

# Variation and contact-induced change in Javanese phonology among multilingual children in Indonesia

Evynurul Laily Zen and Rebecca Lurie Starr

Universitas Negeri Malang | National University of Singapore

As Indonesian becomes more dominant in Indonesia, regional heritage languages, such as Javanese, may be increasingly influenced by phonological transfer. The extent of these effects may depend upon a speaker's region and social background, as well as age of acquisition and proficiency in various languages. This study investigates the impact of these factors on the Javanese production among multilingual children in East Java. Specifically, we analyze the distinction between dental and retroflex coronal stops (/t̪/ /ɖ̪ /, /t/ /ɖ/), which phonemically contrast in Javanese, but not in Indonesian. The data were elicited from 95 children in Malang, a large urban center, and Blitar, a smaller city. The findings indicate that Javanese is shifting to a two-way contrast comparable to that of Indonesian; female and Malang speakers lead in this change. These findings highlight the significance of social factors in children's language acquisition, and illustrate ongoing changes in Javanese.

**Keywords:** phonological variation, Javanese, Indonesia, language acquisition, multilingualism, language contact

## 1. Introduction

While Javanese remains the most widely-spoken ethnic heritage language in Indonesia, the steady decline in use of Javanese in favor of the national language, Indonesian, across historically Javanese-speaking communities has been well-documented, particularly in urban areas (Handono, 2004; Nababan, 1985; Setiawan, 2001, 2013). This shift has not been restricted to the workplace and school, but increasingly also applies to the family domain (Kurniasih, 2005; Smith-Hefner, 2009). Thus, while the language acquisition situation of children in Indonesia has historically been characterized as one of sequential multilin-

gualism, in which children first learn their ethnic language at home and then Indonesian (and English) in school, today, many children of Javanese heritage learn Indonesian as their first language, either simultaneously or sequentially with Javanese, with some children not acquiring Javanese until primary school. Given the widespread decline in attitudes towards and use of Javanese and the precipitous drop-off in intergenerational transmission, Ravindranath and Cohn (2014) argue that Javanese, despite its current status as a language with tens of millions of speakers, is nonetheless at risk of endangerment.

The move away from Javanese in Indonesia is deeply intertwined with social change in urban Java, and in the country more broadly. As argued by Dick (1985), the expansion of the urban middle class since the birth of contemporary Indonesia in 1945 has been marked not only by rising income and spending power, but also by changing social relations, with traditional hierarchies giving way to a greater emphasis on equality. These new egalitarian attitudes have become indexically linked with Indonesian, while older stratifications are associated with Javanese and its various stylistic registers. Smith-Hefner (2009), for example, argues that the shift to Indonesian in the home domain has been shaped by the more equal relationship between husband and wives, as wives were formerly expected to use the high variety of Javanese, *krama*, when addressing their husbands. Similarly, scholars have argued that the shift to Indonesian has accelerated among younger speakers in part due to insecurity regarding their proficiency in *krama*, which must be used in Javanese interactions with elders (G. Poedjosoedarmo, 2006; Smith-Hefner, 1983). The prominent role of social factors in this language shift suggests that studies of change in Javanese must take into account how these changes are taken up by speakers with various social identities.

The decline of Javanese has also been crucially influenced by education policy. While Javanese was formerly used as a medium of instruction in primary schools, the 1975 national curriculum established Indonesian as the sole language of instruction, with Javanese relegated to non-curricular subject status (Hadiatmaja, Padmopuspito, Prawiradisastra, & Sukimin, 1987). As of the 1994 curriculum, regional languages, including Javanese, were no longer compulsory, and Indonesian was institutionalized as the language of education from kindergarten to university level. While the curriculum has evolved in recent years to allow more teaching of cultural and arts subjects in regional languages, Indonesian remains the primary medium of instruction for all core subjects (Gumilar, 2015).

Studies of the impact of the increasing dominance of Indonesian on children's Javanese proficiency have found that children in rural areas outperform those in urban areas. Even in rural areas, however, use of Javanese in academic and formal domains lags behind. Sukamto and Purwo's (2016) study in the rural area

of Gunung Kidul, for example, found that older children performed with greater proficiency in Indonesian than in Javanese in a formal picture description task, despite performing better in Javanese in an oral narrative task, perhaps due to the association of Indonesian with the school domain. The authors concluded that students' Javanese was outpaced by the development of their Indonesian in higher grades, with their Javanese remaining at a more rudimentary level. Scholars have proposed that, although Javanese is taught and used in some schools as a secondary language, the impact of such education has been limited by low institutional support and underdeveloped teaching practices (Harwati, 2018; Wahyuni, Subiyantoro, & Fadhillah, 2017).

Prior work on the decline of Javanese use has focused on domains of use, attitudes, and overall proficiency; the present study, in contrast, analyzes structural changes within the Javanese language itself. While other scholars have investigated the phonological, grammatical, and lexical consequences of Indonesian-Javanese language contact, these studies have focused on the influence of Javanese on Indonesian, reflecting the prior dominance of Javanese as a first language (Adisasmito-Smith, 2004; S. Poedjosoedarmo, 1982). Although Javanese has demonstrably had a significant impact on the structure and lexis of Indonesian as it is spoken in Java, given the expansion of Indonesian and its increasing prevalence as a first language among children, our analysis assesses possible cross-linguistic influence in the opposite direction, focusing instead on the ongoing impact of Indonesian on Javanese among young speakers. Moreover, following prior work on children's acquisition of variation (see Smith & Durham, 2019), we adopt a variationist sociolinguistic approach, examining possible social factors (e.g., gender) in tandem with factors relating to linguistic background (e.g., age of acquisition of Javanese and Indonesian) that may shape children's production of Javanese.

