Do all languages share the same conceptual structure?

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Abstract: In this work, we consider the views of three exponents of major areas of linguistics – Levelt (psycholinguistics), Jackendoff (theoretical linguistics), and Gil (field linguistics) – regarding the issue of the universality or not of the conceptual structure of languages. In Levelt's view, during language production, the conceptual structure of the preverbal message is language-specific. In Jackendoff's theoretical approach to language – his parallel architecture –, there is a universal conceptual structure shared by all languages, in contradiction to Levelt's view. In Gil's work on Riau Indonesian, he proposes a conceptual structure that is quite different from that of English, adopted by Jackendoff as universal. We find no reason to disagree with Gil's view. In this way, we take Gil's work as vindicating Levelt's view that during language production preverbal messages are encoded with different conceptual structures for different languages.

1 Introduction: Levelt's view on conceptual structure

According to current models, language production consists of three types of processes: conceptualization, formulation, and articulation (see, e.g., Roelofs and Ferreira, 2019).[1] During conceptualization, the semantic content of an utterance is prepared. We might call the result of conceptualization the preverbal message.[2] During formulation, the conceptual structure (CS) of the preverbal message is encoded linguistically. A crucial part of this component is the syntactic composition in which we built a syntactic structure (which we can describe in terms of syntactic trees). Another part is the phonological encoding during which a phonological score is built (a representation of how the utterance must be articulated). Finally, during the last stage of language production – articulation – this score is executed: we speak (Levelt, 1989: 11-3; Levelt, 1999: 94-112).

During conceptualization, the preverbal message must be prepared in terms of what we might call a semantic/conceptual structure. As mentioned by Levelt:

> The message is a conceptual structure, consisting of lexical concepts, that is concepts for which there are words in the language. In this respect the message is more specific than just any conceptual structure. Not all concepts that we can entertain are lexical. (Levelt, 1999: 87-8)
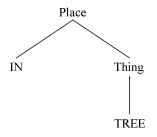
What are the characteristics of this semantic/conceptual structure? Levelt adopts Jackendoff's formulation of CS (see, e.g., Levelt, 1989: 79). As defined by Jackendoff, the CS is composed of "a finite set of mental primitives [like, e.g., the PATH and PLACE functions (Jackendoff, 1990: 43-4)] and a finite set of principles of mental combinations" (Jackendoff, 1990: 9); it gives rise to "an algebraic structure composed of discrete elements" (Culicover and Jackendoff, 2005: 20).[3] In this

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[1] For this work, we will only consider basic features of the conceptualization component in Levelt's early model of language production. For more on later developments of Levelt and co-workers' model see, e.g., Roelofs and Ferreira (2019) and Levelt (2020).

[2] The technical term "preverbal message" (the message that will be expressed before the encoding as a linguistic expression via syntax and phonology) must be addressed from within Levelt's model of language production. Contrary to the case of Jackendoff, which we will see later, the conceptual structure (CS) of the preverbal message does not have to be considered as something previous and independent from the language faculty. "Preverbal" does not mean "pre-linguistic".

[3] We will be using the term conceptual structure (CS) indistinctly to refer to two related things: (1) the 'mental machinery' that instantiates sentence meanings (more specifically, the combinatorial principles and set of primitives postulated by

way, a preverbal CS has an 'algebraic' format (Levelt, 1996: 77). What this means is that basic concepts can give rise to more complex concepts through a set of compositional principles. Two basic ones are function-argument structures and modification. For example, when answering the question "where is Peter?" a speaker might reply "in the tree". In a simple symbolic bracket notation, the corresponding CS might be ($_{place}$ IN ($_{thing}$ TREE)) (Levelt, 1989: 79-80). The concept IN works as a sort of semantic function taking other concepts as arguments (in this case the concept TREE). According to Levelt, "there is a place function, IN, that takes a THING as argument and yields a PLACE as value in just the same way as the function x(x + 1) takes a value of x (say 3) as argument and yields a numeral (12, in that case) as the function's value" (Levelt, 1989: 79). The function-argument structure creates a hierarchical structure as can be seen using a tree notation:

Each concept belongs to what we might call an ontological category corresponding to a basic categorization of experience made by human cognition. In the previous example, IN is in the category of place and TREE in the category of thing. In this way, preverbal messages are conceptual structures that combine in systematic ways the different ontological categories (Levelt, 1989: 78-9).

Another basic feature of the CS, in Levelt's view, is what we might call the thematic structure. Each argument of a semantic function has a thematic role like e.g., agent, patient, source, or goal.[4]

There are many more features associated with the preverbal message, like perspective-taking (Levelt, 1996), mood assignment (Levelt, 1999: 93), focus, topic, and others (Levelt, 1989: 96-103), whose details are not central to the issue addressed in the present work. For us it suffices to consider an aspect of the preverbal message preparation: the CS must be 'tuned' to the specific language adopted in the formulation component. As Levelt mentions, "languages differ, first, in their range of lexical concepts; second, languages differ in the conceptual information that is obligatorily expressed" (Levelt, 1999: 93). In this way, the conceptual preparation might not be independent of the adopted language. That is Levelt's view; accordingly, "we have a language-specific difference in encoding at the message level" (Levelt, 1989: 104).[5] That is, in Levelt's view, in the CS we have language-specific features.[6] This opens the door to the possibility that cross-linguistic variation is related to differences in the CS for speakers of different languages.

