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Morphosyntactic Change in the Brain: Capitalizing on Language Variation in Italo-Romance

1. *The project*

The present project aims at laying the ground for a neurolinguistic investigation into language variation and change in Italy, bringing together data, methods and insights from four research fields: linguistic typology, neurolinguistics, historical linguistics, and Italian dialectology.

While some of these have interacted in linguistic research previously, the research I am planning is unprecedented, as neurolinguistic studies on the dialects of Italy are in their infancy: in what follows, I briefly illustrate why I think this research is promising and timely.

2. *Language diversity and cognition*

In recent years, linguistic typology has increasingly shifted away from the traditional search for language universals (e.g. Comrie 1981) to emphasize structural diversity as *the* fundamental property of language. Its importance for the study of human cognition is aptly synthesized in Evans and Levinson (2009:432):

> "Once linguistic diversity is accepted for what it is, it can be seen to offer a fundamental opportunity for cognitive science. It provides a natural laboratory of variation in a fundamental skill – 7,000 natural experiments in evolving communicative systems."

A line of research entitled 'neurotypology' has taken this challenge literally: in ground-breaking studies, Bornkessel-Schlesewsky et al. (2008) Bornkessel-Schlesewsky and Schlesewsky (2016) (and other papers by the same research group: e.g. Bickel et al. 2015, Bisang et al. 2015) showed that the cross-linguistic preference for accusative/nominative alignment (i.e., for (in)transitive subjects being treated alike and contrasted with direct objects) over ergative/absolutive (where intransitive subjects pattern with transitive direct objects, contrasting with transitive subjects) is cognitively grounded, as processing of sentences with ergative alignment is more costly. That project addresses languages as diverse as Hindi, Turkish, Chinese, and German, i.e. major standard languages, like virtually all neurolinguistic research to date. Just a handful of studies have focused on non-standard dialects (e.g. Dröge et al. 2015) and the few on Italian dialects investigate exclusively sound patterns (Grimaldi et al. 2016).

3. *Why Italy?*

Italo-Romance provides an ideal (and largely underresearched) testbed for linguistic typology, since its diversity is huge, thoroughly described and – for European standards – relatively well preserved. Take agreement phenomena. Among the dialects of Italy, some show subject-

agreement in gender on finite verbs, on infinitives, and even on other nouns in the clause, as exemplified with the dialect of Ripatransone in (1) (cf. Paciaroni and Loporcaro 2016):

(1) a. nəm ˈbɔtːs-u ˈriːð-u
'I(male) can't laugh'
nəm ˈbɔtːs-e ˈriːð-e
'I(female) can't laugh'

b. i ˈsɛnd-u ˈfredː-u
'I(male)'m (lit. 'feel') cold'
i ˈsɛnd-e ˈfredː-e
'I(female)'m (lit. 'feel') cold'

In Ripano, as in other Central-Southern dialects, the gender system is more complex than in Italian, in that it contrasts three genders, as exemplified for the dialect of Agnone in (2):

(2) a.

NEUTER
lə ˈkɛ̯æ̯ʃə
'the.N.SG cheese'

b.

MASCULINE
ru ˈfɔi̯lə
'the.M.SG gall'

c.

FEMININE
la faˈroi̯na
'the.F.SG flour'

That in (1)-(2) is richer material than offered by the (standard) languages of Europe, and time has come to exploit this richness.

4. *Neurolinguistics and agreement*

The neurotypology project (§2) employed the ERP (= event-related potential) experimental paradigm, whereby brain responses to linguistic stimuli are measured via electroencephalography (Friederici 1995). This experimental technique, affording high temporal resolution, provides insight into the online processing of language. Notably, ERP-studies have shed light on agreement phenomena. The procedure consists in presenting subjects with violations, measuring brain responses. In a study on Dutch, Hagoort and Brown (1999) found a P600 effect (= a positive peak at around 600 milliseconds after presentation) in subjects to whom Dutch clauses with the 'wrong' gender form of the definite article were presented (see Figure 1).

