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Linguistic relativity from an enactive perspective: the entanglement of language and cognition

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ABSTRACT

We seek to relate the fields of linguistic relativity (LR) and the enactive approach in cognitive science. We distinguish contemporary research on LR, starting after the mid-1990s, from earlier approaches to the field. Current studies are characterised by a nuanced methodology rooted in the psycholinguistics tradition. While improving on earlier research, they also move away from philosophically oriented discussions about the relation between language and cognition and focus instead on experimentally testing relativistic effects for specific cognitive domains. We claim that this procedure retains some fundamental assumptions from classical cognitive science, precisely those that are challenged by an enactive perspective. These include a commitment to the modularity of mind and a computational understanding of the interactions between cognitive domains. We contend that contemporary LR research is, in fact, compatible with these classical cognitivist ideas, despite superficial points of tension. We then survey recent post-cognitivist approaches to language in cognitive science and explore ways in which LR and the enactive framework could be mutually enriched. Whereas the structural or categorial aspects of language are central for LR research, these are usually downplayed in post-cognitivist approaches, often influenced by the integrationist distinction between first-order linguistic practices and second-order constructs. We advance a specifically enactive perspective that seeks to preserve the systematic features of language while also integrating them within a dynamical understanding of the relation between language and cognition at multiple timescales.

1. Introduction

This article seeks to bridge two fields of research that emerged in notable parallelism after the 1990s and have raised similar questions about the role played by non-neural factors, such as culture or the body, in human cognition. These are the enactive approach in cognitive science and contemporary research on linguistic relativity. Starting from different theoretical assumptions, each has sought to address the age-old debate on whether (and how) language significantly shapes human experience.

The enactive approach is one of several approaches to cognition often loosely grouped under the label 'post-cognitivism' (Gomila and Calvo, 2008). These share a rejection of some of the central assumptions of classical cognitive science, especially

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the computational-representational understanding of the mind. This understanding involves conceptualising the life of the mind fundamentally in terms of processing information about the environment and elaborating internal ('inside the head') models that allow a cognitive agent to act in the world. Closely related to this is the notion that the mind is organised in distinct functional units called 'modules', also known as the modularity hypothesis (Rescorla, 2020).

Post-cognitivist approaches shift the focus to the interaction dynamics that emerge between the brain, the body and the environment, with the aim of highlighting the contribution of 'out of the head' factors to human cognition. Enactivism, in particular, emphasises how cognition is constituted through a history of interactions between autonomous agents and their environments. This is driven by a process whereby agents adaptively regulate their interactions with the environment in ways that tend to sustain their way of life, an activity called *sense-making*. The enactive approach thus highlights that perception and action stand in a circular relation unfolding along an irreducibly temporal dimension (Di Paolo et al., 2017; Varela et al., 1991). Recently, this conceptual framework has been expanded to encompass an account of human language (Di Paolo et al., 2018).

The idea that the language we speak affects how we perceive or think about the world was famously articulated by the American anthropologists Edward Sapir and Benjamin L. Whorf in the 1930s under the name 'linguistic relativity', later popularised as the 'Sapir-Whorf hypothesis' (Leavitt, 2006). Interestingly, it was met with considerable resistance in the emerging paradigm of cognitive science after the 1960s, and, by the mid-1990s, it was generally believed to have been refuted or proved trivial. Against all expectations, the turn of the century witnessed a renewal of interest in the topic that led to reappraisals of Whorf's work and to a re-examination of the methodology employed in previous decades (Gumperz and Levinson, 1996; Lee, 1996). The new studies arising after the 1990s claim to have produced a body of empirical evidence in support of the hypothesis that linguistic diversity has a differential impact on cognition (Everett, 2013).

It is important, therefore, to distinguish three stages in the formulation of this question: (1) Sapir and Whorf's work before World War II, (2) the early attempts at operationalising and testing these ideas, now refashioned as a 'hypothesis', between the 1950s and the 1990s, which we will refer to as the 'first wave' of research on linguistic relativity, and (3) contemporary studies on linguistic relativity (hereafter LR) after the 1990s, the 'second wave' of research. It is with this last stage that we are concerned in this article.

Interestingly, few studies have attempted to relate the fields of LR and enactivism to date, despite compelling reasons to expect some degree of convergence in their findings (van Roey, 2022; Batisti, 2020). Our general aim is to identify the obstacles that stand in the way of this convergence, and to explore potential areas of interaction that might enrich both research programmes. As it will emerge in the article, contemporary LR research continues to operate under the central assumptions of classical cognitive science, precisely those that enactivism rejects. The question therefore arises whether taking the enactive approach as an alternative starting point may lead to new insights in the investigation of LR. At the same time, LR poses the challenge for enactivism of clarifying the contribution of language and the body as constitutive elements in human cognition. Section 2 will characterise the methodology and leading assumptions that distinguish contemporary LR research from earlier approaches. Then, in Section 3, we will analyse the premises that conform the argument for LR with the aim of focusing on the second, the claim that language affects cognition, in the remainder of the article. Section 4 will identify theoretical assumptions in LR research that reflect the influence of cognitivism, which will set the stage to introduce post-cognitivist approaches to language in Section 5. Finally, in Section 6, we will develop a specifically enactive response to LR.

2. Characterising contemporary research on LR

Although the main focus of this section is contemporary research on LR, the impulse for a second wave of studies in the mid-1990s came from a reappraisal of Whorf's works against previous misrepresentations and exaggerations (Lee, 1996; Lucy, 1992, 1996). In this sense, contemporary proponents of LR are often referred to as 'Whorfian' or 'neo-Whorfian'. While some accept this ascription, most prefer to use the term 'linguistic relativity' to distance themselves from the ongoing debates around the exegesis of Whorf's work, and to highlight that LR can be argued for on independent grounds[1].

An initial difference between Whorf and these authors concerns how they understand the philosophical implications of LR. Whorf was the continuator of a tradition in anthropology that started with Franz Boas and raised important questions about the limits of cross-cultural comparison. Can anthropologists translate the life-worlds of the communities they study into their own categories? Is there a middle term of comparison, a neutral viewpoint that can act as a foundation for anthropological theory? Such questions require an adequate characterization of "culture", an elusive and much-debated concept that attempts to capture not only the material, but also the symbolic elements that are shared, acquired and transmitted within a community (Sinha, 2021)[2]. Whereas these issues have remained alive at the heart of anthropology to this day, contemporary research on LR is largely (though by no means exclusively) carried out within the framework of

[1] See for instance the entry 'Sapir-Whorf Hypothesis and Neo-Whorfianism' in O'Neill (2013). The preference for 'linguistic relativity' as a neutral term, in contrast to 'neo-Whorfianism', is helpfully articulated in the discussion in Everett (2013, pp. 1–2). See also Casasanto (2008).

