AUTOMATIC AND SOCIAL EFFECTS ON ACCOMMODATION IN MONOLINGUAL AND BILINGUAL SPEECH

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AUTOMATIC AND SOCIAL EFFECTS ON ACCOMMODATION IN MONOLINGUAL AND BILINGUAL SPEECH

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This dissertation investigates the automatic and social mechanisms underlying accommodation, and how these mechanisms influence the time-course of accommodation. In particular, I examine whether accommodation occurs for reasons related to social factors (e.g., affiliation) or whether accommodation occurs automatically (e.g. recency, novelty)—and how these automatic and social factors influence accommodation at various points both within an interaction and after. The social dimensions of accommodation are addressed by examining accommodation in monolingual and bilingual speech. Specifically, I test whether monolingual and/or bilingual participants converge more with either a monolingual or bilingual model talker, and whether a participant's speech community influences whether they accommodate to a model talker.

To investigate these questions, participants completed a referential communication task with two pre-recorded model talkers: an English monolingual model talker and a Spanish-English bilingual model talker. The participants themselves were either English monolinguals or Spanish-English bilinguals, from either a majority monolingual community (Ithaca, NY: 7.1% Hispanic/Latinx) or a majority bilingual community (Miami, FL: 68.6% Hispanic/Latinx) (U.S. Census Bureau, 2017b, 2017a). Thus, there were four participant groups: English monolinguals from Ithaca (M-Ithaca), Spanish-

English bilinguals from Ithaca (B-Ithaca), English monolinguals from Miami (M-Miami), and Spanish-English bilinguals from Miami (B-Miami). In order to address the time-course of accommodation, each participant interacted with each model talker one-at-a-time, and those interactions were divided into four blocks. Changes in accommodation were then examined by block.

During the experimental task, model talkers asked participants about words on a game board. The words on the boards appeared in pairs, containing both a prime word and a target word. The target words included the dependent variable, Voice Onset Time (VOT) in voiceless stops in English. VOT was selected because it differs in English and Spanish: English has long-lag VOTs at the beginning of a stressed syllable, where Spanish has short-lag VOTs. Half of the prime words contained the dependent variable, creating a priming condition, and half of the prime words did not, creating a non-priming condition.

Using these methods, two experiments were conducted. Experiment 1 addressed the following two questions: (1) Is accommodation automatic and/or socially-modulated? (2) Does accommodation increase during a priming condition? If so, does priming interact with automatic and social factors? Experiment 2 addressed the following two questions: (1) What is the time-course of accommodation? Specifically, how quickly do participants accommodate to a model talker, and how long does accommodation last within an interaction? (2) Will the most-recent, previous interaction influence accommodation during the following interaction?

The results of Experiment 1 provide evidence that accommodation is both automatic and socially-modulated. All participant groups produced longer VOTs with the monolingual model talker and shorter VOTs with the bilingual model talker, indicating that all participants automatically adjusted their speech to accommodate to both model talkers. Additionally, participants accommodated to model talkers when primed by speech that is not common in their speech community. For example, participants from the monolingual community (B-Ithaca, M-Ithaca) produced shorter VOTs when primed by the bilingual model talker. Thus, participants automatically accommodated to speech that is novel to them.

Accommodation was also influenced by social factors. Specifically, bilinguals from the monolingual community (B-Ithaca) produced the longest VOTs with the monolingual model talker, and monolinguals from the bilingual community (M-Miami) produced the shortest VOTs with the bilingual model talker. In both cases, the model talker did not share the same linguistic background as the participant group but did share the same linguistic background as the majority population in their speech community. Thus, a need to affiliate with their speech community, as linguistic outsiders in their speech community, led B-Ithaca and M-Miami to converge more with the monolingual and bilingual model talkers, respectively.

Experiment 2 examines the time-course of social and automatic accommodation. The results provide evidence that socially-motivated accommodation is more persistent (i.e., longer-lasting) than accommodation that occurs due to automatic causes. Specifically, automatic effects found in Experiment 1 occurred in earlier blocks of an interaction, while social effects occurred in later blocks. Also, social factors (e.g., affiliation) related to the most-recent, previous interaction with a model talker influenced participants' accommodation to a different model talker in the following interaction. For example, participants from the bilingual community (M-Miami, B-Miami) who interacted with the bilingual model talker first produced shorter VOTs when interacting with the monolingual model talker afterward. Thus, the time-course for socially-motivated accommodation is longer than the time-course for automatic accommodation. As such, socially-motivated accommodation is more likely to lead to long-term accommodation and, ultimately, language change.

BIOGRAPHICAL SKETCH

Naomi Ruth Enzinna was born in 1988 in Miami, Florida, where she lived until age 25. While in Miami, she received a Bachelor of Arts in English from Florida International University in 2011 and a Master of Arts in Linguistics from Florida International University in 2013. Her master's thesis was titled *The processing of preposition-stranding constructions in English*, under the supervision of Dr. Ellen Thompson. She moved to Ithaca in 2013 to start her PhD in Linguistics at Cornell University. Her current research interests are experimental linguistics, sociolinguistics, phonetic, phonology, and morphology.

This dissertation is dedicated to my mom, Carolyn Enzinna.

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CHAPTER 1

INTRODUCTION

This dissertation investigates the mechanisms underlying *accommodation*—defined as the adjustment of speech and other communicative behaviors during social interactions, in which speakers increase or decrease similarity to an interlocutor or other social group (Giles, 1973; Giles, Coupland, & Coupland, 1991). *Convergence* occurs when speech is adjusted in order to increase similarity to an interlocutor. *Divergence* occurs when speech is adjusted in order to decrease similarity to an interlocutor. Previous research has argued that accommodation occurs automatically[1] within a social interaction, with predominant influencing factors being recency of an interaction and novelty of a stimulus (see Section 1.1.1). There is also extensive evidence of accommodation occurring for social reasons, such as affiliation, bias, talker role, and more (see Section 1.1.2).

In this dissertation, I examine the automatic and social mechanisms underlying accommodation, and how these mechanisms influence the time-course of accommodation. More specifically, I test whether participants are more likely to converge with a model talker that they socially affiliate with—indicating that accommodation is socially-modulated—or whether participants converge with a model talker whom they have recently interacted with or whose speech is novel to them based on past exposure—indicating that accommodation occurs automatically, regardless of social motivations. Further, in a novel study on the time-course of accommodation, I examine

[1]This term is used in the literature to describe accommodation effects that are unconscious and occur at all times, regardless of social affiliations; it is a cognitive reflex to a speech stimulus (Babel, 2010; Trudgill, 2008).

how accommodation changes over the course of a short-term interaction, and how automatic and social mechanisms interact with the persistence of accommodation. (*Short-term interactions* are defined in this dissertation as interactions between a participant and a single interlocutor/model talker, from the start of the interaction until the participant stops interacting with the model talker and begins interacting with another.)

The social dimensions of accommodation are addressed by investigating accommodation in monolingual and bilingual speech. In this dissertation, I examine whether English monolinguals and Spanish-English bilinguals adjust their speech while interacting with an English monolingual and/or Spanish-English bilingual model talker, converging or diverging with the model talker. Additionally, I investigate whether a participant's speech community influences whether they accommodate to a model talker. Specifically, I examine whether participants accommodate more to an English-monolingual model talker or a Spanish-English bilingual model talker if the participant is from a majority English monolingual community or a majority Spanish-English bilingual community. The majority English monolingual community examined is Ithaca, New York—a small college town in northeastern United States, with a Hispanic/Latinx[2] population of 7.1% (U.S. Census Bureau, 2017a). The majority Spanish-English bilingual community examined is Miami, Florida, which is 68.6% Hispanic/Latinx (U.S. Census Bureau, 2017b). By examining these linguistic backgrounds and speech communities, this research is able to answer several different questions about the mechanisms underlying accommodation simultaneously.

To test these questions, an experimental program—the Boards for

[2]Latinx is a gender-neutral form used in place of Latino/Latina.

Automated Referential Communication Task (BARCoT)—was developed (Enzinna & Tilsen, 2018; described in Section 2.1). This program allows for examination of the time-course of accommodation, which has not been explored in previous studies on accommodation. The BARCoT program runs a referential communication task on a computer, using pre-recorded model-talker voices for audio stimuli. Participants interact with the pre-recorded model talkers while completing the task. The program then labels the experimental data according to various independent variables. One such variable is a time variable, which allows for the detailed analysis of accommodation at various points of the experiment.

The independent variables used to test social factors are (1) the model talker's linguistic background, (2) the participant's linguistic background, (3) the participant's speech community, and (4) the interaction between these variables. The experimental design addresses the influence of these variables in the following ways: (1) Participants interact with two model talkers: one that is an English monolingual and one that is a Spanish-English bilingual (described further in Section 2.2.3). (2) Half of the participants are English monolinguals and half of the participants are Spanish-English bilinguals (described further in Sections 2.2.1 and 3.1.1). (3) Half of the participants are from a majority English monolingual community (Ithaca, NY) and half are from a majority Spanish-English bilingual community (Miami, FL). (4) Half of the participants from Ithaca and Miami are English monolinguals, and half of the participants from Ithaca and Miami are Spanish-English bilinguals. Thus, there are four participant groups, listed in Table 1.1. Also, all participants interact with both model talkers, one at a time. The order in which participants interact with the model talkers is counterbalanced for which talker is heard first.

Table 1.1: Participant groups

SPEECH COMMUNITY	LINGUISTIC BACKGROUND	
	MONOLINGUAL	BILINGUAL
MONOLINGUAL	Monolinguals from Ithaca	Bilinguals from Ithaca
BILINGUAL	Monolinguals from Miami	Bilinguals from Miami

The dependent variable is Voice Onset Time (VOT) for voiceless stops in English. VOT was selected because VOT in voiceless stops in English differ from VOT in voiceless stops in Spanish. Specifically, voiceless aspirated (long-lag) stops occur at the beginning of stressed syllables in English. In the same position, unaspirated (short-lag) voiceless stops occur in Spanish (Lisker & Abramson, 1964; Flege & Eefting, 1987; among many others). Also, previous research provides ample evidence that VOT is a phonetic property that participants will accommodate (Flege & Hammond, 1982; Shockley, Sabadini, & Fowler, 2004; Mora, Rochdi, & Kivistö-de Souza, 2014; Abrego-Collier, Grove, Sonderegger, & Yu, 2011; Sonderegger, 2012; Levi, 2015; among others). Therefore, VOT was selected because it was appropriate for the aims of this research. Additionally, VOT was selected because previous research has shown it to be a reliable acoustic measure to use in accommodation studies. (See Section 1.4.2 for more on VOT accommodation research).

Accommodation will be considered automatic if all participants adjust their VOTs, converging toward both model talkers' VOTs. This will indicate that participants accommodate to model talkers due to recency of the speech stimulus. Additionally, accommodation will be considered automatic if participants converge only with model talkers whose speech is novel to them (e.g., if their speech is relatively rare in the participant's speech community). This will indicate that novelty of speech triggers participants to pay more attention to the speech and, consequently, accommodate to that speech.[3] Alternatively, accommodation will be considered socially-modulated if participants' VOTs converge with those of the model talker who shares a linguistic background with them and/or with the majority of people in their speech community. This will indicate that participants accommodate to model talkers that they affiliate with. (See Section 2.3.5 for information on how accommodation/convergence is measured in this dissertation.)

The goals of this dissertation study are addressed in two experiments: "Experiment 1: Accommodation in short-term interactions" (Chapter 3) and "Experiment 2: Time-course of accommodation" (Chapter 4):

EXPERIMENT 1: Accommodation in short-term interactions: Experiment 1 examines the mechanisms that determine whether participants accommodate within a short-term interaction. The following two questions are addressed in Experiment 1: (1) Is accommodation automatic and/or socially-modulated? (2) Does immediate exposure to a phonetic variable (i.e., priming) increase accommodation? If so, does immediate exposure interact with social variables? These questions are answered by examining accommodation within a short-term interaction with a model talker, averaged over the entire interaction. Additionally, accommodation during a priming condition and a non-priming condition are compared.

[3] The difference between recency and novelty, in regard to the predictions in this dissertation, is in whom the participant accommodates to. If a recency effect occurs, participants will accommodate to both model talkers, regardless of linguistic background and speech community. This is because, in all cases, participants are accommodating to what is recent. Social variables do not influence what is recent. If a novelty effect occurs, social variables *are* relevant, though not for affiliation reasons. Rather, participants will accommodate to model talkers whose speech is novel to them, for reasons related to lack of exposure to a linguistic background and/or speech community. Specific hypotheses regarding recency and novelty are presented in Section 3.2.1.

Experiment 2: Time-course of accommodation: Experiment 2 examines how accommodation changes over time, both within an interaction and into the following interaction. The following two questions are addressed in Experiment 2: (1) What is the time-course of accommodation? Specifically, how quickly do participants accommodate to a model talker, and how long does accommodation last within a short-term interaction? To address this question, each short-term interaction with a model talker is divided into four blocks, and accommodation is compared by part. (2) Will the most-recent, previous short-term interaction influence accommodation during the following short-term interaction? To address this question, I examine whether accommodation is influenced by the order in which participants interacted with the model talkers. Both of these questions are examined in the context of both automatic and social influences on accommodation.

The broader question that these two experiments address is how the speech of larger speech communities impacts individual linguistic performance, and vice versa. Experiments 1 and 2 examine the automatic and social mechanisms underlying accommodation and their impact on the time-course of accommodation within a short-term interaction, while also providing insight into the persistence of social and automatic factors and their role in language change. Specifically, the results of this dissertation provide evidence that accommodation is both automatic and socially-modulated, but that socially-motivated accommodation is more persistent (i.e., longer-lasting) than accommodation that occurs due to automatic causes. These findings suggest that socially-motivated accommodation is more likely to lead to long-term accommodation and, thus, language change.

In the remainder of this chapter, I review literature related to accommodation and the aims of this dissertation. In Section 1.1, I discuss the current debate on the automatic versus social nature of accommodation, providing evidence for automatic accommodation in Section 1.1.1 and for socially-modulated accommodation in Section 1.1.2. In Section 1.2, research on the time-course of accommodation, including accommodation's role in language change, is presented. In Section 1.3, I describe exemplar-based approaches to both automatic and/or socially-modulated accommodation. In Section 1.4, research that is relevant for the experimental design is presented. Specifically, regarding the selection of Miami as the bilingual speech community, I discuss the demographics of Miami, the prestige of Spanish in Miami, and the impact of Spanish and English contact on language usage in Miami (Section 1.4.1). Additionally, regarding the selection of VOT as the dependent variable, I discuss VOT differences in English and Spanish, VOT in bilingual speech, and the findings from VOT priming and accommodation studies (Section 1.4.2). Finally, in Section 1.5, a brief overview of the remainder of this dissertation is provided.

1.1 Is accommodation automatic or socially-modulated?

There are at least two views on the mechanisms underlying accommodation: One view is that accommodation is predominantly automatic. Trudgill (2008), for example, argues that accommodation occurs automatically through language contact, and that social group identity does not cause accommodation but rather is a consequence of it. He uses earlier colonial varieties (e.g., Brazilian Portuguese, Canadian French, Australian English) as examples of varieties created by long-term accommodation through language contact in "an era when any role for national identities would be very hard to argue for" (Trudgill, 2008, p. 241). He argues, if accommodation was not influenced by identity for these varieties, then there is no need for identity to factor into accommodation in the present. Similarly, Delvaux and Soquet (2007) argue that accommodation occurs automatically and unintentionally. In order to examine whether socio-psychological aspects of accommodation are necessary for accommodation, they examined whether speakers would imitate ambient background speech that they have not been instructed to listen to. They found that speakers accommodated to the ambient background speech, which they argue is evidence that accommodation occurs automatically, unintentionally, and regardless of social factors.

The second view is that accommodation is also socially-modulated.[4] For example, Babel (2010) argues that accommodation is both automatic and social. Babel examined accommodation by New Zealand English (NZE) participants to an Australian model talker, and whether participants' explicit and implicit biases about the model talker influence whether they accommodate. Explicit biases were examined by having positive and negative conditions in the experiment. In the positive condition, participants were told that the Australian model talker viewed New Zealand positively and was born in Auckland, New Zealand. In the negative condition, participants were told the model talker had strong negative feelings about New Zealand. Implicit biases were examined through an implicit bias task concerning whether participants viewed Australia and New Zealand positively or negatively.

[4]It should be noted that this view does not necessarily exclude automatic influences on accommodation.

The results showed that accommodation was influenced by pariticpants' implicit biases, not their explicit biases. Specifically, NZE pariticpants with pro-Australia implicit biases were more likely to accommodate to the Australian model talker. Babel argues that this shows that accommodation is automatic because it is influenced by subconscious, implicit biases, but that accommodation is also social because these biases are related to social group identities. She states, "This result leads to a nuanced view reminiscent to that of Trudgill 2008: speakers of language cannot help accommodating, but group-identity attitudes modulate this automation process, much like what is predicted in both audience and referee design (Bell, 1984, and CAT (Giles et al. 1991)" (p. 454).

In the sections below, research in support of accommodation occurring automatically (Section 1.1.1) and in support of social factors driving accommodation (Section 1.1.2) are described.