Our study analyzes ongoing contact-induced change in the production of the coronal stop consonants of Javanese, the phonemic contrasts of which differ substantially from Indonesian and English, the other languages in the repertoires of the child participants under investigation. Drawing upon data elicited from primary school-aged children in a trilingual language immersion program, we investigate (1) whether children's production of Javanese coronal stop consonants reflects phonological influence from Indonesian, (2) whether their production varies by region, and (3) whether their production is shaped by their social identities and linguistic background.

## 2. Theoretical background

The present study adopts a variationist sociolinguistic approach to children's multilingual language acquisition, focusing in particular on possible cross-linguistic influence from Indonesian in Javanese. Section 2.1 introduces the phenomenon of cross-linguistic influence and key factors thought to shape this process; prior scholarship on children's sociolinguistic development and acquisition of variation is addressed in Section 2.2.

### 2.1 Cross-linguistic phonological influence and language acquisition

Cross-linguistic influence, or transfer, among second language (L2) learners can occur both in a positive sense, in which a structure from a known language is used to facilitate learning of a similar structure in a second language, and in a negative sense, in which the use of a structure from a known language interferes with native-like acquisition of a structure in the target language (Jarvis & Pavlenko, 2008; Odlin, 1989). Such influence is particularly prevalent in the realm of phonology, in which similar phonemes that differ in their phonetic details are often mapped from one language onto another, a phenomenon referred to as "equivalence classification" (Flege, 1995). This mapping results in what is commonly known as a "foreign accent", in which phonemes of an L2 are produced in a non-native-like manner that is shaped by the speaker's L1.

Due to the reduction of plasticity in phonological perception and articulation relatively early in life, equivalence classification effects in phonology are particularly sensitive to age of acquisition. While learners who are exposed to two languages from birth or to an L2 from early childhood are able to acquire native-like phonetic details, such as Voice Onset Time and place of articulation for coronal stops (Sundara, Polka, & Baum, 2006), later L2 learners generally show influence from their L1 (Flege, 1991). The situation of heritage language speakers, who are exposed to their heritage language early in life but do not speak it as their dominant language, is more complex; prior work has yielded mixed results regarding the degree to which these speakers show influence of the dominant language on their heritage language. Chang, Yao, Haynes, and Rhodes (2011), for example, finds that Mandarin Chinese heritage speakers growing up in the United States are successful at maintaining cross-linguistic contrasts between similar phonemes. On the other hand, numerous other studies have identified a significant phonological influence of English on North American speakers' production of heritage languages, including Cantonese (Tse, 2017), Western Armenian (Godson, 2004), and Yiddish (Nove, 2020). Thus, the early exposure of heritage learners does not necessarily result in native-like phonological acquisition of their

heritage language. At the same time, the findings of these studies must be taken in the context of the extreme societal dominance of English and the monolingual culture typical of North American settings. In the multilingual setting of Indonesia, where Javanese has substantial societal visibility, the level and nature of exposure of multilingual children to their heritage language is not equivalent to the limited exposure children receive to immigrant heritage languages in the United States and Canada. It may be the case, then, that heritage speakers of Javanese in East Java show less influence from Indonesian than we would expect from North American studies, particularly at the level of phonology.

Aside from age of acquisition, researchers have identified multiple factors that shape the extent of cross-linguistic influence in phonological production: these include length and intensity of exposure, proficiency, and feature markedness, as well as ‘dynamic’ factors, such as the activation level of the other language in a particular speech situation (Major, 2008; Simonet, 2014). Notably, even among late L2 learners, cross-linguistic influence is bidirectional to some degree, with phonological influence also observed from L2 to L1, at both the initial stages of L2 learning and among proficient L2 speakers (Chang, 2009; Godson, 2004). In the case of L3 acquisition, learners may show influence from the L1 and/or the L2, with various factors, including L2 status and recency of use, proposed to account for the roles of previously-learned languages (Gut, 2010). Thus, in the multilingual repertoire of a child exposed to Indonesian, Javanese, and English, there is potential for the phonology of any of these languages to influence the other, regardless of order or age of acquisition.

Crucially, the context of this study is not one of an individual multilingual learner, but rather an entire multilingual community that shares exposure to a common set of languages. In this setting, the expansion of contact-induced change within the community does not necessarily result from individual-level transfer of phonological features from each speaker’s dominant language. Although the initial innovation may be triggered by cross-linguistic influence, this change may become an accepted feature of the local community variety, regardless of the linguistic repertoires of individual speakers. As a result, we may observe native Javanese speakers of high proficiency using a feature that originated in contact with Indonesian; such a finding would suggest that this feature has transitioned from a phonological transfer phenomenon into a community norm, yielding contact-induced language change.

## 2.2 Children’s acquisition of sociolinguistic variation

While early work in sociolinguistics held that children did not acquire variation patterns until adolescence (Labov, 1970), multiple strands of research on chil-

dren's use of language soon established that children absorb the social patterns of a language as they acquire its structure (Romaine, 1984). Young children are observed to mirror the patterns of stylistic variation of their caregivers (Smith, Durham, & Fortune, 2007), and to tailor their language use to different interlocutors by as early as two years old (Kornhaber & Marcos, 2000). Children are also able to group speakers by dialect by age three or four, reflecting their development of sociolinguistic knowledge (Jeffries, 2019).

