

Regarding the former, the semantic feedback activation framework has been proposed to explain the facilitating effect of several semantic variables in the LDT (Hino & Lupker, 1996). Most models of visual word recognition assume the existence of three

distinct but interconnected levels of representation: orthographic, phonological, and semantic. These models propose that processing at one level is influenced by the activation of representations at the other levels (see Carreiras et al., 2014). Therefore, activation from semantic units may provide feedback to orthographic units, facilitating the LDT (Siakaluk et al., 2016). This is related to the concept of semantic richness (i.e. the amount and variety of information evoked by a word, Pexman et al., 2008; Yap et al., 2015). Attributes such as imageability, animacy, the number of senses, and emotional content have been proposed to contribute to this concept (Yap & Seow, 2014). Semantically richer words are thought to elicit more semantic activation, resulting in stronger semantics-to-orthography feedback. Thus, although models of visual word recognition do not take into account emotional content (see Norris, 2013, for a review), they may explain its effects as a feature of semantic richness, facilitating the processing of words presented in isolation or embedded in contexts.

With respect to the non-linguistic mechanism, there is ample evidence that emotional stimuli capture attention because of their motivational salience (*Model of motivated attention and affective states*, Lang et al., 1990). This also applies to linguistic stimuli, as demonstrated in paradigms such as the emotional Stroop task (e.g. Brunel et al., 2023) or the picture-naming interference task (White & Abrams, 2021; see Brunel et al., 2024, this issue, for another paradigm). In both cases, the emotional content of words interferes with the task at hand (to name colours or pictures, respectively) and slows down responses. The capacity of emotional words to capture attention has also been demonstrated in many event-related potential (ERP) studies. Compared to neutral words, emotional words evoke an enhanced EPN (a component thought to reflect early selective attention to emotional features). They also evoke a larger LPC (a component thought to index elaborated processing of these emotional features, see Hinojosa et al., 2020, for a review). Thus, allocating attention to emotional words leads to more elaborate processing. Notably, this neural signature is similar to that observed for other emotional stimuli, such as faces and images (Herbert et al., 2008).

The selective attention mechanism may account for the facilitation in processing observed with emotional words, sentences, and texts. It can also explain why emotional content may lead to a disadvantage in some cases. Indeed, Pratto and John (1991) suggested that the larger RT for negative words observed in certain studies may be attributed to the difficulty of disengaging attention once it has been captured. In this regard, the exact circumstances in which an advantage or a disadvantage is to be expected with emotional verbal stimuli remain to be determined. Several modulatory variables have been identified, including the type of task (i.e. focused or not on emotional content, Estes & Verges, 2008), the required response (i.e. approach or withdrawal, Wentura et al., 2000), and the individual's motivational orientation (i.e. the congruence of the verbal information with current goals; Rothermund, 2011). Taken together, these findings suggest that the role of attention attraction in emotional processing is better explained by proposals that consider it to be flexible rather than stable (Rothermund, 2011).

Regardless of the direction of the effect (i.e. an advantage or a disadvantage), it seems that attentional capture by emotional content affects subsequent language processing. This is made possible by the intricate interconnections between brain networks, such that the presence of emotional content in the language input may enhance linguistic processes that require attention and executive control. As an example, the prefrontal cortex is connected to subcortical emotional structures and is also involved in predictive processing in language (e.g. integrating the preceding contextual information, which enables semantic unification processes, Eppinger et al., 2015). Thus, the activity of the prefrontal cortex may be enhanced by emotional information (due to the connection with the amygdala), and this activation may be transmitted to other interconnected cortical structures, leading to more efficient predictive processing. This is consistent with the strong evidence for the interactions between language-related cortical areas (e.g. the inferior frontal gyrus, or the left superior temporal gyrus) and sub-cortical areas (e.g. the amygdala) during emotional language processing (see Hinojosa et al., 2020 for a review).

2.2. Effect of the emotion experienced by the individual on language processing

The emotional state of the individual who is processing language may be considered as part of the context of linguistic tasks and activities (Lin et al., 2024). This topic is addressed in this section, with a focus on mood, which refers to long-term general

feelings with relatively low intensity (Scherer, 2005). In contrast to the research on the emotional content of verbal stimuli reviewed in the previous section, mood research has relied more on supra-lexical verbal units (sentences and texts) than on single words. We first review mood congruency effects and then focus on general mood effects on language processing.