1.1.1 Accommodation is automatic

Previous research has shown that accommodation occurs for reasons that seem, at least on the surface, unrelated to social factors. Two predominant automatic factors are *novelty* (e.g., frequency (Goldinger, 1998; Stollenwerk, 1986; Babel, 2010; D'Imperio, Cavone, & Petrone, 2014) and atypicality (Babel, McGuire, Walters, & Nicholls, 2014; Strand, 2000)) and *recency* (e.g., priming (Nielsen, 2011; Levi, 2015; Enzinna, 2017) and immediacy (Goldinger, 1998)). Additionally, numerous studies argue that imitation and shadowing (i.e., accommodation) occur automatically, without there being obvious social factors included in the experimental design (Goldinger, 1998; Dufour & Nguyen, 2013; Delvaux & Soquet, 2007; Yuen, Davis, Brysbaert, & Rastle, 2010). Further, research suggests that speech perception triggers memory of gestures, causing speakers to imitate those gestures (Yuen et al., 2010; Fowler, Brown, Sabadini, & Weihing, 2003; Shockley et al., 2004). Some of these studies are described below.

In regard to novelty, numerous studies have shown that low-frequency or nonce words are accommodated to more than high-frequency words. For example, Goldinger (1998) showed that participants shadowed a model talker more when target words were low-frequency or nonce words. Similar results were found for low-frequency and nonce words in Stollenwerk, 1986; Babel, 2010; D'Imperio et al., 2014; among others. Goldinger (1998) argues that a similar effect should be found with atypical voices and other unusual contexts. Babel et al. (2014) reported this finding in their results: Participants converged with model talkers who had voices atypical of their gender.[5] These findings together suggest that hearing novel speech automatically triggers speakers to converge to that speech, regardless of social preferences. However, it should be noted that Babel et al. (2014) point out, "It is recognized that these two cognitive mechanisms [(accommodation motivated by automatic cognitive reflexes or social preference)] are not mutually exclusive from one another, in that novelty may positively affect social preference" (p. 147).

In addition to novelty, recency has been argued to increase accommodation. For example, priming increased convergence in numerous studies: In Nielsen, 2011, speakers produced longer VOTs when primed by extended VOTs. In Levi, 2015, speakers produced longer /t/ VOTs after hearing atypically-long

[5]In this same study, female participants were found to accommodate more to typical voices than atypical voices, but both male and female participants accommodated to the atypical voices (Babel et al., 2014).

/p/ VOTs or atypically-short /k/ VOTs. Also, in Levi, 2015, participants primed their own speech with recently-said forms; speakers produced longer /t/ VOTs after saying a prime starting with /k/, and shorter /t/ VOTs after saying a prime starting with /p/. Additionally, in Goldinger, 1998, immediacy was shown to influence accommodation: Speakers imitated a model talker more when they immediately shadowed the talker, compared to when they shadowed a talker after a delay.

In many of the studies mentioned above, participants converged with a model talker during a shadowing or imitation task, in settings and under conditions that are not created to invoke a social response (i.e., they were in a lab, listening to an unknown and/or modified voice over a headset). Shockley et al. (2004), for example, examined whether speakers would imitate extended VOTs in a nonsocial setting, with their goal being "to replicate and extend Goldinger's (1998) finding that adult's shadowing responses, obtained in nonsocial settings, are imitative" (p. 423). The results confirmed that speakers imitated the model talker, regardless of being in a nonsocial setting. Similarly, in numerous shadowing and imitation studies, the conditions are not necessarily socially-motivating, and yet there is accommodation (e.g., Goldinger, 1998; Dufour & Nguyen, 2013; Delvaux & Soquet, 2007; Yuen et al., 2010; among many others).

Shockley et al. (2004) argue that their findings, as well as Goldinger's (1998), might be accounted for by gesture theories, such as the motor theory of speech perception (Liberman & Mattingly, 1985) or the direct realist theory (Fowler, 1986). Under these approaches, speech perception triggers gesture memory, which then causes speakers to produce or imitate those gestures. Results from

Yuen et al.'s (2010) articulatory study support this argument. In their study, speakers produced target words starting with either /k/ or /s/ after being primed by either words starting with the same syllable or words starting with /t/. After hearing words starting with /t/, speakers produced /k/ and /s/ with more tongue-palate (alveolar) contact, compared with when they were primed by words starting with the same syllable. In other words, priming speakers with an alveolar stop activated speakers' memories of the related gestures, causing them to produce those gestures.

These studies provide evidence that accommodation occurs automatically, absent of social motivations. Still, there is ample evidence that accommodation may also occur for social reasons, described in the following section.

1.1.2 Accommodation is socially-modulated

Numerous research studies support the argument that social factors modulate the accommodation process. Social factors argued to interact with speaker convergence are gender (Namy, Nygaard, & Sauerteig, 2002; Pardo, 2006; Pardo, Jay, & Krauss, 2010; Babel et al., 2014), talker role (Pardo, 2006; Pardo et al., 2010, 2013), model talker attractiveness (Babel, 2012; Babel et al., 2014), nationality bias (Babel, 2010; described above), speech community identity (Labov, 1963), social distance/teammate preference (Tilsen, 2016), attitude toward model talker (Abrego-Collier et al., 2011; Yu, Abrego-Collier, & Sonderegger, 2013), closeness to interlocutor (Pardo, Gibbons, Suppes, & Krauss, 2012), native-bias (Hwang, Brennan, & Huffman, 2015; Zajac & Rojczyk, 2014; Chiba, Matsuura, & Yamamoto, 1995; Dalton-Puffer, Kaltenboeck, & Smit, 1997), and many more.

Some of these studies are briefly described below.

Previous studies have argued that gender influences accommodation. For example, both Babel et al. (2014) and Namy et al. (2002) found that women accommodate more than men, but Pardo et al. (2010) found that men accommodate more than women. Babel et al. (2014) found the female participants accommodated toward attractive voices, but male participants did not. Pardo (2006) found that both men and women accommodate, but they accommodate differently depending on their role in an interaction (e.g., giver versus receiver). Contrastingly, both Thomson, Murachver, and Green (2001) and Abrego-Collier et al. (2011) did not find gender to influence accommodation. These findings suggest that gender may influence accommodation but that at present this finding is inconclusive.

Next, as mentioned, Pardo (2006) found talker role to influence accommodation. In a map task, where "givers" give instructions to a "receiver," participants in the giver role converged more with receivers than receivers did to givers. However, there was an interaction with gender, where female participants converged more as givers and male participants converged more as receivers. In Pardo et al., 2010, when participants were explicitly told to imitate, receivers were found to imitate more than givers. In Pardo et al., 2013, participants switched between talker roles; results showed that convergence was influenced by the talker role that the participant had first.

Previous studies have found speakers to accommodate towards speech in their community. For example, Labov (1963) examined speech in Martha's Vineyard, Massachusetts, specifically focusing on the centralization of the first element in the diphthongs /ai/ and /au/. The centralized diphthongs had been produced on Martha's Vineyard in previous generations and were largely associated with older speakers and with the past. At the time of the study, residents of Martha's Vineyard were experiencing economic hardships and felt as if they were losing their homes to summer visitors. Residents in the age group experiencing the most economic hardship (ages 31-45) were found to be producing more centralized diphthongs. Additionally, younger speakers who did not plan on leaving the island were producing the centralized diphthong more than those who were planning to leave the island. According to Labov, "the meaning of centralization, judging from the context in which it occurs, is positive orientation towards Martha's Vineyard" (1963, p. 306). Speakers adjusted their speech in order to associate more closely with their community.

Previous studies have also found speakers to accommodate for reasons related to their attitude toward an interlocutor. For example, Tilsen (2016) found that social distance between two speakers correlated with speech behaviors. In his study, the same eight participants completed map tasks together over 10 consecutive weeks. During those 10 weeks, participants ranked each other on a scale of whom they wanted to play the map-task game with from the most to the least. This ranking was used to calculate social distance. Results showed that social distance was correlated with speakers' vowel qualities, sibilant qualities, and syntactic behavior. Similarly, Abrego-Collier et al. (2011) found that participants converged with interlocutors when the participant had a positive opinion about the interlocutor. Also, Pardo et al. (2012) examined accommodation in college roommates and found that roommates who reported being closer to each other showed more convergence.

Additionally, native-bias has been shown to influence accommodation by non-native speakers. For example, Zajac and Rojczyk (2014) found that Polish learners of English converged with native English speech, and diverged away from non-native, Polish-accented English. Similarly, in Hwang et al. (2015), Korean learners of English converged with English speech spoken by a native English speaker, particularly in priming conditions and pragmatic conditions (i.e., conditions in which homophones created ambiguity). Contrastingly, they did not converge with non-native, Korean-accented English spoken by a Korean native speaker. Both of these studies, along with many others (e.g., Chiba et al., 1995; Dalton-Puffer et al., 1997), suggest that a native bias can influence accommodation by L2 speakers in their second language.

Of importance to note is the role of priming in Hwang et al., 2015. Korean learners of English converged with English speech spoken by a native English speaker when primed (in addition to pragmatic conditions). The same result was not found when primed by the Korean native speaker. This suggests that priming, while often discussed as an automatic or cognitive effect, can also interact with social factors. As Hwang et al. (2015) write, these "findings suggest that priming effects in dialogue are not obligatory but may be motivated" (p. 72); in this case, accommodation was motivated by native-bias. Thus, automatic and social accommodation effects have been shown to overlap.

1.2 The time-course of accommodation

As described above, numerous studies provide evidence that recency, novelty, and a variety of social factors—many of which change along with linguistic experiences—influence accommodation and, thus, cause variation within individual linguistic performance. In order to better understand this variation, accommodation research must address the time-course of accommodation. Specifically, questions that need to be addressed are the following: How quickly does accommodation occur? How do accommodation effects vary within a short-term interaction? What are the lasting effects of consequences from interaction to interaction? If there are lasting effects, does accommodation ultimately cause language change? Previous research studies provide us with some insight into the time-course of accommodation, but further efforts are necessary.

Regarding accommodation within a short-term interaction, previous studies suggest that accommodation occurs rapidly and increases throughout the interaction. In Pardo's 2006 map-task study, shadowing effects were found for tokens produced earlier in an interaction, but stronger shadowing effects were found for tokens produced later in the interaction. Similarly, in Goldinger, 1998, shadowing effects were found immediately after interaction with a prime, and shadowing increased with more repetitions. Thus, there is some evidence that accommodation occurs quickly within a single interaction and increases. However, it should be noted that some studies also show a diminishing effect over time. For example, in Goldinger, 1998, accommodation was greater when shadowing occurred immediately, compared with after a delay. This discrepancy may be explained by further examining how the time-course of accommodation interacts with automatic and social factors.

It should be noted that, while speakers may accommodate rapidly, accommodation is not thought to be a consistent and exact imitation, but rather it is inexact and inconsistent (Pardo, 2006, p. 2382–2383). While speakers will produce speech similar to that of an interlocutor, those productions will not necessarily match the interlocutor's. For example, in Fowler et al., 2003, participants produced longer VOTs after extended VOT primes, but their VOTs were not as long as those in the primes. Also, perceptual judgments of accommodation suggest speakers imitate inconsistently (Pardo, 2006). Thus, while speakers do accommodate within a single interaction, accommodation will likely fluctuate and may not necessarily match a target. Explained by Pardo (2006), "The acoustic output reflects both perceptual/productive limitations on fine-grain accuracy and the influence of other factors that induce directional biases in the discrepancies" (p. 2383).

Regarding the lasting effects of accommodation from interaction to interaction, previous studies have shown that accommodation effects may persist after an interaction. For example, in Pardo, 2006, convergence persisted into a post-task study. In Delvaux & Soquet, 2007, accommodation to ambient speech persisted for over 10 minutes after exposure. In Hay, Warren, & Drager, 2006, the background of the experimenter who provided instructions for the study impacted the results of the study that followed. Thus, accommodation effects have been shown to linger after an interaction.

Assuming that accommodation does have lasting effects, accommodation is often seen as a vehicle of language change (Labov, 1974; Trudgill, 2008; Sonderegger, 2012; Babel et al., 2014; Pardo, 2006). As described by Sonderegger (2012), in the "change-by-accommodation" model, short-term accommodation within a single interaction, if repeated over long periods of time, can lead to medium-term change (change over hours and months) and long-term change (change over many years) within an individual's norms. Previous studies provide evidence that accommodation leads to short-term change (refer to Section 1.1), medium-term change (Sancier & Fowler, 1997; Sonderegger, 2012; Pardo et al., 2012; Tilsen, 2016), and long-term change (Stollenwerk, 1986; Munro, Derwing, & Flege, 1999). As these short-to-long-term changes spread throughout a speech community, accommodation is predicted to lead to language change. For example, prior research provides evidence that Miami is developing a Spanish-influenced variety of English (Enzinna, 2015, 2016) due to frequent contact between English and Spanish in Miami. The change-by-accommodation model may be able to explain the emergence of this new variety.

1.3 Exemplar-based approaches to accommodation

Regardless of whether accommodation is socially-driven or occurs automatically, the research described above provides evidence that speakers accommodate during social interactions. What is less clear is how it occurs. To explain accommodation effects, previous research often refers to exemplar-based theories (Hay et al., 2006; Johnson, Strand, & D'Imperio, 1999; Goldinger, 1998; Nielsen, 2011; Dufour & Nguyen, 2013), such as those described in Pierrehumbert, 2001; Johnson, 2005; Hintzman, 1986; and more.

While there are many different exemplar-based models of phonology, the basic assumptions are the same (Pierrehumbert, 2001; Johnson, 2005). Exemplar tokens of linguistic experiences are stored and categorized based on similarity (e.g., phonetic and non-phonetic properties) to other exemplar tokens. Exemplar storage and retrieval is influenced by an exemplar's resting activation level, which is influenced by recency, novelty, and—maybe—social preferences.

Exemplars with higher activation levels are more likely to be selected during perception and production.

For example, exemplar models can account for the recency effects described above (Pierrehumbert, 2001; Johnson, 2005). More-recently activated exemplars hold higher activation levels than less recent exemplars. For this reason, speakers are more likely to imitate recent speech. For example, in Goldinger, 1998, participants imitated more immediately after hearing a stimulus, and imitated less after a short delay. Additionally, numerous priming studies provide evidence that speakers accommodate when recently primed (Nielsen, 2011; Levi, 2015; among many others).

Similarly, exemplar models can account for novelty effects (Pierrehumbert, 2001; Johnson, 2005; Luce & Pisoni, 1998). When an exemplar is novel, speakers have little experience with exemplars that are similar, and therefore have few exemplars competing with the novel exemplar. For this reason, novel exemplars have higher resting activation levels. Also, by definition, novel exemplars are also recent exemplars. Evidence of novelty effects have been shown in previous research (Goldinger, 1998; Luce & Pisoni, 1998; Johnson et al., 1999). In Goldinger, 1998, participants reacted faster after hearing high-frequency words because those words activated more, similar exemplars (or "traces"), making perception easier and thus responses quicker. For the same reason, participants imitated high-frequency words less: Because high-frequency words activate a large number of exemplars, speakers select and produce an exemplar that is more typical for that exemplar category, based on the speaker's past experiences, rather than imitating a prime. Contrastingly, the opposite effect was found for low-frequency and nonce words: Because low-frequency words activate fewer, similar exemplars, participants reacted slower after hearing low-frequency/nonce words (Goldinger, 1998). Similarly, participants imitated more after hearing low-frequency words, because there were fewer neighboring exemplars and thus the typical exemplar in that category was more easily influenced by the prime.

As repetitions of an exemplar increase, however, typical productions of an exemplar category can shift (Pierrehumbert, 2001). For example, in Goldinger, 1998, participants responded faster and imitated more with increased repetitions of the same speech pattern. The assumption is that, with each repetition, a new exemplar was stored, increasing activation levels for that exemplar, and thus shifting the typical production of that exemplar category. Thus, exemplar models can account for the processes related to accommodation that are considered automatic: "The model automatically generates social accommodation of speech patterns, since speech patterns which are heard recently and frequently dominate the set of exemplars for any given label, and therefore guide the typical productions. This effect arises from the feedback loop from production to classification to production which is set up by the 'speech chain' of conversational interaction" (Pierrehumbert, 2001, p. 13).

Missing from this speech chain, insofar as it has been explained, is how social factors influence perception and production. As mentioned above, linguistic exemplars are categorized by both phonetic and non-phonetic properties; thus, exemplars may be socially-indexed. Evidence of social indexing is found in Hay et al., 2006. In their study, Hay et al. examined perception and production of the NEAR-SQUARE merger in NZE, which is more likely to be merged in younger speech than older speech. In the study, participants heard a recording and had to decide which word was said. In one condition, the speech was associated with either a younger talker or an older talker. Results showed that participants were more accurate when the speech was associated with an older talker. Hay et al. argue that this is because participants expected unmerged vowels with older talkers. This is evidence that those participants indexed the unmerged vowels with the non-phonetic property of talker age.