There are experimental results that we can interpret in terms of Levelt's view that messages must be tuned to the target language.

A robust finding of eye-tracking studies of linguistic descriptions of scenes is that the utterances correspond to the speaker's eye-movements. In a type of experiment, a speaker must describe a visual

Jackendoff); (2) particular conceptual structures built with it (i.e., particular algebraic-like structures, as in the examples given in this work for "In the tree" and "Pat might eat some green apples on Thursday").

[4] For a clear presentation, with examples, of thematic structure and thematic roles, see Culicover (2009: 147-150). According to Levelt, "the character of these roles is probably determined by the functions. Some semantic functions [...] are so basic that they tend to appear in the most diverse conceptualizations. Their presence in a semantic representation imposes a certain 'thematic structure' on the message" (Levelt, 1989: 105).

[5] Levelt's phrasing can be read in two related ways: (1) the 'conceptualizer' is language-specific (i.e., the combinatorial system giving rise to sentence meanings is language-specific); (2) as a result of this, the CS of any preverbal message has language-specific features.

[6] In Levelt's model, the language production components are independent. How do we fit this idea with the language-specificity of the conceptual structure? According to Levelt, "although conceptualization and grammatical encoding are interacting for the language-acquiring child, the mature speaker has learned what to encode when preparing a message for expression [...] in short, the systems have become autonomous. The language-specific requirements on semantic structure have become represented in the conceptualizer's procedural knowledge base" (Levelt, 1989: 105).

scene depicting a particular event. For example, that of a car being towed by a truck. When a speaker produces an active sentence (like, e.g., "the truck is towing the car"), the speaker gazes first at the truck. When the speaker produces a passive sentence (like, e.g., "the car is being towed by the truck"), the speaker gazes first at the car (Konopka and Brown-Schmidt, 2014: 5). This correspondence between eye-movements and spoken sentences is also found in experimental studies on the description of real-world scenes (Ferreira and Rehrig, 2019). These results are taken to imply that the attention pattern of a speaker corresponds to how an event is being conceptualized for language production.

This kind of experimental setup can be adapted to the study of cross-linguistic variation in the preparation of the CS before speaking; that is, the study of cross-linguistic variation of the preverbal message.

One example of such an approach is an eye-tracking study of motion event description by Greek and English speakers (Papafragou and Grigoroglou, 2019). These languages encode motion in different ways. When describing a motion event, like that of a man skating to a snowman, we find the two following situations:

> In English, information about manner of motion is typically encoded in the main verb (e.g. *a man skated* …) and path information is mentioned later, usually in a post-verbal prepositional phrase (… *to the snowman*), In Greek, by contrast, information about path is usually encoded in the main verb (e.g. *Enas andras pige sto hionanthropo* "A man went to the snowman ...") and manner information is mentioned later, usually in a post-verbal prepositional phrase (*me patinia* "on skates") or omitted altogether. (Papafragou and Grigoroglou, 2019: 4)

The experimental results fit into what we might expect from what we have just mentioned. 78% of English speakers adopt a manner verb while only 32% of Greek speakers do the same (Papafragou and Grigoroglou, 2019: 4-5). Also, as expected, there is a close correspondence between fixation patterns and the utterances for speakers of both languages. Specifically:

> Greek speakers were more likely than English speakers to fixate the path endpoint first (e.g. the snowman) rather than the manner of motion region (e.g. the skates). After about a second and a half, Greek speakers turned their attention to manner, while English speakers focused on the path end-point. (Papafragou and Grigoroglou, 2019: 5)[7]

In Papafragou and Grigoroglou's view, this confirms Levelt's idea that conceptualization varies cross-linguistically (Papafragou and Grigoroglou, 2019: 5). That is, they interpret the attention pattern as corresponding to the conceptualization stage of language production during which we have the encoding of the preverbal message. Being this the case, the different attention patterns indicate that different conceptual structures are being encoded for the same event by speakers with different languages. This would imply that the CS is not the same for every speaker independently of the language. Different languages would rely on different CSs.

In section 2, we will see that this conclusion is not inevitable. One can account for Levelt's view and the experimental results that seem to confirm it in a way in which the CS is the same for speakers with different languages. That is the case if we adopt the formal approach to language proposed by Jackendoff. However, in section 3, we will consider another type of 'evidence' that seems to point to the possibility that speakers of 'sufficiently' different languages have different conceptual structures. For that, we will address the case of the Riau Indonesian language. We will see that if we adopt Gil's view on the semantics of Riau, this language is 'incommensurable' to other languages like English. It could be the case that different persons have different semantics. We will finalize this paper with a

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[7] According to an anonymous reviewer, "[this study is] a very important piece of empirical evidence about the psychological and perceptual existence of the conceptual structuring of what Leonard Talmy refers to as satellite-framed and verb-framed languages [(see, e.g., Talmy, 1985)]". In fact, Papafragou and Grigoroglou choose English and Greek due to theoretical considerations like those of Talmy (Papafragou and Grigoroglou, 2019: 4).

section where we make tentative remarks regarding some implications and possibilities open up by this view.
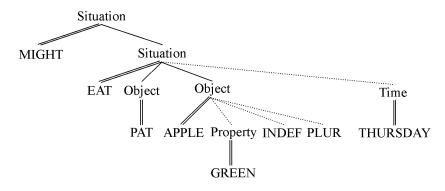

2 Universal semantics: Jackendoff's view on conceptual structure

According to Levelt, the CS of a preverbal message must be tuned to the particular language the speaker adopts. Here, we will consider another possibility. That there is no difference in the CS for speakers of different languages, and the tuning during language production to a particular language arises in the application of distinct interfaces/linkings between the CS and the syntax.