Mood congruency effects (i.e. the facilitation of processing when the affective tone of the information to be processed matches the participant's mood, Bower, 1981), described in relation to memory (see Faul & LaBar, 2023, for a review), have also been reported in language processing. In these studies, participants induced into a particular mood (through pictures, video clips, music, etc.) are presented with congruent and incongruent linguistic information (e.g. positive and negative words). Findings obtained in the LDT (Ferraro et al., 2003) and in the affective decision task (i.e. deciding whether the word is positive, negative, or neutral, Naranowicz et al., 2023) showed faster processing for mood-congruent words compared to mood-incongruent words. Egidi and Nusbaum (2012) obtained convergent evidence for narrative comprehension: endings of stories that were incongruent with participants' induced moods were harder to integrate (see, however, Sereno et al., 2015, for null effects). These findings may be explained by Bower's model (1981), which was inspired by semantic network models of memory and the mechanism of spreading activation between related (close) concepts (Collins & Loftus, 1975). Bower argued that emotional states activate the corresponding concept (node) in the network and that this activation spreads to closely related nodes. For example, positive feelings would activate the concept (node) of *happiness* in the network, and this activation would spread to the concept of *party,* explaining why the word *party* is processed faster when people are in a positive mood.

More recent studies have instead focused on the effects of emotional state on language processing in general (i.e. neutral, non-emotional language), using different paradigms and tasks. For example, Scrimin and Mason (2015) found that a positive mood was associated with a more effective processing (as indicated by eye movement patterns) and better comprehension compared to a negative mood. On the other hand, a negative mood hindered vocabulary learning in an unknown language (Miller et al., 2018), hampered the retrieval of phonological information during word production (Hinojosa et al., 2017), and impaired predictive processing in sentences (van Berkum et al., 2013). These findings suggest that a negative mood has a detrimental effect. However, other studies have reported a different pattern. For example, Naranowicz and Jankowiak (2024) tested bilingual participants and showed that a negative mood facilitated processing, but only when the task involved semantics (participants had to decide whether presented sentences were meaningful or meaningless) and was performed in the L2. Therefore, it seems that certain characteristics of the participants and the type of processing involved may modulate the effects obtained.

The above is related to some theoretical proposals about the interaction between cognition and emotion. Cognitive tuning theories are based on the idea that situational demands influence people's emotional responses, which in turn direct cognitive resources to deal with these demands. For example, the *affect-as-information theory* (Clore & Huntsinger, 2007) postulates that the emotional state informs about the personal value of what is being processed and about the task-dependent processing requirements. Indeed, a negative mood signals cognitive difficulty, whereas a positive mood signals cognitive ease. This leads to different processing styles: while a positive affect triggers relational, global, and heuristic processing, a negative affect favours effortful, systematic and more analytical (detail-oriented) processing, thus limiting associations with stored information.

These theories have guided research on the role of mood in semantic processing (see Chwilla, 2022; and Naranowicz, 2022, for recent reviews). For example, semantic priming (a phenomenon in which a word is processed faster when it is preceded by a semantically related word than by a semantically unrelated word) was observed when people were in a positive mood, but not in a negative mood, suggesting that only the former facilitates the spreading activation of semantically related concepts (Storbeck & Clore, 2008). Likewise, people in a positive mood discriminated more easily between sentences containing expected and unexpected endings, compared to people in a negative mood, evidencing that mood influences semantic predictability (Chwilla et al., 2011). Similarly, plausible sentences (in terms of their agreement with general world knowledge) were discriminated from implausible sentences at the neural level in a positive mood but not in a

negative mood (Vissers et al., 2013), suggesting that a positive mood promotes reliance on heuristics (i.e. word knowledge). In line with this, Bohn-Gettler et al. (2016) found that participants in a negative mood were less accurate when the comprehension questions about a text required integrating prior knowledge with the text. The authors' interpretation was that the local focus associated with negative emotions may limit the amount of activated information.

Taken together, these findings agree with the idea that mood activates thought patterns and cognitive strategies that modulate attention, perception, and action (van Berkum et al., 2013). Positive affective states would activate global and heuristic processing, whereas negative states would promote more detail-oriented processing during language comprehension (Naranowicz, 2022). These assumptions align with the *broaden-and-build theory* (Fredrickson, 2004), which proposes that positive emotions broaden an individual's thought-action repertoire.

Despite the empirical evidence, models of language comprehension have only recently incorporated emotional states. Indeed, the *PET (Process, Emotion, Task) framework* (Bohn-Gettler, 2019) attempts to explain how readers' emotions (induced before reading) influence text comprehension. It posits that the observed effects depend on the nature of the emotion, the type of comprehension process involved, and the task, which explains why advantageous or disadvantageous effects can be observed with a positive/negative mood depending on the particular conditions of the study. Text comprehension involves encoding information at three levels: surface structure (exact words and propositions from the text), textbase (the gist of the text), and situation model (establishment of inferences between the current sentence and prior knowledge or previous information in the text, Kintsch, 1998). According to the PET framework, the most appropriate place to study the influence of emotional state is the situation model because it involves a connection with prior knowledge. The study by Bohn-Gettler et al. (2016), mentioned above, provides positive evidence in this direction.

