THE COGNITIVE COMPLEXITY OF PUNCTUATION

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Abstract – A long-standing scientific debate has focused on the prosodic versus grammatical function of punctuation marks. In this paper, I claim that such an approach is by itself insufficient to explain the complexities of punctuation: no matter how hard we try to systematically connect punctuation with intonation, pauses and syntactic boundaries, exceptions will always turn out in usage that force us to find specific explanations in specific contexts. As an alternative, the paper explores the hypothesis that punctuation is a complex system of signs which contribute to the economy of text interpretability, indicating points in the text where cognitive processes may operate to construct a pattern which enables its interpretation in an efficient, efficacious and appropriate manner.

Keywords: punctuation; cognition; text; grammar; iconicity.

1. Historical background: a brief overview

In the *Preface* to his *Making a Point*, David Crystal writes:

> There are two extreme views about punctuation. The first is that you dont actually need it because its perfectly possible to write down what you want to say without any punctuation marks or capital letters and people can still read it youdontevenneedspacebetweenwordsreally they dont exist when we speak to each other after all and yet we none the less understand what people are saying. The second is that it's essential because it aids legibility. It's much easier to read if there's punctuation. Also, the marks show us how to read aloud in a way that reflects the pauses, rhythm, and melody that we use in speech. They help us see the grammar of complex sentences. And they help us sort out ambiguities – otherwise, nobody would ever have got the joke in *Eats, Shoots & Leaves*. (Crystal 2015, p. IX)

The paragraph iconically reproduces the long-standing debate on the functions of punctuation. With individual opinions ranging between the two extremes, the scientific debate mainly focuses on the prosodic versus grammatical function of punctuation.

Notoriously, the debate has a long-standing tradition, dating back to the beginning of the writing systems themselves and, as far as most of the modern punctuation marks are concerned, to the advent of printing (cf. Buzzoni 2008; Crystal 2015; Mortara Garavelli 2008; Parkes 1992). Briefly, punctuation is traditionally assumed to have developed as a guide to oratory

and eloquence: punctuation marks were used to help readers to orally deliver their speeches in a rhetorically effective manner (therefore marking pauses, breath-taking points, intonation, rhythm); after the advent of printing, and with the spread of literacy and of silent reading, the rhetorical function gradually lost its primacy and came to coexist with a grammatical function whereby readers were helped to make sense of the text structure.

Nowadays, the prevailing view is that punctuation may have both a prosodic and a grammatical function, with prosody indicating pauses that come at the end of some intonational contours and therefore marking off prosodic units and, ultimately, rhythm. The two functions do not necessarily need to be mutually exclusive or in contradiction with each other: physiology actually reveals that speech organs are stimulated during readings (the so-called "inner ear" of writers and readers; cf. also Moro 2015). But it is undeniable that the needs of the ear are different from the needs of the eye, and conflicting patterns of interpretation may arise when the writer is using punctuation marks with oral speech in his/her mind and the reader interprets them with reference to the grammatical articulation of the written text.

A quick look at a few quotations from texts and handbooks prove that the debate is still underway. In their *A Comprehensive Grammar of the English Language,* Quirk *et al*. (1985) claim that

> punctuation practice is governed primarily by grammatical considerations and is related to grammatical distinctions. Sometimes it is linked to intonation, stress, rhythm, pause, or any other of the prosodic features which convey distinctions in speech, but the link is neither simple nor systematic, and traditional attempts to relate punctuation directly to (in particular) pauses are misguided. (Quirk et al. 1985, p. 1610)

On the other hand, Chafe (1988) acknowledges that punctuation may serve different ends, but insists that the prosodic approach is the one to be preferred

> At this point some readers may object that the signaling of prosody is only one of the functions of punctuation, and perhaps not the primary one. Although that is a common belief, and although certainly there are instances of punctuation that do not serve prosodic ends, I will defend the position here that those instances are departures from its main function, which is to tell us something about a writer's intentions with regard to prosody of that inner voice. (Chafe 1988, p. 397)

Nunberg (1990) rejects the general opinion that punctuation is only a device for reflecting intonation, and claims that after the divergence of written and spoken languages, punctuation has become a linguistic system on its own right (cf. also Nunberg *et al.* 2001).

