Active antecedent search triggered by cataphors persists past the subject: evidence from Norwegian and English.

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Background Cataphors precede their antecedents and cannot be fully interpreted until the antecedent is encountered. During online sentence processing, comprehenders expect coreference between a cataphor and the upcoming main clause subject [1-2]. For example, Van Gompel & Liversedge [1] observed a slowdown when the main clause subject mismatched the gender of the preceding cataphor in sentences like *When [HE/SHE] arrived, the boy immediately...* Some researchers have argued that such Gender Mismatch Effects (GMME) reflect an active search for the antecedent [3].

Persistent Search Hypothesis Active antecedent search has been compared to active filler-gap processing [3,4], which has been shown to involve a persistent search for a gap site: after encountering a filled gap, the parser keeps positing the gap in upcoming positions as the sentence unfolds (e.g. [5]). If the same mechanism underlies active gap filling and cataphoric processing, it may be characterized as a more general parsing strategy for processing dependencies in which the interpretation of the first element depends on the last element.

Subject Prediction Hypothesis Alternatively, the observed antecedent GMMEs may reflect an expectation that is confined to subject position. A limitation of many previous cataphor studies is that they focused on GMMEs in subject position, which is structurally prominent and, as a canonical topic position, a likely and commonly occurring position for pronoun antecedents [6,7]. If the cataphoric MME reflects an expectation of coreference based on these specific (syntactic, information-structural, and distributional) characteristics of the subject position, the effect should not extend beyond the subject position.

Experiments In two SPR experiments in Norwegian (exp. 1) and English (exp. 2), we tested whether active cataphor- antecedent search occurs in object position if the subject does not provide a matching antecedent. In the test sentences (figs. 1&2) we manipulated the syntactic position of a proper name (main clause subject or object), and the gender match between the proper name and the preposed cataphor, resulting in a 2x2 (Position x Match) design. In the Object conditions, the main clause subject was always a plural DP, never providing a matching antecedent for the cataphor.

Analysis (resp. N=52, N=80). Using LMEMs (max. random effect structure whenever it allowed convergence), we analyzed log-transformed reading times of the NAME and spillover regions (exp.1: separate LMEMS for subject and object conditions, Match as fixed effect, exp. 2: LMEM with Match, Position, and their interaction as fixed effects).

Results (See figs. 3&4)

Exp.1: We observed a significant Mismatch slowdown in both the NAME region (t = 2.67) and spillover region (t = 2.74) in Subject position. In the Object conditions, we also observed a Mismatch slowdown, significant only in the spillover region (t = 2.18).

Exp.2: The LMEM revealed a significant main effect of Match for both the NAME region (t = 2.38) and spillover region (t = 4.12) and no significant interaction with Position, indicating that a GMME occurred regardless of syntactic position.

Conclusion In both experiments, we observed GMMEs regardless of syntactic position. These results are consistent with the Persistent Search Hypothesis: cataphor GMMEs may be characterized as active search that persists past the main clause subject, similar to filler-gap processing.

References [1] Van Gompel, R. P., & Liversedge, S. P. (2003). JEP: Learning, Memory, and Cogn., 29(1), 128. **[2]** Cowart, W., & Cairns, H. S. (1987). Memory & Cognition, 15(4), 318- 31. **[3]** Kazanina, N. et al. (2007). JML, 56(3), 384-409. **[4]** Yoshida, M. et al., (2014). Language, Cognition and Neuroscience, 29(7), 761-770. **[5]** Stowe, L.A. (1986). Language and cogn. processes, 1(3), 227-45. **[6]** Hobbs, J.R. (1978) Lingua, 44(4),m 311-38. **[7]** Crawley, R. A. et al., (1990). Journal of Psycholinguistic Research, 19 (4), 245-264.

Figure 1 Item set experiment 1

Subject-Match	Etter at	**han**	hadde	betalt,	hadde	Erlend	sendt	den ansatte	til magasinet	for å	hente	Livs pakke.
	After	he	had	paid,	had	NAME	sent	the.SG employee	to the_storage_room	for to	fetch.INF	Liv's package.
Subject-Mismatch		**hun**										
		she										

Object-Match	Etter at	**han**	hadde	betalt,	hadde	de nye	ansatte	sendt	Erlend	til magasinet	for å	hente	Livs pakke.
	After	he	had	paid,	had	the.PL new.PL	employees	sent	NAME	to the_storage_room	for to	fetch.INF	Liv's package.
Object-Mismatch		**hun**											
		she											

Figure 2 Item set experiment 2 (nr. of regions following spillover region 9 varies per item.)

Subject-M	While	**he**	was taking	the orders,	Jonathan	accidentally	annoyed	the waitress	by laughing at	her voice.	
Subject-MM		**she**									
Object-M	While	**he**	was taking	the orders,	a couple of	customers	annoyed	Jonathan	accidentally	by laughing at	her voice.
Object-MM		**she**									

Figure 3 Mean RTs for experiment 1 (NAME and spillover region in box)

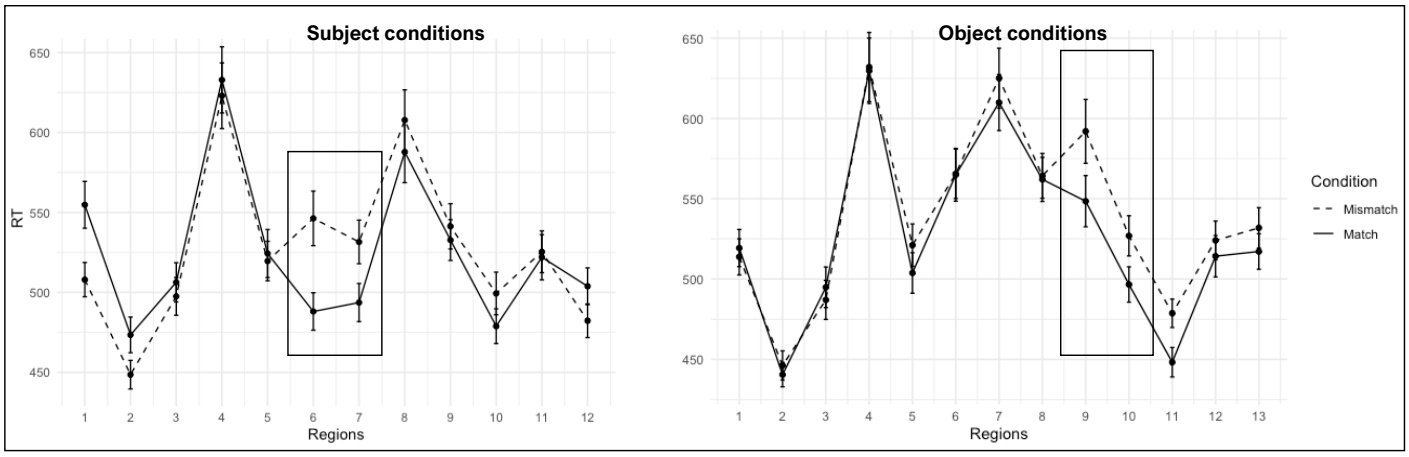

Figure 4 Mean RTs for experiment 2 (NAME and spillover region in box)