Exemplars that are indexed by socially-preferred non-phonetic properties receive additional attentional weighting. As explained by Pierrehumbert (2001), "If a child emulates the speech patterns of a particularly admired role model, this would be modelled by weighting of the exemplars in that particular voice. This weighting represents the net positive effect of feedback from the other levels of representation involved in the child's understanding of his social situation" (p. 13). Evidence of attentional weighting can be found in Tilsen, 2016; Abrego-Collier et al., 2011; and Pardo, 2006 (described in Section 1.1.2), where speaker convergence is found to be influenced by interlocutors' social distance, attitudes, and closeness. Thus, social indexing and attentional weighting in exemplar models can explain the social modulation of accommodation.

Exemplar-based approaches to phonology help explain the cognitive motivations underlying accommodation. Unlike structural or generative frameworks, exemplar theories account for the role of frequency, recency, and social factors in the variable use of phonological patterns, both in a single interaction and over time (Johnson, 2005). This helps us explain intra- and inter-speaker variation, as well as historical and future sound change. This is not to say that structural/generative frameworks are not important; they provide essential formal descriptions of language, which exemplar-based approaches benefit from greatly. Rather, as Johnson (2005) argues, structural and exemplar-based frameworks feed each other: "the most strict formal description of language sound patterns benefits from historical explanation, and the most ardent biological [(exemplar)] description benefits from formalized statements of generalizations" (p. 290). With this said, exemplar models have often been cited by past research on accommodation because of their distinct ability to account for variation caused by both automatic and social factors.

1.4 Goals of the experimental design in this dissertation

As stated in Section 1, the goals of this dissertation research are to examine both automatic and social influences on accommodation. In order to reach these goals, the experimental design includes the following independent, social variables: (1) the model talker's linguistic background, (2) the participant's linguistic background, (3) the participant's speech community, and (4) the interaction between these variables.

These variables are relevant to the design in the following ways: (1) The participants interact with two model talkers: an English monolingual model talker and a Spanish-English bilingual model talker. (2) Half of the participants are English monolinguals and half of the participants are Spanish-English bilinguals. (3) Half of the participants are from a majority English monolingual community (Ithaca, New York) and half are from a majority Spanish-English bilingual community (Miami, Florida). (4) Half of the participants from Ithaca and Miami are English monolinguals, and half of the participants from Ithaca and Miami are Spanish-English bilinguals. Thus, there are four participant groups, presented again in Table 1.2. Also, all participants interact with both model talkers one-at-a-time, counterbalanced for which talker is heard first.

Table 1.2: Participant groups

Speech Community	**Linguistic Background**	
	Monolingual	Bilingual
Monolingual	Monolinguals from Ithaca	Bilinguals from Ithaca
Bilingual	Monolinguals from Miami	Bilinguals from Miami

Ithaca and Miami were selected because of their distinct speech communities. Additionally, prior research provides evidence that Miami is developing a Spanish-influenced variety of English (Enzinna, 2015, 2016) due to frequent contact between English and Spanish speakers in Miami. The change-by-accommodation model may be able to explain the emergence of this new variety: If English monolingual and/or Spanish-English bilingual participants from Miami accommodate to the Spanish-English bilingual model talker differently than Ithaca participants, this will give us insight into the social modulation of accommodation. To provide context to the unique demographics of Miami, research on Spanish in Miami is presented in Section 1.4.1.

The dependent variable is Voice Onset Time (VOT) for voiceless stops. VOT was selected because VOT in voiceless stops in English differ from VOT in voiceless stops in Spanish. Also, previous research provides ample evidence that VOT is a phonetic property that participants will accommodate (Flege & Hammond, 1982; Shockley et al., 2004; Mora et al., 2014; Abrego-Collier et al., 2011; Sonderegger, 2012; Levi, 2015; among others). Therefore, VOT was selected because it was appropriate for the aims of this research. Research related to VOT in English and Spanish and accommodation of VOT is presented in Section 1.4.2.

1.4.1 Miami: A bilingual speech community

The demographics of Miami, Florida, are unique. Unlike most of the United States, the population of Miami is more Hispanic/Latinx[6] than not. In 2017, Miami-Dade County was 68.6% Hispanic/Latinx (U.S. Census Bureau, 2017b). Various areas within Miami-Dade report higher numbers: In 2010, Miami (city) was 70% Hispanic/Latinx, Doral was 79.5% Hispanic/Latinx, Miami Lakes was 81.1% Hispanic/Latinx, and Hialeah was 94.7% Hispanic/Latinx (Carter & Lynch, 2015; Carter & Callesano, 2018). Correspondingly, 71.9% of Miami-Dade residents do not speak English at home; based on Miami's demographics, they are likely speaking Spanish at home (Carter & Lynch, 2015; Carter & Callesano, 2018).

Unlike similar cities in the U.S., Miami-Dade's Hispanic/Latinx population straddles the socioeconomic ladder (Carter & Lynch, 2015; Carter & Callesano, 2018). When Carter and Callesano (2018) "compare[d] the 'percent non-English at home' with median household income, [they found] high percentages of Spanish not only in working-class areas such as Hialeah (median income: $31,648; % non-English: 94.2%), but also in middle-class areas such as Doral (median income: $69,300; % non-English: 88.8%) and in affluent areas such as Key Biscayne (median income: $104,554; % non-English: 79.9%)" (p. 72). As Carter and Callesano (2018) argue, Miami is different from the rest of the

[6]Latinx is a gender-neutral form used in place of Latino/Latina.

country because Spanish is being spoken at home at all socio-economic levels, not just in working-class areas.

The makeup of the Hispanic/Latinx population in Miami is also different than the rest of the country. The majority of the U.S.'s Hispanic/Latinx population is of Mexican heritage (Carter & Lynch, 2015, 2018; Carter & Callesano, 2018). "In contrast, the Mexican-origin population in Miami-Dade is relatively small (3%) compared with the Caribbean groups who make up Miami-Dade's majority Latin@[7] population. Cubans (54%), Puerto Ricans (6%) and Dominicans (4%) make up about 65% of Miami Dade's Latin@ population (Brown and Lopez 2013)" (Carter & Callesano, 2018, p. 72). In other words, Miami-Dade's Latinx population largely consists of Cubans and other Caribbean populations.

Because of Miami's unique demographics, Spanish holds high social value within the community, and is present in various areas of Miami's pop culture, politics, business, media, and more (Lynch, 2000; Enzinna, 2015, 2016). In popular culture, for example, Spanish is spoken in the lyrics of songs written about Miami, from Will Smith's (1998) "Miami" to Pitbull's (2009) "I Know You Want Me" (to name a few). Regarding politics, with the exception of one mayor in 1993-1996, every Miami mayor since 1973 has been Latinx (Enzinna, 2015; Joyner, 2008). In business, 60.5% of all business firms in Miami were Hispanic-owned in 2014 (Enzinna, 2015). Also, many businesses require employees to speak both English and Spanish, as many customers prefer to speak Spanish, can only speak Spanish, and/or are visitors from Latin America. Thus, Spanish is frequently heard in various areas of life in Miami. Importantly, it is frequently heard in areas of prestige.

[7] Carter & Callesano, 2018 use Latin@ in place of Latinx.

Despite its presence in affluent Miami neighborhoods and various areas of Miami life, previous research shows that Miamians may not perceive Spanish as wholly tied to prestige. Rather, their attitudes toward Spanish are complex. For example, in Carter & Callesano, 2018, Miami participants' attitudes toward Peninsular, Colombian, and Cuban Spanish were compared. Results indicated that Peninsular Spanish was associated with wealth, prestigious professions, and earning potential. Importantly, Cuban Spanish was not, despite the success of Cubans in Miami. Additionally, while Lynch (2000) predicted Spanish's rise in social prestige would promote usage of Spanish and bilingualism, Carter and Callesano (2018) argue that Spanish is being spoken less by more recent generations, and that this shift is tied to Miami's lack of bilingual education programs: "Miami-born Latin@s receive the message that educational and sociocultural success is tied to English monolingualism . . . although the widespread use of Spanish in the region may give one the impression that Anglo White linguistic interests are not centralized in public life, Miami-Dade institutions are for the most part English-only." (Carter & Callesano, 2018, p. 86). Thus, while Spanish is common in some areas of prestige, it is not in other important areas of Miami life. To better understand the complex language attitudes in Miami, more sociolinguistic research is needed in Miami (see Carter & Lynch, 2015).

Some research has been conducted on the influence of contact between English and Spanish on language use in Miami. For example, to examine the influence of Spanish-English contact on English monolingual speech, I compared rhythm and pitch in English spoken by English monolinguals from Miami, Spanish-English bilinguals from Miami, and English monolinguals from Ithaca (the same monolingual speech community as in this dissertation research). Rhythm in Spanish is considered more “syllable-timed”, while rhythm in English is considered more “stress-timed” (see Enzinna, 2015 for a discussion on the debate around these terminologies). Spanish pitch has less pitch variation (F0 standard deviation) than English, and non-native speech has a less pitch range (F0 range) than native speech (Kelm, 1995).

My results showed that English monolinguals from Miami have more syllable-timed rhythm (specifically, a lower proportion of vocal intervals (Ramus, Nespor, & Mehler, 1999)) than English monolinguals from Ithaca, and they do not differ rhythmically from early Spanish-English bilinguals from Miami. Also, Miami English monolinguals have less pitch variation and less pitch range than Ithaca English monolinguals. Interestingly, these results were strongest for Miami English monolinguals with English-monolingual parents, not those with Spanish-speaking parents. Thus, English monolingual speech has Spanish-influenced prosodic properties, suggesting that Miami is developing a Spanish-influenced variety of English due to language contact, which may be driven by speakers who do not share a linguistic background with the majority of speakers in their speech community.

Additionally, research has examined the influence of language contact on Miami Spanish-English bilinguals’ English and Spanish speech. For example, in Byers & Yavaş, 2017, early bilinguals in Miami produced native English-like schwa durations, which was argued to be tied to participants’ preference and personal attachment to English. However, those same participants were not able to produce native-like spectral qualities, which was argued to be tied to frequent contact with bilinguals in Miami and lack of native English input. Additionally, contact between different Spanish varieties in South Florida has influenced the

Spanish spoken in Miami (see Carter & Lynch, 2015 for a discussion on this research).

These research studies provide evidence that contact between English and Spanish in Miami is influencing language in Miami in various ways. In this dissertation, I aim to expand this research by examining how English monolinguals and Spanish-English bilinguals in Miami accommodate to English spoken by an English monolingual and/or a Spanish-English bilingual.

1.4.2 Voice Onset Time

Voice Onset Time (VOT) is a measure used to describe the duration between the release of a stop closure and phonation of the following segment (Lisker & Abramson, 1964). VOT separates stop consonants into three categories: voiced, voiceless unaspirated, and voiceless aspirated.[8] VOT for voiced stops are called *lead* VOT due to phonation starting before release of the stop closure, resulting in negative VOT values. VOT for voiceless unaspirated stops are called *short-lag* VOT because phonation starts at the time of release or shortly thereafter. VOT for voiceless aspirated stops are called *long-lag* VOT because there is a significant delay between the release of the stop closure and the start of phonation. VOT values for short-lag and long-lag stops are positive, with traditional ranges cited as ~0-30 ms for short-lag VOT and ~60-120 ms for long-lag VOT (González López, 2012). However, this range varies significantly by place of articulation, with /p/ having a shortest VOT and /k/ the longest (Lisker & Abramson, 1964; González López, 2012; Yavaş & Byers, 2014).

[8] Differences in VOT for these three categories differ cross-linguistically (Lisker & Abramson, 1964). Polarization is cited as one reason for this (Keating, 1984).

Relevant to this dissertation are differences in voiceless stops in English and Spanish. While voiceless unaspirated stops occur in both English and Spanish, voiceless aspirated stops occur in English only. Specifically, voiceless aspirated (long-lag) stops occur at the beginning of stressed syllables in English. In the same position, unaspirated (short-lag) voiceless stops occur in Spanish. English and (Puerto Rican) Spanish VOT differences, from Lisker & Abramson's (1964) cross-linguistic study on VOT, are provided in Table 1.3. As shown below, /p, t, k/ VOTs in English and Spanish have very little overlap, with the exception of /k/.

Table 1.3: English and Spanish mean VOT and VOT range (ms) by place of articulation (Lisker & Abramson, 1964)

	English	Spanish
/p/	58 (20-120)	4 (0-15)
/t/	70 (30-110)	9 (0-15)
/k/	80 (30-150)	29 (15-55)

Previous research has shown that a speaker's L1 can influence their L2 due to L1 interference in L2 acquisition (Flege & Eefting, 1987; González López, 2012). For example, bilingual speakers who have unaspirated voiceless stops in their L1 and aspirated voiceless stops in their L2 (e.g., Spanish-English bilinguals) produce shorter VOTs in their L2. In Flege & Eefting, 1987, L1 Spanish-L2 English speakers (early childhood bilinguals, late childhood bilinguals, and children) produced shorter VOTs for English /p, t, k/ than age-matched native English speakers.

Similar results were found for bilingual speakers who have aspirated voiceless stops in their L1 and unaspirated voiceless stops in their L2 (e.g., English-Spanish bilinguals). In González López, 2012, English L1-Spanish L2 speakers produced VOTs in Spanish monolingual utterances that were longer than those provided in Lisker & Abramson, 1964 (with the exception of /k/). They also produced VOTs in English monolingual utterances that were on the lower end of the range provided in Lisker & Abramson, 1964. This comparison is provided in Table 1.4.

Table 1.4: Comparison of native English and Spanish short-lag and long-lag VOT values (mean (range) in ms) provided in Lisker & Abramson, 1964, (L & A) and English-Spanish bilingual VOT values (mean (SD) in ms) in English or Spanish utterances provided in González López, 2012, (G L).

	English		Spanish	
	Native (L & A)	Bilingual (G L)	Native (L & A)	Bilingual (G L)
/p/	58 (20-120)	52 (.011)	4 (0-15)	27 (.011)
/t/	70 (30-110)	57 (.016)	9 (0-15)	27 (.011)
/k/	80 (30-150)	64 (.010)	29 (15-55)	44 (.014)

Similarly, VOTs in a speaker's L2 can influence their L1. In Yavaş & Byers, 2014, early sequential Spanish-English bilinguals produced VOTs in Spanish monolingual utterances that were longer than the Spanish VOTs provided in (Lisker & Abramson, 1964) (with the exception of /k/). They also produced VOTs in English monolingual utterances that were on the shorter end of the range for English VOTs provided in (Lisker & Abramson, 1964). This comparison is provided in Table 1.5.

Interestingly, in both Yavaş & Byers, 2014 and González López, 2012, bilingual participants produced /k/ in Spanish monolingual utterances with VOT values within both the English and Spanish ranges provided in Lisker & Abramson, 1964. (The expected range for Spanish is 15-55 ms, and the expected range for English is 30-150 ms.) González López, 2012 argues that, while it is clear that the English-Spanish bilinguals' VOTs in Spanish are influenced by

Table 1.5: Comparison of native English and Spanish short-lag and long-lag VOT values (mean (range) in ms) provided in Lisker & Abramson, 1964, (L & A) and English-Spanish bilingual VOT values (mean in ms) in English or Spanish utterances provided in Yavaş & Byers, 2014, (Y & B).

	English		Spanish	
	Native (L & A)	Bilingual (Y & B)	Native (L & A)	Bilingual (Y & B)
/p/	58 (20-120)	50.18	4 (0-15)	27.94
/t/	70 (30-110)	65.89	9 (0-15)	29.69
/k/	80 (30-150)	65.31	29 (15-55)	34.39

English for /p/ and /t/, it is unclear whether VOTs for Spanish /k/ have been affected. "Late L2 learners appear to produce the L2 velar voiceless stop more accurately than the bilabial or dental counterparts. Nevertheless, the fact that the Spanish and English VOT values for /k/ overlap makes it difficult to determine the exact nature of the L2 VOT value produced as a typical Spanish voiceless stop or as a merged phonetic category" (González López, 2012, p. 254). This overlap may have consequences for how VOT for stops of different places of articulation are learned[9] or even accommodated.

With this in mind, VOT was selected as the dependent variable to be compared in this dissertation because voiceless stops in Spanish and English differ, but also because there is a large body of research that shows that VOT is phonetic property that speakers accommodate to (Flege & Hammond, 1982; Nielsen, 2011; Shockley et al., 2004; Mora et al., 2014; Abrego-Collier et al., 2011; Sonderegger, 2012; Levi, 2015; among others). For example, in Nielsen, 2011, participants produced longer VOTs after being primed by extended VOTs. In Flege & Hammond, 1982, native English speakers who had exposure to Spanish-accented English imitated short-lag VOTs in Spanish. In Mora et

[9]This finding is reported in Mora (2008).

al., 2014, Spanish-English bilinguals produced longer VOTs when imitating long-lag VOTs in English. These studies provide evidence that speakers will accommodate when exposed to VOT.