[2] Against what is commonly believed, Whorf's answer to the problem of cultural translation is in the affirmative: cultural and linguistic differences *can* be 'calibrated' (his own term), though this requires more than simply paraphrasing the categories under study in one's own cultural grammar. Rather, this task should lead anthropologists to realise the limitations of their own viewpoint and the need to transcend them by understanding other cultures in their own terms. It is in this sense that Whorf believed in multilingualism as a way to expand, and even challenge, a society's conceptual framework, some ambiguities in his account notwithstanding. See, for instance, Whorf (1956), and the discussion in Lucy (1996). For the contemporary importance of cross-cultural translation in anthropology, see Eriksen (2015, p. 287 ff.).

psycholinguistics. It is closer, in this sense, to what we have called the 'first wave' of research on LR, since studies of this kind move away from the philosophical implications of LR and focus instead on experimentally testing its effects for specific cognitive areas. The role of culture is consequently downplayed or even set aside altogether, in favour of a focus on "language" and "cognition" as variables that must be isolated and controlled for in laboratory conditions.

A strand within contemporary research on LR, influenced by anthropological approaches, raises concerns about the 'ecological validity' of this psycholinguistic outlook adopted by mainstream studies. Laboratory conditions are seldom equivalent to the naturalistic environments where behaviour and cognition could be potentially influenced by language. An inadequate understanding of cultural factors might then lead researchers to project their assumptions and biases onto the experimental design. These alternative approaches advocate complementing experimental methodologies with ethnographic fieldwork that seeks relativistic effects 'in the wild' and is informed by thick descriptions of cultural practices (Athanasopoulos and Bylund, 2020; Sinha and Bernárdez, 2015). This form of circulation between multiple methodologies is not entirely dissimilar to the approach adopted by the enactive perspective, as we will discuss in section 6.

Whatever the merits of the psycholinguistic approach, the field is now undoubtedly characterised by a division of labour according to cognitive domains. The interest has shifted to the study of *partial* effects of language on cognition, according to specific cognitive functions, in contrast to Whorf's approach, which considered the *global* implications of LR, i.e. how language affects the totality of human experience and is articulated in divergent worldviews (Blanco Salgueiro, 2017, p. 83 ff.). As a result of this specialisation, the decades following the mid-1990s have seen a flourishing of empirical studies and research questions as diverse as:

- whether languages (such as English) that explicitly mark a countable-uncountable distinction for nouns promote greater attention to the *shape* or *function* of an object, as opposed to those that do not mark this distinction (such as Japanese or Yucatec Maya) and favour instead attention to *material* or *substance* (Lucy and Gaskins, 2001);
- whether *topological relations* such as proximity, contiguity or containment are universal, or are categorised in irreducibly divergent ways in different languages (Bowerman and Choi, 2001; Levinson and Meira, 2003);
- whether languages that rely on a 'geocentric' or 'absolute' frame of reference (such as Guugu Yimithirr), where terms like 'South' or 'East' are used instead of 'left', 'right', 'front', etc., lead to different *spatial orientation strategies* (Boroditsky and Gaby, 2010; Levinson, 1997);
- whether *spatial metaphors for time estimation* (such as 'time is a distance', 'time is a quantity', 'the future is ahead', and so forth) impact the speakers' perception of time (Casasanto et al., 2004);
- whether *grammatical gender*, in languages such as Spanish or German where it is systematically marked, gives rise, for instance, to associations between traits stereotypically considered 'masculine' and 'feminine' and inanimate objects (Boroditsky et al., 2003);
- whether languages that lack a full-blown system of *numerals*, such as the famous and hotly debated case of Pirahã in the Amazon, foster different cognitive strategies to deal with large quantities (Everett and Madora, 2012; Frank et al., 2008);
- whether languages that differ in their set of *colour terms* show a correlative divergence in their speakers' abilities to recognise and recall hues of colour at the boundary where terms are available or absent (Roberson and Hanley, 2010).

These studies are modest in their assertions and nuanced in their conclusions, since they avoid discussing whether 'reality' is one and the same for speakers of different languages and focus rather on the evidence for specific *cognitive habits* fostered by linguistic abilities. Whenever evidence is found, the general assumption is that any such habits are reversible and merely mediate access to one and the same reality for all human beings (Blanco Salgueiro, 2017, pp. 166–172; Lucy, 1992, pp. 7–8)[3]. While this approach is common to both the first and the second waves of research on LR, what distinguishes them is several important methodological considerations.

Everett (2013) outlines the methodology that characterises contemporary LR research. First, a contrast between two languages is selected for study. This should highlight a linguistic category that is systematic and semantically relevant in either the morphosyntax or the lexicon of the target languages. This aspect sharply distinguishes contemporary research from studies produced between the 1960s and 1990s. The latter were focused, almost overwhelmingly, on colour perception. However, as Lucy (1996) points out, colour terms are a very narrow subset in the lexicon of any language. They do not represent high-frequency expressions, nor do they reflect categorial features. Some of the most famous studies (such as Brown and Lenneberg, 1954) did not involve any kind of crosslinguistic comparison, but measured variables such as 'code efficiency' or interspeaker agreement about the use of terms in one single language, which more closely relates to the pragmatic aspects of communication. This further downplayed the linguistic character of the object of study. Although Whorf

[3] Questions concerning ontology have also been raised about the enactive perspective we discuss later in this paper. Since it makes explicit the perspectival nature of all sense-making and the rejection of a world of pregiven significance, it has sometimes been wrongly compared with forms of internalism and idealism. These positions are clearly rejected in the early work. With all its insistence on anti-foundationalism, Varela et al. (1991, p. 233), acknowledge pragmatist critiques of objectivism but comment that "the argument is never turned the other way round. Mind-independent objects are challenged, but object-independent minds never are", which is what the enactive account also does. More recently, enactivists have insisted that agency and sense-making are world-involving processes (e.g. Di Paolo et al., 2017, p. 40; Di Paolo et al., 2018, p. 49). Avoiding naive realism and foundationalism, they nevertheless insist on the material constraints placed by the world on all forms of cognitive activity (Di Paolo, 2023). For further discussion, see also Rolla and Figueiredo (2023) and van Es (2024).

also based some of his intuitions on the comparison of lexical sets, his more original insights were, in fact, connected with the categorial aspects of language: constraints that the very structure of a linguistic system imposes on the choices made by its speakers (cf. Lucy, 1992, pp. 25–62). As the examples mentioned above show, contemporary LR studies focus on systematically interconnected linguistic features, rather than isolated lexical items.