This view is possible when one adopts Jackendoff's theoretical conception of language, which he calls the Parallel Architecture (PA). In PA, one considers three semi-autonomous components for semantics, syntax, and phonology, respectively.[8] Each component has a combinatorial system that generates the corresponding semantic, syntactic, and phonological structures. These structures are connected with interface or linking rules (see, e.g., Jackendoff, 2017: 190).

In Jackendoff's view, the combinatorial possibilities of semantics (giving rise to conceptual structures) follow mainly from three principles of combination: argument satisfaction (i.e., having function-argument structures), modification, and binding (Jackendoff, 2009: 659). The combinatorial principles make the conceptual structures hierarchical structures (Culicover and Jackendoff, 2005: 153). All constituents of the CS belong to a small set of ontological categories. Examples of these are: object, location, path, action, event, manner (Jackendoff, 2009: 658-9).

The CS corresponding to the sentence "Pat might eat some green apples on Thursday" would look as follows in a bracket notation: [Situation MIGHT ([Situation EAT([Object PAT], [Object APPLE; [Property GREEN]; INDEF PLUR]); [Time THURSDAY]])] (Culicover and Jackendoff, 2005: 154).[9] In a tree notation, it is as follows:

Another feature of the CS is that there is a small set of semantic roles that concepts as arguments of semantic functions can play. As Jackendoff mentions:

> An important part of the compositionality of meaning is captured by treating a situation in terms of the roles its characters are playing. These are delineated in terms of thematic roles, which in turn are identified as particular argument positions in conceptual functions. (Jackendoff, 2007: 195)

How thematic roles are addressed in PA is a bit cumbersome. The CS is taken to be divided into

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[8] A recent development of PA also includes a treatment of morphology. This approach does not include morphology as a fourth component; it proposes an architecture that we can see as a 3 x 2 matrix of components (see, e.g., Jackendoff and Audring, 2020a). In this work, we will only consider the simpler 3-component PA.

[9] The adopted notation is as follows: [FUNCTION (ARG$_1$, ... ARG$_i$); MOD$_1$, ...MOD$_m$; FEATURE$_1$, ... FEATURE$_n$], where ARG can be another function like in the example where EAT is an argument of MIGHT and has PAT and APPLE as arguments.

subcomponents or 'tiers' (Culicover and Jackendoff, 2005: 18).[10] Adopting Culicover's simplified version of CS, we might instead talk about a thematic structure without referring to any tier (Culicover, 2009: 147-50). This thematic structure can be taken into account in our symbolic notation for the CS. For example, the concept WRITE is giving in CS as a semantic function with two arguments. The CS corresponding to the sentence "Sandy writes a book" can be represented using a symbolic notation as WRITE(SANDY, BOOK). Including the thematic structure in our notation, we might have WRITE(AGENT: SANDY, THEME: BOOK).

Jackendoff takes PA to be compatible with models of language production as that of Levelt (Jackendoff, 2002: 201; Jackendoff, 2007: 68-9). In particular, he considers that the message is encoded as a conceptual structure as posited in PA (see, e.g., Jackendoff and Audring, 2020b: 8). There is, however, a crucial difference between Levelt's view and Jackendoff's concerning cross-linguistic variation. As we have seen in the first section, Levelt posits that "we have a language-specific difference in encoding at the message level" (Levelt, 1989: 104). Jackendoff's position is quite different. In his view:

> Conceptual structure is taken to be the form (or one of the forms) in which human thought is couched – it serves as the 'syntax of thought'. It is by hypothesis common to all natural languages: translation preserves conceptual structure. Moreover, CS, is to some degree independent of language, and some aspects of it are shared with nonlinguistic organisms such as apes and babies. (Jackendoff, 2010: 7)

This point has been mentioned by Jackendoff elsewhere. For example, he writes that "PA takes the combinatorial system of meanings to be universal" (Jackendoff, 2009: 656), or that people "think the same thoughts, no matter what kind of grammatical system they use" (Jackendoff and Wittenberg, 2014: 66).

If this is the case, how can we reconciliate it with the apparent existence of cross-linguistic differences in the CS? Levelt gave some examples of how CS might be different depending on the adopted language. One is that in English and Dutch the distinction between "here" and "there" and "this" and "that" relies on two categories: PROXIMAL and DISTAL. In Spanish and Japanese, we have to consider a further category: MEDIAL. According to Levelt, "English and Dutch speakers must represent that information in their messages in a bipartite way, whereas Spanish and Japanese speakers must use a tripartite code" (Levelt, 1989: 103-4). for Levelt the difference is at the level of the CS of the preverbal message.

Jackendoff's position is distinct. As we have mentioned, semantics and syntax are, according to PA, connected by linking rules. The difference in the languages does not occur in the CS, it occurs in the syntax – in the autonomous combinatorial principles of the syntax of a specific language –, and, importantly, in the linking rules that related a universal CS to the syntax of a particular language. Jackendoff considers that cross-linguistic variation of the type mentioned by Levelt or Papafragou can be account for within PA (Jackendoff, 2010: 24).