Additionally, speakers' VOTs are influenced by medium-term exposure to short-lag or long-lag VOTs. For example, Sancier and Fowler (1997) examined a native Brazilian Portuguese speaker's VOTs in Brazilian Portuguese and in English (Brazilian Portuguese has short-lag VOTs similar to Spanish) after spending several months in Brazil and in the United States. While the speaker's VOTs were always shorter in Brazilian Portuguese than in English, VOTs were longer after her stay in the U.S. than after her stay in Brazil. Thus, medium-term exposure to short-lag or long-lag VOTs influenced the speaker's productions. Similar effects may be expected for speakers in Miami due to long-term exposure to VOTs produced by Spanish-English bilinguals.

Present in these studies on accommodation are two additional points of note. First, convergence to longer VOTs may be more likely than accommodation to shorter VOTs. In Nielsen, 2011, speakers accommodated to extended VOTs but not to reduced VOTs. To explain this, Nielsen argued that English speakers have difficulty producing reduced long-lag VOTs because the VOTs would be too similar to the short-lag/lead VOTs of English voiced stops. Shortening VOTs would reduce essential phonemic contrasts and would increase semantic ambiguity. Contrastingly, producing longer long-lag VOTs would not affect phonemic contrasts. For these reasons, lengthening VOTs may be easier than shortening VOTs (Nielsen, 2011).

Results from Levi, 2015 may provide some evidence against this argument, however. In this study, participants produced longer /t/ VOTs when primed by

/k/ and shorter VOTs when primed by /p/. Participants also produced longer VOTs when primed by extended /p/ VOTs and shorter VOTs when primed by shortened /k/ VOTs. Thus, participants were able to accommodate to both longer and shorter VOTs. Regardless, the direction of VOT accommodation (i.e., increasing or decreasing VOT) *may* influence the amount of convergence, and therefore should be considered when analyzing VOT accommodation.

Second, VOT accommodation is generalizable to different places of articulation. As described above, in Levi, 2015, participants primed with /p/ or /k/ produced shorter or longer /t/ VOTs, respectively. Similarly, in Nielsen, 2011, participants, primed by words with extended /p/ VOTs, produced longer VOTs in novel instances of /p/ and also in words beginning with /k/. Last, in Offerman & Olson, 2016, L1 English-L2 Spanish learners received visual feedback training to aid them in producing Spanish VOTs. After visual feedback for /p/, participants produced /t/ and /k/ with shorter VOTs. These studies provide evidence that phonetic properties—specifically, VOT—are generalizable during accommodation.

1.5 Overview of dissertation

The remainder of this dissertation is organized as follows: Chapter 2 outlines the methodology employed in Experiments 1 and 2, including the BARCoT program (Section 2.1), the experimental design (Section 2.2), and the data analysis methods (Section 2.3). In addition to testing for accommodation, this methodology was designed to examine the time-course of accommodation—examining both automatic accommodation and socially-motivated accommodation and their interactions—which has not been explored in previous accommodation studies.

Using this methodology, two experiments were conducted. Experiment 1 establishes the social and automatic effects influencing accommodation by testing whether participants accommodate to model talkers within short-term interactions and what causes them to accommodate. Experiment 2 expands on Experiment 1 by examining the time-course of social and automatic effects on accommodation—both within a short-term interaction and into the following interaction. Experiments 1 and 2 are presented in Chapters 3 and 4, respectively. Both experiment chapters contain a brief introduction, a short methods section, research questions and hypotheses, results, and a brief discussion.

The main findings in Experiment 1 and 2 are as follows: In Experiment 1, results showed that participants accommodated to model talkers for both automatic and social reasons. In Experiment 2, the results showed that the time-course of those automatic and social effects differed. Specifically, automatic accommodation occurred at the beginning of short-term interactions, while accommodation caused by social affiliation was longer-lasting, extending later into short-term interactions. These findings are discussed and compared in Chapter 5. Finally, Chapter 6 concludes the dissertation by discussing the results in terms of language change and exemplar theory and by discussing further issues and the future implications of this research.

CHAPTER 2

GENERAL METHODOLOGY

This chapter details methodology that is relevant for both Experiments 1 and 2. Section 2.1 describes the experimental program designed for this dissertation research, BARCoT (Enzinna & Tilsen, 2018). Section 2.2 details the experimental design used in both Experiments 1 and 2, including information about the participant groups (2.2.1), task (2.2.2), model talkers (2.2.3), word stimuli (2.2.4), and stimuli ordering and randomization (2.2.5). Section 2.3 describes the data analysis, including data processing methods (2.3.1), model variables (2.3.2), normalization of VOT for speech rate (2.3.3), the use of block as a measure of time (2.3.4), how accommodation was measured (2.3.5), and the mixed-effects model (2.3.6).

2.1 The BARCoT program

The experiments in this dissertation were conducted using the Boards for Automated Referential Communication Task (BARCoT) program (Enzinna & Tilsen, 2018) in MATLAB. This program emulates the task used in Hwang et al., 2015. It was built for several reasons: First, the task needed to be conducted in two locations (Miami and Ithaca). By using pre-recorded model talker voices, the program allows for participants in different locations to be able to interact with the same model talkers. Second, using pre-recorded model talker voices helps to control the data. All participants interact with the same stimuli; thus, any variation in the model talker's speech is the same for all participants, and does not differ on a day-to-day basis like the speech of an in-person model talker. Third, the program is built to automate data processing, which then speeds up data analysis and allows for more data collection. Finally, our hope in creating the BARCoT program is that other future researchers will benefit from the program's capabilities once it is made available for public download.

In order to run BARCoT, a user must provide instructions, a word-stimuli spreadsheet, and model talker recordings. The word-stimuli spreadsheet must include information about the words used in the experiment, such as the target words, the prime words, the features being examined (e.g., VOT), etc. The model talker recordings must include sound files and their corresponding labelled Praat Text Grids (Boersma, 2002). Using the word-stimuli spreadsheet and model talker recordings, BARCoT generates a table of randomized boards for the number of participants that the user tells it to produce. The table includes information that will be used for all boards for all participants, such as what squares on the board each target word and prime word will appear in, the corresponding model talker sound file information, etc. An example board is provided in Figure 2.1.[1]

[1] The colors used in the boards are color-blind friendly.

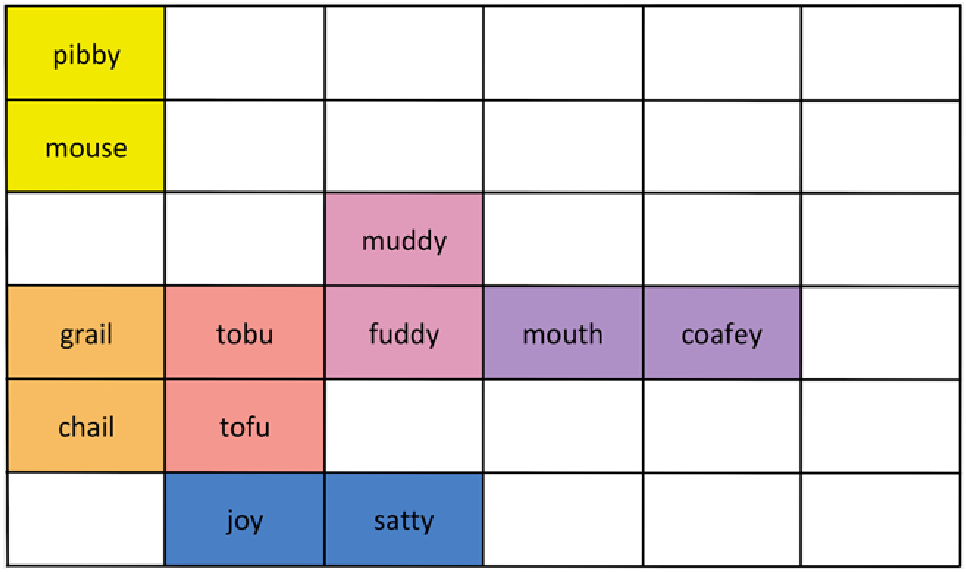


Figure 2.1: Example of a randomized board produced by the BARCoT program

Once all instructions, model talker recordings, and randomized board information have been provided, the BARCoT task is ready to run. (The task will be described in Section 2.2.2.) At this point, the experimenter tells the program the participant's identification number, board set number, and location (if relevant). All corresponding data is then labelled with this information. The task then runs as follows: First, instructions are shown to the participant. Then, the participant completes the practice trials. After the practice trials, the participant is shown another, shorter set of instructions, preparing them to begin the task with the first model talker. Next, they complete the task with the first model talker. Following, there is another short set of instructions. At this time, participants are allowed to take a break. Once they are ready to begin again, they complete the task with the second model talker. Afterward, they are notified that the experiment is complete.

During the task, the model talkers ask the participants questions about the words on the board, and the participants respond. After a participant responds, they must click on the square that corresponds to the word related to their response. Their click time is then recorded, and the program is triggered to move on to the next trial. If participants need the model talker to repeat the question, they can right click anywhere on the screen and the model talker will repeat the question. The right clicks are also recorded.

All participant speech data, board information, and click information are then stored into a data table, which is then used to process the data. A Praat script[2] (provided with the BARCoT program) uses the click times to create Text Grids that can then be used with the Montreal Forced Aligner (McAuliffe, Socolof, Mihuc, Wagner, & Sonderegger, 2017) to segment the speech data.

2.2 Experimental design

This section details the experimental design used in both Experiments 1 and 2, including information about the participant groups (2.2.1), task (2.2.2), model talkers (2.2.3), word stimuli (2.2.4), and stimuli ordering and randomization (2.2.5).

2.2.1 Participants

Participants in Experiments 1 and 2 are categorized by two independent variables: (1) linguistic background and (2) speech community. The two

[2] Thanks to Daniel Scarpace for helping me write this script.

linguistic backgrounds examined are English monolingual and Spanish-English bilingual. The two speech communities examined are a majority English monolingual community (Ithaca, New York) and a majority Spanish-English bilingual community (Miami, Florida). Thus, there were four participant groups total: (1) Spanish-English bilinguals from Ithaca (B-Ithaca), (2) English monolinguals from Ithaca (M-Ithaca), (3) Spanish-English Bilinguals from Miami (B-Miami), and (4) English Monolinguals from Miami (M-Miami). These group abbreviations are summarized in Table 2.1. More detailed information on the participants is provided in the experiment chapters (Section 3.1.1).

Table 2.1: Participant group abbreviations

Speech Community	**Linguistic Background**	
	Monolingual	Bilingual
Monolingual	M-Ithaca	B-Ithaca
Bilingual	M-Miami	B-Miami

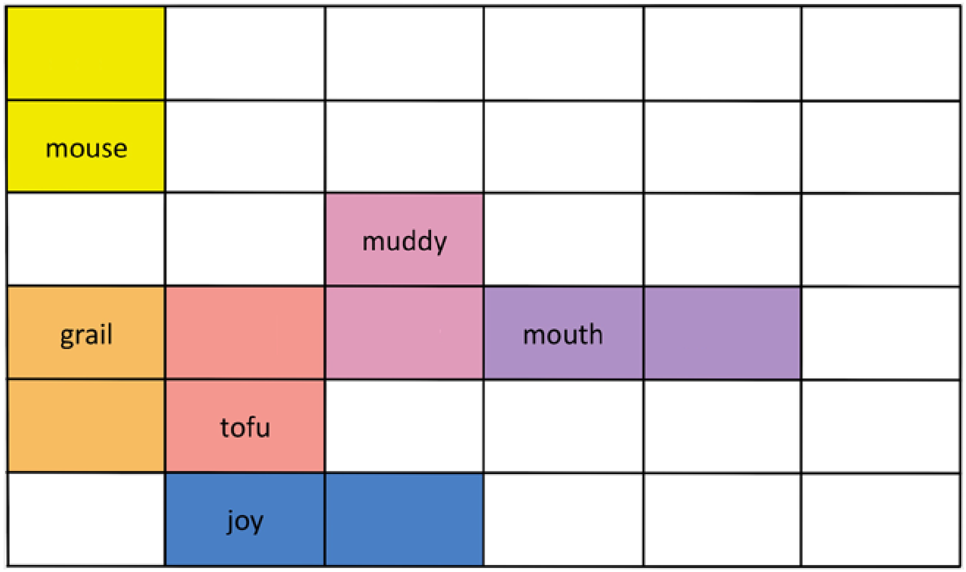
2.2.2 Task

Participants completed a referential communication task, similar to the task used in Hwang et al.'s (2015) accommodation study. In the task, participants see a board with 6x6 squares (Figure 2.2b). In some of the squares there are words. Participants are asked about the words on the board, by a pre-recorded model talker over a headset with audio and recording capabilities.

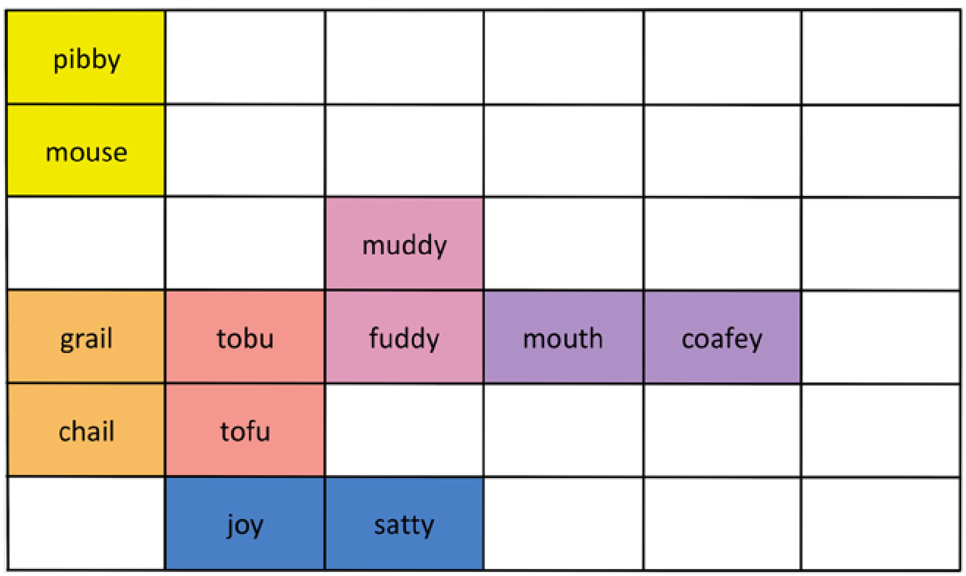
In the instructions (provided in Appendix A), participants are told that the model talkers have incomplete boards, which they need the participant's help to complete. An example of a model talker's incomplete board (provided in

Figure 2.2a) is shown to the participant. To complete the boards, the model talkers ask participants what words are on their boards, referencing other words on the boards to indicate which empty square they need help with. The reference word is always next to the square being asked about and is always in a square of the same color.

Using Figure 2.2 as an example, the model talker asks, "What is by the word MOUSE?" Both MOUSE and PIBBY are in yellow squares and next to each other on the participant's board. In response, the participant says, "PIBBY is by the word MOUSE." After responding, the participant clicks on the square containing the answer (PIBBY). The model talker then asks about another word on the board. Once the participant has been asked about all of the words on the board, a new board begins. There are a total of 75 boards in the study: 3 in the practice trials, 36 with the Spanish-English bilingual model talker, and 36 with the English monolingual model talker.



(a) Model talker's board



(b) Participant's board

Figure 2.2: In the task, the participant helps the model talker fill in the missing words on their board.

2.2.3 Model talkers

The two pre-recorded model talkers are (1) an English monolingual ("monolingual model talker") and (2) a Spanish-English bilingual ("bilingual model talker"). The monolingual model talker is a 29-year-old male[3] who had been living in Ithaca, New York, for five years and had lived the majority of his life in northeastern U.S. The bilingual model talker is a 40-year-old male from Mexico City, Mexico. He started learning English in elementary school in Mexico but did not begin speaking English regularly until moving to South Florida at age 30.

It should be noted that there is not a large Mexican population in either Miami or Ithaca. Selecting a model talker that is not representative of a majority Latinx population in either location is beneficial for several reasons: (1) Because Miami and Ithaca participants both do not interact with speakers from Mexico City frequently, this is balanced for both speech communities. Alternatively, if I were to use a Cuban model talker, participants from Miami would have had much more past exposure to this Spanish variety than the Ithaca participants. (2) If participants accommodate to the bilingual model talker for reasons of social affiliation, this result is more likely to indicate that participants are affiliating with Spanish or bilingual speakers, rather than with speakers of a specific Spanish variety. (3) Selecting a model talker who is representative of a common Latinx population in Miami (e.g., a Cuban model talker) may increase or decrease affiliation for participants differently. For some, participants may converge with the model talker because the model talker shares their own heritage, or the heritage of a large portion of their social group(s). For others,

[3]Both model talkers were male. Thus, both model talkers' genders were the same and did not impact the results differently.

however, participants may diverge away from the model talker, as Cuban Spanish is somewhat stigmatized in Miami. (See Section 1.4.1.) For these reasons, selecting a model talker from Mexico proved to be more neutral and thus more appropriate for the purposes of this study.

