Parsing strategies in French Hebrew and Italian: Avoid Gaps or Avoid Nodes?

Previous psycholinguistic research provided evidence of structural parsing heuristics during language processing of temporary ambiguity, beyond frequency-based accounts (Staub et al., 2018). What happens when two independently motivated heuristics make opposite predictions about the continuation of a sentence? One such case would be the processing of a temporary ambiguity triggered by verbs like 'convince', that admit a transitive parse (1a), involving a Gap, and a ditransitive parse (1b), involving no gap but more syntactic nodes. Initially, an Avoid Node heuristic (Minimal Attachment; Frazier 1987) dictates a preference for the transitive parse, as, when the incoming DP 'the boy' is integrated, this parse involves fewer nodes. When the complementizer *that* is encountered after *the boy*, however, an ambiguity arises. One can stick to the transitive parse, in which the DP is the head of a relative clause (RC) introduced by *that*, but this option should be disfavoured by an Avoid Gap heuristic (Minimal Chain Principle; De Vincenzi, 1991). Alternatively, one can switch to the ditransitive parse, in which *that* is the head of a complement clause (CC), so no gap is postulated, but this option is disfavored by an Avoid nodes heuristic. Verbs in (1c-d) unambiguously select one of the two structures, thus not posing specific challenges to the parsing mechanism.

(1)	a. Mary convinced the boy that _ should leave	Amb – RC	[- nodes, +gap]
	b. Mary convinced the boy that he should leave	Amb – CC	[+nodes, -gap]
	c. Mary called the boy that _ should leave	Unamb – RC	[-nodes, +gap]
	d. Mary told the boy that he should leave	Unamb – CC	[+nodes, -gap]

Three experiments were conducted across 3 languages with 24 experimental items similar to (1), tested within participants in a Latin square design (+ fillers). These languages varied w.r.t. *dependency* and *timing*: French and Italian RCs involve a Gap, Hebrew has a resumptive pronoun (RP) instead; in Italian and Hebrew stimuli disambiguation happens late, early in French stimuli. In **French** (N=48) we used a G-maze task to test ambiguous (and unambiguous) sentences like (2) in which the critical point of disambiguation was the selection between *qui* (subjRC) or *qu'il* (CC). In **Hebrew** (N=60) and **Italian** (N=59) we used a self-paced reading task of ambiguous (objRC/CC) sentences like (3) and (4), respectively (disambiguation point is underlined).

Results. In **French**, participants performed as expected in the Unamb conditions, preferring *qui* in transitive (RC) and *qu'il* in ditransitives (CC); they evenly split in Amb (Figure 1). RTs (Figure 2) were significantly longer when selecting a +Gap continuation (t= 2.26, p=.024), suggesting that Avoid-Gap wins over Avoid-Nodes. However, *qui* opens a new dependency while *qu'il* resolves one already opened by the verb; furthermore, the point in which disambiguation occurs (early vs. late) might matter. Two possibilities arise and we addressed them with further experiments: (i) a gap is always avoided if an alternative parse is available; (ii) a gap is avoided only if its postulation requires opening a new dependency rather than closing it. Results in **Hebrew** (Figure 3, left) show no cost for RC with RPs over CC in Amb: **et** is significantly slower than **al** in the unambiguous condition (consistent with the complexity of obj-RCs), but not in the ambiguous condition (lmer on log(RT) in spillover: Cue*Cond: t=2.26, p=.023). Results in **Italian** (Figure 3, right) confirm a cost of RC over CC that emerges already at the point of disambiguation and continues up to +2 (lmer on log(RT) in Amb, in spillover: t=2.48, p=.013), strongly modulated by the verb.

Conclusions. Considering the type of dependency (gap, as in French and Italian vs. RP, as in Hebrew) and the timing of disambiguation (early, as in French vs. late, as in Hebrew and Italian), our conjoined results provide evidence for an Avoid Gap heuristic in language processing. Furthermore, resumptives seem to be exempted from it, with interesting theoretical implications. We are currently extending this research with a study on subject-RC in Hebrew (with no RPs) and a maze task in Italian, to further compare our crosslinguistic results across tasks.