When children enter school, their social world broadens as they are introduced to a larger peer group. One factor that commonly emerges as significant in studies of children in preschool and primary school is gender. Gender-based distinctions at this age are shaped in part by children's preference for same-sex friendship groups, in which they are socialized into distinctive patterns of interaction and language use (Coates, 1993; Litosseliti, 2006). Observations of gender-based differences in children's use of sociolinguistic variation were made as early as Fischer (1964), who found in a study of American children that girls used the standard /ɪŋ/ form of (ING) more frequently, while boys preferred the non-standard /ɪn/ form. While girls lead in the use of conservative, standard variants from an early age, Eckert (2011) argues that, at least in a Western context, the commonly-observed female lead in innovative sound change emerges in preadolescence, as children take on more complex social roles. Given the very different social setting and gender norms typical of East Java, however, we might expect the role of gender in children's language to follow a somewhat different pattern from Western societies. The gendered patterning of language use is particularly worthy of investigation in this setting because, as discussed above, investigations of language change among Javanese speakers have argued that ongoing language shifts in the community reflect shifts in gender relations (Kurniasih, 2005; Smith-Hefner, 2009).

Regarding second language acquisition among children, research on L2 learning in classroom contexts finds that children tend to orient towards standard language, overusing formal variants relative to native-speaking children (Mougeon, Nadasdi, & Rehner, 2010; Starr, 2017). This phenomenon may not simply result from skewed exposure to formal language; Starr (2017) found that primary school children acquiring Mandarin Chinese in a two-way immersion program overwhelmingly use standard variants, even when non-standard features are dominant among teachers. Starr also observed, however, that heritage language learners in these programs were comfortable maintaining their own use of non-standard, regional features, even as their L2 learner peers acquired more standard variants. Thus, if we consider the children in the present study to be heritage learners of Javanese, we would not necessarily expect them to acquire standard Javanese phonology, despite the classroom setting. Starr (2017) argues that chil-

dren learning language in a primary school setting are keen observers of dialect differences and are quick to form their own norms for language use; if children conclude that a teacher does not speak a variety that is appropriate for them to target, they will attempt to avoid acquiring that teacher's language patterns. In sum, far from being naïve mimics of language, primary school-aged children are active negotiators of language who develop their own sociolinguistic conventions among their peer group and use language to construct their social identities, just as adult speakers do.

In the present study of multilingual children's acquisition of Javanese, we consider the impact of social factors, and specifically gender and region, alongside other factors traditionally incorporated into analyses of second language acquisition, including age of acquisition and proficiency. While a considerable body of prior research on second language acquisition among university students has identified gender and other social factors as influential in acquisition of variation in an L2 (e.g., Regan, Howard, & Lemée, 2009), no prior work has directly assessed the role of these factors in language learning among primary school children. Nevertheless, given the prominence of gender in shaping language use among children in this age group, and in light of differences in language shift in urban and rural regions of Indonesia, we expect both gender and region to significantly influence children's production of Javanese.

### 3. Javanese coronal stop consonants

Table 1 illustrates the coronal stops of Javanese, Indonesian, and English, the three languages in our participants' repertoires, as they are traditionally characterized in phonological descriptions of these languages.

**Table 1.** Javanese, Indonesian, and English coronal stop consonants arranged by place of articulation (Fagan, 1988; Lapoliwa, 1981; Ladefoged & Johnson, 2011; Nothofer, 2006)

	Place of articulation		
	Dental	Alveolar	Retroflex
Javanese	/t̪/ /d̪/		/t̠/ /d̠/
Indonesian		/t/ /d/	
English		/t/ /d/	

As shown in Table 1, while Indonesian and English have only one pair of contrasting coronal stops each, Javanese has two pairs, a dental and a retroflex

set. To better understand how these phonemes might interact cross-linguistically among multilingual speakers, we must examine their phonetic realizations more closely. Although the Javanese back set of coronal stops are traditionally described as retroflex, phoneticians have observed that retroflexion of these stops is minimal (see overview in Hayward & Muljono, 1991). Using electropalatography, Hayward and Muljono (1991, p.142) demonstrated that Javanese /ɖ/ has a less retracted place of articulation than /ʈ/, and suggested that this phoneme is more properly classified as alveolar. Regarding voicing, the manner of distinction between pairs of stops with the same place of articulation differs across languages. In Javanese, this contrast is primarily realized via phonation on the following vowel and, for some speakers, voice onset time (VOT) (Seyfarth, Vander Klok, & Garellek, 2017). The “tense” (or “light”) consonants (/ʈ, t/) are realized with modal voice on the following vowel, while the “lax” (or “heavy”) consonants (/ɖ, d/) are realized with breathy voice on the vowel; for those speakers who produce a VOT contrast between these sets, (/ʈ, t/) have a positive VOT (“lag” VOT) while (/ɖ, d/) are pre-voiced (“lead” VOT) (G. Poedjosoedarmo, 1993; Seyfarth, Scott, Vander Klok, & Marc, 2017). In English, the /t/ versus /d/ contrast is primarily one of VOT, with /t/ having a longer positive VOT (Ladefoged & Johnson, 2011). In Indonesian, however, in addition to a minor VOT distinction between /t/ and /d/, researchers have observed a place of articulation distinction between these stops that reinforces this contrast, with /t/ produced as dental and /d/ as alveolar (Adelaar, 1983).

With this information in mind, we can make certain predictions regarding the equivalence classification of similar phonemes across these languages. First, we predict that the Indonesian voiceless stop /t/ will be classified with the tense Javanese consonants (/ʈ, t/), while /d/ will align with the lax stops (/ɖ, d/), given their orthography and VOT cues. Crucially, given prior evidence that /t/ is produced with a dental place of articulation in Indonesian, as suggested above, we anticipate that this phoneme will map most closely onto the /ʈ/ of Javanese. The /d/ of Indonesian, however, will likely map onto the Javanese /ɖ/, which, as noted above, has been found to have an alveolar place of articulation. Therefore, if a merger of the Javanese coronal stops is taking place among Indonesian-dominant speakers of Javanese, we expect the light consonants to merge to /ʈ/, and the heavy consonants to merge to /ɖ/. The following analysis investigates the possibility of such a merger.