In the second place, LR researchers design psycholinguistic tests to investigate whether crosslinguistic variations result in distinct cognitive or behavioural patterns among different populations. Crucially, this step aims to verify the existence of cognitive diversity, since crosslinguistic variation alone is insufficient to establish this. Whorf frequently made this unwarranted inference. He observed, for instance, that Hopi speakers have different terms corresponding to the English word 'water' and suggested that this contrast between English and Hopi lexicons reveals an underlying difference in cognitive categories (Whorf, 1956). However, he presented no empirical evidence that Hopi speakers conceptualise these kinds of water in divergent ways. This type of linguistic evidence, by itself, is unable to prove cognitive diversity.

What is required, instead, is a means to measure cognitive differences without resorting to the linguistic contrasts established in the first step. Here, some important methodological challenges become apparent. Speakers of a language may display behavioural or cognitive patterns that correlate with linguistic structures, such as particular strategies for spatial orientation or for conceptualising time. However, these effects might be induced by the real-time use of language in communication and disappear whenever speakers are not using language. This would amount to what is called 'thinking for speaking' (Slobin, 1996), the idea that thought needs to conform to the categories available in language for the very act of communication. It should be noted that some important assumptions are already operative at this stage, such as a clear distinction between thought and language. We shall return to this in the following sections.

What most contemporary researchers of LR maintain, however, is a stronger thesis: that linguistic structure has longer-term effects that leave an observable mark on cognitive habits, *even* in the absence of language. This constitutes, of course, the methodological crux of current studies: observing 'non-linguistic' cognitive phenomena under experimental conditions. Failing to achieve this would again incur the charge of circularity just described, 'using language as a source of hypotheses about the mind and also as a means to test these hypotheses' (Casasanto, 2015, p. 165), which poses important challenges when delivering instructions or performing experimental tasks[4]. The wide range of techniques currently employed to circumvent this obstacle include verbal suppression tasks preventing experimental subjects from resorting to language, psychophysical tests that measure responses to stimuli without linguistic mediation, and, in some cases, neuroimaging methods aimed at discriminating the different brain areas involved in cognitive processing. These are often considered a vital methodological advance over earlier studies (see Casasanto, 2015 for further discussion).

If these difficulties are overcome, then a *correlation* can be established between an independent variable (crosslinguistic diversity) and a dependent variable (cognitive or behavioural diversity). In this sense, contemporary LR research follows the standard statistical methods applied in psycholinguistics. The researcher then attempts to rule out possible 'confounders' underlying the interaction of both variables, such as the influence of (non-linguistic) cultural factors on cognition. This may be achieved by studying communities with the *same* language but *different* material or environmental conditions, and hence controlling for confounders. Since this is often not possible, the evidence can only amount to a *correlation* between linguistic and cognitive variables. If, on the other hand, the linguistic element stands as the only plausible explanation for the observed cognitive diversity, then the strength of the evidence may incline researchers to speak of a 'causal link' or a 'causal influence' of language on cognition, and shift the burden of proof onto the anti-relativistic position.

3. The argument for LR

The steps involved in the methodology just outlined help to clarify the logical structure of general arguments for and against LR. Since at least the mid-1990s, this has been commonly articulated as the following syllogism (Gumperz and Levinson, 1996, p. 24, cf. also Blanco Salgueiro, 2017, pp. 29–30):

Premise 1 [Linguistic Diversity]	The world's languages differ in non-trivial ways.
Premise 2 [cognitive impact of language]	Language affects cognition.
Conclusion [linguistic relativity]	Therefore, different languages give rise to divergent cognitive patterns in their speakers.

The first premise, the assertion of linguistic diversity, corresponds to the first methodological stage mentioned earlier, where a systematic contrast between two or more languages is selected for study. Linguistic diversity is usually regarded as an empirical matter that involves questions about the existence of linguistic universals and the degree to which languages can vary. In contrast, the second premise concerning the cognitive impact of language raises deeper questions. These involve complex philosophical problems regarding how 'language' and 'cognition' (as well as their interaction) are understood (Blanco Salgueiro, 2017, pp. 61–115). What characterises contemporary studies on LR is that they often sidestep the conceptual clarification these issues require by adopting the experimental methodology of psycholinguistics. In this way, they

[4] Not all of the studies mentioned above fulfil this requirement: Boroditsky et al. (2003); Boroditsky and Gaby (2010), for instance, rely on language to carry out the experimental tasks.

circumvent the numerous debates surrounding LR in past decades, often marked by acrimony and an inability to find shared conceptual ground (for a review, see Leavitt, 2006). The objective is, instead, to seek empirical confirmation for the conclusion: *assuming the truth of the second premise*, one would anticipate observing the cognitive effects posited by LR. Conversely, if different linguistic communities do not exhibit the expected cognitive diversity, this constitutes negative evidence against the second premise. The claim that language affects cognition can thus be operationalised, and this forms the core objective of the second methodological step described earlier. Of course, much hinges on what sort of cognitive diversity should be expected in each case and whether a suitable method has been selected to measure this kind of diversity specifically.

This approach is not exempt from problems, since the model of psycholinguistic research adopted also introduces its own theoretical assumptions. As we have seen, language and cognition are conceptualised as variables in correlation. More importantly, the specific cognitive mechanisms governing their interaction are normally placed in a 'black box', until further studies are able to shed light on the matter (Blanco Salgueiro, 2017, pp. 96–97). It also suggests that these interactions can be studied by adopting the experimental procedures common in the empirical sciences, albeit without fully articulating a theory of linguistic influence on cognition, a necessary condition if hypotheses are to be made falsifiable.

A final clarification regarding the argument for LR is necessary. As has already been pointed out, each of its premises can be subject to a variety of interpretations, according to how we understand terms such as 'language' or 'cognition'. More importantly, there is a close conceptual interrelation between the premises, since the kind of linguistic diversity asserted in the first premise will act as the 'source' of cognitive impact in the second. In this sense, it is important to appreciate that linguistic diversity can be construed in multiple ways: as a contrast between linguistic systems ('languages'), but also between varieties of the same language ('dialects', 'sociolects' and so forth) and even between communicative styles differing from speaker to speaker ('idiolects'), or at different points during a speaker's lifetime (what can be called *intraspeaker* variation). In a similar manner, it is possible to contrast human and non-human animal systems of communications, amounting to a claim of 'semiotic diversity': how the specific characteristics of human language shape human cognitive abilities, in a way that is distinct from other species.

Therefore, we must bear in mind that contemporary research is concerned only with 'linguistic relativity' proper (also called 'structural relativity'), the effects induced on cognition by different *languages*, such as English or Spanish. This distinguishes it from what is called 'discursive relativity' (cognitive diversity resulting from different varieties and uses *of the same language*, even at the individual, 'idiolectal' level) and 'semiotic relativity' (from different systems of communication) (Everett, 2013, p. 33; Lucy, 1996)[5]. Within linguistic (or structural) relativity, multiple versions of the argument can then be derived depending on how the second premise is characterised: as 'determining', 'constituting', 'influencing', etc. such and such cognitive domain. In fact, there will be as many 'linguistic relativities' as variations on the claim that language affects cognition (see discussion in Blanco Salgueiro, 2017, pp. 155–208).