3. Emotion labelling

According to the shared multi-component view of the emotion process (see the Introduction), this process is not necessarily conscious, but when it is, it gives rise to a feeling. This feeling can be verbally labelled with a specific emotion term, such as *happy* or *sad*. This section presents the main topics of interest in relation to these labels. First, we review the literature about the description and characterisation of emotion terms. Second, we review the research about the impact of language in general and of emotion terms in particular on the understanding, experience, and regulation of emotions.

3.1. The lexicon of emotion terms

Emotion terms (also called emotion words or emotion-label words) are the labels that people use for an emotion (Shablack, 2024). This section begins with studies on which words should be included in the lexicon of emotion terms. It then reviews some work on the semantic structure of emotion terms and their cross-language correspondence, in relation to cultural influences on emotional meaning.

The number of emotion terms that should be included in the emotion lexicon is a debated issue, probably because it is not so easy to determine what an emotion word is (Hoemann, 2024). There have been several attempts to build comprehensive corpora in different languages (see Hoemann, 2024 and Pérez-Sánchez et al., 2021, for overviews). Some studies have extracted these words from dictionaries according to the criteria of human coders (Ng et al., 2019). Others have relied on speakers, either asking them to produce as many emotion terms as possible (Frijda et al., 1995), to report their experience in response to emotionally evocative stimuli (Cowen & Keltner, 2017) or to rate the extent to which a list of potential emotion terms refers to an emotion (Fehr & Russell, 1984; Pérez-Sánchez et al., 2021). This research has consistently shown that the lexicon of emotion terms has a prototypical organisation, with some exemplars being more representative of the emotion category than others (Pérez-Sánchez et al., 2021). Apart from valence and arousal, the attributes that contribute most to this representativeness are the intensity (i.e. intense) and the duration (i.e. brief) of the emotional experience (Fehr & Russell, 1984; Pérez-Sánchez et al., 2021), as well as the interoceptive bodily sensations evoked by the word (Ferré et al., 2024).

Other researchers have focused on the semantic structure of emotion terms, examining their correspondence across languages. Based on a multi-component view of emotions, Scherer and co-workers

developed the GRID instrument (Fontaine et al., 2013; Scherer, 2005). In this questionnaire, participants are given a set of emotion terms and are asked to indicate the extent to which they are related to a large list of features corresponding to the different components of the emotional experience (appraisals, physiological changes, expression, action tendencies, and subjective feelings). From these ratings, an affective space can be created, and the underlying dimensions identified. Using this approach, these authors have repeatedly demonstrated that the internal structure of the space of emotion terms includes four factors: valence, arousal, power, and novelty. The consistency of these dimensions was observed in a large-scale study involving many countries that provided the semantic profile of 24 main emotion terms (Fontaine et al., 2013).

In fact, the mapping of emotion lexicons across languages is a topic of great interest. However, this is not an easy task. On one hand, the number of emotion terms varies considerably from one language to another. There are also distinct grammatical realizations, with some languages favouring nouns and adjectives to represent emotions (e.g. English) and others favouring verbs (e.g. Russian), which may be related to the conception of emotions as personal internal states or processes, respectively (Soriano, 2022). On the other hand, there are cases of emotion words that do not have a single translation in other languages (e.g. the Portuguese word *saudade*) or whose translation equivalents do not completely overlap in meaning (e.g. the English-Spanish pair *shame-vergüenza*) even when they are cognate words (i.e. translation equivalents with a very similar form). For example, using the GRID tool, Soriano and Ogarkova (2025) reported that the meaning of the English word *frustration* does not fully share the meaning of its Spanish, French, and German equivalents (*frustración*, *frustration*, and *Frustration*, respectively), with the English meaning being more related to anger than in the other three cases.

A different approach was pioneered by Wierzbicka (1999), who proposed the use of the natural semantic language (NLS) approach to identify a set of lexical universals or semantic primitives that can represent concepts in all languages. It is noteworthy that although *feel*, *good* and *bad* were included in this list, there was no single emotion term. Jackson et al. (2019), in turn, examined the semantic structure of emotion terms, relying on colexification (i.e. when multiple concepts are co-expressed by a single word) as an index of semantic similarity. Comparing colexification patterns across many languages, these authors found evidence for both universal structure (i.e. all languages differentiated emotions primarily on the basis of valence and activation) and cross-linguistic cultural variation. Notably, geographically close languages showed more similar patterns of colexification, potentially providing evidence for cultural influences on emotion meaning (Jackson et al., 2019).