Many contributions from corpus analysts and computational linguists have further striven to find regularities in the grammatical parsing functions

of punctuation (Bayraktar *et al.* 1998; Garat 2006; Jones 1994, 1996) and the relationship between tonicity, tonality and grammatical units has been further explored in studies on the guide functions of punctuation (Halliday 2005; Patt 2013).

I would like to argue that such approaches, although detailed and articulated, are by themselves insufficient to explain the complexities of punctuation: no matter how hard we try to systematically connect punctuation with intonation, pauses and syntactic boundaries, exceptions will always turn out in usage that force us to find specific explanations in specific contexts. A systematic account of the contemporary usage of punctuation seems to call for new dimensions of analysis. In this paper, I would like to put forward the hypothesis that from a cognitive point of view, punctuation marks points in the text where the mind can operate to build a pattern which enables the interpretation of the text in an efficient, efficacious and contextually appropriate manner (cf. Bertuccelli Papi 2017).

2. Conventional and unconventional punctuation

Let me first consider the first part of my thesis. There are conventional and unconventional patterns of punctuation usage. Here are some examples.

Grammars prescribe that full stops mark the end of sentences, but in (1) they unconventionally mark off a constituent (a prepositional phrase) and in (2) they isolate nouns:

(1)   You are no doubt working extremely hard. At avoiding the things you dislike and doing the things you do best. (*Oxford English Grammar*, p. 512)

(2)   But there is also punishment and self-imposed pain here – guilt, perhaps, at taking the role of breadwinner away from the father. Anxiety. Solitude. Defilement. Despair. Blacking. All these things come together, and we are left with the image of a young boy writhing in agony on the rat-infested floor. (*Oxford English Grammar*, p. 512)

Present-day grammars warn against the use of commas between subject and verb or verb and its object (they condemn the usage as yob's comma), but this is a time-bound convention, since in the XVII century placing a comma in those positions was recommended for reasons of clarity. In his *An Essay on Punctuation* (1785), Joseph Robertson gave the following examples:

(3)   The good taste of the present age, has not allowed us to neglect the cultivation of the English language. (p. 73)

(4)   Whoever is capable of forgetting a benefit, is an enemy to society (p.74).

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Grammars say that commas are normally used to separate words and word groups in a simple series of three or more items as in

> (5)   They own a car, a motorbike, two bikes, and a scooter (Oxford comma before "and" in the list)

but it is not infrequent to find use of coordination with no commas:

> (6)   And then I couldn't see the walls anymore and the back of someone's jacket touched my knee and I felt sick and I started groaning really loudly and the lady on the bench stood up and no one else sat down. And I felt like I felt like when I had a flu and I had to stay in bed all day and all of me hurt and I couldn't walk or eat or go to sleep or do maths. (Haddon 2003, p. 216)

As Nunberg (1990, p. 13) argued, all other things being equal, changes in punctuation marks may trigger different inferences and meanings in the text:

> (7)   a. Order your furniture on Monday, take it home on Tuesday. (conditional reading: if you… you can …)
>
> b. Order your furniture on Monday; take it home on Tuesday. (sequence of two orders)
>
> (8)   a. He reported the decision: we were forbidden to speak with the chairman directly.
>
> (second sentence is the content of the "decision")
>
> b. He reported the decision; we were forbidden to speak with the chairman directly.
>
> (second sentence explains why someone else reported the decision)
>
> c. He reported the decision – we were forbidden to speak with the chairman directly.
>
> (both 8a and 8b).

Intuitively, there is a clear distinction between (7a)-(8a) on one side and (7b)-(8b) on the other side. While commas and colons integrate material to complete one (simple or complex) proposition, semicolons and full stops mark the boundaries between two pragmatically independent propositions, leaving to the reader the burden to flesh out or saturate logical forms that might be incomplete with as many inferences as necessary up to the highest levels of illocutions and attitudes.

This is evident in the sentences below, where the likelihood of George writing the article diminishes, and the ironic tone increases, as punctuation marks become stronger:

(9)   a. George promised to write the article when he had the time.

b. George promised to write the article, when he had the time.

c. George promised to write the article. When he had the time.

d. George promised to write the article…. when he had the time.

