Portuguese has two underlying rhotics: evidence from Lisbon and Carioca varieties

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Background: At the surface level, the Portuguese rhotics are only contrastive between vowels (e.g. ca[ɾ]o vs. ca[ʁ]o), being neutralized in other positions, e.g. in word-initial position, [ʁ]/* [ɾ] (Mateus et al. 2005). How the Portuguese rhotics are represented underlyingly is still a matter of debate. Some researchers propose that there is only one underlying rhotic, which is a tap "**weak-r**" (Monaretto 1997, Mateus & Andrade 2000), and the surface word-initial [ʁ] is is derived by a position-sensitive rule - strengthening at the left edge of a prosodic word (Vigário 2003). Apart from obeying the principle of representational economy, this account is supported by the evidence from loanword adaptations in European Portuguese (the equivalence between the English [ɹ] and the Portuguese [ʁ] and [ɾ]; Vigário 2021) and morphological alternation in Brazilian Portuguese, namely in the Carioca dialect (ma[x] ~ ma[ɾ]es; sea: sing. ~ pl.).

Bonet and Mascaró (1997), on the contrary, argued that there are two different rhotics in the Portuguese lexicon: **a weak-r** which always surfaces as a tap, and a **strong-R** that can be realised as a trill or a fricative (depending on dialectal and individual variation). The distinction between [ɾ] and [ʁ] is thus ascribed to the lexicon, instead of phonological computation. Data from L1 phonological acquisition is consistent with this analysis: both Portuguese (Amorim 2014) and Brazilian children (Miranda 1996) parse the **weak-r** as a sonorant, but the **strong-R** as an obstruent, implying the recognition of two different phonological categories.

In sum, the previous analyses differ with respect to whether the Portuguese word-initial fricative ([ʁ] in Lisbon variety and [ɦ] in Carioca variety) reflects faithfully its underlying form (Bonet and Mascaró 1997) or is derived by a rule (Monaretto 1997, Mateus & Andrade 2000). We deem that probing the underlying identity of the word-initial fricative would help choosing between competing analyses.

Current study: We designed a transformational language game, in which participants were asked to name objects represented in pictures and to add a stressed prefix [ˈpa] whenever an object was presented in black-and-white. This morphological alternation (cued by a black-and-white or a coloured picture) was meant to eliminate the left edge of a prosodic word (the domain of rule application) which the rhotic occupies by affixation, thus eliciting different outputs hinging on the underlying representation of the rhotic. For instance, for the naming of a black-and-white picture of a *rose* 'rosa', we expect different productions: pá[ʁ]osa for underlying **strong-R** or pá[ɾ]osa for underlying **weak-r**. At the beginning of the game, participants were familiarised with the task with 3 demonstration and 4 training items without any rhotic. In this phase, they were shown that changing from a coloured object to its black-and-white version would require adjunction of a stressed prefix [ˈpa] and that the original stressed syllable [ˈbɔlɐ] would become unstressed, [ˈpabulɐ], which would in turn induce vowel reduction. This change in the stress pattern of the word (with consequences to the vowel quality) was meant to ensure that the prefix was not in any way treated as a separate lexical unit.

In the testing phase, participants were asked to name 24 objects, presented **either** in colour or in black-and-white. The stimuli consist of 8 Portuguese disyllabic words with an initial rhotic (e.g. [ˈʁɔzɐ]), presented in black-and-white only, and 12 fillers, presented always in

colour. Inspired by Guimarães & Nevins (2013), we also included 4 control items with initial /s/ (e.g. [ˈsaku]), with the purpose of detecting potential orthographic influence (<saco>[ˈsaku] → <pasaco> [ˈpasɐku] or [ˈpazɐku]). Both [s] and [z] can occur in intervocalic position in Portuguese. But the grapheme <s> corresponds to [z] between vowels. Therefore, the realisation of an intervocalic [z] after adjunction would indicate an orthographic influence. Two versions of the game were created considering the lexical and phonological differences between Lisbon and Carioca varieties. 8 native speakers from Lisbon and 8 from Rio de Janeiro participated. We only considered for analysis those tokens with expected stress shift (to the prefix) and clear vowel reduction of the original stressed vowel.

Results & Discussion: The posterior fricative ([ʁ] for Lisbon and [ɦ] for Carioca variety) was consistently produced by 7 out of 8 Portuguese and all 8 Brazilian participants. Only one participant from Lisbon displayed variation between [ʁ] and [ɾ]. We believe that the alternation is due to orthographic influence, rather than underspecified representation.

Results of this study suggest that the fricative realisation of the Portuguese word-initial rhotic is not a result of rule application, in support of the view that Portuguese has two underlying rhotics (Bonet & Mascaró 1997).

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