Timing of structural and non-structural information in processing of reflexives in the L2

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Background: Chomsky's Binding Theory, Principle A (BP-A) (1981) predicts for reflexives (e.g., *himself*) to be bound by a c-commanding local antecedent. This is mainly true for English, but Turkish reflexives *kendi* and *kendisi* (*(him/her)self*) do not abide by BP-A (e.g., Kornfilt, 2001). Native speakers were shown to be initially guided by BP-A (e.g., Nicol & Swinney, 1989) or by discourse-level information as well as syntax (e.g., Badecker & Straub, 2002). Sturt (2003) found that although initial stages of antecedent retrieval is informed by syntax, later stages can be affected by discourse. This study tested the role of syntactic constraints and discourse prominence/antecedent proximity in Turkish learners' processing of English reflexives.

Method: Two eye-tracking experiments (Expts 1&2) and one pen-and-paper antecedent identification task (Expt 3) were conducted. The materials were adapted from Sturt (2003). In Expts 1&2, there were 24 experimental items each consisting of three sentences: (i) a lead-in sentence with the inaccessible antecedent (a proper noun), making it discourse prominent, (ii) the critical sentence with the inaccessible antecedent, the reflexive and the accessible antecedent (a stereotypical male/female noun), (iii) a final wrap-up sentence. In Expt 1, the accessible antecedent was linearly closer to the reflexive and both antecedents c-commanded it. In Expt 2, the inaccessible antecedent was linearly closer to the reflexive, but it did not c-command it. Gender congruence between the antecedents and the reflexive was also manipulated, creating a match/mismatch between the reflexive and the (in)accessible antecedents. (See Table 1 for examples.) In Expt 3, the critical sentences were the same as those in Expts 1&2 but they were presented both with and without discourse context. The participants (95 in total, Turkish speakers) were advanced learners of English. 48 of them took part in Expt 1 and the other 47 participated in Expt 2. All took part in Expt 3. An additional antecedent identification task with monolingual Turkish speakers tested BP-A in Turkish.

Results: In Expts 1&2 six standard eye-tracking measures (first fixation, gaze (first pass, in spillover), regression path, re-reading and total duration measures and the probability of regression out) were entered into a mixed-effects linear or logistic regression model for the disambiguating region (the reflexive) and the spillover region (the two words following the reflexive). In Expt 1 the participants showed sensitivity to gender (mis)matches associated with the accessible antecedent in regression path duration at the spillover region, $t = 3.27$, $p < .01$. In Expt 2 they showed sensitivity to the accessible antecedent in regression path, rereading and total duration measures (t's > 1.96, p's < .05) and in the probability of regression out ($z = 2.05$, $p < .05$) at the disambiguating region and in regression path duration at the spillover region ($t = 2.05$, $p < .05$). There was no effect of the inaccessible, discourse prominent antecedent in either experiment. (See Table 2 for mean values and standard errors.) In Expt 3 participants chose the local and c-commanding antecedent (> 79%), but in contexts with a discourse prominent inaccessible antecedent, the accessible antecedent choices were reduced, $z = 5.14$, $p < .001$. The Turkish antecedent identification task confirmed the BP-A violation for Turkish reflexives.

Conclusion: The eye tracking experiments revealed that Turkish learners of English used structural information associated with BP-A in their antecedent retrieval behavior, but they showed evidence of integrating this information in later measures (e.g., regression path duration, re-reading duration) compared to the early measures (e.g., first fixation duration, first-pass reading time) reported for native speakers in Sturt (2003). Unlike the L2 speakers in Felser and Cunnings (2012), Turkish learners of English did not show an initial sensitivity to the non-structural cues (discourse prominence/linear proximity of antecedents) although they used discourse prominence in their final interpretations (reduced accessible antecedent preference). The results appear to be parallel to those reported in Sturt (2003) with the exception that the L2 learners were slower than native speakers in their integration of structural and non-structural information, which can be attributed to L2 learners' slower processing speed (Hopp, 2006).