Again, intuition suggests that the "pragmatic space" left empty by full stops and ellipses is larger than the one left by commas. Whereas in (9a) and (9b) the time clause is governed by the verb "promise", in (9c) and (9d) the full stop and the ellipses mark two independent communicative units, each with its own implicit illocutionary force, and consequently the empty space can be filled with inferences that may take various forms. In particular, the pragmatic segmentation produced by the full stops and ellipses triggers a higher order ironic attitude of skepticism founded on an echo of words that are typically used in contexts when one does not want to really commit himself to keep a promise (cf. Wilson and Sperber 2012, Yus 2016).

Punctuation marks determine different syntactic segmentations of the sentence/text and consequently generate different meanings. It is often the case that our knowledge of the world helps us to make sense of wrong or missing punctuation by mentally correcting and converting it to the conventional paradigm. The title of Lynne Truss's publication, *Eats, Shoots & Leaves*, is only an amusing example of the dramatic consequences that may follow from the wrong use of punctuation marks:

(10)   A panda walks into a cafe. He orders a sandwich, eats it, then draws a gun and fires two shots in the air.

"Why?" asks the confused waiter, as the panda makes towards the exit. The panda produces a badly punctuated wildlife annual and tosses it over his shoulder.

"I'm a panda," he says, at the door. "Look it up."

The waiter turns to the relevant entry and, sure enough, finds an explanation.

Panda. Large black-and-white bear-like mammal, native to China. Eats, shoots and leaves. (Truss 2003, p. 3)

The comma is clearly misplaced: what is meant is "Eats shoots and leaves."

Exclamation and question marks may replace verbal speech acts and attitudes. Plenty of examples could be drawn from blogs and e-mails that testify to the existence of conventional functions. Here is an example from a children's book:

(11) Pooh said something so clever that Christopher Robin could only look at him with mouth open and eye staring, wondering if this was really the Bear of Very Little Brain whom he had known and loved so long.

"We might go in your umbrella," said Pooh.

"?" (=WHAT DO YOU MEAN?)

"We might go in your umbrella," said Pooh.

"??" (= I STILL DO NOT UNDERSTAND)

"We might go in your umbrella," said Pooh.
"!!!!!!!" (=OH, I SEE)
For suddenly Christopher Robin saw that they might." (Milne 2004, p. 9)

The interpretations suggested in capital letters show that a basic prototypical cluster of conventional emotional meanings must be attached to these marks, leaving to the context the task of identifying their real pragmatic value.

The next point in my argument is: if punctuation marks signal points in the text where cognitive processes may operate to construct a pattern which allows its pragmatic interpretation in an efficient, efficacious and appropriate manner, what happens when we have no punctuation at all?

Here are some examples: a literary text (12), a student's e-mail in Italian (personal communication) which may easily translate into English (13) and a technical report (14):

(12) I was a Flower of the mountain yes when I put the rose in my hair like the Andalusian girls used or shall I wear a red yes and how he kissed me under the Moorish wall and I thought well as well him as another and then I asked him with my eyes to ask again yes and then he asked me would I yes to say yes my mountain flower and first I put my arms around him yes and drew him down to me so he could feel my breasts all perfume yes and his heart was going like mad and yes I said yes I will Yes. (Joyce, 1997, Ulysses, p.107)

(13) Salve professore io ho svolto l'esame di inglese giuridico a settembre 2015 e ottenni l'idoneità tuttavia a causa di impedimenti di tipo lavorativo non ho mai potuto venire a ricevimento per convalidare il voto sul libretto cartaceo purtroppo solo adesso mi accorgo che non è stato convalidato neanche sul libretto elettronico mi chiedevo se fosse necessario recarsi a ricevimento per ottenere questa convalida l'email con il risultato la ho sempre ma sul vecchio indirizzo di posta elettronica (…) [*Hello professor I sat the exam of Legal English in September 2015 and I passed it however because of work engagements I have never been able to come see you in your office to have the mark added to my university record book unfortunately I have just realized that it hasn't been added to my online transcripts either I was wondering whether I should come see you to have this mark recorded I still have the email message with the results but it was sent to my old email address* (…) – personal communication]