Here, we will not dispute this view. In fact, that the attention patterns in eye-tracking studies correspond to the message encoding as stipulated in Levelt's model is a working hypothesis that has not been tested in detail. This is the position of many researchers (see, e.g., Ferreira and Rehrig, 2019) but needs further scrutiny. Returning to the experiment mentioned in Papafragou and Grigoroglou (2019), there was also a non-linguistic task in which people had only to study the events without describing them in English or Greek. In contrast to the linguistic task, the result was that the attention pattern was similar for both language groups (Papafragou and Grigoroglou, 2019: 5). In this case, the conceptualization did not show the expected differences according to cross-linguistic variation. We

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[10] These tiers are semi-independent structures that embody different aspects of meaning, and are connected by interface components (Jackendoff, 2009: 661). Besides the propositional tier, of which the above example represents some aspects, we have the information tier that reflects aspects of meaning related to, e.g., new and old information, topic, and focus. Also, the propositional tier is taken to be further divided. As a result, the thematic roles are associated with two tiers, which Jackendoff calls the thematic and macrorole tiers (Jackendoff, 2007: 44).

might try to argue that it might well be the case that this conceptualization corresponds to Jackendoff's CS. In this way, the CS would be the same for both language groups. The attention patterns in the linguistic task might, as well, correspond not just to the conceptualization stage of Levelt's model but also to some aspects of formulation where linking rules might be at play (in this way, explaining the differences for the two language groups). By challenging the experimenters' working hypothesis, we could try to argue that there would not be any clear experimental results confirming Levelt's view that there is a difference at the level of the CS of preverbal messages for different languages, and that Jackendoff's view is equally compatible with the research results. However, we have a way out of this, somewhat rhetorical, conundrum. There is at least one language that seems to lead us to question Jackendoff's view that CS is universal. If this is the case, Levelt's view would be vindicated.

3 Vindicating Levelt: Gil's view on conceptual structure

In this section, we will look in some detail into a language – Riau Indonesian (RI) – which may lead us to question Jackendoff's view that there is a universal CS. According to David Gil, the syntax of RI is very simple. Almost all words belong to a single open syntactic category S.[11] RI has a very flexible word order. When there is some preference in the ordering of words, it results from adopting optional semantic principles (see, e.g., Gil, 2005b; Gil, 2013).[12] Jackendoff and Wittenberg characterize the syntax of RI as consisting of a flat, non-hierarchical syntactic structure (Jackendoff and Wittenberg, 2014; Gil, 2014; Jackendoff, 2017).

Regarding the semantics of RI, according to Gil, it does not rely on function-argument structures like Jackendoff prescribes to be the case for a universal CS.[13] Instead, we only have a looser semantic relationship of association. Formally, the CS of RI can be described in terms of an association operator $A(, ...,)$, which is the basic mechanism to derive the meaning of a sentence from the meanings of its constituents.[14] However, as Gil notices, "its broad associational meaning is substantially narrowed down by the context" (Gil, 2012: 316). The operator $A()$ only implies, regarding the meaning of a sentence, that its meaning has something to do with the meaning of each of the constituents (see, e.g., Gil, 2005b; Gil, 2008a).

Let us see an example of a typical sentence in RI. For the sentence "beli aku laser" (which we might translate as "I'll buy a laser"), the syntactic and semantic structures are as follows:

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              S                              A(BUY, 1:SG, LASER)
        _____|_____                          _____|_____
       |      |      |                         |      |      |
       S      S      S                        BUY    1:SG   LASER
      beli   aku   laser                      beli   aku    laser
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In what regards the syntactic structure, according to Gil, "*beli*, *aku* and *laser* are all Ss, as is the construction as a whole; from a formal point of view, *beli aku laser* is thus a coordination of three Ss" (Gil, 2008b: 64). Regarding the semantic structure, the association operator $A()$ "applies to the three meaning components of the sentence, yielding the formula A (BUY, 1:SG, LASER)" (Gil, 2008b: 65).

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[11] There is also a closed syntactic category S/S containing just a few semantically heterogeneous words. Members of S/S only occur combined with members of S, yielding an S expression. This means that all multi-word expressions also belong to S (the notation S/S is adopted to refer to the fact that a member of S/S combines with a member of S to yield another member of S).

[12] According to Gil, in RI we also find "a handful of bona fide affixes, plus various other morphological processes, such as compounding, reduplication and truncation" (Gil, 2008c: 126). However, RI comes close to being a language without word-internal morphological structure. Accordingly, a basic sentence structure is one without any morphology present, only with members of S, and without any further semantic rules at play that go beyond simple associational semantics. That is, a simple sentence consists of a concatenation of words (belonging to the same open syntactic category S) without any prescribed order (words can be combined in any order whatever).

[13] Gil calls function-argument structures as predicate-argument relations, referring to a semantic function as a predicate.

[14] We take the association operator $A(, ... ,)$ to be a theoretical construct (in line with the algebraic-like semantic functions of Jackendoff's theoretical approach) that enables a more formal description of the semantic phenomena observed in RI.

That the composition of meaning in RI is described in terms of A() instead of semantic functions has important consequences. As mentioned by Gil, "the sentence *Beli aku laser* is endowed with a single unitary semantic representation which is indeterminate concerning a variety of categories such as number, definiteness, tense, aspect and thematic roles" (Gil, 2008b: 65). Gil characterizes this situation by saying, e.g., that the meaning of a sentence in RI is vague with respect to thematic roles (see, e.g., Gil, 2005a: 367). As we will see, this is also the case with ontological categories.