In our analysis, following the orthographic conventions of Javanese, we will refer to the sociolinguistic variables corresponding to the dental pair of coronal stops in Javanese as (T) and (D), and to the retroflex pair as (TH) and (DH).



## 4. Field sites

The following sections introduce key background information regarding the two regions of East Java under study, and the trilingual language immersion school setting in which this research was carried out.

### 4.1 Malang and Blitar

The fieldwork for this study was conducted in the Indonesian province of East Java, in which Javanese constitutes the majority ethnolinguistic group. Setiawan (2001) confirms that, as in other urban areas of Indonesia, speakers in Surabaya, the provincial capital of East Java, now have lower proficiency in Javanese than in Indonesian; speakers reported using Javanese primarily in the home and places of worship, and with friends at school and older interlocutors. In Setiawan (2013), which compared children in Surabaya with those in a small town and rural village in East Java, greater use of Javanese was found in the rural area; attitudes towards Javanese, however, were uniformly negative across all three regions. In light of the differences observed between urban and rural areas in prior research, one aim of our study is to investigate whether these differences in Javanese use are reflected in changes in the production of Javanese, with the hypothesis that speakers in larger urban areas will show more cross-linguistic influence from Indonesian.

The two fieldsites of our study are located in Malang, a large, diverse urban center, and Blitar, a smaller, more homogenous city. Malang, the second largest city in East Java, has a population of 874,890 as of 2020 (BPS Kota Malang, 2020). Due to Malang's colonial history, the city has longstanding Chinese and Arab minority populations, in addition to the indigenous Javanese majority and Madurese minority (Budianta, 2012, p.258). The city has developed into a center of higher education, and is home to several state and private universities (BPS Kota Malang, 2020); this concentration of universities has attracted migration from elsewhere in the country, resulting in greater ethnolinguistic diversity. Residents from minority ethnic groups in Malang are primarily from eastern Indonesia, Sulawesi, and Kalimantan; of these, the majority are students attending local universities (Pemerintah Kota Malang, 2020). Malang's concentration of universities has contributed to its growth into a major urban center, as indicated by the presence of many multinational brands, including McDonald's, KFC, and Apple. As a consequence of its linguistically diverse population, Indonesian plays a key role as a commonly-used *lingua franca* in Malang.

The second fieldsite, Blitar, is about 78 kilometers southwest of Malang, and has a population of 142,798 (BPS Kota Blitar, 2020). Blitar is a small city, with only one modern shopping center and a single cinema. Residents are largely Javanese,

with much less diversity than Malang; Blitar reported only 4,148 new migrants into the city in 2019 (BPS Kota Blitar, 2020). Consistent with its demographics, in the experience of the first author, who is native to this region, Javanese is commonly used as an everyday language in Blitar.

## 4.2 Research setting

The fieldwork and data elicitation for this analysis, which formed part of a larger project on children's acquisition of Javanese and English, was carried out in 2018 by the first author at two branches of the Primary Laboratory School of State University of Malang. Both branches of this school, in Malang and Blitar, are administered by the State University of Malang and follow a common curriculum. In the school's International Class Program, the focus of the present analysis, the national curriculum is combined with the Cambridge International curriculum, yielding a hybrid style of program. Crucially, the curriculum includes instructional time in Indonesian, English, and Javanese; the national curriculum consists of core subjects, religion, and physical education delivered in Indonesian for 13 contact hours per week and Javanese class for two hours per week, while the Cambridge curriculum involves science, math, and English all delivered in English for a total of 10 hours per week. Thus, while students do receive weekly exposure to Javanese in the program, the number of contact hours for Javanese is dwarfed by those of Indonesian and English.

Because many of the participants in this analysis are exposed to Javanese primarily via the classroom, the nature of the classroom input they receive is worthy of note. Data regarding teachers' production of the Javanese coronal stops was elicited during the fieldwork period via one-on-one recording sessions, allowing for assessment of the extent to which children are acquiring teacher models. While all teachers – who are all native speakers of Javanese – were found to categorically maintain the standard four-way coronal stop contrast, we note that one of the teachers of non-Javanese subject, a young woman, exhibited a merger of the sort suggested in Section 3, using a /t̚/-/d̚/ two-way contrast consistent with Indonesian. These findings among teachers provide preliminary evidence that, while children continue to be exposed to the standard four-way contrast in Javanese language classes, a change may indeed be in progress in this community.

## 5. Participants and method

95 third-grade students with a mean age of 8.8 participated in the study, including 68 children in Malang and 27 children in Blitar. Participants were approximately

evenly split by gender at each site, with 37 female and 31 male students in Malang, and 14 female and 13 male students in Blitar. Students' language backgrounds, as well as their parents' language backgrounds and other demographic information, were collected via parental survey. Parents were predominantly middle-class, and 94% of mothers and 86% of fathers were of Javanese ethnicity; all children had at least one Javanese parent. With respect to parent-child communication patterns, 62.5% of parents reported that they used only Indonesian with their child, 8.5% used only Javanese, while 29% reported using a mix of languages.

Table 2 indicates the language backgrounds of student participants from the Malang and Blitar school branches. Children's order of acquisition of Javanese, Indonesian, and English was determined by parental report; a reported age of acquisition within one year of another language was considered simultaneous, while any greater gap was labeled as sequential. Consistent with recent work on language shift, only four of the 95 participants demonstrated the "classic" order of acquisition historically typical of Indonesia, with Javanese as their sole L1 and Indonesian (and English) learned later in life. Instead, the most common position for Javanese was as an L2, acquired after Indonesian. A significant minority of participants, however, learned Javanese as an L3, meaning they began learning Javanese a year or more after beginning acquisition of both Indonesian and English; this pattern was more prevalent in Malang (28%) than Blitar (11%).