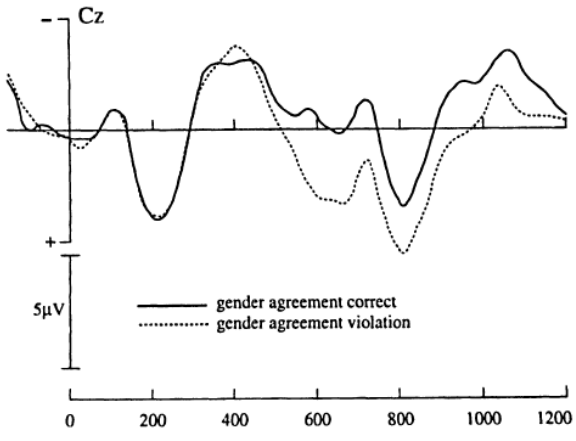

Figure 1. ERP waveforms at the central midline electrode (Cz) for the correct gender agreement and the gender agreement violations in sentence-medial position. The critical noun is presented at time zero. At 600 ms the next word appeared on the screen. Negativity is plotted upwards (Hagoort & Brown 1999:721)

5. *The neurolinguistic study of change in complex agreement systems*

This technique has been applied to Agnonese in the first neurolinguistic study on the morphosyntax of an Italian dialect by a team including neuroscientists from the IUSS (Pavia) and the SNS (Pisa), funded by the University of Zurich. First results are exposed in Bambini, Canal et al. (2017), from which Figure 2 is drawn, that compares brain responses by Agnonese speakers to correct clauses containing neuter nouns ((2a), blue line, at the bottom) with reactions to violations: interestingly, placing a feminine definite article ((2c)) before a neuter noun triggers a stronger P600 (red line, on top) than when the masculine article ((2b)) replaces the neuter (green line, in between). These results are interesting because they a) indicate morphosyntactic violations (thus disconfirming alternative hypotheses analyzing the neuter (2a) as a merely semantic subdivision of the masculine: [masculine, –count]); and b) point to a 'weakness' of the neuter/masculine contrast wrt. neuter/feminine (and also – not shown here – feminine/masculine). Since we independently know that the neuter has been beating a retreat for centuries (resulting in the binary system of Italian), this is possibly the FIRST NEUROLINGUISTIC MEASUREMENT of ongoing morphosyntactic change.

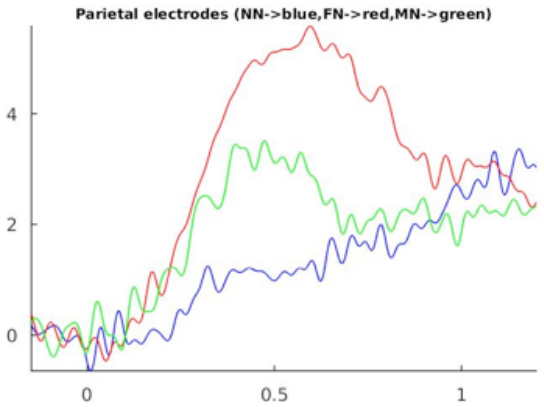

Figure 2. ERP waveforms (parietal electrodes) for Agnonese neuter nouns (Bambini, Canal et al. 2017).

As a further step, I am planning similar ERP-experiments on other dialects of Italy, capitalizing on the detailed inventory of gender systems and gender agreement in my forthcoming OUP monograph. Most of those systems – e.g. that of Ripano (cf. (1)) – are instable, and so one is liable to encounter more cases where ERP reveals the brain signature of on-going change in apparent time.

As illustrated in Loporcaro and Pescarini (2015) – a position paper at a conference I organized in order to launch the interdisciplinary research whose first fruits are seen in Figure 2 – the difficulty of the endeavor cannot be underestimated, as this planning requires not only careful inspection of dozens of lesser-known dialect systems, but also of the demographic/sociolinguistic data, in order not to waste time designing experiments on dialects that do not have enough native speakers as young as required for ERP studies. Since many dialects are not being passed on to younger generations, this research has to be carried out now, or never.

I am grateful to the Italian Academy, an institution hosting scholars interested in bringing together human and natural sciences (especially neuroscience), for providing the ideal setting to work on this project.

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