To obtain the model talker recordings, both model talkers were asked to read a list of sentences. All of the sentences in the list were the frame same sentence, varying only by a single word: "What is by the word [WORD]?" For example, the model talkers read "What is by the word MOUSE?" with "MOUSE" alternating with other words. Each sentence repeated twice in the list, presented in a randomized order. Then, those alternating words (e.g., MOUSE) were extracted from the frame sentences and spliced together with one version of the frame sentence. Thus, only one frame sentence was heard by all participants. This reduced additional variation in the recordings, which may have influenced the trials. Next, to ensure that the new spliced recordings sounded natural, I listened to them and selected the most-natural sounding version for each word for use in the experimental trials. Last, two colleagues tested the full experiment and said that they did not notice the splicing.

To examine the model talkers' speech, the VOTs from their recordings—the same VOTs used in the experimental task—were extracted and compared.[4] The monolingual and bilingual model talkers had different VOT durations for /p/, /t/, and /k/, and for stops overall (/p/, /t/, and /k/ combined). A comparison of the model talkers' VOTs is presented in Table 2.2 and illustrated in Figures 2.3 and 2.5. Similarly, the model talkers' VOTs normalized for speech rate (VOT_{norm}) are different overall and by stop. (The normalization of VOT is

[4]For VOT_{norm}, the model talker's VOT was divided by the duration of "word" in the frame sentence that is used in the experiment.

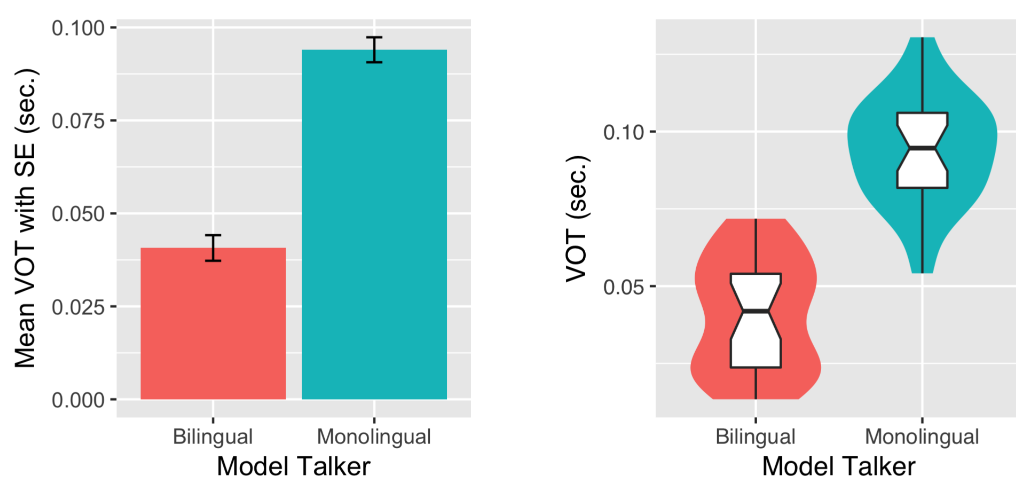
described further in Section 2.3.3) These results are presented in Table 2.3 and illustrated in Figures 2.4 and 2.6.

Table 2.2: Mean VOT and standard deviation (in seconds) by model talker and stop

Model talker	All stops	/p/	/t/	/k/
Bilingual	0.041 (0.018)	0.020 (0.004)	0.042 (0.012)	0.058 (0.010)
Monolingual	0.094 (0.017)	0.083 (0.019)	0.100 (0.016)	0.099 (0.012)

Table 2.3: Mean VOT_{norm} and standard deviation (in seconds) by model talker and stop

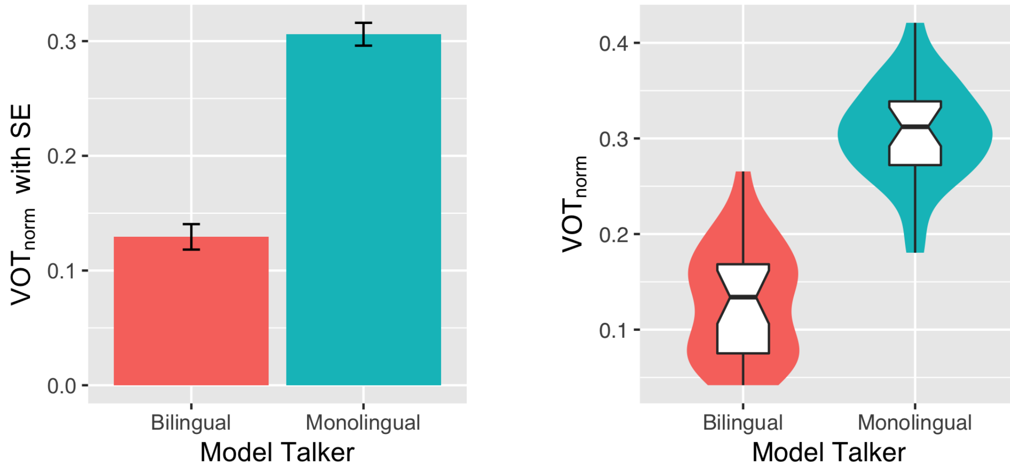
Model talker	All stops	/p/	/t/	/k/
Bilingual	0.129 (0.059)	0.066 (0.016)	0.131 (0.037)	0.185 (0.039)
Monolingual	0.306 (0.052)	0.282 (0.065)	0.330 (0.046)	0.306 (0.032)



(a) Bar plot with SE error bars

(b) Violin and box plot

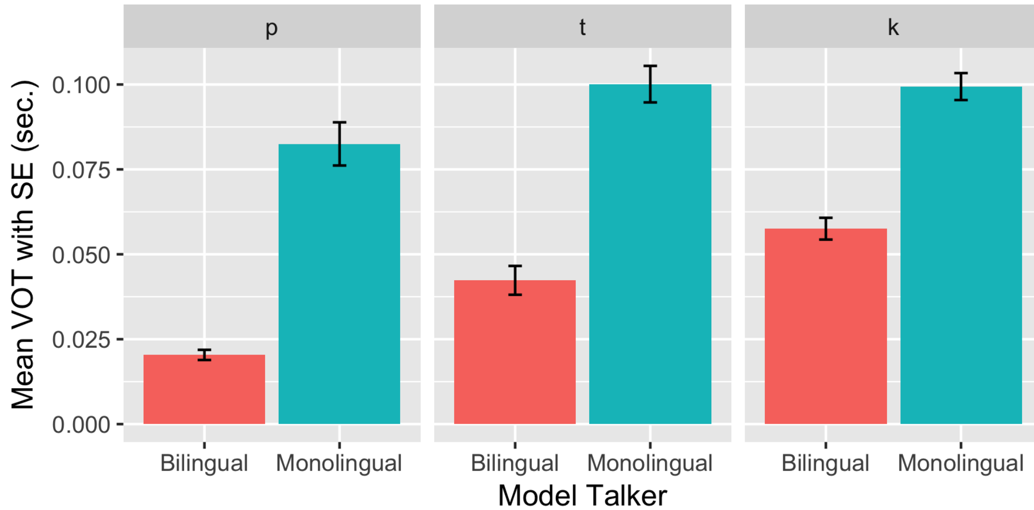
Figure 2.3: Difference in overall VOT between model talkers



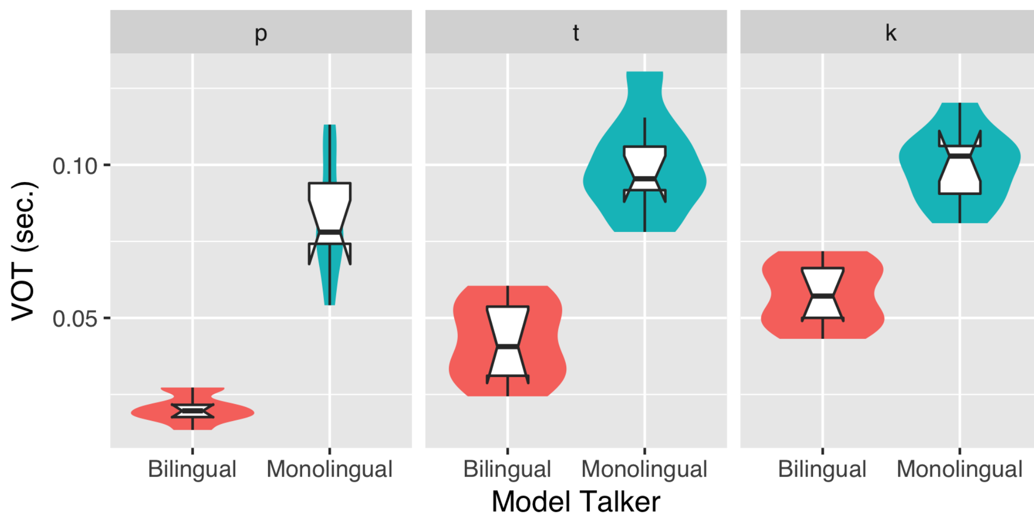
(a) Bar plot with SE error bars

(b) Violin and box plot

Figure 2.4: Difference in overall VOT_{norm} between model talkers

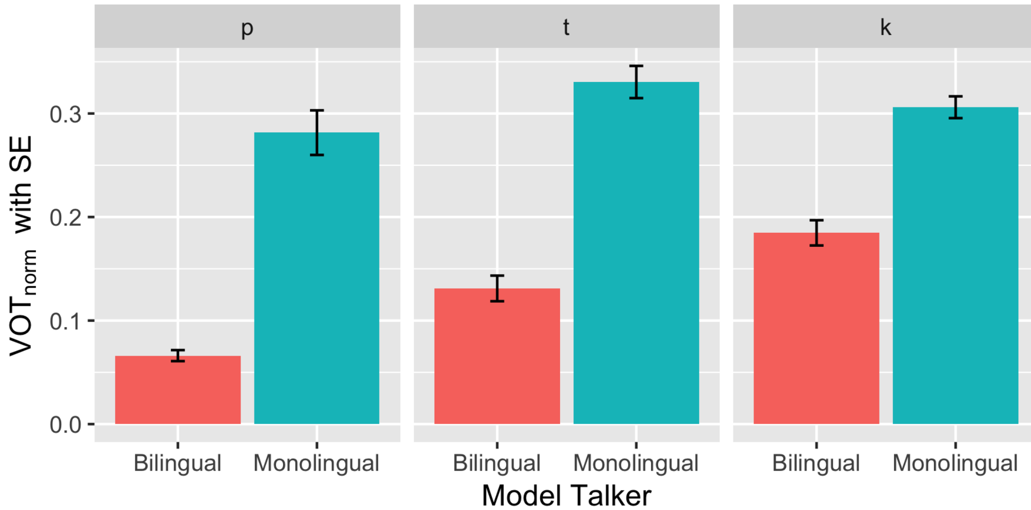


(a) Bar plot with SE error bars

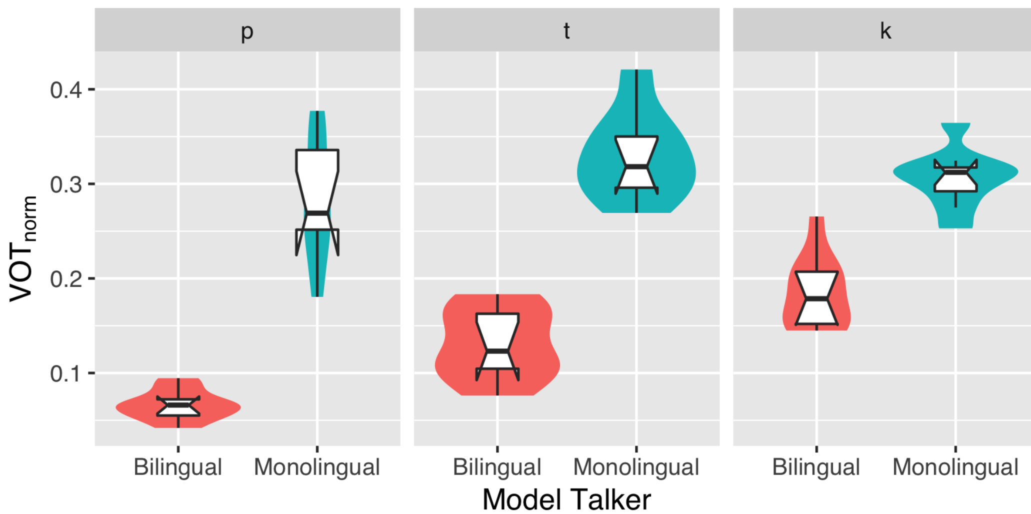


(b) Violin and box plot

Figure 2.5: Difference in VOT between model talkers by stop



(a) Bar plot with SE error bars



(b) Violin and box plot

Figure 2.6: Difference in VOT_{norm} between model talkers by stop

2.2.4 Stimuli words

The words used in this study come in pairs (henceforth, "word-pairs"). There are a total of 234 word-pairs in the study: 18 in the practice boards and 216 that occur once per model talker. These word-pairs consist of a prime word and a target word. For example, using the boards in Figure 2.2 as an example, the model talker asks, "What is by the word MOUSE?" and the participant responds, "PIBBY is by the word MOUSE." In this example, the prime word is MOUSE and the target word is PIBBY.

The word-pairs were designed to allow for examination of the following dependent variables: duration of VOT after a voiceless stop, velarization of word-final /l/, duration of intervocalic /t/ and /d/ (flapping), vowel quality differences for /ɪ ɛ æ ʌ i e ɑ o u/, rhythm, and pitch (henceforth referred to as *target variables*).[5] These target variables were selected because they differ in English and Spanish.[6] In this dissertation, I examine VOT only, specifically those in the target words. The remaining target variables will be examined in future studies. A complete list of the word-pairs containing voiceless stops is provided in Table 2.4.

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[5]It should be noted that there was a wide variety of variation in the vowels, which are not examined in this dissertation. Also, the orthography did not always produce the intended target words; however, for the segments relevant in this dissertation (/p, t, k/), this was not an issue.

[6]VOT differences in English and Spanish are described in Section 1.4.2.

Table 2.4: Word-pair stimuli

Target Variables		Primed Word-Pairs		Unprimed Word-Pairs	
Stop	Vowel	Prime Word	Target Word	Prime Word	Target Word
/p/	/ɪ/	pitchy	piffy	mouse	pibby
/p/	/ɛ/	peggy	pessy	choice	petchy
/p/	/æ/	patchy	paggy	gore	passy
/p/	/ʌ/	puffy	pubby	mime	putchy
/p/	/i/	peachy	peagy	force	peasy
/p/	/e/	pacey	pafey	shout	pabey
/p/	/ɑ/	posse	pobby	why	poffy
/p/	/o/	pogo	pogey	wifi	poachy
/p/	/u/	poofy	pooby	sight	poogy
/t/	/ɪ/	tizzy	tibby	good	tiffy
/t/	/ɛ/	techy	teggy	house	tessy
/t/	/æ/	taffy	tatchy	roy	tassy
/t/	/ʌ/	tubby	tussy	sort	tuggy
/t/	/i/	teeny	teeby	wood	teefy
/t/	/e/	taser	taber	four	tafey
/t/	/ɑ/	toffee	tossy	out	totchy
/t/	/o/	tofu	tobu	ground	toasu
/t/	/u/	toothy	toosy	rye	toochy
/k/	/ɪ/	kissy	kibby	short	kiffy
/k/	/ɛ/	kegger	kessy	door	keggy
/k/	/æ/	canny	caffy	south	cabby
/k/	/ʌ/	cubby	cuffy	voice	cussy
/k/	/i/	keesha	keesy	foot	keechy
/k/	/e/	casey	cafey	hood	cabey
/k/	/ɑ/	coffin	cobby	buy	cossy
/k/	/o/	kobe	coasey	mouth	coafey
/k/	/u/	cougar	coogy	bore	coosy

There are 108 target words total. The target words are the words missing from the model talkers' boards, which means the participant does not hear the model talkers say the target words. All target words contain two of the aforementioned target variables each: one target consonant and one target vowel. 54 of the target words contain a voiceless stop. All target words containing a voiceless stop are disyllabic, with the aspirated stop both word-initial and phrase/sentence-initial.[7] All of the target words are nonce words

[7]Because target VOTs occurred phrase-initially, closure duration and its interaction with VOT could not be included in this analysis.

or very-low frequency words (in cases where there were no nonce options) to increase likelihood of accommodation (refer to Sections 1.1.1 and 1.3 for discussion on novelty effects in accommodation). The target word PIBBY, for example, begins with a voiceless stop, contains vowel /ɪ/, is disyllabic, and is a nonce word.

All target words occur once with a "target prime" and once with an "unrelated prime." The target primes contain the same target variables as the target word. The unrelated primes do not contain any of the target variables. All of the priming words are real words. The target primes are low-frequency words that share the same target vowel (/ɪ ɛ æ ʌ i e ɑ o u/) and target consonant (/p t k l t d/) as the target word it is paired with, differing from the target word as little as a possible. For example, for the target word TASSY, the target prime is TAFFY. It shares the target vowel /æ/ and the target consonant /t/, differing only in place of articulation for the second consonant. The unrelated primes are words that do not contain a target consonant or vowel, and word frequency is not restricted. For example, for the target word TASSY, the unrelated prime is ROY.