In this work, we are interested, in particular, in thematic roles and ontological categories since they help us see clearly the difference with the CS of English. So, we will focus on these. What is it to be a sentence that is vague in relation to thematic role or ontological category? Let us consider the following sentence:

Aku Cina   tak   makan lah.

1.SG China NEG eat   CONTR
[Context: going out to eat, approaching a Chinese looking place]

We can translate this sentence to English at least in two ways, and these differ in relation to the thematic role associated with one of the participants. In what follows, "Chinese food" has the thematic role of patient, and "Chinese place" has the thematic role of location:

1) "I'm not eating Chinese food";

2) "I'm not going to eat in a Chinese place". (Gil, 2005b: 249-50)

When considering possible English translations of the RI sentence, we see that the CS of English leads to the assignment of thematic roles. However, in RI we do not have this assignment. According to Gil this sentence "illustrate[s] vagueness with respect to thematic roles" (Gil, 2001: 119). As Gil mentions, "in the given context, the various construals end up meaning the same thing, and it is hard to imagine that the speaker could have been intending to convey one interpretation to the exclusion of the other or others. Rather, in the context at hand, it is a safe bet that the speakers had in mind a single undifferentiated reading encompassing the given glosses" (Gil, 2001: 119).

Regarding ontological categories, we face a similar situation. In RI, in many cases, the ontological category of a sentence is vague. Let us see one example:

Cewek   bawa.

woman   drive
[Context: In car, going fast down rural road, another car suddenly pulls out dangerously in front of us; speaker sees the driver and comments]

This utterance can be translated to English in two different ways:

1) "a woman is driving";

2) "(It's) a woman driving". (Gil, 2005b: 251)

In the first case, the ontological category of the sentence is that of activity; in the second case, the ontological category is that of thing. As Gil mentions, "in the context at hand, the different readings end up meaning the same thing, and it is clear that the speakers were intending a single underspecified interpretation unmarked with respect to ontological categories" (Gil, 2001: 119). In the CS of English, we have an ontological category for a sentence, but this is not the case of RI. There are cases of sentences in RI for which its CS does not include a defined ontological category.

In this way, in RI, its compositional semantics, described in terms of the association operator A(), leads to a CS that is, usually, vague regarding thematic roles and ontological categories. Accordingly, "thematic roles and ontological categories are not obligatorily marked in the grammar of Riau Indonesian" (Gil, 2001: 119).[15] It seems that we are working with a different CS – let us refer to it as CS_{RI} – where there is no thematic structure and no ontological categories assigned, contrary to the case of the CS of English (CS_{ENG}).

In RI, however, there are also other "optional" semantic principles.[16] Considering the most important of these principles and what we will call thematic role assignment, we will see how within RI we can approach the CS_{ENG} by having sentences that are not vague with respect to thematic roles and ontological categories.

Let us consider the English sentence "the chicken is eating". We want to approach in RI the CS of this sentence. In terms of Jackendoff's approach to CS, we have something like [$_{Situation}$ EAT([$_{Object}$ CHICKEN], [$_{Object}$ X])].[17] The predicate/function EAT has as an argument CHICKEN. Including in our notation explicitly the thematic role of CHICKEN as an argument of EAT, we have [$_{Situation}$ EAT([$_{Object}$ AGENT: CHICKEN], [$_{Object}$ PATIENT: X])]. What is the counterpart in Riau Indonesian of this English sentence and its CS_{ENG}? To begin with, we only have a concatenation of two words: *Ayam makan* (chicken eat) or *Makan ayam* (eat chicken), which without further semantic principles have the same meaning. In fact, its corresponding CS is given by A(CHICKEN, EAT) or A(EAT, CHICKEN) which are the same since A() is symmetrical (contrary to semantic functions; EAT(CHICKEN, X) is not the same as EAT(X, CHICKEN)).

Including in the CS_{RI} a thematic role assignment, we can have something like A(CHICKEN$_x$, EAT$_r$), where the index r indicates that EAT is the assigner of a thematic role to CHICKEN, which is assigned the thematic role x. In this way, with a thematic role assignment included in the CS of RI, we can assign to CHICKEN the thematic role of agent (Gil, 2012: 308).[18] This makes the meaning precise regarding the thematic role. However, the meaning is still vague concerning the ontological category. Considering possible English translations, the meaning A(CHICKEN$_{agent}$, EAT$_r$) is still vague, e.g., between "the chicken is eating" and "the chicken that is eating". The ontological category

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[15] This is not to say that vagueness cannot be reduced by taking into account linguistic and extra-linguistic context. In fact, Gil mentions that "pragmatics is there to flesh out utterances with whatever additional information happens to be relevant in the given context" (Gil, 2008a: 128). However, "there is no reason to suppose that [speakers] go beyond what is necessary, in order to make distinctions that are not relevant to the given context" (Gil, 2008a: 128). More precisely, "it is not reasonable to assume that whenever a speaker of Riau Indonesian encounters a [particular] sentence [...] he or she automatically embarks on some long and arduous pragmatic path of "figuring everything out": assigning number and definiteness [...] tense and aspect [...] thematic role [...], and ontological type to the construction as a whole – essentially translating [the sentence] into English. Rather, the speaker simply fills in what is necessary in the situation at hand, and does not bother with anything else" (Gil, 2008a: 128).