**Table 2.** Language background of participants, including order of acquisition of Javanese, age of acquisition of Javanese, and parental use of Javanese in the home

School	N	Order of Javanese acquisition				Javanese age of acquisition		Parents use Javanese at home
		L1 Jav only	L1 Jav & other	L2 Jav	L3 Jav	Birth	<5*	
Malang	68	1%	25%	46%	28%	26%	68%	51%
Blitar	27	11%	26%	52%	11%	37%	89%	94%
<b>Total</b>	<b>95</b>	<b>4%</b>	<b>25%</b>	<b>47%</b>	<b>23%</b>	<b>29%</b>	<b>74%</b>	<b>63%</b>

\* Figures in this column are inclusive of those who learnt Javanese from birth.

Other notable differences between Malang and Blitar in Table 2 include parental use of Javanese, with 94% of Blitar parents but only 51% of Malang parents reporting using Javanese in the home. Similarly, while 89% of Blitar children had begun learning Javanese before the age of five, this applied to only 68% of Malang children. These findings confirm the observed difference between the use of Javanese in more and less developed areas, as well as the previously-reported drop in intergenerational transmission of Javanese; note that although almost all

Blitar parents speak Javanese in the home, only 37% of parents in Blitar report that their child was exposed to Javanese from birth, suggesting that Javanese is used in many homes in this region as a language for communication between adults, but is not used when speaking to young children.

Overall, the distribution of language backgrounds among participants indicates that most participants learn Indonesian as an L1 and continue to speak it as their dominant language, while Javanese is acquired in a manner similar to a heritage language, with many children receiving little or no exposure to Javanese in their first years of life. To obtain a more concrete measure of the Javanese proficiency of these participants, Mean Length of Utterance by word (MLUw) was calculated based on participants' production in two tasks administered as part of the present data collection, a storytelling task and a story retelling task. MLUw was operationalized as the total number of words divided by the total number of complete and intelligible utterances, excluding instances of Indonesian code-mixing (see Dethorne, Johnson, & Loeb, 2005; Parker & Brorson, 2005). Participants' mean Javanese MLUw was 6.6, with scores ranging from 0.0 to 11.1. To investigate the role of Javanese proficiency in participants' phonological production of Javanese, MLUw is included as a continuous fixed effect in the following statistical modelling.

The data for this analysis were elicited via a picture-naming task, part of a larger session conducted in a quiet room of the school using a Zoom H2n Handy Recorder. Participants were asked to name 104 familiar objects represented on picture cards that included labels written in Javanese. Pictures were selected from Snodgrass and Vanderwart (1980). 14 out of 104 items in this task elicited the production of the relevant coronal stop consonant variables (T, D, TH, DH) (see Table 3). For the two items that contained reduplicated syllables with two instances of the variable (e.g., *dhadha*), only the word-initial token was coded.

1,229 tokens in total were correctly identified by participants and included in the present analysis. Production of the target items was coded auditorily by the first author, a native speaker of Javanese, as either dental or retroflex. To identify significant predictors of the realization of these variables, factors were incorporated into generalized linear mixed-effects regression models, carried out using the *glmer* function of the *lme4* package in R (Bates, Maechler, Bolker, & Walker, 2015).

Table 4 summarizes the factors considered in the modeling process. The light (T, TH) and heavy (D, DH) consonants will be considered separately, leaving standard place of articulation (dental, retroflex) as the relevant language-internal fixed effect in the model. Best-fit models were determined via ANOVA comparison.

**Table 3.** Target items in Javanese picture-naming task<sup>\*</sup>

Variable	Target word	Gloss
(T)	<i>telu</i>	three
	<i>tapih</i>	traditional skirt
	<i>telo</i>	cassava
(D)	<i>dawa</i>	long
	<i>desa</i>	village
	<i>dina</i>	day
	<i>dimar</i>	traditional lamp
(TH)	<i>thukul</i>	grow
	<i>tharik-tharik</i>	standing in lines
	<i>kuthuk</i>	chick
	<i>bathuk</i>	forehead
(DH)	<i>dhahar</i>	eat
	<i>dhara</i>	pigeon
	<i>dhadha</i>	chest

<sup>\*</sup> Among the 14 target-words, *desa* and *dhadha* have cognates in Indonesian. However, they differ from these Indonesian cognates with regard to various phonemes, most notably the ‘a’ vowel, which is realized as [a] in Indonesian and [ɔ] in Javanese. Thus, using these cues, only Javanese-like productions of these terms were included in the present analysis.

**Table 4.** Summary of random and fixed effects considered in mixed-effects modeling

Effect type	Effect name	Levels
Random effects	participant	–
	item	–
Fixed effects	region	Malang, Blitar
	gender	female, male
	Javanese acquisition order	L1, L2, L3
	Javanese from birth	yes, no
	Indonesian from birth	yes, no
	English from birth	yes, no
	Javanese MLUw	(continuous)
	std. place of articulation	dental, retroflex

6. Findings

The overall distribution of dental versus retroflex realization for each variable by participants in Malang and Blitar is given in Table 5. While a certain degree of variable realization is observed for each variable, (T) is overwhelmingly produced as a standard /t/, as predicted in Section 3 based on the similarity of Indonesian /t/ to this phoneme. Also consistent with the predictions in Section 3, we observe that (D) shows a low rate of standard production, meaning that it is often realized as retroflex /ɖ/ rather than dental /ḍ/, while (TH) shows the opposite trend, often being produced as dental /t/ instead of retroflex /ʈ/. Finally, (DH) is standardly realized as retroflex /ɖ/ by a majority of participants in both regions. Taken together, these realization patterns support the hypothesis that many participants are merging Javanese (TH) with (T), and (D) with (DH), transforming a four-way contrast into a two-way contrast in a manner consistent with the equivalence classification proposed in Section 3 based upon the phonological structure of Indonesian.