In summary, current literature suggests that emotion terms have a prototypical structure, although there is no agreement on the underlying factors, with some studies identifying valence and arousal as the universal dimensions (Jackson et al., 2019), while others also include power and novelty (Fontaine et al., 2013). This section also illustrates the research interest in the semantic structure of emotion terms across languages. This is related to the debate on the universality of emotions and is based on the assumption that emotion terms are important linguistic cues to emotion concepts (i.e. the internal representation that people have about emotions, Shablack, 2024). In this context, the *lexical sedimentation hypothesis* claims that some essential facts of world knowledge are embodied in language (Scherer & Fontaine, 2019). Hence, the study of emotion terms is seen as a tool for investigating questions related to emotions themselves, such as how people experience emotions and mentally represent them (Jackson et al., 2019). It should be noted, however, that some authors do not share this assumption and argue that the study of emotion terms is merely descriptive and that inferences cannot be drawn directly from findings in one domain (emotion terms) to another (emotion experience) (Scarantino, 2012).

3.2. Effects of language on the understanding, experience and regulation of emotions

The previous section is devoted to the labels used to name emotions. This section reviews the literature about the effects of these verbal labels on emotion understanding (i.e. the conceptual knowledge and recognition of emotions, Grosse & Streubel, 2024, this issue) and on the experience and regulation of emotions. It includes studies conducted with children and adults. Although most work is about emotion terms, the influence of other aspects of language (e.g. general vocabulary, linguistic abilities) has also

been examined and these aspects are therefore included where appropriate.

Numerous studies illustrate the close relationship between language and emotion understanding in children (Griffiths et al., 2020; Ornaghi & Grazzani, 2013). Children's verbal knowledge mediates the transition from a unidimensional conception of emotions based on valence towards a two-dimensional representation that includes both valence and arousal (Nook et al., 2017). Similarly, preschool and young children with better grammatical skills or larger vocabulary sizes are better at identifying facial expressions (Ornaghi & Grazzani, 2013) and attributing emotions to a character in a story (Rieffe & Wiefferink, 2017). They also make more accurate emotional appraisals in videos displaying affective scenarios (Ramírez & Ruetti, 2023). A relationship between general vocabulary knowledge and emotion recognition in facial expressions has also been reported in older children (Grosse & Streubel, 2024, this issue). Likewise, Vy et al. (2024, this issue) documented a link between verbal reasoning and emotion understanding (assessed as the ability to comprehend the nature, causes, and consequences of emotions) in children with non-specific intellectual developmental disorders. This research suggests that language abilities support the development of emotional abilities by helping children to give meaning to their own emotions, which facilitates the understanding of emotion concepts (Denham, 2007).

Other studies have focused on the effect of emotion-specific language skills. For instance, young children's ability to identify facial expressions seems to be closely linked to the acquisition of linguistic labels to denote emotions (Widen, 2013). This influence is maintained at later ages, with emotion recognition in adolescents being more related to emotion-specific vocabulary knowledge than to general vocabulary (Grosse & Streubel, 2024, this issue).

Studies conducted with adults have mainly focused on emotion perception, that is, the ability to perceive what emotion other people are experiencing (Shablack, 2024), which is a critical social skill. For example, the affective categorisation of faces is facilitated by the previous presentation of an affectively congruent sentence (Liu et al., 2019). Furthermore, verbal information (e.g. the word *sadness*) benefits, more than emotion-evoking scenes, the recognition of a similar facial emotion (i.e. sadness) (Doyle et al., 2021). Brain activity is also sensitive to the incongruency between faces expressing emotions and affective sentences (Aguado et al., 2019). In a related vein, some learning studies have demonstrated the facilitative effect of emotion labels in the identification of novel facial movements as discrete emotions in chimpanzee faces (Fugate et al., 2010) and in "alien" faces (Doyle & Lindquist, 2018). In addition, recent research shows that the facilitative effect extends to the affective categorisation of body expressions (Du et al., 2024). These findings suggest that emotion terms make their related emotion concepts more accessible, facilitating emotion perception.

Convergent evidence has been obtained from situations in which the access to emotion concepts is unavailable, either temporarily or permanently. In the semantic satiation paradigm, participants are instructed to repeat a given emotion word (e.g. *sadness*) out loud several times, which makes the corresponding concept temporally unavailable (Tian & Huber, 2010). This manipulation hinders the immediate recognition of the corresponding emotional facial expression (Gendron et al., 2012). Furthermore, patients with semantic dementia (i.e. a neurodegenerative disorder, which is characterised by a progressive loss of semantic memory, Gorno-Tempini et al., 2011) show an impairment in facial emotion recognition. For instance, when asked to organise a set of face pictures displaying several discrete (basic) emotions, these patients tended to sort them based on valence (positive–negative-neutral) rather than on discrete emotions, suggesting that the permanent loss of emotion concepts impairs emotion perception (Lindquist et al., 2014). A similar deficit was observed when they were required to match a series of emotion labels with facial expressions and prosody sounds (Macoir et al., 2019). Neuroimaging data provides evidence in the same direction, revealing a significant overlap of the brain areas involved in emotion perception and in semantic knowledge representation, such as the anterior temporal lobe, the medial temporal lobe, the medial prefrontal cortex, and the ventrolateral prefrontal cortex (see Satpute & Lindquist, 2021, for a review).