References: **Badecker, W., & Straub, K. (2002).** *Journal of Experimental Psychology: Learning, Memory, and Cognition, 28*(4), 748-769. **Chomsky, N. (1981).** Dordrecht: Foris Publications. **Felser, C., & Cunnings, I. (2012).** *Applied Psycholinguistics*, *33*(03), 571-603. **Hopp, H. (2006).** *Second Language Research*, *22*(3), 369-397. **Kornfilt, J. (2001).** *Long-distance Reflexives, 33*, 197-226. **Nicol, J., & Swinney, D. (1989).** *Journal of Psycholinguistic Research, 18*(1), 5-19. **Sturt, P. (2003).** *Journal of Memory and Language*, *48*(3), 542-562.

Table 1: Examples of experimental items

Experiment 1	Experiment 2
Jonathan/Jennifer was pretty worried at the hospital. ***He/She*** remembered that ***the surgeon*** had pricked ***himself/herself*** with a used syringe needle. There should be an investigation soon.	***Jonathan/Jennifer*** was pretty worried at the hospital. ***The surgeon*** who treated ***Jonathan/Jennifer*** had pricked *himself/herself* with a used syringe needle. There should be an investigation soon.

Table 2: Mean values for four conditions with standard errors in parentheses for six standard eye-tracking measures in Experiment 1 & Experiment 2 (Expt: Experiment; DR: Disambiguating Region, SR: Spillover Region; Acc.: Accessible, InAcc.: Inaccessible; M: Match, MM: Mismatch)

		Expt 1		Expt 2	
		DR *Mean (SE)*	SR *Mean (SE)*	DR *Mean (SE)*	SR *Mean (SE)*
First Fixation Duration (ms.)	Acc.M-InAcc.M	259 (11)	252 (11.2)	255 (6.8)	268 (14.4)
	Acc.M-InAcc.MM	251 (6.1)	263 (12.5)	255 (6.3)	243 (9.8)
	Acc.MM-InAcc.M	250 (7.6)	254 (10.7)	254 (6)	285 (14)
	Acc.MM-InAcc.MM	256 (9)	288 (11)	261 (7)	245 (8.1)
Gaze /First Pass Duration (ms.)	Acc.M-InAcc.M	305 (12.8)	288 (20.4)	293 (9.2)	295 (16.5)
	Acc.M-InAcc.MM	301 (10.6)	291 (15.3)	297 (8.9)	269 (12)
	Acc.MM-InAcc.M	294 (10)	294 (17.7)	300 (9.3)	300 (14.5)
	Acc.MM-InAcc.MM	313 (12.4)	292 (13.2)	303 (9.1)	286 (13.8)
Regression Path Duration (ms.)	Acc.M-InAcc.M	427 (36.3)	345 (19)	386 (25.9)	487 (35.1)
	Acc.M-InAcc.MM	426 (29.3)	417 (36.1)	407 (22.5)	467 (25.7)
	Acc.MM-InAcc.M	394 (25.1)	439 (56.6)	493 (43.3)	511 (40.4)
	Acc.MM-InAcc.MM	445 (34.9)	490 (39.3)	416 (25)	543 (43.7)
Rereading Duration (ms.)	Acc.M-InAcc.M	238 (39)	124 (25.4)	255 (29.6)	137 (25.4)
	Acc.M-InAcc.MM	192 (23.5)	144 (30.2)	301 (32.8)	140 (25)
	Acc.MM-InAcc.M	238 (37.9)	154 (28)	361 (34.5)	179 (30)
	Acc.MM-InAcc.MM	296 (34)	130 (27.5)	289 (26.1)	170 (26.2)
Total Duration (ms.)	Acc.M-InAcc.M	417 (31)	213 (18.7)	433 (26.9)	227 (18)
	Acc.M-InAcc.MM	403 (22.1)	194 (18.8)	448 (27.6)	212 (17.7)
	Acc.MM-InAcc.M	423 (31.6)	212 (19)	508 (31.1)	245 (19.4)
	Acc.MM-InAcc.MM	456 (29.8)	215 (17.6)	509 (27.2)	241 (18.9)
Probability of Regression Out	Acc.M-InAcc.M	.18 (.03)	.16 (.39)	.14 (.02)	.18 (.03)
	Acc.M-InAcc.MM	.16 (.02)	.16 (.04)	.15 (.02)	.19 (.04)
	Acc.MM-InAcc.M	.15 (.02)	.16 (.04)	.18 (.03)	.15 (.03)
	Acc.MM-InAcc.MM	.14 (.27)	.24 (.05)	.16 (.03)	.25 (.04)