Language Under Discussion
http://www.ludjournal.org ISSN: 2329-583x

Dependencies are more psychologically plausible, not more parsimonious

Comments on Osborne, Timothy. 2018. Diagnostics for Constituents. What They Really Reveal about the Nature of Syntactic Structure. *Language Under Discussion.*

Richard Hudson[a]

[a] University College London, r.hudson@ucl.ac.uk.

Paper received: 21 November 2018
DOI: 10.31885/lud.5.1.224 *Published online: 13 December 2018*

Abstract. I argue that the crucial criterion for evaluating analyses is psychological plausibility, and not parsimony, so the number of nodes isn't important—and indeed, one version of dependency analysis recognises as many nodes as some phrase-structure analyses do. But in terms of plausibility, dependency grammar is preferable to phrase structure because the latter denies that the human mind is capable of recognising direct links (dependencies) between words.

Keywords: syntax, dependency structure, phrase structure, psychological plausibility, node counting

Tim Osborne's paper, "Tests for Constituents" (Osborne 2018), raises a really important issue: how should we evaluate syntactic theories (or, more generally, theories of language structure)? For him the question concerns the choice between theories based on dependency and phrase structure, but of course it goes well beyond that.

The answer depends on what kind of science you think linguistics is: is it like astronomy or psychology? If it's like astronomy, then our data are all observational so we're looking for a parsimonious theory which uses the fewest possible assumptions to explain the observed data. But if psychology is our model, our data come from a lot of different sources—observation, experimentation, introspection and everyday experience—and what we're trying to model is the 'theory' that an ordinary person builds to explain their experience of language, and also to guide their own use of the language. In that case, the challenge is to find a theory which meshes as cleanly as possible with everything we know about how human minds work, and parsimony is only as important for linguists as it is for ordinary human beings.

Language Under Discussion, Vol. 5, Issue 1 (April 2018), pp. 42–44
Published by the Language Under Discussion Society

So is language an external phenomenon, like the universe of astronomy, or is it an internal one, like the mental processes of psychology? The answer isn't self-evident, and each option has been espoused by some linguists; for instance, Katz argued that language is a Platonic 'abstract object', and not a mental object (Katz 1981). This position may seem extreme, but a great deal of our theoretical discussion is uncomfortably close to it in practice; and in particular, the argument from parsimony. An abstract object is 'out there', like the universe, so if that's what language is, parsimony is relevant. In contrast, cognitive linguistics assumes the opposite extreme, that language is mental and any theory must be a mental theory, fully compatible with everything we know about the mind. In this approach, parsimony plays a minor role. In the words of Jim McCawley,

> I regard the phenomena … as being primarily mental in nature. … the popular idea that grammars must be nonredundant is quite implausible when viewed from the perspective of a scenario for language acquisition in which children extend the coverage of their internalized grammars by making minimal alterations in them. Under such a conception of language acquisition, a child might learn several highly specific rules before he hit on an insight that enabled him to learn a general rule that rendered them superfluous, but learning the general rule would not cause him to purge the now-redundant special rules from his mental grammar. (McCawley 1988: 9–10)

For Osborne, among the potential criteria for distinguishing dependency from phrase structure (including, of course, accuracy as shown by standard tests) "the word-to-node ratio, is the most principled."(page 6). I admit to having made similar claims in the past (Hudson 2016), but given my aims of modeling mental reality, I was surely wrong. The word-to-node ratio is only 'principled' if it is based in some way on the mental reality being modeled, but I no longer believe this is in fact the case. It could be objected that Osborne is talking about sentence structures whereas McCawley's principle concerns rules in the grammar, but the two are so intimately connected that they are inseparable. In short, I no longer believe that dependency necessarily gives more parsimonious structures or grammars than phrase structure, because my own grammars are based on dependency but require a separate node for a word for every dependent it has (Hudson 2018). But neither do I believe that this matters when choosing between dependency and phrase structure.

What does matter is psychological plausibility, and here, it seems to me, dependency structure is obviously superior to phrase structure. Dependencies are relations between individual words, which phrase structure declares impossible. At least in Chomsky's definition of phrase structure, the nearest relation that is possible between two words is the part-whole relation between them and a shared mother. Admittedly, some versions of phrase structure recognise additional relations such as government, binding and control, but these are additional and not part of phrase structure as such. So in a simple example such as Osborne's *drink tea*, the important question is not about the nodes but about the relations: is there a direct link between *drink* and *tea*? According to dependency theory, there is, but phrase-structure theory denies it. Without dependencies, the words are related only indirectly, via the phrase *drink tea*.

So, in my opinion, the main issue that distinguishes the two approaches is whether the human mind is capable of recognising a relation between the two words. Put in that way, the answer is surely obvious, and if evidence is needed, we turn to cognitive psychology. For

example, consider the mass of evidence from priming experiments which show that words do in fact activate one another directly; so hearing *doctor* primes *nurse* so that we retrieve the word more quickly than after hearing an unrelated word such as *lorry*. Or consider social networks, where we have no difficulty in recognising direct relations between individuals without invoking some kind of 'phrase' node to bind them together.

In short, psychology favours dependency grammar. But interestingly, the roots of phrase structure also lie in psychology: the theoretical writings of the German psychologist Wilhelm Wundt, much admired by Leonard Bloomfield. Wundt's focus was the structure of thought, in which he was heavily influenced by the logical tradition dating back to Aristotle whose fundamental units were propositions with a two-part structure of subject and predicate. Wundt's main example of a sentence analysis involves the sentence in (1) whose English translation is in (2) (from (Wundt 1900: 318–319) quoted in (Percival 1976)).

(1) Ein edlich denkender Mensch verschmäht die Täuschung.
(2) A sincerely thinking person scorns (the) deception.

Wundt's top-down analysis recognised no relations other than the part-whole relation of the subject and predicate to the proposition, so it was propositions all the way down—including the noun phrases. So 'a sincerely thinking person' was represented in the analysis as 'a person thinks sincerely', and 'thinks sincerely' was then divided into 'thought' and 'is sincere'. The analysis scored high on parsimony: just one structure applied recursively. But few, whether in linguistics or in psychology, would defend it nowadays even as an analysis of the sentence's meaning, let alone of its syntax.

My main point of disagreement with Osborne is therefore over the significance of node-counting. I have argued that node-counting is much less telling than psychological plausibility, and in particular the psychological question of whether the part-whole relation is the only one that the human mind can grasp. That is the big question, and once asked it is very easy to answer; so my test actually leads to the same conclusions as Osborne's: word-word dependencies are real.

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