A distinct line of inquiry has dealt with the influence of language on emotional experience and well-being, focusing on affect labelling (see also Kaźmierczak et al., 2024, this issue, for another approach). Labelling one's affective state helps people experience it as a more discrete specific emotion (Lindquist, 2021). For instance, only participants who were asked

to report their experience of anger while performing a stressful mental arithmetic task showed a physiological response consistent with the experience of anger (Kassam & Mendes, 2013). This has significant implications, considering the positive effects of emotional granularity (i.e. the extent to which people make fine-grained distinctions in their emotional states) (Barrett et al., 2001). Variations in this capacity are accompanied by differences in neural processing during emotional experiences (Lee et al., 2017). Furthermore, emotional granularity has consequences for well-being. In a recent meta-analysis that included clinical and nonclinical samples, Seah and Coifman (2022) found that the capacity to discriminate between negative emotions was negatively related to maladaptive behaviours (i.e. behaviours aimed at avoiding or downregulating negative emotions, which may have harmful health consequences, such as non-suicidal self-injury), regardless of diagnostic status. Relatedly, the ability to differentiate between emotions has been shown to confer resilience against the development of stress-related psychopathology during adolescence (Nook et al., 2021) and is associated with better psychotherapy outcomes in patients with mood and anxiety disorders (Lazarus & Fisher, 2021). Notably, recent studies have attempted to develop strategies for training this ability (Seah & Coifman, 2024, this issue).

Additional evidence of the link between language, emotional granularity and well-being is provided by alexithymia, which literally means "a lack of words for feelings" (Sifneos, 1972). This personality construct is characterised, among other things, by the difficulty of identifying one's own feelings and describing them to others and is associated with decreased well-being, including substance abuse, increased somatisation and psychopathology (see Hoemann, 2024; and Luminet et al., 2021, for reviews). People scoring high on alexithymia vs. those scoring low show deficits related to emotional language (Welding & Samur, 2018). For instance, they do not exhibit the same pattern of recognition of emotional prosody (Telli & Bilge, 2024, this issue), they produce less emotion terms and have a less varied emotion vocabulary (Wotschack & Klann-Delius, 2013). There are also reports of more general language effects (not restricted to emotional language). Just as an example, Samur et al. (2021) found that alexithymia was negatively correlated with narrative engagement while people were reading texts. Similarly, Hobson et al. (2019) argued that language impairment, in general, can give rise to alexithymia (the *alexithymia language hypothesis*). Despite this, language seems to be only one of the aspects involved in alexithymia, which encompasses other cognitive processes, such as attention and memory (see Luminet et al., 2021, for a review), suggesting a global impairment in emotional information processing.

The link between language and emotional well-being outlined above raises the question of whether language may be used to regulate emotion (i.e. to change the emotion an individual is experiencing, or how and when s/he experiences and expresses it, Gross, 1998). Some evidence points in this direction. Research with children illustrates the relationship between language abilities and knowledge of regulation strategies to modify emotional reactions. Indeed, toddlers with higher language abilities are better at seeking support from their mothers and initiating distraction strategies to minimise anger and frustration (Pemberton-Roben et al., 2012). Similarly, the size of emotion vocabulary predicts preschool children's individual differences in the knowledge about the use of problem-focused coping or reappraisal as tools for regulating anger, sadness, or fear (Streubel et al., 2020). Parental emotion talk seems to play a relevant role in these emotional competencies (see Reaume & Thomassin, 2024, this issue).

Studies focused on adult populations have proved the modulatory effect of language on emotional regulation. For example, Pfeifer et al. (2024, this issue) showed that accompanying negative images with ironic statements (compared to literal statements) decreased their emotional impact. Other pieces of evidence are the improvement in physical and mental health produced by writing texts on stressful events (Memarian et al., 2017). Furthermore, labelling negative facial expressions with the corresponding emotion words downregulates arousal as indexed by amygdala activation (Torrisi et al., 2013). In fact, there is ample evidence that affect labelling (i.e. "putting feelings into words") has experiential, autonomic, behavioural and neural consequences and that it can be a form of implicit emotion regulation (see Torre & Lieberman, 2018, for a review). Several modulatory factors have been identified. For instance, affect labelling when looking at negative pictures had a beneficial effect only in individuals with high emotional granularity (Yue et al., 2024, this issue) and when these images were of high intensity (Levy-Gigi & Shamay-Tsoory, 2022).

