Adapting to systematic and relevant variation, while discarding irrelevant and incidental variation [1,2], is one of the core challenges in language learning. Here we examine how listeners utilize prior knowledge about the contexts that give rise to variation in phonotactic constraints during learning. During experiments that expose participants to an artificial language, listeners rapidly adapt to novel phonotactic constraints that don’t exist in their native language (e.g., in the artificial language, syllables can begin, but cannot end, in /n/ or /ʃ/ [3]). We examine how prior experience constrains this adaptation. If listeners are aware that speaker-dependent constraints (e.g., Fred doesn’t end his syllables in /ʃ/, Barbara doesn’t end her syllables in /n/) are not typical of naturally occurring human languages [4], listeners should fail to adapt to such speaker-dependent constraints (see [5]). Although individuals vary along other dimensions, e.g. vowel productions, listeners should treat speaker-dependent phonotactics as merely incidental variation (and therefore ignore it). In contrast, learners may know that there are systematic differences in phonotactic grammars between languages. If this is the case, when speakers differ from one another in their language backgrounds (i.e., their native languages) listeners should treat this language-dependent phonotactic variation as relevant. We test this hypothesis in two experiments.

**Experiment 1: Learning language- vs. speaker-dependent phonotactic constraints.** Participants are exposed to phonotactic constraints over natural classes (fricatives vs. stops) that require tracking the identity of the talker (Talker A doesn’t end their syllables in /ʃ/, /t, k/; Talker B doesn’t end their syllables in /p, t, k/), while manipulating talker language background.

**Experiment 1A.** Our initial experiment contains 3 conditions. In the Shared Native condition, both talkers are native English speakers. There are two Different conditions in which one talker is French and the other is English. The English talker’s syllables use the vowels /i/ and /u/ in all conditions. In the Strong Different condition, the French talker used /i/ and the non-English vowel /y/ (which fits the English /u/ category poorly); in the Weak Different condition, the French talker used /i/ and /u/. We predict adaptation in the Different conditions, since listeners have evidence that talkers who differ in language background are likely to differ in phonotactics. In the Shared condition, we predict weak or no adaptation, since talkers do not differ in language background.

**Method.** Participants implicitly learned novel phonotactic constraints in a recognition memory task [6]. Participants hear nonsense syllables one at a time and are asked whether they heard each syllable previously in the experiment. Participants are exposed to 4 repetitions of a set of 18 familiarization syllables, all of which follow the experimental phonotactic constraint (e.g., Speaker A says *fut*; Speaker B says *puf*). Participants then hear 18 novel syllables intermixed with the final 9 repetitions of the familiarization syllables. Half of these novel syllables are legal (i.e., follow the phonotactic constraint), while the other half are illegal (i.e., violate the constraint; e.g., Speaker A says *tif*; Speaker B says *tut*). If listeners are tracking the constraint, legal syllables should seem more familiar than illegal syllables; as such, participants should be more likely to false alarm, incorrectly believing they had previously heard legal syllables.

**Results:** *Experiment 1A.* Forty-eight native English speakers participated. A logistic mixed-effects regression, which included false alarm rate as the dependent variable, syllable legality as an independent variable, and random slopes and intercepts for participants and item, indicated that participants were more likely to false alarm on syllables that follow the experiment-specific phonotactic constraint in both of the Different conditions (*Strong*: $\beta = 0.73$, s.e. $\beta = 0.19$, $\chi^2(1) = 13.1$, $p < 0.001$; *Weak*: $\beta = 0.46$, s.e. $\beta = 0.19$, $\chi^2(1) = 6.14$, $p < 0.05$). There was no such difference
in the Shared Native condition ($\beta = 0.19$, s.e. $\beta = 0.20$, $\chi^2(1) = 0.92$, $p = 0.34$), suggesting listeners only adapted to talker-specific phonotactic constraints when speakers differed in language background.

**Experiment 1B.** We are currently conducting a high-powered, pre-registered replication of Experiment 1A, incorporating an additional Shared Non-native control condition (in which both talkers are native French speakers), with 256 total participants.

**Experiment 2: Sensitivity to differences among non-native languages.** The results from the first experiment are consistent with two possibilities: first, that listeners’ prior knowledge is coarse-grained, with only a single distinction made between the listener’s native language (or languages) and all non-native languages. Alternatively, listeners may have more fine-grained expectations, and make distinctions between multiple non-native languages. The preliminary results discussed above suggest native English listeners expect that English and French speakers are likely to produce different phonotactics. Do native English speakers also expect that speakers of two different non-English languages are likely to produce different phonotactics?

Listeners ($n = 128$) are exposed to two different talkers, each of whom produces a different phonotactic pattern. Talkers come from one of three language backgrounds: English, Hindi, and Hungarian. In the Different Native condition, the design of Experiment 1 is replicated with novel language backgrounds. In the novel Different Non-native condition, participants are exposed to one talker from each of two non-native language backgrounds (i.e., listeners hear one Hindi talker and one Hungarian talker). This condition distinguishes between the two hypotheses: if listeners adapt when both talkers are non-native, it suggests they expect not only for talkers from native and non-native language backgrounds to differ in phonotactics, but for talkers from different non-native languages to differ as well. In contrast, if listeners’ expectations are fairly coarse-grained, we predict weak or no adaptation.

**Conclusion.** When distinguishing between systematic and incidental variation during adaptation to novel phonotactic constraints, listeners rely on their past experience that the phonotactics of languages, but not individual speakers, differ. In Experiment 1, we find evidence to support this perspective; listeners only adapt to speaker-dependent phonotactics when the two speakers differ in language background. In Experiment 2, we will investigate the structure of listener knowledge with regards to the relationship between phonotactics and language background. These experiments illuminate one of the core abilities we have as speakers and listeners: appropriately adapting to our dynamic language environment.

**References**