In the following sections, the second premise will inform the bulk of our discussion. The first premise, the claim of linguistic diversity, will be deferred to the final section, where we will only offer a few general observations about its place within an enactive approach.

4. Cognitivist assumptions in LR research

As has already been discussed, many contemporary studies on LR are carried out within the experimental framework of psycholinguistics. This discipline, which brings together research in linguistics and cognitive psychology, has its roots in mainstream cognitive science, an interdisciplinary endeavour that, since the 1960s, has aimed to integrate the fields of neuroscience, artificial intelligence, philosophy and anthropology, as well as linguistics and cognitive psychology (Bermúdez, 2020, pp. 3–5). What holds together these diverse research programmes is a set of theoretical commitments, often referred to as the computational-representational theory of mind, and, in a broader sense, 'cognitivism' (Piccinini, 2012; Rescorla, 2020; Varela et al., 1991).

According to this, the human mind can be conceptualised as an information-processing machine that 'computes' the sensory inputs received from the environment. These inputs come together to form *mental representations*, inner models of the outer world that enable making predictions and inferences about future states of affairs. The cognitive agent is then able to act on the basis of these models by issuing a range of behaviours or 'outputs'. What results from this is a form of functionalism that sharply distinguishes between the information-processing 'software' of cognition from the 'hardware' where such activity is realised, be it biological or non-biological in nature (Dupuy, 2009, p. 38). It is precisely against the functionalist implications of this paradigm, with its consequent downplaying of the role of the body in cognition, that several 'post-cognitivist' approaches emerged during the 1990s.

[5] Jackendoff (1996) and Carruthers (2002) represent a position akin to semiotic relativity from a cognitivist perspective. They claim that language affects cognition, but disregard a possible differential impact induced by linguistic diversity, i.e. they deny the first premise while asserting the second. The relativity under consideration here is 'semiotic', since the implied contrast is between (species-universal) human language and other forms of non-human communication. A further logical possibility consists in asserting that human languages differ in irreducible ways (first premise) while denying that these impact cognition in any meaningful sense (second premise). Interestingly, this position comes close to that of Edward Sapir's mentor Franz Boas, who defended the radical particularity of every culture, while at the same adhering to the so-called principle of the 'psychic unity of mankind', which asserts that all human beings are cognitively alike.

A specific version of computational theory, of great relevance for our present purposes, is the so-called *modularity of mind* hypothesis, first advanced by Fodor (1983). A *mental module* is a functional unit that encodes information in a domain-specific way and operates beyond the conscious control of the agent. Although some modules may be mapped onto concrete brain regions, they are normally understood as theoretical or heuristic entities attempting to capture clusters of cognitive functions, rather than descriptions of the anatomical units of the brain. Crucially, modules operate independently of each other, as specialised systems that process fixed kinds of information and thereby increase their efficiency, a property called 'informational encapsulation' (Robbins, 2017). In Fodor's original proposal, modules are regarded as innate, developing along a prespecified ontogenetic sequence that is largely unaffected by developmental influences. Given these characteristics, the modular mind parallels what Herbert Simon called a 'nearly-decomposable system' (2008), i.e. a system where the function of each component is defined prior to and independently of its place within the whole. In this sense, neither the processing of information nor the interaction between mental modules fundamentally alters the overall structure to which these belong.

Cognitivism regards language as part of the modular architecture of the mind. Although several versions of this account exist, they largely agree on regarding the language module as made up of several submodules for each of the traditional areas of linguistic analysis: phonology, morphosyntax, semantics, and the lexicon (Gonzalez-Marquez, 2012, p. 677). Each, in turn, processes information in a sequential and unidirectional way, the phonology module feeding input into the morphosyntax module, and so on. The language module is ultimately responsible for 'translating' an inner mental medium that Fodor calls the 'language of thought' into communicable form (Fodor, 1975). It closely follows from the modular account of the mind that language serves the purpose of 'expressing' or 'reflecting' thought without significantly affecting it. Human languages *encode* internally stored information and make it publicly available by giving it an audible (phonological) realisation. The 'hearer' of an utterance, in turn, decodes the information contained in it through the symbol system shared by the interlocutors. For this reason, the cognitivist account of language is often variously called the 'communicative', 'instrumental' or 'code' view of language[6]. This view of communication presupposes not only the innateness of language, which ensures the stability of shared codes of communication, but also the idea that the 'language of thought' is isomorphic with natural languages, in the sense of sharing some basic structural and symbolic properties such as compositionality or recursion, which makes the task of cross-modal 'translation' possible.

These brief remarks clearly show the tension between the cognitivist approach to language and LR. On the one hand, cognitivism contradicts the first premise of the argument for LR (on linguistic diversity) by claiming that the language module is innate and species-universal. This is particularly true of morphosyntax, which in Noam Chomsky's version of the argument has pride of place as revealing the underlying structures common to all human languages – the well-known theory of Universal Grammar (see, for instance, Chomsky, 2000, p. 7). A defender of LR would normally question any talk of innate neural structures and emphasise instead the irreducible role played by cultural and environmental factors in shaping particular languages. On the other hand, the view of language as a tool for the communication of thought is clearly contradicted by the relativistic claim that language also performs a 'cognitive' (Carruthers, 2002) or 'supra-communicative' (Clark, 1998) function, i.e., that it actively shapes at least some aspects of cognition. Proponents of LR have typically argued for this second premise in at least two ways: they may claim that 'higher-order' cognitive processes take place in the medium of natural language, rather than in a distinct, inner language of thought; alternatively, they may accept a separate mental medium but argue that it is unstructured and lacks language-like properties (Blanco Salgueiro, 2017, p. 70 ff.). In this latter sense, languages 'scaffold' certain human cognitive abilities and even imprint properties such as compositionality on them. The majority of contemporary LR researchers opt for this second option and explicitly distance themselves from the strong implications of the first, since it implies that hardly any 'higher-order' cognitive process would be possible in the absence of language. As we have seen, the methodological viability of LR depends at least on a distinction between linguistic and non-linguistic forms of cognition[7].

It is nevertheless crucial to appreciate that some variations of the cognitivist approach can accommodate the claim that language affects cognition. These accounts generally reject the first premise of the argument for LR but develop a version of the second that would seem, in principle, compatible with LR. Examples of this can be found in Carruthers (2002) and Jackendoff (1996). Carruthers asserts, for instance, that the language faculty is responsible for bringing into conscious awareness the representations formed from the input of different modules. This happens because language transforms such cross-modular stimuli, which operate below the level of consciousness, into phonologically articulated representations, thereby making new forms of cognitive activity possible. This approach combines a commitment to massive modularity (the idea that the mind is modular through and through) with the claim that the language module shapes some aspects of cognition in a substantial way. This shows that a modular version of this second premise of LR is possible, even if this position still contradicts LR by rejecting its first premise. It also suggests that cognitivist approaches to language could perhaps be better regarded as agnostic concerning the claim that language affects thought, and that the key divergence with the LR hypothesis centres on the assertion of non-trivial linguistic diversity.