(14) This initial workshop identified the work scopes and phasing generated several different sourcing strategies for those work scopes and proposed selection criteria to compare the sourcing strategies to best benefit the [project]. (online text[1])

No doubt the reasons for omitting punctuation in Joyce's text are different from those of the student and of the technician. The effects are also different. In Joyce's text the so-called *stream of consciousness* effect, the reproduction of the flow of thoughts can be invoked; we have seen that in Haddon's text above (example 6) the lack of punctuation was rhetorically meant to reproduce the anxiety of the young autistic protagonist who finds himself alone in an unknown train station; the student may have had in mind the intention of not bothering the Professor and going to the nitty gritty of the message – which is often the case with social media and e-communication, but as to the technical report, we can safely assume that it is not inspired by either the stream of consciousness philosophy or by the spur of anxiety. Moreover, while in the e-mail sentences are unambiguously connected by the discourse markers that make them cohere, in the technical report the lack of punctuation creates garden-path effects that make comprehension more difficult.

Dawkins (1995) claims that there is a conventional hierarchy of punctuation ranging from the strongest (full stops, question marks and exclamation marks), through the medium (semicolon, colon, dash), to the weakest (commas and zero punctuation), and suggests that going up and down the scale creates stronger or weaker connections between elements of the text. In his view, if we want to mark close connection between elements, we will choose no punctuation – if appropriate – or punctuation that provides minimum separation, like commas. If, on the other hand, we want to indicate separation, we will choose punctuation that provides the maximum separation. It seems to me that connectedness is not what the reader will appreciate most in the student's e-mail and in the technical report above, and even in the literary text the notion of connectedness definitely underestimates the communicative import of the omission of punctuation. I agree with Dawkins, however, that sometimes there is a way of punctuating which follows "principles" rather than "rules" in order to reproduce intended meanings and intended emphasis.

From a cognitive point of view, this raises the question of the nature of such principles. My proposal (cf. Bertuccelli Papi 2017) is that these principles can be referred to *naturalness* and *markedness* as global semiotic

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[1] Example retrieved from https://cybertext.wordpress.com/2012/11/22/a-light-hearted-look-at-how-punctuation-can-change-meaning/ (last accessed October 2022).

parameters upon which the notion of cognitive economy hinges. A crucial constraint on all cognitive operations, the biological principle of economy is based on assessment of the complexity of the task in terms of attention and information processing, time resources, and cognitive efforts, and is constantly at work to guarantee the efficiency of any communicative system. The underlying assumption of my hypothesis is that the naturalness of punctuation is directly proportional to the economy of text comprehension: the more natural the punctuation choices, the more economical the processing of the text.

Naturalness and *markedness*, in turn, are here understood as follows (for individual approaches cf. Battistella 1990; Dressler 1989; Haimann 1985, 1995; Willems, de Cuypere 2008): "natural" is what makes a pattern cognitively more accessible, fosters functional efficiency, makes information processing easier and consequently makes text interpretation more economical, whereas "marked" is what makes a pattern cognitively less accessible, exhibits lower functional efficiency, makes information processing more difficult and engages more cognitive resources, thus making text comprehension less economical (cf. Givón 1989):

+economical	--	-economical
+natural	--	-natural
-marked	--	+marked

Table 1
Naturalness vs. markedness.

As stated above, my guiding hypothesis is that, from a cognitive point of view, punctuation marks contribute to the economy of text/discourse interpretation by indicating points in the text where cognition may operate to construct a pattern which makes the text easier to process. In order to be able to provide a comprehensive framework for the analysis of punctuation, the hypothesis needs to be further articulated in terms of a set of parameters to which we may assume the notions of markedness and naturalness are related.

The notion of pattern I am using here, for instance, invokes the semiotic notion of iconic diagrammaticity (cf. Haimann 1980, 1985; Langendonck 2010; Nöth 2008). A subtype of iconicity, this notion has been widely employed in several different contexts. Here, reference is made to Peirce's classification of signs into icons, indices, and symbols (cf. Hartshorne, Weiss 1931-1935) and to the subdivision of icons into images, diagrams, and metaphors.