Table 5. Rate of standard realizations for variables by participant region

Variable	Region	
	Malang	Blitar
(T)	99.5%	100%
(D)	17.3%	56.5%
(TH)	5.2%	21.3%
(DH)	83.3%	76.5%

Table 6. Rate of standard realizations for variables by participant gender

Variable	Gender	
	F	M
(T)	100%	99.2%
(D)	22.1%	35.8%
(TH)	5.4%	14.8%
(DH)	86.3%	75.8%

Table 5 also makes evident certain regional differences between Malang and Blitar. While Blitar participants are not producing these variables in an entirely standard fashion, their rates of standard realization are markedly higher, particularly for (D), where over half of Blitar participants use a standard realization in

contrast to only 17.3% of Malang participants, and (TH), which shows a 16.1% standardness gap between the two regions. Within the Malang data, looking at the likelihood that a (T) or a (TH) will be realized as dental (99.5% and 94.9% respectively), and the likelihood that a (D) and a (DH) will be realized as retroflex (82.7% and 83.3%), it would seem that these pairs of variables are already being treated as merged in this region, with each equally likely to receive a certain realization, regardless of its standard place of articulation. Blitar, in contrast, is not yet at that point, and does show different realization patterns by standard place of articulation.

Variable realization patterns by gender also show key differences (Table 6). For both (D) and (TH), male participants use more standard variants than female participants, indicating that girls are leading in this merger in progress. The following statistical analysis addresses whether these regional and gender difference can be entirely accounted for by differences in Javanese proficiency, age of acquisition, or other factors and their interactions.

The fixed effects included in the best generalized linear mixed-effects model for variation in (TH), incorporating random effects of participant and item, are shown in Table 7. Given the uniformly standard realization of (T) in the data, our analysis excludes this variable from the analysis of light stops.

**Table 7.** Fixed effects for best glmer model for (TH), with random effects of participant and item. Positive *z* value indicates more retroflex (standard) pronunciation

Fixed effects	Estimate	Std. error	<i>z</i> value	<i>p</i> value
(Intercept)	-2.6608	0.9744	-2.731	0.00632 **
Region (Malang)	-2.1453	0.7549	-2.842	0.00449 **
Gender (Male)	1.9311	0.7665	2.519	0.01176 *
Javanese as L1 vs. L2	-0.5826	0.7193	-0.810	0.41800
Javanese as L1 vs. L3	-2.6297	1.1427	-2.301	0.02138 *

\*\*  $p < 0.01$  \*  $p < .05$

Models including the factor of MLUw, measuring proficiency in Javanese, as well as the factors of Indonesian and English from birth, did not significantly outperform the model in Table 6; these were therefore excluded from the final model. As suggested in Table 5, a significant difference in region is identified, such that participants in Malang are significantly less likely to produce standard retroflex (TH). This difference remains significant even when controlling for language background factors. There is also a significant difference by gender, with boys significantly more likely to produce standard (TH) than girls, indicating that

girls are leading in the adoption of the dental-retroflex merger. Finally, a significant effect is found in order of acquisition of Javanese; speakers of Javanese as an L1 are more standard than Javanese as an L3.

**Table 8.** Fixed effects for best glmer model for (D) and (DH), with random effects of participant and item. Positive *z* value indicates more standard pronunciation

Fixed effects	Estimate	Std. error	<i>z</i> value	<i>p</i> value
(Intercept)	−0.08595	0.32349	−0.266	0.790464
Std. place of articulation (retroflex)	1.75735	0.50272	3.496	0.000473 ***
Region (Malang)	−1.99320	0.29583	−6.738	<0.0001 ***
Region (Malang) * std retroflex	2.44461	0.43513	5.618	<0.0001 ***
Gender (M)	0.79192	0.27866	2.842	0.004485 **
Gender (M) * std retroflex	−1.53737	0.41324	−3.720	0.000199 ***

\*\*\* *p* < .001    \*\* *p* < .01

Table 8 gives the fixed effects in the best model for the heavy stop variables, (D) and (DH). Again, several factors, including Javanese MLUw, did not significantly improve the model according to ANOVA testing and are therefore excluded. There is a main effect of standard place of articulation, such that (DH) is realized standardly more often than (D). While there is also a main effect of region, with Malang speakers less standard than Blitar speakers overall, this effect significantly interacts with standard place of articulation, meaning that the difference between Malang and Blitar is less pronounced for (DH), where no shift is taking place.

Similar to the (TH) model, boys are found to lead significantly in standardness; as illustrated by the significant interaction of standard place of articulation and gender, this effect is limited to (D), the variable undergoing change. No effects of proficiency or order of acquisition play a significant role in predicting (D)/(DH) variation.

7. Discussion

In this analysis of children’s production of Javanese, we have identified strong evidence supporting the notion that ongoing language shift in Indonesia has been accompanied by contact-induced changes to Javanese phonological structures, as children increasingly speak Indonesian as their first and dominant language. Specifically, we have identified a merger in progress between (T) and (TH) to



dental /t̪/, and one in the opposite direction of (D) and (DH) to retroflex /ɖ̪/, thus shifting from a four-way coronal stop contrast to a two-way contrast similar to that of Indonesian. Both of these mergers are found to be significantly more advanced in Malang, the larger city, where participants no longer show significant differences between their realizations of these variable pairs. Female participants were also found to lead in both mergers. No effects of Javanese proficiency or learning Javanese, Indonesian, or English from birth were identified; however, in the case of (TH), L3 speakers did lead in the shift relative to L1 speakers.

