Prosody and eye movements on attachment in Brazilian Portuguese

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This research explores how prosodic cues, such as contrastive pitch accent and prosodic boundary, can influence the attachment of adverbial prepositional phrases in ambiguous Brazilian Portuguese (BP) sentences like (1).

(1) O colega do Paulo revelou que a Camila fumou <u>na varanda do sobrado.</u>
    (Paul's friend revealed that Camila smoked <u>on the house balcony.</u>)
 a. *high attachment meaning*: Paul's friend revealed something to him on the house balcony.
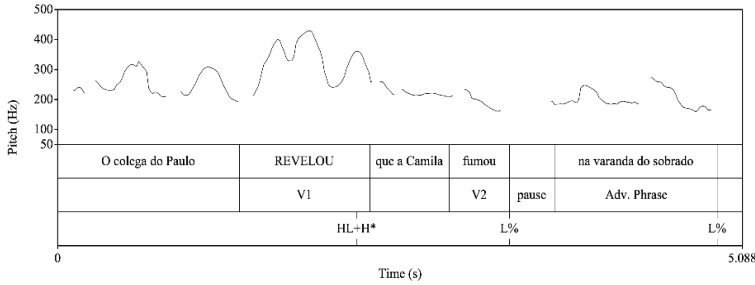 b. *low attachment meaning*: Camila smoked on the house balcony.

Both prosodic boundaries and pitch accents can affect attachment preferences in some syntactic structures. In English, Clifton *et al.* (2002) found that a prosodic boundary before the final adverbial phrase increased high attachments (HAs) to the first verb (e.g., *revealed*), while Carlson & Tyler (2018) showed that contrastive pitch accents (L+H*) on the first or second verb (e.g., *smoked*) drew attachment to the accented verb. For BP, Fonseca *et al.* (2019) found only 10% of HAs in a reading questionnaire, while in an auditory questionnaire there was evidence of the prosodic boundary effect on interpretation but not the accent effect. In the current study, the aim is to investigate if the accent on the first verb and the boundary before the adverbial phrase increase HA choices in a visual world paradigm experiment (Tanenhaus & Trueswell, 2006).
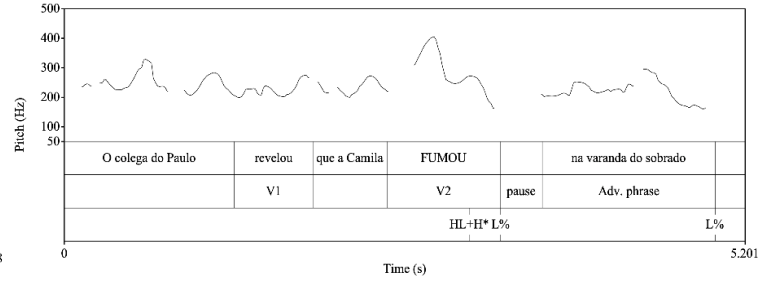
We crossed pitch accents on the first verb (*revealed*) vs. on the second verb (*smoked*) with a prosodic boundary (IP) before the adverbial phrase vs. none. The four conditions were named V1, V2, V1IP and V2IP. Pictures 1 and 2 show the pitch tracks of the two conditions with IP boundaries and accents. The accented verb has a HL+H* accent and it also has increased duration and intensity, mainly in the stressed syllable.

The experiment (N=28) was a spoken language comprehension task with the VWP which tested 24 sentences in four conditions. BP native speakers listened to the sentences while two pictures were being shown on the screen. One picture biased high attachment interpretation and the other one biased low attachment interpretation (see Pictures 3 and 4). After listening to the sentences and seeing the pictures, they had to answer a comprehension question like: *What happened on the balcony? a) Paul's friend revealed something there* or *b) Camila smoked there*. In V1 and V1IP conditions, we considered that the picture with high attachment bias was the target and the picture with low attachment bias was the control. In V2 and V2IP conditions, the picture with low attachment bias was the target and the picture with high attachment bias was the control.

We measured the participants' eye movements (total fixation duration/TFD and fixation count/FC) to both pictures on the screen, using an Eyelink 1000 eye tracker, while they were listening to the final part of the sentence (the ambiguous adverbial PP underlined in example 1). The means of TFD were higher to the target pictures than to the control pictures in all prosodic conditions (see Graph 1). In a linear regression model and a Tukey HSD post hoc test running in R Studio (R Core Team, 2020), we found out that participants looked more to the target pictures while they were listening to the final adverbial PP in all prosodic conditions. (β = 94.73, SE = 36.273, df = 1158.752, t = 2.612, CI [23.64~165.83], p = 0.009). We also analyzed the interpretation choices and we found out that V1IP and V1 had more high attachment choices than the other two conditions (see Graph 2) (V1IP x V2IP conditions β = -1.676, SE = 0.235, z = -7.138, CI [-2.161 ~ -1.218], p < 0.001). These results point out that listeners are sensitive to prosodic cues like contrastive accents and boundaries, and that they are able to use this prosodic information early in processing (Warren, 1996; Speer & Blodgett, 2006).

O colega do Paulo	REVELOU	que a Camila	fumou		na varanda do sobrado	
	V1		V2	pause	Adv. Phrase	
HL+H*			L%			L%

Picture 1: Example of Condition V1IP

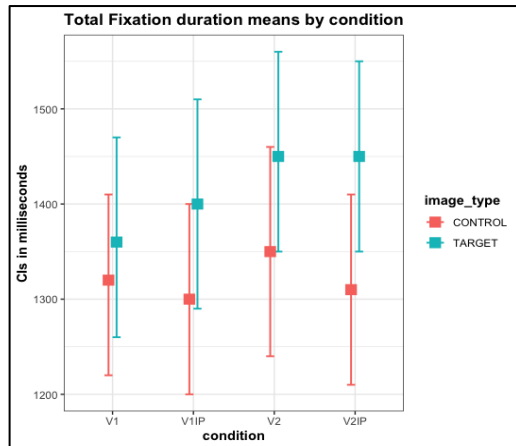| O colega do Paulo	revelou	que a Camila	FUMOU		na varanda do sobrado	
	V1		V2	pause	Adv. phrase	
			HL+H* L%			L%

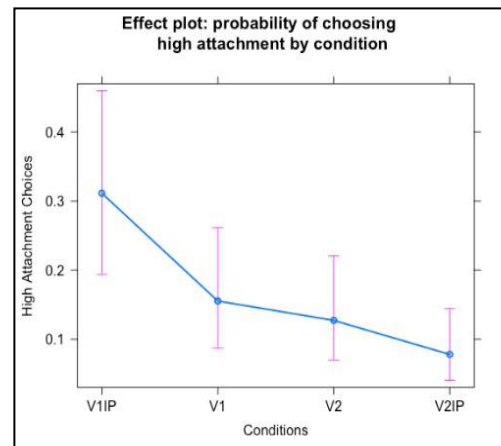Picture 2: Example of Condition V2IP

Picture 3: High Attachment Interpretation Bias

Picture 4: Low Attachment Interpretation Bias

Graph 1: TFD means

Graph 2: Effect plot of high attachment choices

References

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