Finally, research with bilingual populations may provide additional information about the effect of language on the emotion experience, well-being and regulation, considering the phenomenon of reduced emotional resonance in the L2 (see Section 1.2). Bilinguals sometimes prefer using their L2 to talk about threatening or anxiety-evoking topics because this may enable them to distance themselves from negative emotional experiences and, consequently, feel safer (Movahedi, 1996). A few studies have recently provided empirical evidence for this phenomenon. Dylman and Bjärtå (2019) observed that the level of distress experienced after reading negative texts in the L1 decreased by simply asking participants a series of questions about them in the L2 vs. the L1. Furthermore, fear conditioning was less effective in the L2 vs. the L1 when participants were informed of the potential presence of an aversive stimulus after a neutral stimulus (García-Palacios et al., 2018). This suggests that reduced emotionality in the L2 can help people distance themselves from the situation, which may have clinical applications, concerning exposure therapy.

Despite these promising findings, the results with typical emotion regulation strategies such as affect labelling and cognitive reappraisal (i.e. the transformation or reinterpretation of the situation to alter its emotional impact, Gross, 1998) are not entirely consistent. Indeed, Ortigosa et al. (2024) instructed participants with subclinical phobia of cockroaches to use cognitive reappraisal with phobic pictures (i.e. saying out load a prespecified sentence to decrease the emotion), finding that the L2 sentence was more effective to down-regulate negative emotions compared to the L1 sentence. In contrast, labelling negative faces with L1 words, but not with L2 words, decreased amygdala activation in the study of Vives et al. (2021).

To sum up, there is considerable evidence of the impact of language on emotion understanding and experience, which in turn has consequences for well-being. There is disagreement, however, regarding the nature of this influence and the extent to which language has a foundational role in emotions (Sauter, 2018). A difference should be made between constitutive and interactive models (see Satpute & Lindquist, 2021, for a detailed description). Constitutive models give a central role to emotion terms in the construction of emotion, arguing that they are necessary elements for creating the experience of discrete emotions. These accounts, like the *constructionist Conceptual Act Theory* (CAT, Lindquist, 2013) propose that people experience an emotion when they make meaning of their affective state by integrating external and internal sensations with emotion conceptual knowledge. Language plays a pivotal role in this process. Alternatively, interactive accounts (e.g. Clore & Ortony, 2008) posit that emotion terms and the concepts they refer to are separate from emotion, although the underlying neural systems may interact and influence each other. In this way, the language system may modulate the emotional system and contribute to regulating emotion but does not play a role in the creation of emotional states (see also Sauter, 2018, for a critical review of the role of language in emotion perception).

4. Discussion

In the last century, language and emotion were considered and studied separately. Language processing was thought to involve abstract mental representations, while emotions were associated with the body (Jensen, 2014). The numerous studies reviewed in this article show the inadequacy of this dichotomy and demonstrate the great interest that the interplay between language and emotion has aroused in recent decades. Some of these studies focus primarily on the influence of emotion on language and others on the reverse. This paper can therefore be informative for researchers in any of these fields. It may also be useful for newcomers as a first approach to the most studied topics, research methods, relevant findings and theoretical proposals.

The review shows that language and emotion are intimately connected. The studies included in the first section demonstrate that emotionality is conveyed through all levels of language, that emotional content is linked to linguistic stimuli during development, and that this associative process continues throughout an individual's life as long as new words are learned in naturalistic contexts involving sensorimotor and emotional experiences. The second section shows that emotion, either in terms of the affective verbal content or the individual's affective state, affects all levels of linguistic processing. The results are highly consistent for positive emotions but more variable for negative emotions. This may be explained by the more heterogeneous nature of the latter and/or by different attentional and processing styles associated with positive and negative emotions. Furthermore, it is necessary to elucidate

the contribution made by linguistic and non-linguistic mechanisms to the emotional effects. The studies included in the third section provide evidence for both universal structure and cross-linguistic variation in emotion terms. Furthermore, although the constitutive role of language in emotion is debated, this research reveals the capacity of language to influence emotion understanding in children and adult speakers, and to modulate the emotional experience. These findings have implications for both language research and emotion research, which are discussed below.

Current literature demonstrates that emotions elicited by language subsequently affect language processing, as does the emotional state of the individual. Emotion influences all aspects of language, from vocabulary acquisition to word, sentence, and text processing. This clearly challenges the modular view of language (Fodor, 1983) and has implications for the scientific understanding of meaning representation and language processing. Regarding meaning representation, these findings suggest that grounded theories (Barsalou, 2008) are better suited than abstract symbol theories (Anderson et al., 1997) because they include emotional information as a relevant source from which meaning is derived, along with linguistic, perceptual, and motor experiences. This framework can explain why words with emotional content are acquired earlier in infancy and adulthood and why, once acquired, they have a privileged status in processing, due to the contribution of emotional content to higher semantic richness (Yap & Seow, 2014). Furthermore, grounded theories suggest that the activation of word meaning depends on the particular context or situation. This may account for the influence of the individual's emotional state on language processing.