Because this study focuses on child data and has no comparable adult Javanese data with which to compare findings (with the exception of our limited observations of teacher production), the question arises as to whether the observed merger may simply be a reflection of children not yet reaching the adult-like acquisition stage for certain phonemes. This explanation is unlikely; while there is no prior work on children's phonological acquisition of Javanese, studies of children acquiring Hindi, which has a similar stop contrast, confirm that children master this distinction well before the age of 8, the youngest age of participants in the present study (Pyata & Banik, 2016). The preliminary evidence available from teacher speech, as discussed in Section 4, also suggests that at least some younger adults in the community make use of this merger, meaning that this is not a phenomenon limited to child speech.

Another alternative explanation is that this merger is a novice L2 learner phenomenon that will resolve as children's proficiency in Javanese increases. Again, this is unlikely, given that the merger was also observed among children who had learned Javanese from birth, and there was no correlation between acquiring Javanese at birth or Javanese MLUw and production of the merger. Although children who had acquired Javanese as an L3, after both Indonesian and English, did show significantly more fronting of (TH), supporting the account that this merger originates from cross-linguistic influence, this L3 group represents a small number of participants. Thus, the proposal that this is a phenomenon restricted to novice learners cannot explain the widespread merger observed throughout the participant data. Given the absence of significant effects for proficiency and age of acquisition factors, the most reasonable account is that the coronal stop merger is a developing community norm that has now been adopted by young Javanese speakers across proficiency levels, rather than resulting only from individual-level transfer of Indonesian phonology by novice Javanese learners. In other words, although we cannot be certain at this stage, the merger observed in the data appears to reflect a change in progress in the community, rather than age-grading arising from children's ongoing multilingual development.

The fact that the coronal stop merger was so prevalent in these data is particularly striking given the formal, careful nature of the picture-naming task. More-

over, each image was accompanied by a caption, meaning that students had an explicit orthographic cue as to the standard pronunciation of each token. Regarding implications for language change in the community, this high rate of use in a careful elicitation task means that the merger is likely to be even more advanced in participants' spontaneous speech, as is typically observed in variationist work (Labov, 1972). These results also suggest that the coronal stop merger is not a feature that is salient to this community as non-standard; if this were a feature that was frequently corrected in the classroom, we would expect students to avoid it in careful speech in an academic setting. Another factor that may explain children's failure to avoid this feature is the extremely low number of school contact hours that they receive for Javanese – only two hours per week. This limits the potential for the acquisition of novel phonological contrasts and restricts students' opportunities to gain sociolinguistic knowledge regarding the standardness of various features, particularly for those children whose parents do not use Javanese with them at home.

The considerable regional differences identified in this analysis are consistent with previous work indicating that the decline of Javanese is more advanced in urban areas of East Java (Setiawan, 2013). These findings are also in line with the language use data provided in the questionnaire by parents of participants, which suggested that Blitar participants are exposed to Javanese more frequently in the home domain. The differences found between Malang and Blitar underscore that the urban versus rural dichotomy oversimplifies the situation of regional variation in Javanese use in Indonesia; while both areas are cities, Malang, due to its diverse population, has shifted more dramatically towards Indonesian. At the same time, the fact that the merger has made considerable inroads in Blitar is also worthy of note, as is the finding that only 37% of Blitar participants acquired Javanese from birth. Further research on more rural areas of East Java may clarify the regional scope of this merger.

As discussed in Section 2.2, gender is a construct that children in many societies use to organize their social lives, resulting in commonly-identified sociolinguistic differences among boys and girls. While adult women are often found to lead in changes in progress in addition to upholding more conservative variants (Labov, 1972), in prior studies of children, young girls are most often observed to do only the latter (e.g., Fischer, 1964), and have been argued to take on the role as leaders of change as they enter preadolescence (Eckert, 2011). It is somewhat surprising, then, to find in the present study that girls as young as eight years old are leading in the adoption of these mergers.

The observed gender pattern in the data suggests that girls in these communities have certain social motivations to adopt this sound change that become salient to them at an early age. Previous work on the social motivations for

the shift to Indonesian point to its association with a more modern, egalitarian lifestyle (Smith-Hefner, 2009); similarly, Kurniasih (2005) observed that boys were more oriented towards their Javanese identity than girls. Moreover, in the present analysis, correlations were observed between residents of the more developed urban center with use of the merger in Javanese. It is therefore possible that, within these communities, traditional Javanese phonological features have become indexically linked with traditional, patriarchal values, while this Indonesian-influenced merger indexes a more modern, urban lifestyle that presents greater opportunities for women. This phenomenon might be said to reflect a process of fractal recursivity (Irvine & Gal, 2000), such that the ideological opposition between Javanese and Indonesian is replicated in the distinction between traditional and Indonesian-influenced Javanese. The gender patterns identified in this study highlight the utility of examining non-Western contexts, and particularly communities in the global South, to further our understanding of the interplay of gender and language in different societies.

## 8. Concluding remarks

In this study, we have argued that the ongoing merger of coronal stop consonants in Javanese, although originating in cross-linguistic influence from Indonesian, is now becoming a community norm in the two urban communities investigated. Given the rapid rise of Indonesian, it is likely that the merger we have considered here is one of many changes underway in the Javanese spoken by younger Indonesians. In future work, elicitation of data from adult speakers, along with incorporation of a wider range of linguistic variables and different stylistic contexts, as well as data collection in non-urban areas and from a broader range of social classes, would provide a more complete picture of the patterns of language use in these communities. In addition to examining language production, it would also be of interest to investigate whether listener perception of phonemic contrasts in Javanese is shaped by linguistic repertoire or ongoing community language change.