(2) French

a. Marie a convaincu l'enfant **qui/qu'il** devait partir. Amb-RC
b. Marie a convaincu l'enfant **qui/qu'il** devait partir. Amb-CC
c. Marie a entrainé l'enfant **qui/qu'il** devait partir. Amb-RC
d. Marie a garanti l'enfant **qui/qu'il** devait partir. Amb-CC
Mary convinced/trained/guarantee-to the boy that (he) had to leave

(3) Hebrew

a. šixnati et ha-oved še-ha-menahel ca'ak al-av aval lo et ha-ovedet ha-axeret. Amb-RC
I convinced the worker$_M$ that the manager yelled at __ but not the other worker$_F$.
b. šixnati ha-oved še-ha-menahel ca'ak al-av aval lo **al** ha-ovedet ha-axeret Amb-CC
I convinced the worker$_M$ that the manager yelled at him but not at the other worker$_F$.
c. ra'iti et ha-oved še-ha-menahel ca'ak al-av aval lo **et** ha-ovedet ha-axeret. Unamb-RC
I saw-to the worker$_M$ that the manager yelled at __ but not at the other worker$_F$.
d. amarti l-a-oved še-ha-menahel ca'ak al-avaval lo **et** ha-ovedet ha-axeret. Unamb-RC
I said-to the worker$_M$ that the manager yelled at him but not at the other worker$_F$.

(4) Italian

a. Il mediatore convinse gli ostaggi che i rapitori dovevano rilasciare **stasera** prima di procedere. Amb-RC
b. Il mediatore convinse gli ostaggi che i rapitori dovevano rilasciare **garanzie** prima di procedere. Amb-CC
c. Il mediatore rassicurò gli ostaggi che i rapitori dovevano rilasciare **stasera** prima di procedere. Unamb-RC
d. Il mediatore assicurò agli ostaggi che i rapitori dovevano rilasciare **garanzie** prima di procedere. Unamb-CC
The mediator convinced/reassured/assured the hostages that the kidnappers will have to release tonight/guarantees before proceeding.

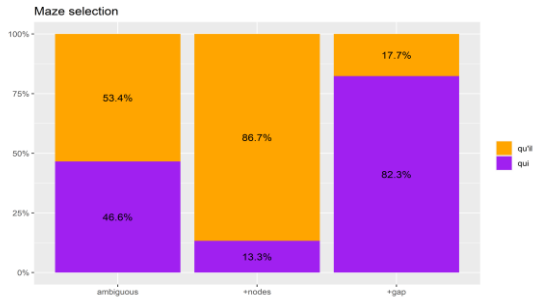

Figure 1. Maze selection of qui/qu'il in French.

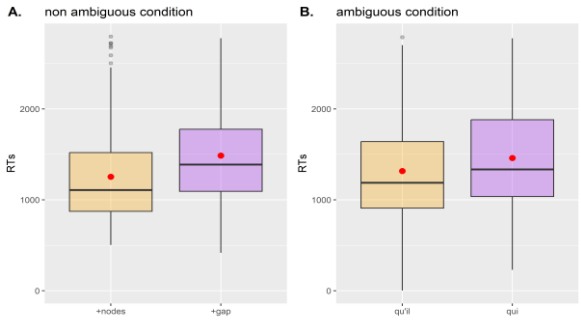

Figure 2. RTs in the G-maze task between qui/qu'il in French.

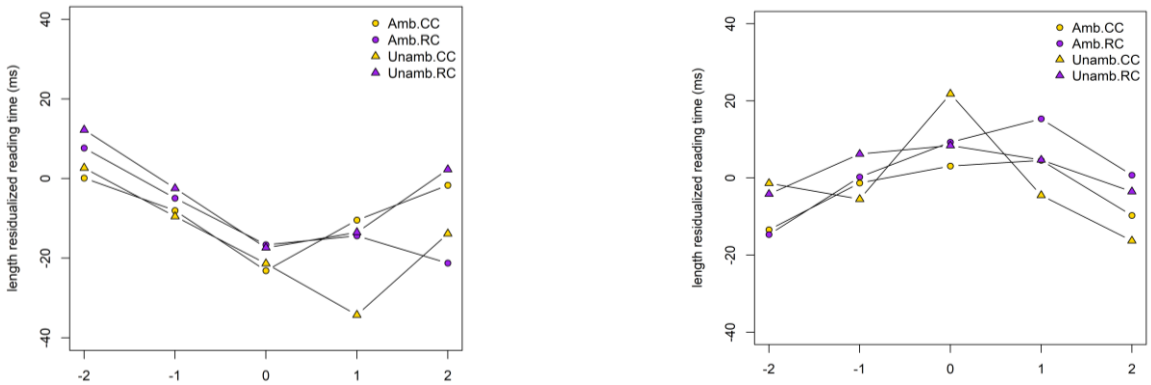

Figure 3. Residual RTs of Hebrew (left) and Italian (right) of the words preceding or following the disambiguating cue in the 4 experimental conditions: Amb and Unamb continuations resolved towards a RC or a CC.