Does SAE have /r/?
Evidence from Canadian Raising and vowel durations
Bethany Dickerson*

**Objective:** The experiments reported here use production data to investigate speakers’ phonemic representation of [r] in monomorphemic words (henceforth, ambiguous [r]), where there is no morphophonological evidence to suggest the underlying representation (e.g., *Fido, cider . . .*). We show using evidence from Canadian Raising that the phonemic representation of ambiguous [r] is actually unclear, and potentially different from both /d/ and /t/.

**Background:** Canadian Raising typically refers to the raising of the nucleus of the diphthongs /aI/ and /aU/ before voiceless segments (Joos 1942). In certain varieties of English in the Continental US (including mid-western dialects), Canadian Raising is restricted to the front diphthong /aI/ (Moreton and Thomas 2007). Furthermore, as is well known, in certain varieties of English, including the one under discussion, flapping of /t/ and /d/ occurs between a stressed vowel and an unstressed vowel (Fox and Terbeek 1977; Kahn 1976). While there is quite a lot of literature discussing Canadian Raising in the context of surface [r] stemming from /t/ or /d/; all of the discussed cases involve words where morphophonological evidence clearly indicates whether the [r] is underlyingly a /t/ or a /d/ (e.g., *ci[rt]e/ci[r]ing vs. bi[d]/e/bi[r]ing*).

This raises the question: How does ambiguous [r] pattern with respect to Canadian Raising, and what is its phonemic representation? Specifically, do they pattern with voiced consonants or voiceless consonants or different from both. If speakers’ underlying representation of ambiguous [r] is /t/, then it is expected the /aI/ raises before ambiguous [r]; and, if ambiguous [r] is represented as /d/, then /aI/ should not raise in this environment.

**Experiment 1:** In Exp. 1, we compared the vowel heights (F1) of the nucleus of /aI/ before an ambiguous [r] [e.g., *cider*, total=9 words] as compared to before voiced stops [e.g., *cyber*, total=5 words] and voiceless stops (e.g., *cycle*, total=6 words). Ten speakers of MI English participated in the production experiment, where they produced the test words of each type along with 120 other filler words. Results (Fig. 1) suggest that the F1 of /aI/ before ambiguous [r] is different from the F1 of /aI/ before /t/ [t(11)=3.4, p<0.01] and from the F1 of /aI/ before /d/ [t(11)=7.2, p<0.001].

**Experiment 2:** The unexpected intermediate behavior of ambiguous [r] in Exp. 1 could have been an artifact of the fact that we compared /aI/ before ambiguous [r] to voiced and voiceless consonants at other places of articulation. To control for this, in Exp. 2, we compared /aI/ before ambiguous [r] to /aI/ before [r] that are clearly from /d/ (e.g., *ri[le]/er, hi[le]/er . . .*) and to /aI/ before [r] that are clearly from /t/ (e.g., *wri[le]/er, fi[le]/er . . .*). Fourteen speakers of MI English participated in the production experiment, where they produced 6 words of each type along with 90 other filler words. The results (Fig. 2) suggest again that the F1 of /aI/ before ambiguous [r] is different from that before /t/ [t(13)=7.3, p<0.001] and from that before /d/ [t(13)=3.9, p<0.01].

In Exp. 2, we also checked the vowel durations of /aI/ in all three contexts (Fig. 3). The vowel durations before flapped /t/ were different from those before ambiguous [r] [t(13)=2.8, p<0.05], but the vowel duration before flapped /d/ were not [t(13)=-1, p=0.32].

---

*Michigan State University*
Discussion: Experiment 1 and 2 show that the phonetic realization of /aI/ before ambiguous [ɾ] is intermediate between /t/ and /d/ with respect to vowel height (F1), but is similar to that of a [ɾ] from an underlying /d/ with respect to vowel durations. One could postulate an articulatory reason why /aI/ raises before ambiguous [ɾ], but this would have to account for why /aI/ acts as one would expect both before a flapped /d/ and flapped /t/. Our results suggest that the phonemic representation of ambiguous [ɾ] (i.e., [ɾ] in monomorphemic words with no morphophonological evidence that suggests the source is /d/ or /t/) is potentially different from both /d/ and /t/. The results raise the further possibility that the underlying representations of segments in non-alternating morphemes cannot be directly inferred from those in morphophonological alternations as a result of the Free Ride principle (McCarthy 2005).

References