[6] The idea that language operates as a 'code' to translate thought, however, antedates cognitivism. Cf. Rączaszek-Leonardi (2012); van den Herik (2018).

[7] The claim that thought is 'nothing but' internalised language is the target of Pinker's (1994) well-known criticism of LR. Comparing it with Orwell's 'political nightmare' in *Nineteen Eighty Four*, he rejects this claim on the grounds that it contradicts the experience available in introspection, since the absence of a *word* would entail the absence of a *concept*. Carruthers (2002) calls the same position 'anti-realism about thought'.

As discussed earlier, contemporary research on LR also tends to remain neutral regarding the theoretical foundations of this second premise. Moreover, its experimental orientation builds on the framework of psycholinguistic research. Considering these factors, is it plausible that certain cognitivist assumptions might resurface in a number of these studies? We identify three areas that strongly indicate this possibility.

First, the *relation between language and cognition is often characterised in computational terms*. This is evident in the common distinction between 'online' and 'offline' cognitive processing, which differentiates between levels of involvement of the body in cognition. Although well-established in psycholinguistics, the distinction reflects the functionalist understanding of the mind-body interaction. LR studies, in this sense, attempt to identify relativistic effects that operate beyond 'online' processing, i.e., the immediate use of language in communication. They achieve this by establishing plausible 'causal' links between linguistic and non-linguistic variables, another aspect that reflects computational assumptions, since these interactions typically involve unidirectional forms of influence that go *from* language *to* cognition and vice versa. Even if some degree of interdependence between both is sometimes acknowledged, the model of causation adopted remains firmly *linear*, in a way that parallels the sequential computations of an information processor.

Second, a commitment to *modularity* is present to varying degrees. Sometimes, this is made explicit: for instance, studies of numeric cognition accept that humans share with other non-human animals an innate 'number sense', a module that grounds the capacity to recognise numerosities up to for and to approximate larger quantities (Everett, 2013, p. 144). On other occasions, modularity is tacitly assumed, for instance, when neuroimaging techniques are used to discriminate which brain regions are activated upon the use of language (Gilbert et al., 2006). The assumption is perhaps most implicit when discussing the 'reversibility' of relativistic effects, since this frequently entails that language is not a constitutive part of the normal functioning of other cognitive domains (cf. Gonzalez-Marquez, 2012, p. 681).

Casasanto et al. (2004) and Casasanto (2008) clearly exemplify this. These studies obtained evidence for the influence of one-dimensional and three-dimensional spatial metaphors on time perception in several languages, e.g. 'time is a distance' vs 'time is a quantity'. Interestingly, one of the experiments involved training the subjects (by way of experimental intervention) in the use of the opposite metaphors. After about 30 minutes' training, the cognitive differences between both groups of speakers had been neutralised (Casasanto, 2008, p. 74–75). This shows that the timescale under consideration often does not include long-term developmental processes where the development of cognitive skills may be strongly influenced by language acquisition.

Finally, the focus of LR research remains firmly on the *systematic* properties of language. The locus of 'causal influence' is the patterns that recur in linguistic utterances and constitute pervasive semantic and morphosyntactic categories. Although this is not exactly equivalent to the code view of language characteristic of the cognitivist approach, there is an important degree of convergence in the attention paid to the structural and formal aspects of language, and in the preference for the synchronic over the diachronic. In the next section, we will consider several challenges that have been raised against this conception of language, both from theoretical linguistics and from dynamical approaches to cognitive science. This will help us to explore what a post-cognitivist approach to LR could entail. In particular, the enactive approach will form the basis for a new version of the claim that language affects cognition.

5. Post-cognitivist approaches to language

In this section, we briefly explore how post-cognitivist programmes have approached human language. This will set the stage for a comparison between the contemporary field of LR and the enactive approach.

In the first place, it is important to appreciate that 'post-cognitivism' is a cover term for a variety of approaches that reject the theoretical commitments of cognitivism. What these have in common is the claim that cognition cannot be reduced to what occurs 'inside the head', but needs to take into account further factors such as the non-neural body and the environment. They differ, at the same time, on the degree to which each departs from cognitivism, particularly in the role and relative importance they assign to these factors in cognition. For instance, the approach called 'extended functionalism' acknowledges a causal role for the body in shaping mental representations, but retains the basic computational framework (Wheeler, 2010). Others, like the enactive approach and ecological psychology, reject mental representations, the modular understanding of the mind, and information processing as the fundamental explanatory model for cognitive activity (Newen et al., 2018).

Many post-cognitivist currents rely on a shared vocabulary that derives from the application of Dynamical Systems Theory (DST) to the study of cognition and language (Richardson and Chemero, 2010; Rączaszek-Leonardi and Scott Kelso, 2008). The novelty of DST resides in its ambition to describe the compound formed by brain, body, and environment as coupled elements in constant interaction, without giving explanatory priority to one over the others (Clark, 2001; Chiel and Beer, 1997; Varela et al., 1991). In this sense, the brain loses its place as a 'central controller' determining the function of each element in the cognitive system, and the emphasis falls instead on the interaction dynamics arising between its constituents. This contrast is sometimes referred to as that between 'interaction-dominant' and 'component-dominant' dynamics (Richardson and Chemero, 2010; van Orden, 2002). In the former, the relations between components vary flexibly and nonlinearly according to contextual or environmental factors and give rise to widespread feedback loops across the system. An important consequence of these nonlinear, interaction-dominant relations is that the global behaviour of the system cannot be predicted from the behaviour of its individual constituents in isolation. Instead, the brain-body-environment compound can be regarded as an 'entangled' or 'softly assembled' system, a term used in contraposition to 'hard-moulded' or 'nearly decomposable' systems where the dynamics are largely determined by the function of each constituent (Richardson and Chemero,

2010). Whereas the latter are characteristic of non-biological entities, such as a computer, cognitive and behavioural phenomena exhibit the degree of fluidity and contextual adaptation denoted by soft assembly.