Emotion is, therefore, a key element in some theories of word meaning, but it has been neglected by the mainstream models of language processing (see Norris, 2013, for a review), which conceive it as a process involving the retrieval, manipulation and storage of abstract and decontextualised information. However, humans are not cold information processing systems, as they have emotional states that may precede the linguistic activity (e.g. reading a text, having a conversation) or be provoked by it, and, in both cases, these emotional states influence processing. People use language for many purposes, such as to connect emotionally with other people or to evoke emotions in them. Therefore, emotion is not a secondary aspect of language but a central one (van Berkum, 2019).

New proposals are emerging that incorporate an affective perspective on language processing. Two of them, focused on comprehension, are worth mentioning. On one hand, the PET *(Process, Emotion, and Task) framework* (Bohn-Gettler, 2019), described in Section 2.2, was developed to account for emotional effects in text processing, and brings together the disciplines of discourse comprehension and emotion. This account can explain some of the conflicting findings for positive and negative moods, as it predicts that the effects will depend on the type of task and process involved (e.g. whether the comprehension task assesses the surface structure or instead requires connecting text information with knowledge stored in memory). It is worth noting that although the model deals with emotional states prior to starting to read, it could be extended to include the emotion elicited by the text.

On the other hand, the *Affective Language Comprehension Model* (ALC, van Berkum, 2019) is inspired by ideas coming from emotion science, psycholinguistics and pragmatics. Van Berkum advocates for contextualising language comprehension and using more ecological situations, such as conversations. The model proposes that people rely on multimodal (verbal and non-verbal) signs (e.g. intonation, posture, exclamation marks in writing). These signs are recognised and parsed using information stored in long-term memory, as well as contextual information, of which the affective state of the interlocutor is an important part. Correct interpretation can only be successfully achieved considering contextual aspects based on pragmatic cues, such as referential, social and communicative intentions.

The PET and ALC models are promising frameworks for guiding research on the interplay between language and emotion. They represent an important qualitative shift from previous theoretical proposals, bringing together ideas from emotion science and language science. This highlights the importance of knowing the emotion literature for language researchers interested in the cognition–emotion interplay, just as it is important for emotion researchers with the same interest to know the language literature. The approach taken in this review can help with this, as it includes topics that focus on the influence of emotion on language and vice-versa. The developments and theoretical proposals in affective science can help language scientists to

guide their research and inspire new questions. For example, psycholinguistic studies have traditionally relied on a dimensional framework. However, a few studies have shown distinct response patterns between negative words in several recognition tasks (Briesemeister et al., 2011; Ferré et al., 2018; Huete-Pérez et al., 2019). This may be related to different action tendencies (e.g. approach or withdrawal for anger and disgust-related words, respectively), which suggests that the predictions of basic emotion theories are worth investigating.

In another area, recent studies based on the multi-component view of emotions have concluded that the semantic structure of emotion terms is better defined by four factors. One of these is novelty (Fontaine et al., 2013). Psycholinguistic studies should investigate whether this factor adds explanatory power to the influence of valence and arousal in language processing. Furthermore, the multi-component framework could be used to characterise not only emotion terms, but also emotion-laden words (see Betancourt et al., 2024, for a recent study in this line), and to explore the role of the different features associated with the components of emotion (e.g. interoception) in emotional language processing. It is noteworthy that interoception, which refers to the sensation and perception of the internal state of the body, is associated with the quality and intensity of the affective experience (Feldman et al., 2024) and with people's ability to identify their own emotions (Hobson et al., 2019). Linguistic studies have begun to examine this variable, showing its key role in distinguishing abstract non-emotion words from emotion words and in organising the concrete-abstract semantic space (Connell et al., 2018).

The most relevant contribution of linguistic studies to emotion research is related to the assumption that emotion terms provide information about the way people experience and conceptualise emotions (Scherer & Fontaine, 2019). This means that emotion words can be used to test the predictions of emotion theories. An example of a controversial issue is the cultural influence on emotions. Basic emotion theories argue for the existence of a limited set of universal primary or basic emotions, with little room for cultural and linguistic variation (Ekman, 1992; Panksepp & Watt, 2011), whereas constructionist theories propose that emotions arise from cultural patterns that shape the way in which people interpret their interoceptive responses to significant events (Barrett, 2006; Rimé, 2020). Accordingly, the meaning of emotion terms is permeated by social interactions rooted in cultural norms.