Sharing a relation that semioticians have variously identified as one of similarity/resemblance / parallelism/ projectability between *signans* and *signatum*, iconic signs can also be extended to cover analogies between *signantes* at different levels of language organization.

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Functional Theories of Naturalness as developed in phonology and morphology make use of a notion of iconicity which is best understood as *diagrammaticity* or *isomorphism* – a stucture/function mapping according to which the nodes of the codified function are mirrored, in a 1-1 correspondence, by the nodes of the codifying function. Nöth (2008) has remarked that the notion of diagrammatic iconicity is particularly important as a precondition for mutual understanding:

> Diagrams in language are both cognitively necessary and rhetorically efficient since icons are superior to other signs when clearness of representation and coherence of argumentation is concerned. (Nöth 2008, p. 73)

The point that I would like to make is that punctuation choices may be more or less diagrammatic in so far as they enable the construction of a pattern that exhibits functional correspondence nodes.

Punctuation is a segmentation pattern of the physical space which can be mapped diagrammatically onto a conceptual space. The conceptual space is organized phonologically, syntactically, semantically, and pragmatically. Each of these levels may represent a possible pattern that punctuation brings to the fore, isolating it from the others and selectively shifting the reader's attention to it.

Here are some examples of how punctuation may be diagrammatic with reference to each level.

- Phonologico-prosodic: punctuation is diagrammatic if it reproduces rhythm, pauses and intonation. This may happen if the text is a transcript of an oral discourse, if it is mimetic of a spoken utterance, or if it includes instructions for aloud reading. In the following example, ellipses are diagrammatic because they mark the pauses of inarticulate thought:

(15) Mouth:.... out... into this world... this world... tiny little thing... before its time... in a godfor–... what?.. girl?.. yes... tiny little girl... into this... out into this... before her time... (Beckett 1973, p. 1)

- Semantic: punctuation is diagrammatic if it mirrors the conceptual structure of a sentence propositional content. Below, the comma mirrors the meaning of the verb "to pause":

(16) He paused for a moment, and then began to speak.

Commas slow down the rhythm of reading, thus mirroring the slow rhythm of walking in:

(17)   She walked with long, slow, steady, and deliberate strides. (*Using English for Academic Purposes*[2])

Finally, in example (18) full stops block the smoothness of syntax, breaking the sentences into small, rigid units, thus mirroring the rigidity of the members:

(18)   Then all of a sudden I went rigid. ….I couldn't move. I couldn't even speak. I tried to call out to my boy for help but I couldn't. Rigor mortis. Paralysis. My entire body had turned to stone. (Dahl 1980, p.13)

- Syntactic: punctuation is diagrammatic if it marks the syntactic structure of a sentence in terms of its hierarchical organization and of its linear distribution. Syntactic diagrammaticity marks the syntactic boundaries of the sentence and of the text (for a textual approach to Italian punctuation cf. Ferrari 2003; Ferrari, Lala 2013; Ferrari *et al.* 2008, 2017; Lala 2012). Therefore, if we signal the end of an independent sentence by means of a full stop or a colon, our punctuation pattern is highly diagrammatic, but if we mark it by a comma or a semicolon it is less diagrammatic:

(19)   a. He missed the train. He arrived late.
        b. He missed the train; he arrived late.
        c. He missed the train, he arrived late.
        d. He missed the train: he arrived late.

Variations of syntactic punctuation brings about different semantic and pragmatic interpretations: "late" in (20a) implies "at the station" whereas in (20d) it implies "at the meeting".

- The use of a punctuation sign is pragmatically diagrammatic if it marks the attitude or the illocution conventionally associated with it. Exclamation marks, for instance, prototypically mirror the writer's emotions:

(20)   It's a boy, it's a boy! (Parsons 1999, p. 1)

Individual marks may be pragmatically diagrammatic in specific contexts. It has been noticed, for example, that "In most written language, the full stop is a neutral way to mark a pause or complete a thought; but digital communications are turning it into something more aggressive" (Crair 2013):

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[2] http://www.uefap.net/grammar/grammar-in-eap-punctuation (last accessed October 2022).

