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COMMENTARY

The transdisciplinary nature of affective neurolinguistics: a commentary on Hinojosa, Moreno and Ferré (2019)

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Hinojosa, Moreno and Ferré (2019) provide an excellent review of an emergent and important field, affective neurolinguistics, and they nicely describe how the history of the relationship between neurolinguistics and affective neuroscience combines two traditions that have travelled very different and relatively separate paths. The study of language from the perspective of cognitive neuroscience has traditionally focused on mechanisms associated with sub-lexical, lexical, syntactic, and semantic processes, overshadowing emotion as a potential target in neurolinguistics. From a scientific point of view, this divorce could have contributed to establishing a more efficient strategy, helping the scientific community to gain knowledge about the different linguistic levels of representation, and contributing to understanding the distinct neurocognitive mechanisms involved in language processing as discrete sets that work together in efficient language comprehension and production (see Caldwell-Harris, 2014). However, considering the bulk of evidence demonstrating that affective neurolinguistics is a key actor, doors have been opened to a new era exploring the interface between affective and linguistic processes.

In their review, Hinojosa et al. (2019) brilliantly synthesise the evidence about the effects of emotional information on the processing of linguistic elements of different lengths, from single words to sentences and discourse. The studies described in their article are framed in a view that considers the manipulation of some critical modulating factors (e.g. valence or arousal) as a window to understanding the effects of different dimensions of emotions on language processing, and we agree with them that this is an enlightening research avenue. As their review article nicely depicts, the field of affective neurolinguistics is still in its infancy, but there are already important findings indicating that the processing of the emotional properties of linguistic units involves

the interaction of verbal information, affective experience, and motor components distributed in a set of brain areas. From the findings reviewed by Hinojosa and coauthors, the most straightforward take-home message is that emotion plays a crucial role in language processing, yielding the logical immediate implication that studies focusing on language cannot be blind to the multidimensionality of emotions. Thus, emotional features should be considered, in addition to other factors such as concreteness or familiarity.

We completely agree with Hinojosa et al. (2019) that these implications are important for the part of the field focusing on neurolinguistics and affective neuroscience, but we would like to note in this commentary that the breadth of the impact of this area of research should not be limited to studies exploring how one or multiple facets of emotions modulate language processing. Hinojosa et al. mention in their article that, after establishing the important effects of emotions in visual word recognition, two other important issues have constituted the core of the field of affective neurolinguistics: the functional localisation of emotion effects in word processing and the neural representation of emotional word features. Although Hinojosa et al.'s article consistently focuses on *the role of emotions in language processing*, we would like to add a third object of study that, despite its complexity, has burst onto the scientific scene in recent years: *the role of language in emotion processing*.

Language is linked to human development from an overarching perspective. Development is linked to language acquisition, as well as to the acquisition of other important growth-related outcomes such as emotional competence (i.e. the ability to understand, express, and regulate emotions), suggesting an intrinsic interactive relationship between language, development, and emotions. Even if the theories of basic emotions (i.e. Izard, 2011) do not grant an important role to language,

language can help in the complex task of identifying emotions. Furthermore, constructivist theories of emotions give language a prominent role, suggesting that language plays a role not only in the identification and communication of emotions, but also in shaping emotion perception and developing emotional competence (Lindquist, Satpute, & Gendron, 2015). Thus, if language can shape emotions, it can be an important ally in areas such as educational and clinical psychology. In fact, affect labelling and conceptual reappraisal are strategies that use language to train people with psychological disorders to better regulate their emotions. In this regard, affective neurolinguistics could contribute to disentangling the mechanisms involved in the role of language in emotion regulation, with the final goal of improving ways to train children in emotional competence and even improving psychotherapeutic strategies targeting emotion regulation. Hence, a natural next step in affective neurolinguistics should be the study of individual or group differences in the way emotional features influence syntactic and semantic unification, as a way to understand impairments in emotional competence (e.g. people with developmental disorders or with emotional disorders). By increasing the collaboration among different disciplines such as neurolinguistics, affective and cognitive neuroscience, developmental psychology, educational psychology, and psychopathology, we could take important steps towards a better comprehension of the dynamics through which language and emotion work together to shape human cognition.