These dynamical ideas challenge some of the central cognitivist assumptions outlined in the previous section. First, the environment ceases to be regarded as a source of informational stimuli to be processed by the brain and becomes instead a constitutive element in cognition. Some dynamical approaches therefore dispense with the notion of mental representation and speak of a direct engagement between the cognitive agent and the environment. The range of behaviours 'outputted' by such an agent is no longer seen as the result of inferential processes, based on inner models of the world, in what Susan Hurley (1998) has described as the 'sandwich' model of cognition. Rather, action and perception stand in a circular relation that unfolds through a history of engagements, where each conditions the next. Understanding agent–environment interactions in this way makes it possible to abandon the framework of information processing altogether (although not all dynamical approaches do this). Secondly, DST seeks above all to identify the regularities occurring in dynamical systems across a wide range of timescales, a dimension often underexplored from the cognitivist perspective. This enables DST to integrate different methodologies for phenomena as varied as developmental processes spanning months or years, patterns of social coordination unfolding at the level of minutes, or isolated instances of neurocognitive activity lasting only milliseconds. Finally, and most importantly, dynamical approaches constitute an important alternative to the modular understanding of the mind, since interaction-dominant dynamics make it very difficult to identify distinct modules with clearly defined cognitive domains and developmental paths (see Anderson et al., 2012; Sporns, 2010).

What are the potential applications of this framework to LR, and to the study of language more generally? While some research programmes within the post-cognitivist paradigm have undertaken the task of elaborating a dynamical approach to language, LR is still to be integrated into these studies (for an exception, see Rączaszek-Leonardi, 2010). The more fully developed perspective to date is the Distributed Language Approach (DLA), which extends the distributed cognition framework to the study of human language and has close ties with integrationism in linguistics (Cowley, 2011; Love, 2004). Similarly, the enactive perspective has recently articulated its own account of language drawing from Bakhtinian dialogics and interaction studies, among other influences (Di Paolo et al., 2018). In what follows, we shall comment on the general features of these approaches and explore their potential application to LR.

The rejection of mental representations advocated by some dynamical perspectives entails a fundamental departure from the cognitivist view of language as a code. Linguistic expressions cease to be regarded as symbols that stand for internal mental states. What comes to replace this model is 'languaging', the idea that human language is continuous with other forms of human activity and cannot be understood apart from them[8]. Languaging is the primary vehicle through which social interactions are enacted, coordinated and regulated. Human languages are, therefore, unlike codes of form-meaning pairings abstracted from specific contexts of use. Their formal features are shaped not by an innate universal grammar, but rather by dynamics that emerge at multiple timescales, including those of social interaction, language acquisition, sociocultural transmission, and biological evolution (Rączaszek-Leonardi, 2010). The processes that constitute languaging also go beyond the traditional units of linguistic analysis, such as phonemes, words or sentences. A variety of elements like gestures, intonational cues in the mother-infant relation (Trevarthen, 1979) or turn-taking in social interactions (Schegloff, 1996) are constitutive of the 'meshwork' of human activity in which language is embedded, and therefore fundamental to languaging.

Of particular importance for the DLA is the idea that the relevant objects of study for a dynamical approach might in fact be radically different from the classic views about language developed in theoretical linguistics. This is usually expressed through the integrationist distinction between first-order activity and second-order constructs:

> For the integrationist, a language is a second-order cultural construct, perpetually open-ended and incomplete, arising out of the first-order activity of making and interpreting linguistic *signs*, which in turn is a real-time, contextually determined process of investing behaviour or the products of behaviour (vocal, gestural or other) with semiotic significance. (Love, 2004, p. 530)

While this distinction helps to articulate the inadequacy of the language-as-code view, it also has far-reaching implications for the understanding of linguistics as an academic discipline, since it questions the explanatory value of formalising linguistic phenomena. The level at which 'languaging' unfolds is that of first-order activity, often involving processes that occur beyond the conscious awareness of language users. It is the second-order constructs that provide a vocabulary to raise first-order activity to an object of reflection. 'Since analysis of words, constructions, grammars, semantics, texts, etc. abstract away from human activity, it masks from whence it comes' (Cowley, 2017, p. 2). Accordingly, this distinction often forms the basis for arguments questioning the reliability of phenomenological insight in the study of languaging.

We can now identify some important points of tension that emerge between dynamical approaches to language and current research on LR. First, the emphasis on 'languaging' as a primary form of human social interaction raises questions about the psycholinguistic methodology common in LR research, since this typically involves observing cognitive responses in a laboratory environment, therefore abstracting linguistic phenomena from real-life settings. This parallels the concerns about 'ecological validity' raised from the culturalist perspectives mentioned in section 2. Secondly, the notion of 'languaging' also shifts the focus away from what we have called 'linguistic relativity' towards 'discursive relativity', the question of

[8] The concept of 'languaging' can be traced to the work of Humberto Maturana (1983) whose contribution to the theory of autopoiesis laid the groundwork for the enactive approach. For further context about the notion of languaging, see Raimondi (2019).

whether switching between contexts of language use may affect cognition. For instance, the bulk of the argument in Di Paolo et al. (2018) concerns the different ways in which speakers 'incorporate' each other's utterances, as a fundamental dynamic underlying languaging. Since this takes place *within the context of the same language*, it can point to how interspeaker and intraspeaker variation may differentially impact cognition, but it does not constitute LR, which would require a contrast *between languages*[9]. The main problem, of course, is that the very notion of 'a language' comes under question from the integrationist perspective (Love, 2004, pp. 528–529). Particular languages such as English or Spanish, understood as systems of identifiable linguistic units instantiated in every act of languaging, only exist as second-order theoretical constructs, with no real involvement in the dynamics of communication.

Clearly, these aspects pose a serious challenge for LR research, since its main contention is that the *formal* and *systematic* features of language, as enshrined in its lexical and grammatical categories, are precisely what shapes cognition. At the same time, there are important reasons to expect a theoretical convergence between the fields of research here discussed. Both agree, against cognitivism, that human cognition is a situated phenomenon that depends on cultural and social factors and cannot be accounted for only by appealing to 'inside the head' activity. Additionally, both pay attention to the irreducibly diverse ways in which language and cognition are realised in different human communities in interaction with their environments. In the next section, we will comment on these issues and sketch a proposal to relate the findings of LR and the enactive perspective.

6. Integrating LR within the enactive framework

What contributions could a specifically enactive perspective make to the study of LR? How could this approach, in turn, be enriched by a more serious engagement with these issues? Di Paolo et al. (2018) offer an enactive version of the second premise of the argument for LR: the claim that language affects cognition. This account makes its philosophical commitments explicit, while at the same time remaining rooted in a variety of areas of empirical research. The philosophical aspect is instantiated in the ambition to develop a 'constitutive theory of language' (pp. 131–136), following Taylor (2016). This means understanding language as more than a 'tool' arising for the communication of pre-existing, fully formed thoughts. Instead, language is regarded as having a global impact on human experience, both in its cognitive and affective aspects, in such a way that it reconfigures prior forms of experience and makes new ones possible. This constitutes a clear endorsement of the idea that language affects cognition, in a version that comes close to Whorf's own understanding of the claim. In its adoption of several strands of philosophical thought, including phenomenology as well as dialectics, the enactive approach goes beyond contemporary LR research in articulating an explicit theoretical framework for language.