At the start of the experiment, before the boards with the monolingual and bilingual model talkers begin, there are 3 practice boards. The model talker that participants hear during this portion of the study is the pre-recorded voice of the experimenter (Naomi Enzinna).[8] The priming words in the practice trials are all unrelated primes: no target variables were included. However, in the practice target words, target variables are included in some word pairs: On the

[8]I used my voice during the practice trials for several reasons. First, even though this could influence the participants' speech (Hay et al., 2006), all participants had to interact with me before the study in order to receive instructions, and thus using my voice did not add any new factors. Further, I was both a Miami native and an Ithaca resident at the time of the study, and therefore I fall into both of the target speech communities.

first practice board, no target consonants occur in the target words. Across the second and third practice boards, there are two words containing each target consonant. The purpose of this was to use the data collected from the second and third boards as baseline values for participants, to compare changes in VOT with. The first practice board, which is absent of target consonants, was intended to be the true practice board. However, participants made too many mistakes during the practice trials for these values to not be misleading. For this reason, the data collected from the practice trials were not included in the results section.[9]

2.2.5 Stimuli ordering and randomization

The stimuli were ordered and counterbalanced in several ways. First, the order in which participants heard the model talkers was counterbalanced. Half of the participants heard the monolingual model talker first, followed by the bilingual model talker; and half of the participants heard the bilingual model talker first, followed by the monolingual model talker.

The ordering of the word-pairs was also counterbalanced. In the word-pairs, each target consonant occurs twice with each target vowel (/ɪ ɛ æ ʌ i e ɑ o u/), creating two target words. As discussed in Section 2.2.4, these two target words are then primed by a target prime and an unrelated prime, creating in total 4 word-pairs. For example, /p/ and /ɑ/ occur in the target words POBBY

[9] After conducting this study and finding that accommodation can be influenced by a speaker's previous interaction, I do not suggest using "baseline" values as comparisons at all. I do not believe that there is a such thing as a baseline value, as there is evidence that speech is influenced by recent interactions, changes in frequency, changes in social factors, and so forth. Instead, I recommend analyzing changes and differences in speech within and between interactions in order to better understand accommodation effects. See Section 2.3.5 for more information on this matter.

and POFFY, which are both primed by POSSE (target prime) and WHY (unrelated prime). These combinations create the following 4 word-pairs: POSSE-POBBY, WHY-POFFY, WHY-POBBY, and POSSE-POFFY.

These word-pairs are then split across two halves of the study, so that each target word occurs only once per half. For example, if POSSE-POBBY and WHY-POFFY occur in the first half of the experiment, then WHY-POBBY and POSSE-POFFY will occur in the second half (and vice-versa). This is done to create some distance between each time a participant produces a target word. The ordering of the halves of the stimuli are counterbalanced, so that half of all participants saw POSSE-POBBY and WHY-POFFY first, and the other half saw WHY-POBBY and POSSE-POFFY first. Further, all words within a half were randomized for each participant. This randomized order was then repeated with each model talker.[10]

Within a single board, one word-pair containing each target consonant appeared on each board. Also, half of the word-pairs on each board are primed with a target prime, and half are primed with an unrelated prime. Last, priming of a target consonant alternated by board. For example, if /p/ was primed by a target prime on a board, then on the following board it would be primed by an unrelated prime.

2.3 Analysis Methods

This section describes the data analysis, including data processing methods (2.3.1), model variables (2.3.2), normalization of VOT for speech rate (2.3.3), the

[10]I asked several participants, after they were done with the entire experiment, whether they could tell that the words appeared in the same order for both model talkers, and they said that they could not tell because there were too many words to keep track of.

use of block as a measure of time (2.3.4), the measurement of accommodation (2.3.5), and the mixed-effects model (2.3.6).

2.3.1 Data Processing

BARCoT was used to record all speech, board information (specifically, the responses the participant said in the order that they said them), and click times. The click times and board information were saved in tables, which were then used with a Praat script to create Text Grids with boundaries after each response. Those Text Grids and their matching sound files, along with a dictionary containing all of the words used in the study and their pronunciations, were used with the Montreal Forced Aligner (MFA) to segment speech. I used the MFA with a pre-trained acoustic model trained on English. It should be noted that this model does not segment aspiration separately from the preceding stop. Thus, in my dictionary, I added an /h/ (HH) after all voiceless stops, and the MFA segmented the aspiration as if it were an /h/. After the MFA aligned the speech, I checked all of the alignments for errors.[11] After checking the alignments, the VOT durations were extracted from the Text Grids and analyzed in MATLAB and R (R Core Team, 2017).

[11] I do not recommend this method for automatic alignment of VOTs. I chose this method because it allowed me to align all of my speech data, which will be useful for future analysis of all of the remaining dependent variables.

2.3.2 Variables

All variables included in the linear mixed-effects model (presented in Section 2.3.6) are provided in Table 2.5 below. The variables included to examine social accommodation are linguistic background (LingBackground), speech community (Community), and model talker (Model Talker).

Table 2.5: Description of variables

Variable Name	**Description**	**Continuous/ Categorical?**	**Variable/Effect Type**
VOT_{norm}	VOT is normalized for speech rate by dividing a participant's VOT by their average "word" duration per board	Continuous	Dependent
Participant	Participant ID#	Categorical	Random effect
Word	Target word: Each repeated 4 times per participant	Categorical	Random effect
Stop	/p/, /t/, /k/	Categorical	Fixed effect
LingBackground	monolingual, bilingual	Categorical	Fixed effect
Community	Ithaca, Miami	Categorical	Fixed effect
Model Talker	monolingual, bilingual	Categorical	Fixed effect
PrimeType	primed, unprimed	Categorical	Fixed effect
Block	Boards are divided into 4 blocks per model talker	Categorical	Fixed effect & random slope
Model Talker Order	Order that participants heard model talker voices in (monolingual-bilingual or bilingual-monolingual)	Categorical	Fixed effect

2.3.3 VOT_{norm} is VOT normalized for speech rate

The dependent variable examined in this dissertation is VOT normalized for speech rate. For the remainder of this dissertation, I will refer to VOT normalized for speech rate as VOT_{norm}. VOT_{norm} was calculated by dividing a participant's VOT by their mean duration, per corresponding board, of the word "word" in the frame sentence, "[TARGET WORD] is by the **word** [PRIME

WORD]". It should be noted that the mean "word" duration per board was used, rather than the duration of "word" from the sentence that the VOT came from, because, on occasion, participants said the wrong frame sentence (e.g., "[TARGET WORD] is by [PRIME WORD]", etc.) or the program cut off the sentence before they said "word" because the participant clicked on the prime word too soon.[12] For this reason, each VOT could not be divided by the duration of "word" in the sentence that the VOT was produced in; thus, mean "word" durations per board were used.

It is important to normalize for speech rate when examining VOT, especially in an experiment of this duration, because VOT has been shown to be positively correlated with speech rate, with longer VOTs being associated with slower speech (Allen, Miller, & DeSteno, 2003; Miller, Green, & Reeves, 1986; Pind, 1995; Sonderegger, 2012). Other studies have controlled for speech rate by using a durational measure within the word as a proxy, such as syllable duration or vowel duration when the vowel being compared is a single vowel type (e.g., /a/) . However, this comparison is not possible for these data because the VOT durations come from words with a variety of different vowels. As vowels differ in duration for numerous reasons (e.g., voicing of the following consonant, intrinsic differences between vowels, dialectal differences), vowel duration would not be a fair proxy for these data.

Instead, the duration of "word" is used because the phones within "word" do not change, and, thus, and the duration of "word" should be more-or-less stable if speech rate is consistent. Further, just as VOT is positively correlated with vowel/syllable duration, VOT is positively correlated with

[12]If participants did this too often (e.g., one participant stopped saying the correct frame sentence and did not say the correct frame sentence again until the next model talker), they were excluded from the study. Only two participants were excluded for this reason.

"word" duration in this dissertation study. As shown in Figure 2.7, participants' VOT durations increase as "word" durations increase.[13]

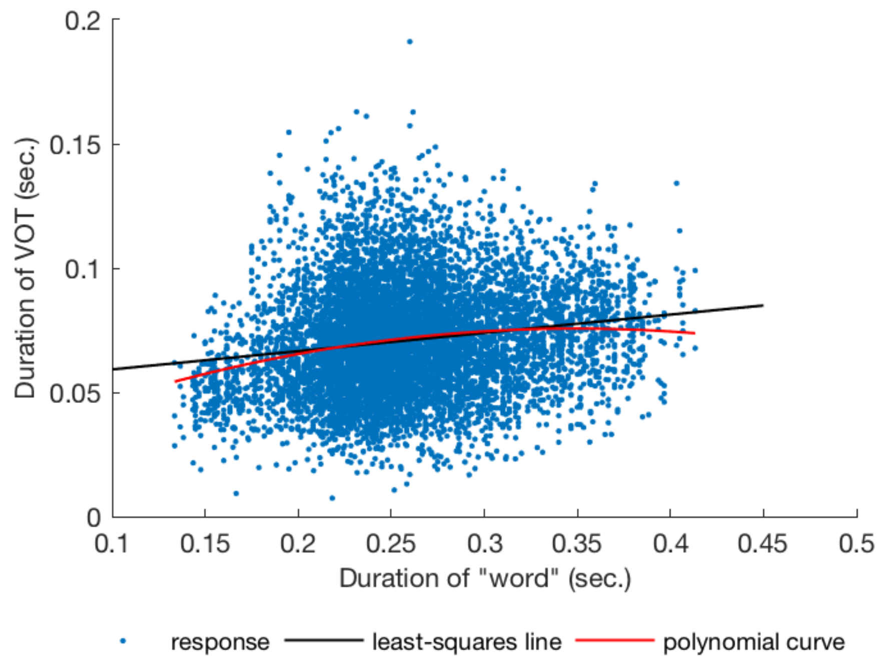


Figure 2.7: VOT and "word" duration (sec) are positively correlated.

For these reasons, VOT_{norm} was used as a dependent measure instead of VOT. However, it is important to note that the overarching findings of this research are generally consistent regardless of whether non-normalized VOT duration or VOT_{norm} was used as the dependent variable.[14] Where the results differed is when examining Model Talker Order. This difference is briefly discussed in Section 4.1.

[13]All stops (/p, t, k/) are included in this figure, accounting for some of the variation.
[14]Non-normalized VOT results are provided in Appendix F.

2.3.4 Block as a measure of time

In order to examine the time-course of accommodation, the duration of each short-term interaction was divided into four blocks, with each block consisting of 9 boards. Interactions were divided into four blocks for reasons related to the experimental design. As described in Section 2.2.5, each target consonant occurred with each target vowel twice, creating two target words. The two target words occurred in the first half of the interaction (Blocks 1 and 2) and then repeated in the second half of the interaction (Blocks 3 and 4). Within each half of the interaction, one of the target words occurred primed and the other occurred unprimed, counterbalanced across the two halves of the interaction. Thus, each target consonant and target vowel combination occurred approximately once per Block—and four times within the entire short-term interaction.

Dividing short-term interactions into blocks in this way allowed for the categorical comparison of accommodation at different points within a short-term interaction. In the mixed-effects model, Block is a categorical variable, rather than a continuous variable, because participants did not maintain a continuous positive or negative slope for VOT_{norm}. Instead, the slopes and direction of the change often differed depending on the Block. For example, as will be described in Section 4.3.1, B-Miami converged with both the monolingual and bilingual model talkers in the second block (increasing or decreasing VOT_{norm}, respectively) and then stopped converging in the third and fourth blocks. Thus, the direction and slope of the first to second block versus the second to the third block were different. By including Block as a categorical variable, VOT_{norm} was able to be compared block-by-block, without the expectation that VOT_{norm} will change in a continuous manner. Additionally, I added a random slope and intercept for Block for each participant, which allows for different slopes and intercepts per Block.

2.3.5 Measuring accommodation

In this dissertation, accommodation is measured by examining the dependent variable, VOT_{norm}, within short-term interactions. For example, to examine whether participants' VOT_{norm} is produced differently with the two model talkers, VOT_{norm} with the monolingual model talker is compared with VOT_{norm} with the bilingual model talker. Additionally, to test the influence of various independent variables (e.g., Prime Type, Model Talker Order, etc.) on accommodation, I examine how VOT_{norm} differs within a short-term interaction with a single model talker, as well as how VOT_{norm} differs between model talkers with each independent variable. To examine the time-course of accommodation, VOT_{norm} is compared between blocks within a short-term interaction with a single model talker, as well as between model talkers by block. By examining VOT_{norm} within these short-term interactions, accommodation within a specific amount of time can be assessed.

In these comparisons, a participant who has longer VOT_{norm} with the monolingual model talker is seen as converging with the monolingual model talker. A participant who has shorter VOT_{norm} with the monolingual model talker is seen as diverging from the monolingual model talker. Contrastingly, a participant who has shorter VOT_{norm} with the bilingual model talker is seen as converging with the bilingual model talker. A participant who has longer

VOT_{norm} with the bilingual model talker is seen as diverging from the bilingual model talker.

This method of measuring accommodation is different from other studies. For example, accommodation studies often measure accommodation by comparing the dependent variable in the experimental trials with those in a baseline trial. The baseline measures are recorded prior to completing the experimental trials and often consist of participants reading a word list or completing some other task. Then, during the experimental trials, or just prior to the trials, participants interact with a model talker and/or are exposed to speech stimuli. Afterward, the dependent variables from the baseline trials are compared with the dependent variables in the experimental trials in order to determine whether the participants' speech has changed (i.e., whether they accommodated). This comparison is made by quantitatively measuring the difference between the baseline trials and experimental trials, or by conducting an AXB discrimination task. In an AXB discrimination task, recordings from the baseline trials and experimental trials are played for a separate group of participants, who are asked which recording (baseline or experimental) is the most similar to the model talker's recording.

These ways of measuring accommodation, however, can be problematic. As discussed in Section 1.2, previous interactions, and even ambient background noise, can have lasting effects on participant's speech. This means that interactions that occurred prior to the baseline trials may have influenced those baseline measures. Further, whether baseline measures are influenced by prior interactions is dependent on a wide variety of both automatic and social factors, which differ based on the individual participant. Thus, baseline measures may not be indicative of a participant's baseline, if there is a such thing as a baseline at all. Additionally, AXB discrimination tasks rely on the ability of participants to perceive accommodation changes, and participants' perception abilities are influenced by their individual linguistic backgrounds.

By instead examining how speech changes throughout a single short-term interaction, and by using quantitative measures, I am better able to compare how participants alter their speech with different model talkers and how it changes over time, without assuming that there is a baseline or relying on participants' discriminatory judgments. Thus, when using the terms *accommodation, convergence,* and *divergence*, I am referring to the present study's method of measuring accommodation—not those used in other studies.

2.3.6 Mixed-effects model

A linear mixed-effects (LME) regression was conducted in R, using the lme4 (Bates, Mächler, Bolker, & Walker, 2015) and emmeans (Lenth, 2018) packages. The experiment was originally designed to examine the effect and interaction of the following variables: Stop, Prime Type, Ling Background, Community, Model Talker, and Block on VOT_{norm}. (See Table 2.5 for descriptions of each variable.) Therefore, all of these variables were included as fixed effects in the mixed model. Additionally, Model Talker Order was added to the model after graphs of individual participants' results suggested that Model Talker Order was influencing the results. Participant and Word were added as random effects because there were multiple VOT_{norm} values per participant and word, thus violating the independence assumption of fixed-effects models and requiring random effects.

Before conducting the LME regression, I checked the following assumptions: linearity, absence of collinearity, homoskedasticity, normality of residuals, and absence of influential data points. To ensure that outliers were removed from the data, and thus there were no extreme, influential data points, VOTs that were 3 or more standard deviations from each participant's mean VOT for each stop type (/p, t, k/) were removed from the data.[15] Only 54 outliers (out of 8588 total data points) were removed from the data, with no more than 5 outliers removed for any single participant.

Next, I conducted Likelihood Ratio Tests to check the significance of adding each fixed effect predictor to the model (see Winter, 2013), as shown in Table 2.6. I added each fixed effect first as a main effect and then as an interaction. The results show that adding each fixed effect as either a main effect or an interaction is significant and improves the model. In the experiment chapters (Chapters 3 and 4), post-hoc Tukey test results are presented and discussed for further comparison.[16]

[15] Extreme data points were typically caused by the participant hesitating at the start of a response.

[16] Post-hoc results related to the main effects Stop, LingBackground, and Community are provided in Appendix C.

Table 2.6: Likelihood Ratio Tests for fixed effects (main effects and interactions) with VOT_{norm} as dependent variable.