This might seem to be an impossible endeavour, but there are already examples showing how transdisciplinary research based on affective neurolinguistics can transcend classic compartmentalised conceptions of emotions. One of the clearest examples was offered by the author to whom Hinojosa et al. (2019) review is dedicated: Albert Costa. In the last few years and until he sadly passed away, he devoted a large part of his prolific scientific activity to investigating how using a nonnative language could change the way emotions are felt. With his extensive network of collaborators, Costa demonstrated that, when confronted with emotionally loaded materials, humans make more rational decisions if they use a second or foreign language rather than using their native language (Costa, Vives, & Corey, 2017; Ivaz, Costa, & Duñabeitia, 2016; Keysar, Hayakawa, & An, 2012; see also Costa, Duñabeitia, & Keysar, 2019), and one of the leading hypotheses to explain these differences relies on the differential relationship between a mother tongue vs. a nonnative language and emotions. This intriguing mediator effect of the language context or nativeness on the processing of emotional stimuli is still a

conundrum for many of us, highlighting the need to orient affective neurolinguistics toward its study.

Admittedly, there is still a somewhat opaque relationship to be clarified between the processing of emotions and the linguistic context that mediates this process. However, numerous studies have tried to investigate whether the use of different languages can modulate language-mediated emotion comprehension, production, or even emotional psychophysiological markers (e.g. Jankowiak & Korpal, 2018). As a result, there is evidence suggesting possible variations in emotion processing depending on the level of linguistic competence of the speakers in a given language (Puntoni, De Langhe, & Van Osselar, 2009), and studies with classic paradigms and factorial approaches have also provided suggestive evidence negating a language-independent universality of emotional dimensions contained in language (e.g. Ferré, Anglada-Tort, & Guasch, 2018). Although there is still some debate about the degree of generalisation of the findings (see Ponari et al., 2015), emotion processing seems to depend on whether the language being used is a native one or a language acquired throughout life in which speakers have a lower level of competence. In a nutshell, this admittedly young line of research suggests that not only does emotion modulate language processing, but language also modulates emotion processing.

The idea that a nonnative language helps one to take distance from emotions is not that novel. Observational and anecdotical accounts coming from clinical psychology reveal that using a nonnative language helps patients to talk about distressing events because they report being more in control of their emotions than when using their mother tongue (Costa & Dewaele, 2014). With this in mind, and together with Albert Costa, we recently started a series of experiments to explore whether this so-called foreign language effect occurred in emotional experiences related to psychopathology, given the importance of these findings in the development of new therapeutic approaches. In a first study, we found a strong foreign language effect in fear acquisition, one of the most important paradigms in experimental psychopathology (Garcia-Palacios et al., 2018). We reported the first experimental evidence about how the use of a foreign language may reduce fear conditioning, opening the door to the use of a nonnative language as a means of reducing emotion intensity or, in other words, as a way to regulate emotions.

In the interplay between multiple neighbouring disciplines, affective neurolinguistics cannot be alien to these new lines of research, insofar as they represent the natural point of confluence of different areas of expertise, such as basic psychology, cognitive science,

psychopathology, and clinical psychology. Affective neurolinguistics should accept this transdisciplinary challenge and provide the applied community with important findings about the relationship between language and emotion in order to allow a much more eclectic and advanced development of new forms of psychological intervention. The multidimensionality of the interactions between language and emotion transcends specific aspects of experimental psychology, encompassing various related disciplines that must be taken into account not only in the development of research projects that allow us to increase our knowledge about language and emotion, but also as possible natural recipients of applied research in the area of affective neurolinguistics.

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