(21) "Say you find yourself limping to the finish of a wearing workday. You text your girlfriend: "I know we made a reservation for your bday tonight but wouldn't it be more romantic if we ate in instead?" If she replies,

we could do that

Then you can ring up Papa John's and order something special. But if she replies,

we could do that.

Then you should probably drink a cup of coffee: You're either going out or you're eating Papa John's alone" (Crair 2013).

The punctuation mark would be perceived here as expressing a speech act of threatening.

3. Conclusions

These few remarks are meant to draw attention to the complexity, dynamicity, and flexibility of the contemporary system of English punctuation, while at the same time trying to open up new directions of research that might lead to the discovery of a higher order systematicity beyond apparent irregularities. In my mind, future research in the direction briefly outlined here will need to take into account at least the following points.

Within each pattern, the distribution of punctuation marks may be more or less natural, more or less marked, depending on choices along a set of contextual parameters that need to be further specified. The parameter I have selected here for exemplifying the analysis of punctuation is Diagrammatic iconicity, but others could be found. Transparency, for instance, to be understood as a property of punctuation marks which concerns the quality and quantity of inferences they make necessary in order to interpret a text, would make for a good candidate. We could hypothesize that a mark is transparent if it enables direct access to a pattern: consequently, transparency correlates with naturalness and diagrammaticity. Its opposite is opacity or scarce transparency, which correlates with markedness and lack of diagrammaticity. A scale of naturalness might be tentatively put forward featuring at its positive extreme what is +iconic/diagrammatic, +transparent, and at its opposite end what is not natural, and therefore +marked, which would include iconic/ diagrammatic, and -transparent. Intermediate points along these scales are determined by pragmatic factors which occur in the communicative process to modify the abstract values assigned to some choices by the theory (in this respect the hypothesis presented here differs

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from Battistella 1996). These factors affect the efficiency, efficacy and appropriateness of some choices making them more or less optimal. These remarks call for further research on the relationship between the parameters and optimality (cf. Bertuccelli Papi 2017).

Naturalness and optimality are not mutually exclusive because they belong to different dimensions of text interpretability. Specifically, naturalness concerns the cognitive dimension of text interpretation, whereas optimality concerns the communicative dimension of texts in terms of regulative parameters (Beaugrande, Dressler 1981). Text efficacy, efficiency and appropriateness are bound to text types and context variables which make some patterns more salient than others. Therefore, punctuation choices that the theory would envisage as more or less marked in abstract cognitive terms can actually turn out to be optimal in a specific context and with reference to a specific text type. Thus, the lack of punctuation in Molly's monologue would be considered unnatural (i.e., marked) in purely theoretical terms because it makes syntactic and semantic processing more difficult, but it is optimal in terms of communicative efficacy, efficiency, and appropriateness once we assume that the intention of the author was to diagrammatically reproduce the flow of thought. Similarly, a comma after the subject as in

(22) Sylvia, is playing the piano

which the theory would predict as marked because syntactically non diagrammatic, would be optimal in communicative terms assuming the speaker is implying that Sylvia, not someone else, is playing the piano, and therefore an information structure pattern is to be constructed.

Furthermore, there are correlations among parameters and there are interactions between parameters and patterns. These interactions may be harmonic or in conflict: cf. Battistella (1990, p. 45): "No single diagnostic is a fully reliable indicator of marked/unmarked status for every opposition. We cannot count on all indicators pointing to the same conclusion", and Dressler (1989, p. 118): "Several parameters of markedness must be considered simultaneously, and they may be in conflict with one another". From a theoretical point of view, the complexity of the punctuation systems calls for finer investigation of such interrelatedness.

Finally, the theoretical framework for punctuation that I have put forward above has no direct bearing on the pedagogy of punctuation, even though the proposal is not neutral in this regard. In fact, it stands to reason that, from our perspective, "correctness" cannot be the only parameter for assessing the use of punctuation in students' writings. Instead, making students aware of the many variables that affect the use of punctuation and of the cognitive motivations underlying them, may help students to become aware of their

punctuation choices and of the consequences they have in text structuring and interpretation.

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