The goal in Di Paolo et al. (2018) is to show that human bodies are *linguistic*. Following the enactive theory of bodily constitution across organic, sensorimotor, and social dimensions (Di Paolo et al., 2017; Thompson and Varela, 2001), the authors propose a model of increasingly complex and interlinked forms of social agency motivated by the need to manage the tensions inherent in interactive situations (De Jaegher and Di Paolo, 2007). Each of these forms of social agency, from coordinating a handshake to adapting to a rapid switch in a conversation genre, entails its own shared know-how and a historically modulated orientation towards social norms and towards the world, culminating in reflexive forms of idealisation and personhood characteristic of human minds in their diversity. Cognitive abilities involving abstraction, reflection, (self-) reference and symbolising emerge as a consequence of this enactive model of languaging.

Accordingly, and against the modular understanding of language as a distinct function within a nearly-decomposable system, the enactive approach insists on language as a constitutive element in the organic whole that is a linguistic body. The notion of 'constitutive element' contrasts here with that of 'contextual factor' and 'enabling condition' (De Jaegher et al., 2010). Contextual factors are contingent influences on a given phenomenon. For instance, wind currents affecting the flight of a bird are a contextual factor for this behaviour. This is reminiscent of the characterization of language in contemporary LR research as a variable leading to measurable changes in (non-linguistic) cognitive operations, with the implication that the latter retain their normal function in the absence of the former. Whereas contextual factors are not necessary for the constitution of a phenomenon, enabling conditions are the kinds of influences that make it possible, such that their absence would prevent the dependent variable from occurring altogether (e.g. a bird's flight is enabled by the presence and use of functioning wings). In stronger versions of the thesis that language impacts cognition (for instance, in Slobin's 'thinking for speaking'), the exercise of linguistic abilities is similarly involved in enhancing cognitive skills, e.g. as a practical strategy that makes it possible to manipulate large numerosities or orient oneself in space.

The notion of constitutive elements, however, expresses a stronger relation: an element is constitutive of a phenomenon if it is part of what makes the phenomenon what it is (e.g. moving through the air without support and without falling is constitutive of flying). Constitutive relations can arise from the organization of enabling relations, for example, when several enabling conditions come together to form self-sustaining networks of processes that are mutually enabling and enabled (i.e. operational closure). These feedback loops and circular causal paths are characteristic of the living phenomena that inspire

[9] A notable exception to this is *code-switching*, the practice of alternating between languages or varieties in conversation, which is considered in Di Paolo et al. (2018, pp. 289–290), and could provide an alternative way of approaching the question. However, given the rejection of the language-as-code view from the dynamical perspectives, one would need to argue that switching between 'codes' is in some respect significantly different from switching between registers or styles within the same language.

much of enactive and dynamical systems research. In parallel to this, stronger accounts of the interaction between language and thought regard language as intimately involved in the development of some cognitive abilities – for instance, in Vygotsky's account of the emergence of 'higher' mental operations from internalized speech (1978)[10]. If we adopt this perspective, language and the diverse cognitive skills it supports can be regarded as *entangled processes* that cannot be strictly isolated except for specific methodological purposes. They call for developmental or diachronic approaches, such as those common in the nonlinear and time-bound mode of description of dynamical systems theory. This kind of developmental research is not unknown in LR studies (Bowerman and Levinson, 2001), but the possibility of further integration with dynamical approaches is an avenue of research still to be explored.

As a second specific contribution, the enactive approach seeks to develop an account of symbols and symbolisation that avoids denying their causal involvement in the dynamics of languaging, but that also steers clear from the cognitivist understanding of languages as codes. This account has many affinities with the work of Joanna Rączaszek-Leonardi (2014), who, building on the work of Howard Pattee, speaks of a third way between 'dynamical' and 'symbolic' approaches. This middle path regards both as complementary and necessary modes of description of cognitive phenomena. Its central notion is that symbols act as constraints on dynamical processes: the formal properties of symbol systems have been selected in the process of cultural evolution for their ability to control the dynamics of human communication and interaction. Whereas the material properties of symbols enable them to interact causally with the processes they are embedded in, their informational properties play a special role in controlling and constraining the range of possible interactions. Rączaszek-Leonardi's account, however, maintains the integrationist principle that linguistic systems are second-order constructs with no real influence over first-order dynamics. The 'units' into which language is usually analysed (words, sentences, etc.) are regarded as the product of a first-person phenomenology that fails to grasp the dynamics present in languaging[11].

The enactive proposal aims to reconcile these tensions between structure, dynamics, and experience. Its gist, as with many enactive moves, is to seek the underlying root of these distinctions in activity, viz. in the enactments of symbolic languaging, or *symbolising* and *sensitising* (Di Paolo et al., 2018, pp. 293ff). At the core lies the idea that symbols are always part of an activity; there are no inert symbols. Symbolic activity realises the experience of meaning in the act of calling forth other linguistic acts in specific ways, rather than indicating direct correspondences to the world. The coherence that is thus called forth (with the concomitant tensions that invite further acts of negotiation and sense-making when it is not satisfactorily attained), harks back to the etymology of the word "symbol" (*symbolon* as two halves of an object warranting the identity of the contracting parties holding each half). Enactive symbols, which are always material and hence dynamic, enact (or re-enact) a microframing of dialogic sense-making. They are at once dynamic in that concrete acts of situated sense-making are involved in granting symbols their meaning. They are structural in that gestures, utterances, inscriptions, etc., that symbolise rely on forms of recursive regulation that have sedimented in a community and normatively modulate acts of participation. And they are experiential in that symbolising jointly projects (warrants and casts together) engaged and consensual acts of sensitivity to rightness, i.e. sensitivity to coherence with other linguistic and non-linguistic acts.

Enactive symbols, thus conceived, are broader than the notion of correspondence one often associates with the term. Bringing folders and papers together into a neat pile towards the end of a business meeting calls forth the coming to the end of the meeting and is successful as a symbol only if met by a consensual reframing of the encounter by other parties, e.g. an agreement to end the meeting, also manifested by enacted symbolic activity (utterances, relaxing backwards into the seat, taking off reading glasses, checking phones, and so on). The enacted symbol is dynamic in its constraining/framing of an interactive encounter (it would not work were it performed with awkward timing or insufficient vitality). It is also structural in its invoking of sedimented connotations, by expressively intensifying an act that is understood in terms of existing social habits (one normally picks one's belongings up after a meeting is over). It is experiential, too, in its redirection or confirmation of expectations, evoking surprise or relief, as the case may be, and other forms of affect and sensitivity that depend on the social relation of the performer to the other participants. In these root properties of consensually calling forth, prior to abstract distinctions, symbols eventually empower participants with the ability to refer and *re*-present. But these powers presuppose the practice of symbolising as one of several forms of linguistic sense-making and do not constitute this practice as such.