Predictor	ChiSq	df	Pr(<ChiSq)	
Stop	–	–	–	
Stop + LingBackground	2.967 1	1	0.0849	.
Stop * LingBackground	15.948	2	0.0003	***
Stop * LingBackground + Community	0.7855	1	0.3754	
Stop * LingBackground * Community	62.766	5	3.256e-12	***
Stop * LingBackground * Community + ModelTalker	210.43	1	<2.2e-16	***
Stop * LingBackground * Community * ModelTalker	39.038	11	5.218e-05	***
Stop * LingBackground * Community * ModelTalker + PrimeType	1.4197	1	0.2335	
Stop * LingBackground * Community * ModelTalker * PrimeType	60.257	95	3.507e-05	***
Stop * LingBackground * Community * ModelTalker * PrimeType + Block	92.415	12	1.679e-14	***
Stop * LingBackground * Community * ModelTalker * PrimeType * Block	124.02	69	0.8448	
Stop * LingBackground * Community * ModelTalker * PrimeType * Block + ModelTalkerOrder	120.95	93	0.02733	*
Stop * LingBackground * Community * ModelTalker * PrimeType * Block * ModelTalkerOrder	398.02	285	1.072e-05	***

As mentioned in Section 2.3.4, a random slope was added for each Block. This slope was added once Block was added to the model. Adding a random slope to the model improved the model, as shown in Table 2.7 below.

Table 2.7: Likelihood Ratio Test for adding random slope for Block with VOT_{norm} as dependent variable.

<table>
<tr><th>Predictor</th><th>ChiSq</th><th>df</th><th>Pr(<ChiSq)</th><th></th></tr>
<tr><td>Stop * LingBackground * Community * ModelTalker * PrimeType * Block * ModelTalkerOrder + (1|Participant) + (1|word)</td><td>–</td><td>–</td><td>–</td><td></td></tr>
<tr><td>Stop * LingBackground * Community * Model Talker * PrimeType * Block * PrimeType * ModelTalkerOrder + (1+Block|Participant) + (1|word)</td><td>77.898</td><td>9</td><td>4.221e-13</td><td>***</td></tr>
</table>

CHAPTER 3

EXPERIMENT 1: ACCOMMODATION IN SHORT-TERM INTERACTIONS

As discussed in Chapter 1, previous research has argued that accommodation is an automatic and/or social phenomenon. Experiment 1 aims to tease apart the mechanisms underlying accommodation by testing for both automatic and social accommodation effects occurring within short-term interactions. Thus, the following two questions are addressed in Experiment 1: (1) Is accommodation automatic and/or socially-modulated? (2) Does immediate exposure to a phonetic variable (i.e., priming) increase accommodation? If so, does immediate exposure interact with social variables? These questions are answered by examining accommodation within a short-term interaction with a model talker, averaged over the entire interaction. Additionally, accommodation during a priming condition (word-pairs with a target prime) and a non-priming condition (word-pairs with an unrelated prime) are compared, and the interactions between social variables and priming are examined.

As a reminder, the social variables examined are (1) the model talker's linguistic background, (2) the participant's linguistic background, (3) the participant's speech community, and (4) the interaction between these variables. The linguistic backgrounds examined are English monolingual and Spanish-English bilingual, and the speech communities examined are a majority English monolingual community (Ithaca) and a majority Spanish-English bilingual community (Miami). Additionally, the model talkers are an English monolingual model talker and a Spanish-English bilingual model talker. A model talker is considered similar to a participant if the participant and the model talker share linguistic backgrounds (e.g., the model talker is an English monolingual and the participant is an English monolingual) or if the model talker's linguistic background is the same as the majority of speakers in the participant's speech community (e.g., the model talker is an English monolingual and the participant is from a majority monolingual community). The dependent variable is VOT in voiceless stops in English.

If accommodation occurs automatically, *recency* and/or *novelty* effects are predicted to occur. If accommodation is socially modulated, *similarity affiliation* and/or *outsider affiliation* effects are predicted to occur. These effects are defined in (1)-(4) below. Automatic and social effects associated with social variables are also defined. "Accommodation" is used in these definitions to describe convergence effects, but divergence may also be expected.

(1) AUTOMATIC: RECENCY EFFECT

Due to exposure during an interaction, the participant accommodates to the model talker. This effect occurs regardless of whether social variables are shared. In other words, all participants accommodate to all model talkers.

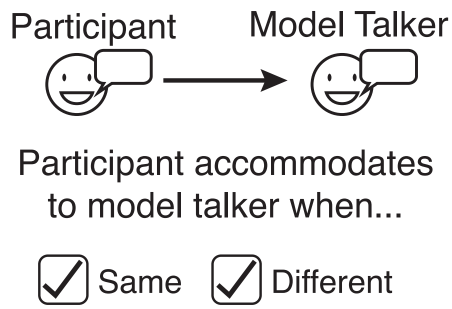


Figure 3.1: If a recency effect occurs, all participants accommodate to all model talkers, regardless of similarities and differences.

(2) AUTOMATIC: NOVELTY EFFECT

The participant and the model talker do not share a social variable. Due to less exposure to speech by interlocutors with this social variable, the participant accommodates to the model talker. The following novelty relationships are examined:

a. LINGUISTIC BACKGROUND NOVELTY

The participant and model talker have different linguistic backgrounds.

b. SPEECH COMMUNITY NOVELTY

The model talker's linguistic background is different from the majority of people in the participant's speech community.

c. LINGUISTIC BACKGROUND & SPEECH COMMUNITY NOVELTY

The model talker's linguistic background is different from the participant and from the majority of people in the participant's speech community.

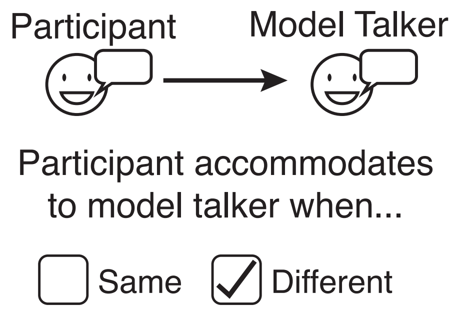


Figure 3.2: If a novelty effect occurs, participants accommodate to model talkers who are different from them.

(3) SOCIAL: SIMILARITY AFFILIATION EFFECT

The participant and model talker share a social variable. To increase similarity with a model talker who is similar to the participant, the participant accommodates to the model talker. The following similarity affiliation relationships are examined:

a. LINGUISTIC BACKGROUND SIMILARITY AFFILIATION

The participant and model talker have similar linguistic backgrounds.

b. SPEECH COMMUNITY SIMILARITY AFFILIATION

The model talker's linguistic background is similar to the majority of people in the participant's speech community.

c. LINGUISTIC BACKGROUND & SPEECH COMMUNITY SIMILARITY AFFILIATION

The model talker's linguistic background is similar to the participant and to the majority of people in the participant's speech community.

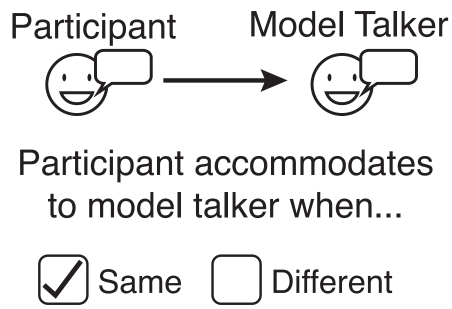


Figure 3.3: If a similarity affiliation effect occurs, participants accommodate to model talkers who are similar to them.

(4) SOCIAL: OUTSIDER AFFILIATION EFFECT

The participant and model talker share one social variable but do not share the other social variable. Due to the unshared social variable, the participant is an outsider to the group of speakers with that unshared social variable. To decrease dissimilarity from the model talker/group, the participant accommodates to the model talker. The following outsider affiliation relationships are examined:

a. LINGUISTIC BACKGROUND OUTSIDER AFFILIATION

The model talker's linguistic background is the same as the participant but different from the majority of people in the participant's speech community. The participant is an outsider to others who share their linguistic background due to lack of access to speakers within the participant's speech community.

b. SPEECH COMMUNITY OUTSIDER AFFILIATION

The model talker's linguistic background is the same as the majority of people in the participant's speech community but different from the participant. The participant is an outsider in their speech community due to the participant's linguistic background.

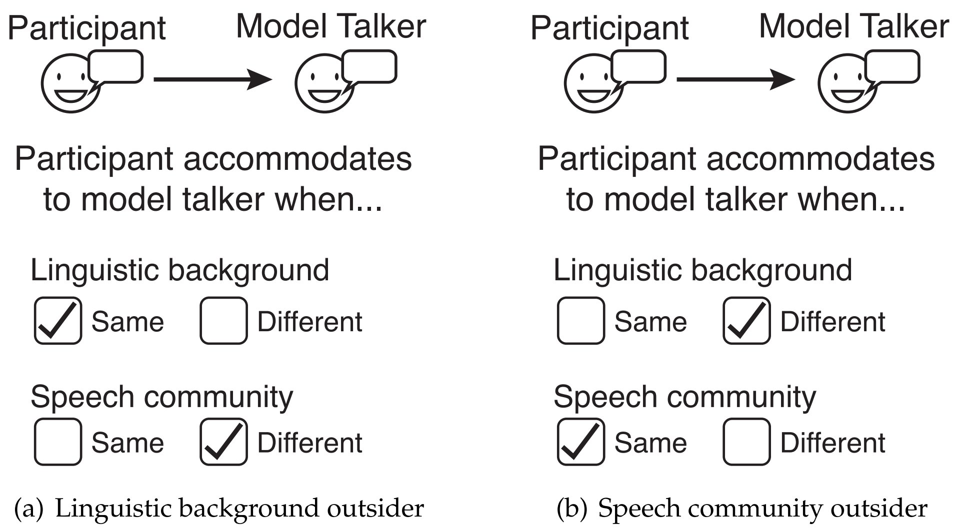


Figure 3.4: If an outsider affiliation effect occurs, participants accommodate to model talkers who are similar to them in one way and different from them in another.

The remainder of this chapter is organized as follows: Methods related to Experiment 1 are detailed in Section 3.1. Research questions, hypotheses, and predictions are presented in Section 3.2. Results are provided in Section 3.3 and discussed in Section 3.4.

3.1 Methods

This section details the methods used in Experiment 1: the participants (3.1.1), the procedure (3.1.2), and the data analysis (3.1.3).

3.1.1 Participants

The participants in Experiment 1 were English monolinguals and Spanish-English bilinguals from either a majority English monolingual community or a majority Spanish-English bilingual community. The majority Spanish-English bilingual community tested is Miami, Florida. The majority English monolingual community is Ithaca, New York. Thus, there were four participant groups: (1) Spanish-English bilinguals from Ithaca (B-Ithaca), (2) English monolinguals from Ithaca (M-Ithaca), (3) Spanish-English Bilinguals from Miami (B-Miami), and (4) English Monolinguals from Miami (M-Miami)—as presented in Table 3.1. There were 40 total participants, with 10 participants in each participant group.

Table 3.1: Participant group abbreviations

SPEECH COMMUNITY	**LINGUISTIC BACKGROUND** MONOLINGUAL	BILINGUAL
MONOLINGUAL	M-Ithaca	B-Ithaca
BILINGUAL	M-Miami	B-Miami

All participants from Ithaca had been living in Ithaca for at least a year[1] at the time of the study. Also, all participants from Miami had been living in Miami for at least a year at the time of the study. All English monolinguals are English speakers who are self-reported monolinguals.[2] All Spanish-English bilinguals

[1]One year was selected because, after a year, participants would have had an extended period of exposure to either monolingual or bilingual speech, as a member of the community. Also, because there were few Spanish-English bilinguals living in Ithaca, the pool of bilinguals who had lived in Ithaca for longer was severely restricted.

[2]Many of the English monolinguals reported learning a second language in school, but they reported having a very limited vocabulary. Unsurprisingly, many of the Miami "monolinguals" reported using some Spanish is their daily lives, particularly at work. This is to be expected, as there is frequent interaction between monolinguals and bilinguals in Miami and it is a

speak both Spanish and English fluently.

The bilingual participant groups (B-Ithaca, B-Miami) had similar age of acquisition charactertistics. The mean age of acquisition for B-Ithaca was 7.1 (min: 0, max: 23). The mean age of acquisition for B-Miami was 5.3 (min: 0, max: 20).[3] B-Ithaca consisted of 4 simultaneous bilinguals (who learned English and Spanish at the same time) and 6 sequential bilinguals (who learned Spanish before learning English). B-Miami consisted of 3 simultaneous bilinguals and 7 sequential bilinguals. Of the sequential bilinguals, 2 B-Ithaca and 2 B-Miami learned English after the age of 10.

All participants were between the ages of 19 and 36 at the time of the study. The mean age of each participant group was the following: 24.6 for B-Ithaca (min: 19, max: 36), 23.5 for M-Ithaca (min: 19, max: 31), 29 for B-Miami (min: 23, max: 35), and 28.5 for M-Miami (min: 21, max: 31). There were both male and female participants: 3 male and 7 female participants in B-Ithaca, 3 male and 7 female participants in M-Ithaca, 5 male and 5 female participants in B-Miami, and 5 male and 5 female participants in M-Miami.

3.1.2 Procedure

The procedure of the experiment is as follows: First, participants complete a consent form. Then, participants are seated in front of a laptop computer in a quiet room. Connected to the laptop computer is a headset, which has both

requirement of any job that involves speaking with other people to know some basic vocabulary. Still, I refer to these speakers as monolinguals because they identify as being monolingual in their language background questionnaire.

[3]Participants were told to write "0" for their age of acquisition when a language was their first language. Their first language was defined as the language they acquired first.

audio and recording capabilities, and a mouse. At this time, participants read the instructions and are encouraged to ask questions. After the instructions, participants complete three practice boards. While they complete the practice boards, I listen and correct them if they make mistakes, and I answer any questions they have. Once the practice boards are complete and all of their questions are answered, they begin the main portion of the experiment. At this point, the participants are given privacy to complete the experiment on their own.

Once the task begins, they hear one of the two pre-recorded model talkers and complete 36 boards with that model talker. After interacting with the first model talker, participants are allowed to take a break if they wish. There is no restriction on the amount of time they can take for their break, only that they cannot speak to anyone during this period.[4] After the break, they complete the rest of the task (36 more boards) with the second model talker. After the task is finished, they complete a language background questionnaire (provided in Appendix B). The entire experiment, including instructions and the questionnaire, took around 1 to 1.5 hours to complete, and participants were paid $15 for their participation.

3.1.3 Data analysis

The variables included in the linear mixed-effects model (presented in Section 2.3.6) that are relevant for Experiment 1 are the following: VOT_{norm}, Participant, Word, Stop, Ling Background, Community, Model Talker, and

[4]No participant took longer than a few minutes in between model talkers (e.g., for a bathroom break).

PrimeType. Descriptions of these variables are provided in Table 3.2.

Table 3.2: Description of variables

Variable Name	**Description**	**Continuous/ Categorical?**	**Variable/Effect Type**
VOT_{norm}	VOT is normalized for speech rate by dividing a participant's VOT by their average "word" duration per board	Continuous	Dependent
Participant	Participant ID#	Categorical	Random effect
Word	Target word: Each repeated 4 times per participant	Categorical	Random effect
Stop	/p/, /t/, /k/	Categorical	Fixed effect
LingBackground	monolingual, bilingual	Categorical	Fixed effect
Community	Ithaca, Miami	Categorical	Fixed effect
Model Talker	monolingual, bilingual	Categorical	Fixed effect
PrimeType	primed, unprimed	Categorical	Fixed effect

As described in Section 2.3.6, a LME regression was conducted. In the results section of this chapter (Section 3.3), the post-hoc Tukey test results, comparing VOT_{norm} both within-groups and between-groups, are presented. To examine accommodation within a short-term interaction, averaged over the entire interaction, all VOT_{norm} values are included and averaged in the post-hoc analyses. Block—the variable that is representative of time—is not included in the post-hoc analyses. Additionally, Model Talker Order—the variable that is representative of the lasting effects of accommodation—is not included. To examine the influence of priming, the variable PrimeType is included in the post-hoc analyses. All post-hoc analyses are conducted by examining VOT_{norm} with all stops combined (*overall VOT_{norm}*) and VOT_{norm} by Stop.

3.2 Research questions and hypotheses

In this section, the following research questions are presented: (1) Is accommodation automatic and/or socially-modulated? (2) Does immediate exposure to a phonetic variable increase accommodation? If so, does immediate exposure interact with social variables? These questions are discussed in Sections 3.2.1 and 3.2.2. Hypotheses and predictions related to the automatic and social effects described in (1)-(4) (summarized in Figure 3.5) are proposed.