[16] According to Gil, "most of word-order phenomena in Riau Indonesian can be accounted for in terms of a single principle pertaining to head-modifier structure: heads precede modifiers. A residue of word-order facts is accounted for in terms of two additional principles associated with different grammatical domains: iconicity and information flow" (Gil, 2005b: 243).

[17] In the 'formula', X stands for a generic argument like, e.g., FOOD with the ontological category of object and the thematic role of patient. We must distinguish the semantic and syntactic structures of "eat". It is not syntactically obligatory to include the "eaten", but it is still part of the semantics of EAT (see Jackendoff, 2002: 133-4).

[18] It is beyond the scope of this work to determine how a thematic structure might arise in the CS_{RI}. In CS_{ENG}, according to Jackendoff, thematic roles "are not primitives of semantic theory. Rather they are relational notions defined structurally over CS" (Jackendoff, 1990: 47). In this way, "the stipulation of thematic roles is a notational convenience. In a more fully articulated semantic theory, thematic roles reduce to structural positions in Conceptual Structure: Theme is the first argument of GO or BE, Goal is the argument of the Path-function TO, and so on" (Jackendoff and Audring, 2020a: 89 footnote 1). In the case of CS_{RI}, we might have a similar situation; thematic roles might arise due to the other two principles of word-ordering at play in RI: iconicity and information flow. Gil mentions that "in terms of iconicity, a prototypical bi-participant activity may be viewed as originating with an agent and culmination with a patient […] with respect to information flow, it has been observed that people tend to talk about agents more often than about activities or patients" (Gil, 2005b: 259-60). Might it be the case that in RI thematic roles are not primitives, and arise due to the semantic principles at play? Even if thematic roles are not primitive in CS_{RI}, there is an important difference with respect to CS_{ENG}. In the second case, the function-argument structure gives rise to the thematic structure; in the first case, the thematic structure plus headedness (ontological category assignment) gives rise to function-argument structures.

of the sentence can be made precise by assigning headedness to the sentence (Gil, 2012: 308). Headedness gives the sentence the same ontological category of its head (see, e.g., Gil, 2005b: 257). In this way, if we choose EAT as the head of the sentence, its ontological category will be that of a situation (following Jackendoff; see, e.g., Culicover and Jackendoff, 2005: 153) or event (following Gil; see, e.g., Gil, 1994: 188). Adopting a formal notation, we have $[A(\text{CHICKEN}, \text{EAT}^i)]^i$, where the index i indicates that EAT is the head of the sentence.[19] If we have simultaneously an assignment of headedness and thematic roles, the conceptual structure $[A(\text{CHICKEN}_{\text{agent}}, \text{EAT}_r^i)]^i$ is a close approximation to the CS_{ENG} of the sentence "the chicken is eating" (Gil, 2012: 309). However, the sentence is still vague regarding categories such as number, definiteness, tense, or aspect.

This example shows us that even if the meaning of RI sentences is usually vague with respect to the ontological category and thematic roles, we can, using the association operator A() and a few more optional semantic assignments, approach the structure of CS_{ENG}, where we have function-argument structures with defined ontological categories and thematic roles. This would imply that predication (i.e., having function-argument structures in a CS) can be seen as an emergent structure when we have headedness and thematic role assignment. In Gil's view, "predication is a thematic role-assigner head, while its arguments are its thematic role-bearing modifiers" (Gil, 2012: 310). That is, with the CS_{RI} structure $[A(\text{CHICKEN}_{\text{agent}}, \text{EAT}_r^i)]^i$, we are approaching the CS_{ENG} structure $[_{\text{Situation}} \text{EAT}([_{\text{Object}} \text{AGENT: CHICKEN}, [_{\text{Object}} \text{PATIENT: X}])]$.

We must, however, notice that in RI almost all words can be combined in any linear order. This means that, usually, we do not have a thematic role-assigner head. And this implies that, usually, we do not have predication (function-argument structures) in the conceptual structure of Riau Indonesian. Accordingly, RI is a language "without systematic expression of predication" (Gil, 2012: 316). In general, the CS is built just with the association operator A() and is vague regarding ontological categories and thematic roles. What are the consequences of this regarding Jackendoff's idea of a universal CS? Gil's position is that "the existence of such a universal semantics is questionable" (Gil, 2008a: 125).[20] Sampson and Babarczy have a similar reading of the implications of Gil's work regarding this issue. According to them, "languages define the structures of thought which they offer means of expressing, and different languages may define different thought-structures" (Sampson and Babarczy, 2014: 12). We must agree with this position.