Regarding the more general implications of this work, these findings underscore the fundamental role that social factors play in our use of language; even in a low-proficiency heritage language produced by young children, speakers use the resources available to them to perform key aspects of their social identity. Moreover, the leading role played by girls in this merger reminds us that the characterization of young girls as upholders of conservative, academic norms and standard language is an overgeneralization that may not apply in societies such as Indonesia, in which conservative norms are linked to patriarchal social systems.

Finally, in the realm of education policy and practice, we note that more work must be done to equip teachers of Javanese with the time, resources, and knowledge of variation needed to effectively teach the language in this rapidly evolving, multilingual context. Our findings confirm a dramatic decline in inter-generational transmission from parents to children, leaving school as children's primary source of Javanese exposure. If Javanese is to survive, families and schools must work together to ensure that children are not cut off from their own heritage language.

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## Abstract (Indonesian)

Dengan semakin dominannya Bahasa Indonesia di Indonesia, bahasa – bahasa daerah seperti Bahasa Jawa berpotensi mendapat pengaruh fonologis dari bahasa nasional ini. Besar kecilnya pengaruh fonologis tersebut dapat bergantung pada beberapa faktor, diantaranya daerah asal dan latar belakang sosial seorang penutur serta usia pemerolehan bahasa dan tingkat kemahiran berbahasa. Penelitian kami ini mengkaji dampak beberapa faktor tersebut terhadap ujaran

lisan Bahasa Jawa pada anak – anak multilingual di Jawa Timur, provinsi dengan jumlah penutur Bahasa Jawa terbanyak kedua setelah Jawa Tengah. Secara spesifik, kami menganalisa produksi fonem dental (/t/ /d/) dan retroflex (/ʈ/ /ɖ/) yang secara fonemis berbeda dalam Bahasa Jawa, tetapi tidak dalam Bahasa Indonesia. Data bahasa dalam penelitian ini kami kumpulkan dari 95 anak usia sekolah dasar di Malang (kota besar) dan Blitar (kota kecil). Penelitian kami menemukan bahwa empat fonem dalam Bahasa Jawa tersebut sedang mengalami perubahan, yaitu dari empat menjadi dua bunyi distingtif, menyerupai Bahasa Indonesia. Temuan penting lain adalah bahwa perubahan fonologis ini utamanya ditunjukkan oleh anak – anak perempuan dan anak – anak yang berasal dari kota besar. Oleh sebab itu, hasil penelitian kami menggarisbawahi betapa pentingnya faktor sosial dalam pemerolehan bahasa pada anak – anak multilingual. Selain itu, temuan kami juga menggambarkan perubahan elemen kebahasaan yang sedang terjadi dalam Bahasa Jawa.

**Kata kunci:** variasi fonologis, Bahasa Jawa, Bahasa Indonesia, pemerolehan bahasa, multilingualisme, dan kontak bahasa

## Abstract (Javanese)

Tansaya kathah ingkang angginakaken Basa Indonesia ing tlatah Indonesia, anjalari basa-basa daerah, kadosta Basa Jawi, kénging pengaruh *fonologis* saking basa nasional punika. Ageng alitipun pengaruh *fonologis* punika gumantung dhumateng mapinten-pinten perkawis, ing antawisipun daerah asal saha *latar belakang sosial* sarta yuswa anggènipun pikantuk basa lan tingkat wasis basanipun. Panalitèn kita punika migatosaken *dampak* mapinten-pinten perkawis menika tumrap ujaran lisan Basa Jawi laré- laré *multilingual* wonten ing tlatah Jawi Wétan, satunggalipun provinsi ingkang nggadhahi panutur Basa Jawi paling kathah saksampunipun Jawi Tengah. Bab ingkang kita kaji punika mligi babagan angungelaken *foném dental* (/t/ /d/) kalia *rétroflex* (/ʈ/ /ɖ/) ingkang wonten ing Basa Jawi bènten, manawi dipun pirsani kanthi adhedasar *fonemik*, ananging mboten bènten wonten ing Basa Indonesia. *Data* basa wonten ing panalitèn punika, kita kempalaken saking 95 laré sekolah dasar ing Malang (minangka wakilipun kitha ageng) kaliyan Blitar (kitha alit). Panalitèn kita punika, manggihaken bilih wonten sekawan *foném* ing Basa Jawi ingkang pinanggih éwah, inggih punika saking sekawan dados kalih suwanten *distingtif*, mèmper kaliyan Basa Indonesia. Hasil penting sanèsipun inggih punika éwah-éwahan *fonologis* punika dipun tindakaken kaliyan laré-laré èstri samanten ugi kaliyan laré-laré saking kitha ageng. Kanthi punika, hasil panalitèn kita ngiyataken pentingipun perkawis sosial wonten ing pikatukipun basa tumrapipun laré-laré *multilingual*. Kejawi saking punika, hasil kita ugi nggambaraken éwah-éwahanipun *elemen* basa ingkang nembé kadosan wonten ing Basa Jawi.

**Tembung kunci:** *variasi fonologis*, Basa Jawi, Basa Indonesia, pikantukipun basa, *multilingualisme*, lan kontak basa



## Address for correspondence

Evynurul Laily Zen  
Universitas Negeri Malang  
Jalan Semarang 05 Lowokwaru  
Kota Malang, East Java 65415  
Indonesia  
[evynurul.laily.fs@um.ac.id](mailto:evynurul.laily.fs@um.ac.id)

## Co-author information

Rebecca Lurie Starr  
National University of Singapore  
Department of English Language & Literature  
[rstarr@nus.edu.sg](mailto:rstarr@nus.edu.sg)