The results reviewed here show variation across languages, with different patterns of association between emotion concepts. For instance, the word *anxiety* was associated with *fear* in Tai-Kadai languages, but with *grief* and *regret* in Austroasiatic languages (Jackson et al., 2019). Current literature also reveals different grammatical realizations of emotion terms across languages (verbs vs. adjectives/nouns), suggesting different conceptions of emotions (e.g. processes vs. internal states, Soriano, 2022). Consistent with this, people from different cultures use different types of words to communicate negative emotions. For example, Korean speakers (Choi et al., 2016) use more words that refer to bodily sensations and convey actions involving other people (and fewer words that describe subjective feelings) than American speakers.

The review has also shown that some languages lack equivalent terms for basic emotions, or that words labelling similar emotions differ in meaning across languages (Soriano & Ogarkova, 2025). All these findings support proposals claiming a role for a cultural influence on emotion (Gendron, 2017), although there is evidence for a universal distinction in terms of valence and activation (Jackson et al., 2019). Another example of how research with emotion terms may inform emotion theories is the work of Scherer and Fontaine (2019), who showed that appraisal patterns and response features predict the quality of feelings associated with emotion words. This supports the component appraisal model of emotion (Component Process Model, Scherer & Moors, 2019), according to which feelings are integrated representations of the changes in the components of the emotion process.

The findings reviewed here may have additional implications for other theoretical proposals. Specifically, the *Differential Emotions Theory* includes the notion of an emotional schema, which consists of both a feeling with an evolutionary origin and a learned concept that emerges during a dynamic interaction between emotion and cognition and serves regulatory and motivational functions (Izard, 2007). This view assumes that the acquisition of language during childhood is a powerful tool in the development of emotional schemas, as it allows feelings to be labelled and shared. The studies reviewed in Section 3.2 about the role of language skills in children's understanding of emotion support this

proposal. Additional evidence is provided by the studies with adults reviewed in the same section, which show that the effective regulation of emotions through affect labelling is related to emotional granularity (Seah & Coifman, 2022). These findings suggest that language plays a role in the many cognitive operations involved in the generation and modification of emotion schemas (Izard, 2011).

In a related vein, these language-mediated processes might be involved in the activation of tertiary-process emotions, a concept developed in some basic emotion models (Panksepp & Watt, 2011). These are complex cognitive–affective clusters that include thoughts about emotional phenomena, which allow people to cope with ongoing emotional events. Tertiary-process emotions rely on connections between subcortical and cortical structures. The studies reviewed in Section 2.1 show that these connections are at work during emotional language processing (Hinojosa et al., 2020). Thus, research on the interplay between language and emotion, which has often been neglected, offers new opportunities and insights for the development of theoretical views of emotion. Nevertheless, additional efforts are needed to further characterise the involvement of language in constructs such as emotion schemas or tertiary-process emotions.

Finally, the mutual enrichment of language research and emotion research can also lead to a number of practical applications, some of which are already being explored. In the field of language, these applications relate to the beneficial effects of emotion. Studies carried out with sentences and texts show that emotion (either in terms of the emotional content of the verbal stimuli or the emotional state of the individual), especially when it is positive, improves semantic processing (e.g. prediction), reading fluency, and comprehension. This suggests that including emotional information in texts may be a useful strategy for facilitating comprehension in people with difficulties. As another example, there is strong evidence that emotional content facilitates word acquisition in both children and adults. This has implications for foreign language vocabulary learning. Indeed, teaching strategies based on attaching emotional content to new words (e.g. using pictures) may facilitate learning.

In a related vein, studies with bilinguals suggest that the reduced emotional resonance in the L2 is due to the learning (usually instructional) setting. Creating learning contexts that are more embodied in terms of sensorimotor and emotional experiences may facilitate the attachment of affective properties to L2 words. Bilingual findings may also be a source of inspiration for practical applications in the field of emotions. Preliminary evidence obtained with bilinguals suggests that purposeful use of the non-native language may be a good strategy for attenuating negative emotions (Ortigosa et al., 2024). The few studies conducted so far have mostly been carried out with healthy people. This research should be expanded, to delineate the specific disorders and particular therapeutic situations which can benefit from the use of the L2.

In conclusion, this review illustrates the fascination that the relationship between language and emotion has aroused in various fields. It shows the empirical evidence for the bi-directional nature of this relationship, with emotion affecting language and language affecting emotion. The review also includes the most influential theoretical frameworks in relation to the topics discussed, highlighting the benefits of a comprehensive approach that considers different disciplines. Interesting theoretical and applied advances will undoubtedly emerge from the mutual enrichment of language and emotion research.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by Project PID2023-149606NB-I00 (funded by MICIU/AEI/10.13039/501100011033 and by FEDER, U.E.). Project HORIZON-MSCA-2023-SE-01. Ref. 101182959 (funded by the Horizon Europe Framework Programme). Project ED431B 2022/19 (funded by the Xunta de Galicia). Project 2023PFR-URV-00196 (funded by Universitat Rovira i Virgili).

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