In our view, Gil's work serves as a vindication of Levelt's view that "we have a language-specific difference in encoding at the message level" (Levelt, 1989: 104). It might be the case, as mentioned above, that Levelt's specific examples might be addressed from within Jackendoff's framework (with its universal CS) by taking into account, in particular, different linking rules between semantics and syntax. However, Levelt considered that there are different CSs, due, in particular, to the fact that "languages differ in the conceptual information that is obligatorily expressed" (Levelt, 1999: 93). What we see with RI is an example of this. Compared with the CS of English, the CS of RI is much vaguer. There is simply a lot of information that might not be encoded in the CS of the preverbal message (mood, aspect, thematic role, ontological category, etc.). More than this, the compositional semantics of CS_{RI} does not rely on predication (function-argument structures). Instead, it relies on a simple symmetrical association operator.[21] What is "obligatorily expressed" is so much less than in

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[19] Like in the case of thematic roles, we might ask how can the CS of RI be enriched with headedness in some cases? Thematic roles and ontological categories are different regarding the CS. While we might consider the thematic roles as derived notions, ontological categories seem to be primitive notions. They may be even more primitive than the CS. According to Jackendoff, "the total set of ontological categories must be universal: it constitutes one basic dimension along which humans can organize their experience, and hence it cannot be learned" (Jackendoff, 1983: 56). We might speculate that headedness results from picking up ontological categories that are present in a more general conceptualization of a situation underlying the particular CS that is 'built' during language production. This being done, when the ontological category of a 'word' (concept) coincides with that of the 'sentence' (the whole CS), we say that we have an assignment of headedness. Headedness would result from ontological category assignment, not the other way around.

[20] Notice that Gil makes is point solely by considerations related to RI's semantics not its syntax (even if RI's syntax is, evidently, compatible with the "underlying" CS_{RI}).

[21] Strangely, this fact seems to have gone unnoticed by Jackendoff and Wittenberg when addressing RI as an example of concatenation grammar. From the start, they presuppose that even a simpler two-word grammar relies on function-

English that RI relies on a compositional apparatus that is much simpler than that of English. To try to maintain Jackendoff's view, we would need to find ways to 'simulate' the semantics of RI with the CS_{ENG} prescribed by Jackendoff to be universal. Only if we could achieve this and justify how we 'disable' most of the compositional machinery of CS_{ENG} could we maintain the view that CS is universal.

4 Further comments

The position we arrive at in this work might be somewhat perplexing. How come that different people might have distinct CSs? Does this even make any sense? If we address this issue starting from a view close to that of Jackendoff, we take the CS to be part of our 'central cognition' (which in Jackendoff's view is constituted by CS and the spatial structure; see, e.g., Jackendoff, 2017). CS would not be part of the 'language faculty'. According to Jackendoff, "conceptual structure is not part of language per se – it is part of thought […] it is the cognitive structure in terms of which reasoning and planning take place" (Jackendoff, 2002: 123). If this was the case and different people had different CSs then they would be thinking differently in a drastic way. If we free ourselves from 'Jackendoff cut' and take CS to be part of the language faculty (or, from the point of view of this paper, take CS to be part of the language production system), then it is not so strange the possibility of different people having different CS; after all, this is the case with the rest of the components of language production. We would be applying a looser 'Levelt cut' between 'central cognition' and the CS associate to language. This possibility is clear in Levelt's writings. He mentions the possibility of different languages of thought (Levelt, 1989: 71) and that the propositional format might have to be further specified during conceptualization to have a CS that relies on lexical concepts (Levelt, 1989: 73-4; Levelt, 1999: 87-8).

From this perspective, having different CSs might not be that strange. But would this imply that "the structures of thought expressed by the grammar of one language may be incommensurable with those expressed by another language's[?]" (Sampson and Babarczy, 2014: 12). We have seen that, in practice, we can translate, even if imperfectly, between RI and English. We just do not have a one-to-one correspondence between sentences in RI and English; that is, to a particular CS_{RI} it may correspond somewhat different CSs of English. And how do we make this translation? We simply have two PAs, one for each language. What changes with respect to Jackendoff's approach is that for each language we have to consider a different CS, in the same way that we have a different syntax and phonology.

At this point, it seems appropriate to address an issue to which we avoided referring to until this moment. That was due to methodological reasons. We wanted first to address the issue of having a universal CS or different CSs for different languages before including issues that might be related or unrelated to this. We are thinking about the well-known Sapir-Whorf hypothesis.[22] How can we relate the present treatment of cross-linguistic differences, as related to different CSs, with the Sapir-Whorf hypothesis also known as the linguistic relativity hypothesis?

Research points to what we might call a weak form of linguistic relativity. Accordingly, "the cross-language differences are usually diminished or disappear under those conditions where language is selectively excluded" (Gleitman and Papafragou, 2016: 58). In this way, "language-specific patterns of cognitive performance are a product of the on-line language processing that occurs during problem-solving. These patterns are indeed transient in the sense that they do not change the nature of the domain itself" (Gleitman and Papafragou, 2016: 59). The research example from section 1, will help us to clarify what this means. As we have seen, Greek and English speakers linguistically encode motion in different ways. In English, information about manner of motion comes first, and path

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argument structures (Jackendoff and Wittenberg, 2014). As Gil mentions, they "provide no explicit argument in support of the claim that Riau Indonesian has English-like predication" (Gil, 2014: 1).

[22] For a presentation of the Sapir-Whorf hypothesis in terms of its historical development see, e.g., Pavlenko (2014: 1-18).

information is mentioned later. In Greek, path information comes first, and manner information is mentioned later (Papafragou and Grigoroglou, 2019: 4-5). Also, there is a close correspondence between fixation patterns and the utterances for speakers of both languages. In a linguistic task, when asked to describe an event, each group looks first at what they will utter first (Papafragou and Grigoroglou, 2019: 5). That might seem to imply that there is "a potential salience of prominence effect of the categories of language onto the categories of thought" (Gleitman and Papafragou, 2016: 34). But this result must be contrasted with the results from related non-linguistic tasks in which "people were asked to simply study (but not describe) the events" (Papafragou and Grigoroglou, 2019: 5). In this case, "attention allocation as the events unfolded was strikingly similar for both language groups" (Papafragou and Grigoroglou, 2019: 5). That implies that "event perception is independent of the viewer's native language" (Papafragou and Grigoroglou, 2019: 5).