Finally, fuller integration of LR research within the enactive approach would require extending the accounts of constitution and symbolisation we have just outlined to the study of linguistic diversity, the first premise of the argument for LR. Although an exhaustive elaboration of this point lies beyond the scope of this article, we note that enactive theory could be the source of rich empirical questions if applied to real-life cases of language contact.

For instance, a situation where several speakers are attempting to communicate in a language they are not proficient in could be explored as an instance of coregulation of social interaction. In this case, the means of coregulation is a linguistic code that the speakers have not yet mastered. The communicative act is, therefore, especially precarious and vulnerable to the

[10] This also coheres with Sapir's own view of the relationship between language and thought (1921, pp. 12–17), which in turn directly influenced Vygotsky. Cf. Lee (1985).

[11] See Rączaszek-Leonardi, 2009: 'The phenomenological units into which structure is readily analyzed do not necessarily match the division into functional units that stem from how language controls and is maintained at different levels and time-scales' (p. 668). 'Many processes that shape language are not accessible to individual consciousness. Indeed, the phenomenology of language is likely to be subservient to dynamics at the level of inter-individual coordination' (p. 670).

interference of different linguistic and cultural norms, which could become the source of relativistic effects on the interaction. An enactive perspective would then seek to place these elements in the wider context of a social interaction requiring its participants to coregulate their acts and their sense-making via contrasting linguistic and non-linguistic means, thus integrating cognitive, interactive and affective features as part of the explanatory model.

A similar case study could consider bilinguals engaging in code-switching or code-mixing during a conversation (see Di Paolo et al., 2018, 289 ff.). Here, the success of the interaction does not depend on the speakers' linguistic proficiency. Instead, relevant questions could be raised about how switching from one language to another contributes to, or hinders, the coregulation of the interaction. This could highlight not only the formal properties of each linguistic system but also less commonly explored aspects, such as the normative or sociolinguistic features that distinguish the contexts in which each language is deemed appropriate. In this way, a richer account of linguistic diversity is achieved that does not focus exclusively on typologically contrasting structures but also on sociocultural elements that enter into the constitution of distinct linguistic identities.

These are only some tentative proposals, but they underline the ways in which enactive methodology could be brought to bear on research questions proper to LR. What is characteristic of this enactive methodology is the circulation between first-person embodied experience and theory-making (Varela et al., 1991), not entirely dissimilar to the combination of research 'in the wild' and 'in the lab' suggested by the culturalist approaches mentioned earlier (Athanasopoulos and Bylund, 2020). This is a necessary consequence of the reflexivity involved in all research in the cognitive sciences. The starting point, then, must be the lived experience of language users in real-life communicative settings, as in the case studies we have just suggested. The distinctive contribution of enactive approaches is their reliance on phenomenological descriptions of first-person experience, which then feeds into theoretical reflection aiming to uncover those aspects of a phenomenon inaccessible to conscious awareness.

To make this methodological circulation possible in the case of language, however, it is important to qualify the integrationist distinction between first-order activity and second-order constructs as standing in a dialectical relation. Since languaging is a form of social interaction, it is ultimately pervaded by the kinds of social normativity that help to regulate such interactions. At the same time, social (linguistic) norms tend to be influenced by the more prestigious varieties that often form the basis of linguistic standards, which are, in turn, grounded in theoretical reflection on language. In this way, second-order linguistic constructs are able to impact the way language users participate in languaging. There is, consequently, no such thing as 'pure' first-order activity that is not directly or indirectly informed by linguistic theorization (see also van der Herik, 2017). The phenomenology of language can then provide insights into the constitutive elements of languaging.

This circulation between the 'practical' and 'theoretical', 'live' and 'reflective' aspects of languaging is also made possible by its *habitual* character. Habits are conceptually central to the enactive approach (Di Paolo et al., 2017). They are understood not as automatisms, but as precarious self-sustaining patterns of agent-environment interactions and as flexible schemes that normatively structure activity, without fully determining it. It is obvious that the habitual nature of language was fundamental in Sapir and Whorf's original formulation of LR, and it also features prominently in contemporary LR research (Lucy, 1992, pp. 7–8). This constitutes another potential point of interaction between both research fields, since it can highlight the diachronic dimension at work in the interplay between different cognitive domains.

7. Conclusions

Much remains to be said about the potential interactions between current research on LR and the enactive approach and other post-cognitivist perspectives. We have aimed to identify the potential points of contact and the divergences that may lead to fruitful developments for all the programmes involved.

The centre of our discussion has been the claim that language affects cognition, the second premise of the argument for LR. To summarise, in rejecting the cognitivist commitments that implicitly or explicitly can be found in many LR studies, the enactive approach offers at least a way of reformulating the questions driving this research.

First, particular languages are no longer understood as abstract codes that translate internal 'mental representations' into audible or visible signs. Instead, languages become part of languaging, an ongoing activity that is continuous with human interactions and embedded in specific cultural settings. This lies at the basis of a nonrepresentationalist account of language. Second, the enactive framework, building on DST and post-cognitivist approaches to language, emphasises the inextricable links between different cognitive domains, as well as between brains, bodies, and the environment. This can only be appreciated from a diachronic perspective seeking the integration of timescales such as actual communication, language acquisition and transmission. The result is an alternative to modular understandings of the language-thought linkage. Third, the enactive framework favours the integration of phenomenological and scientific approaches to language. It does this through the recognition that the first-order practices making up 'languaging' are not sealed off from the influence of the second-order constructs arising from reflection on language. Crucially, this rescues the central insight from LR studies that linguistic categories have a non-trivial impact on language use.

Finally, we have also advanced some tentative proposals for an enactive approach to the first premise of the argument for LR, the idea that the world's languages differ in non-trivial ways. Despite our claim that enactivism can provide a useful perspective for LR studies, much research in embodied approaches to language has, in fact, been sceptical of, when not contrary to, the implications of linguistic diversity. For instance, Eleanor Rosch's fieldwork on colour perception among the Dani of Papua-New Guinea laid the ground for early arguments against LR, as well as for key discussions in cognitive science

about natural categories (1973; 1972). Her position was later influential in the development of Conceptual Metaphor Theory in cognitive linguistics (Lakoff, 1987, Chapter 2), no less than in the shaping of the enactive framework, as one of the co-authors of *The Embodied Mind* (1991). The differences between these theoretical frameworks and LR are interesting and stem, in part, from a tendency to see the human body as playing a universal grounding role for the human mind, which diminishes the import of linguistic diversity in shaping cognition (cf. Sinha and Jensen de López, 2001). From an enactive perspective, human bodies are always already both material and lived bodies in ongoing becoming; they are historical processes in themselves. Therefore, the perspective of *Linguistic Bodies* reaches the contrasting conclusion that, if there is a universal, it is human diversity (2018, p. 5). This tension opens further avenues of research and deserves a separate examination.

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None.

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