The same situation arises with other cross-linguistic effects. One example is the boundary shift in object categorization using words (Gleitman and Papafragou, 2016:24-30). Different language groups adopt mass or count terms differently for objects that we might consider to be somewhat in the "border" between stuff/substance and objects/things. One might be tempted to say that "language is altering the very categories of perception and thought" (Gleitman and Papafragou, 2016: 27), even if the claim "is not for a rampant reorganization of thought; only for boundary shifting" (Gleitman and Papafragou, 2016: 27). But this is not the case. As in the example above, when adding a new non-linguistic task, the cross-linguistic effect disappears: "in nonlinguistic tasks, individuals with a different linguistic background are found to respond in terms of the same conceptual categories" (Gleitman and Papafragou, 2016: 30).

A general feature of cross-linguistic effects is that they occur on-line, i.e., during language production (or, at least, when language is, in some way, recruited to realize the task). As mentioned earlier, Papafragou and Grigoroglou take the on-line cross-linguistic differences to correspond to the conceptualization stage of language production during which we have the encoding of the preverbal message. If this is the case, then cross-linguistic effects would be the result that different CSs are at work for each participant or group due to having a different language.

That leads us to another related issue. That we have different CSs that are part of the language faculty does not imply that there is not a shared non-linguistic conceptualization at play. In Levelt's view, "there is more than a single 'language of thought'; however, if a thought is to be expressed in natural language, the [CS] must be propositional" (Levelt, 1989: 71). In fact, research using non-linguistic tasks gives us some insight into the non-linguistic conceptualization.[23] As we have just seen, in a non-linguistic task, participants from two language groups had the same attention pattern (contrary to the case of a linguistic task). This suggests that there is a non-linguistic conceptualization of events that is different from the linguistic conceptualization. The non-linguistic conceptualization, which we can hypothesize to be common to all language groups, seems to have homologies with the linguistic CSs. For example, in an experiment, participants were shown, very briefly, photographs of two-person events. They were asked to describe the event category (e.g., pushing) and to describe event roles (e.g., agent and patient). The research found that "people successfully recognize both event categories and event roles" (Papafragou, 2015: 330). In this way, "the perceptual-conceptual representation of events is sensitive to roles such as agents and patients that are relevant for the description of events in language" (Papafragou, 2015: 330).

We might have a situation in which humans share a non-linguistic conceptualization and have linguistic CSs that have homologies with it but also enable cross-linguistic differences.[24]

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[23] Here, "non-linguistic conceptualization" is not a theoretical notion. It refers to conceptualizing events non-linguistically in particular experimental contexts like the non-linguistic tasks in experiments mentioned in Papafragou and Grigoroglou (2019). That is different, as experiments show, from the linguistic conceptualization made during linguistic tasks, which Papafragou and Grigoroglou relate to the encoding of the preverbal message (i.e., to the CS).

[24] Neuroscientific research points to the existence of brain regions that encode information about thematic roles like agent and patient (Frankland and Greene, 2020). It is possible that these neural representations "may not be restricted to language" (Frankland and Greene, 2020: 289). These might be related to the non-linguistic representation of events that shows homologies with language, mentioned by Papafragou (2015). Research also points to the existence of map-like representations "within a system capable of compositional thought" (Frankland and Greene, 2020: 287). These map-like

Let us finish the present work by addressing what might look as a cumbersome issue: let us suppose that as a child someone only learns RI. As an adult he/she can develop the CS of English or his/her language production does not go beyond the type of CS of RI? Jackendoff mentions works on late second language acquisition. Studies show that speakers can achieve a stage called 'basic variety'. This stage is very simple; it consists basically of simple semantically based principles of word order like the case of RI. Importantly, many speakers are unable to improve beyond this stage (Jackendoff, 2015: 203; Jackendoff and Wittenberg, 2017: 221). In this way, we might conceive of a possible case in which a person that only learns RI during language development is unable as an adult to develop a CS that goes beyond the CS of RI with its associational semantics.

In relation to this, and regarding the experimental studies we have mentioned in the first section, these are made with languages that possibly have very similar CSs. As mentioned, the results might be explained not in terms of Levelt's view but Jackendoff's. As mentioned, we might try to argue that the different attention patterns in linguistic tasks, might relate not just to the CS of each language but include early stages of formulation where linking rules are at play. That would make it possible to explain the results as not being due to differences in the CSs but to differences in the linking rules connecting the same CS to different syntaxes. Considering the view favored in this work that there is no universal CS, we suggest that the current working hypothesis of researchers that take the results to correspond to the conceptualization during language production is the correct one. However, it would be interesting to extend this kind of experimental work to languages like RI with a CS that seems to be so markedly different from that of English.

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representations are different from linguistic representations (relying, according to Gil, on meaning association and a few more semantic assignments, which can lead to an algebraic-like CS). It may well be the case that "there is more than a single 'language of thought'" (Levelt, 1989: 71), as Levelt suggests.

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