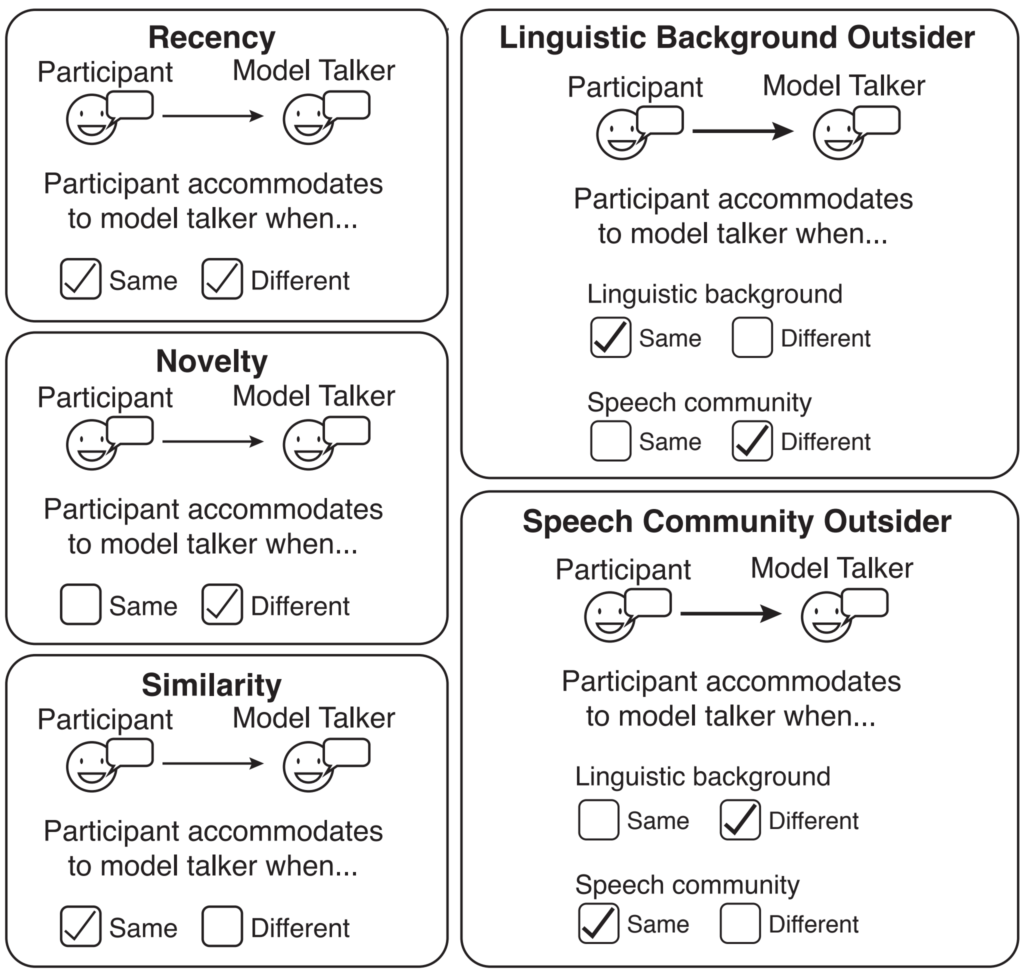


Figure 3.5: Summary of automatic and social effects examined

3.2.1 Is accommodation automatic or socially-modulated?

Research Question #1: Is accommodation automatic or socially-modulated? Specifically, which of the following effects occurs during accommodation: recency, novelty, similarity affiliation, or outsider affiliation? Hypotheses and predictions for each effect are presented and illustrated below.

Hypothesis #1-1: Automatic: Recency Effect

- All participants will accommodate to all model talkers.

Prediction #1-1: Automatic: Recency Effect

- All participants will produce longer VOT_{norm} when interacting with the English monolingual model talker.
- All participants will produce shorter VOT_{norm} when interacting with the Spanish-English bilingual model talker.

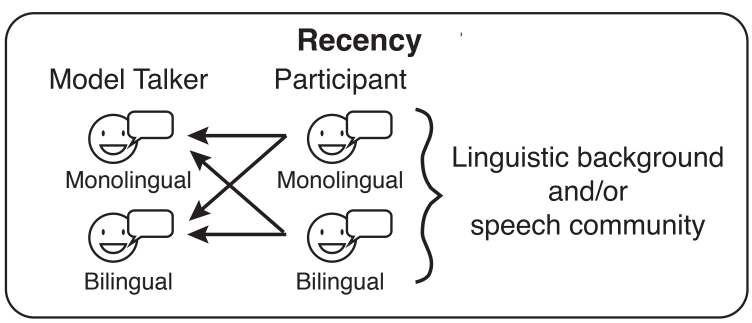


Figure 3.6: Recency: All participants will accommodate to all model talkers.

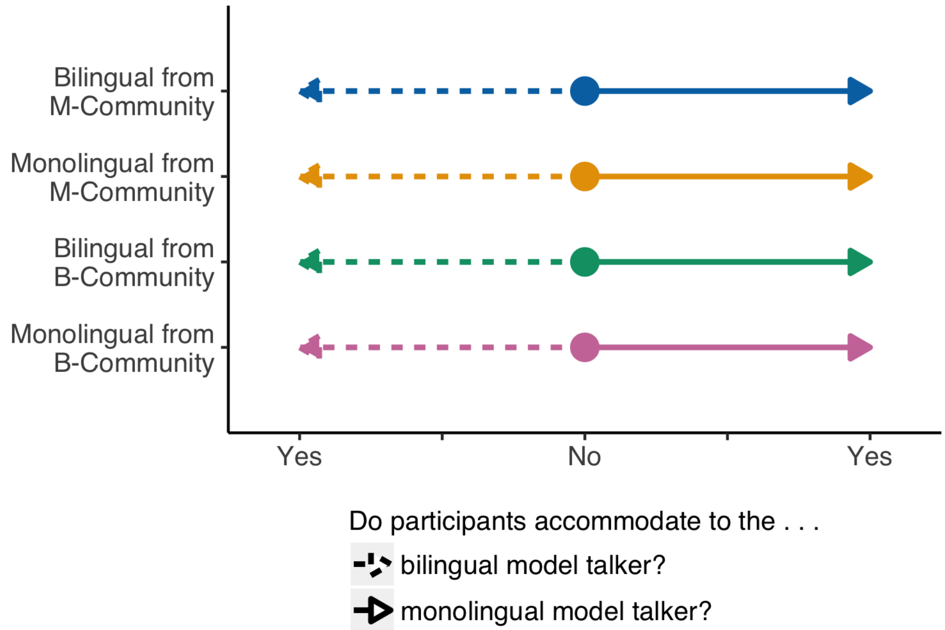


Figure 3.7: If recency effects occur, all participants will accommodate to all model talkers.

Hypothesis #1-2: Automatic: Novelty Effect

- Participants with less exposure to speech from an interlocutor of some social variable will accommodate to a model talker of that social variable.

Prediction #1-2: Automatic: Novelty Effect

- Participants with less exposure to English monolingual speech will produce longer VOT_{norm} when interacting with the English monolingual model talker.
- Participants with less exposure to Spanish-English bilingual speech will produce shorter VOT_{norm} when interacting with the Spanish-English bilingual model talker.

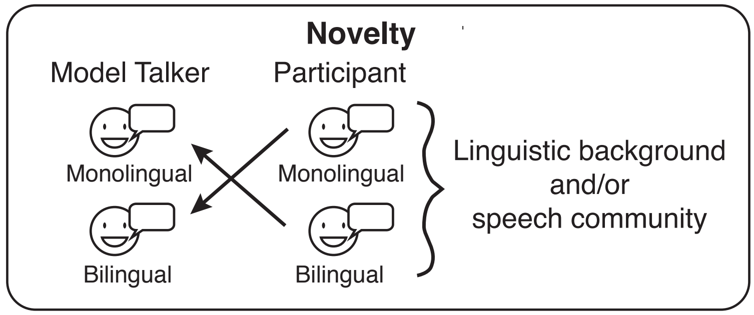


Figure 3.8: Novelty: Participants will accommodate to model talker that they have less exposure to.

Specific hypotheses and predictions for each social variable (e.g., linguistic background, speech community, and the interaction between linguistic background and speech community) are presented and illustrated below.

HYPOTHESIS #1-2A: Linguistic Background Novelty

- English monolingual participants will accommodate to the Spanish-English bilingual model talker.
- Spanish-English bilingual participants will accommodate to the English monolingual model talker.

PREDICTION #1-2A: Linguistic Background Novelty

- English monolingual participants will produce shorter VOT_{norm} when interacting with the Spanish-English bilingual model talker.
- Spanish-English bilingual participants will produce longer VOT_{norm} when interacting with the English monolingual model talker.

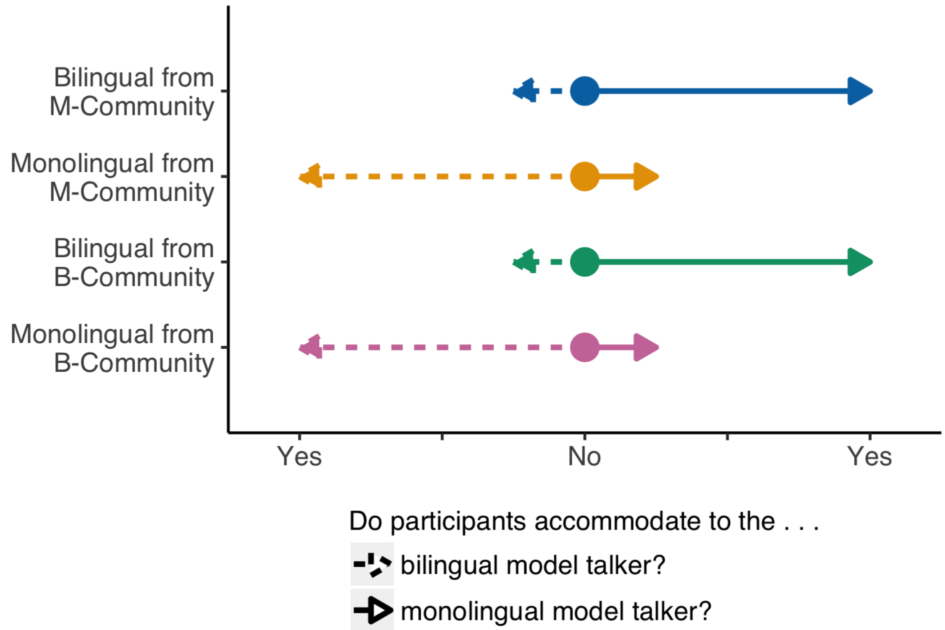


Figure 3.9: If linguistic background novelty effects occur, bilingual participants will accommodate to the monolingual model talker and monolingual participants will accommodate to the bilingual model talker.

HYPOTHESIS #1-2B: Speech Community Novelty

- Participants from the English monolingual community will accommodate to the Spanish-English bilingual model talker.
- Participants from the Spanish-English bilingual community will accommodate to the English monolingual model talker.

PREDICTION #1-2B: Speech Community Novelty

- Participants from the English monolingual community will produce shorter VOT_{norm} when interacting with the Spanish-English bilingual model talker.

- Participants from the Spanish-English bilingual community will produce longer VOT_{norm} when interacting with the English monolingual model talker.

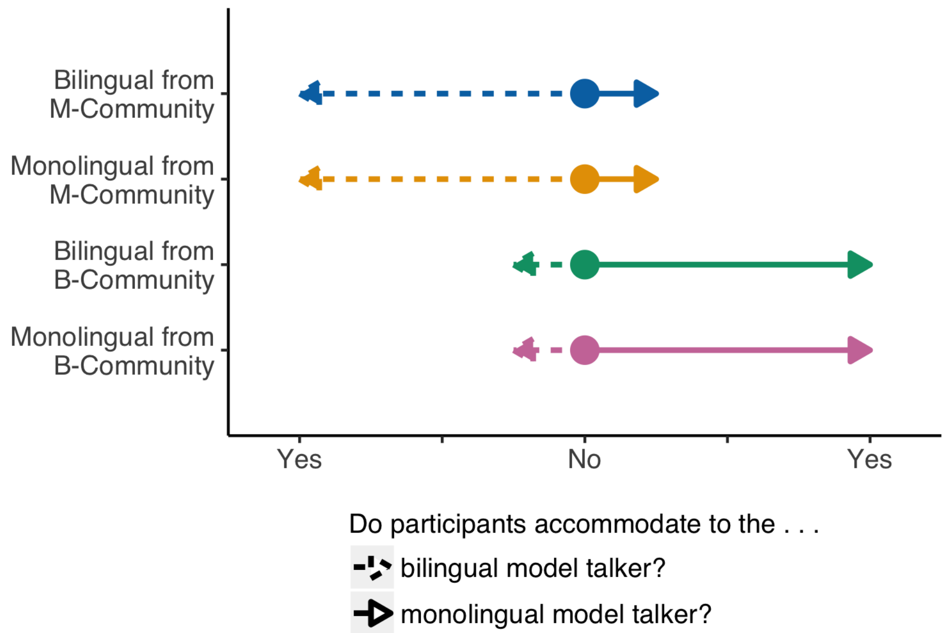


Figure 3.10: If speech community novelty effects occur, participants from the monolingual community will accommodate to the bilingual model talker and participants from the bilingual community will accommodate to the monolingual model talker.

HYPOTHESIS #1-2C: Linguistic Background & Speech Community Novelty

- English monolingual participants from the English monolingual community will accommodate to the Spanish-English bilingual model talker.
- Spanish-English bilingual participants from the Spanish-English bilingual community will accommodate to the English monolingual

model talker.

PREDICTION #1-2C: Linguistic Background & Speech Community Novelty

- English monolingual participants from the English monolingual community will produce shorter VOT_{norm} when interacting with the Spanish-English bilingual model talker.
- Spanish-English bilingual participants from the Spanish-English bilingual community will produce longer VOT_{norm} when interacting with the English monolingual model talker.

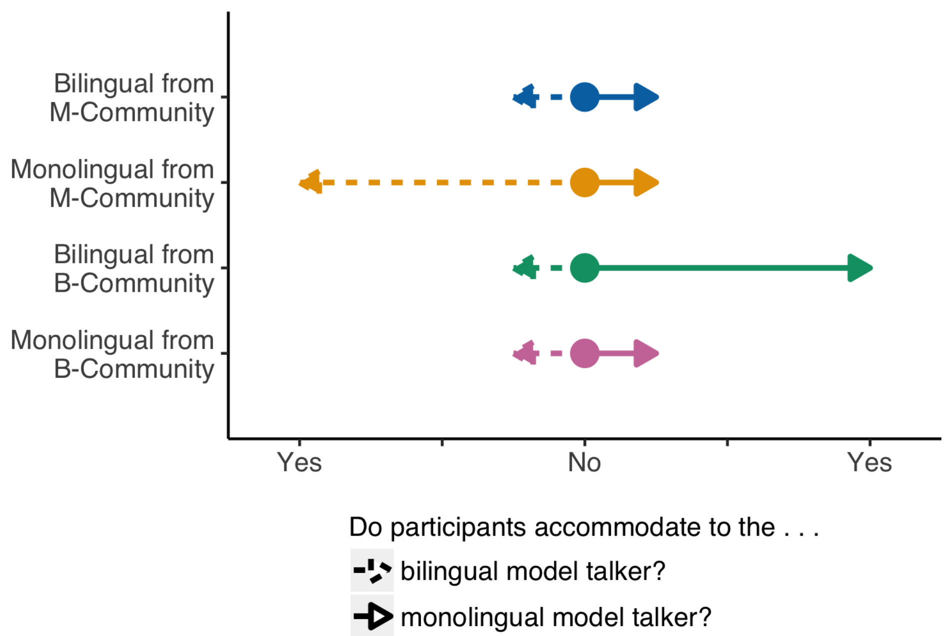


Figure 3.11: If linguistic background and speech community novelty effects occur during accommodation, monolingual participants from the monolingual community will accommodate to the bilingual model talker, and bilingual participants from the bilingual community will accommodate to the monolingual model talker.

HYPOTHESIS #1-3: Social: Similarity Affiliation Effect

- Participants will accommodate to a model talker who shares a social variable with them.

PREDICTION #1-3: Social: Similarity Affiliation Effect

- Participants who share a social variable with the English monolingual model talker will produce longer VOT_{norm} when interacting with the English monolingual model talker.
- Participants who share a social variable with the Spanish-English bilingual model talker will produce shorter VOT_{norm} when interacting with the Spanish-English bilingual model talker.

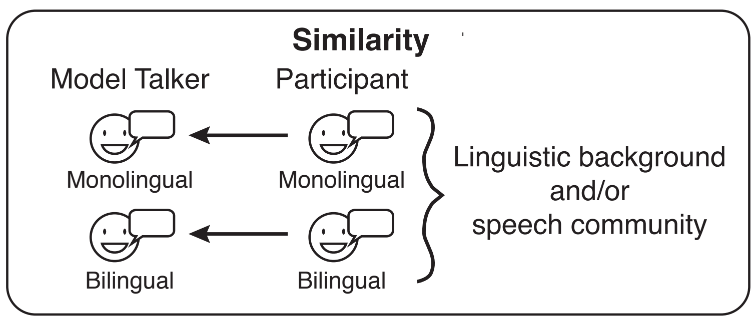


Figure 3.12: Similarity affiliation: Participants will accommodate to model talker that is similar to them.

Specific hypotheses and predictions for each social variable (e.g., linguistic background, speech community, and the interaction between linguistic background and speech community) are presented and illustrated below.

HYPOTHESIS #1-3A: Linguistic Background Similarity Affiliation

- English monolingual participants will accommodate to the English monolingual model talker.
- Spanish-English bilingual participants will accommodate to the Spanish-English bilingual model talker.

PREDICTION #1-3A: Linguistic Background Similarity Affiliation

- English monolingual participants will produce longer VOT_{norm} when interacting with the English monolingual model talker.
- Spanish-English bilingual participants will produce shorter VOT_{norm} when interacting with the Spanish-English bilingual model talker.

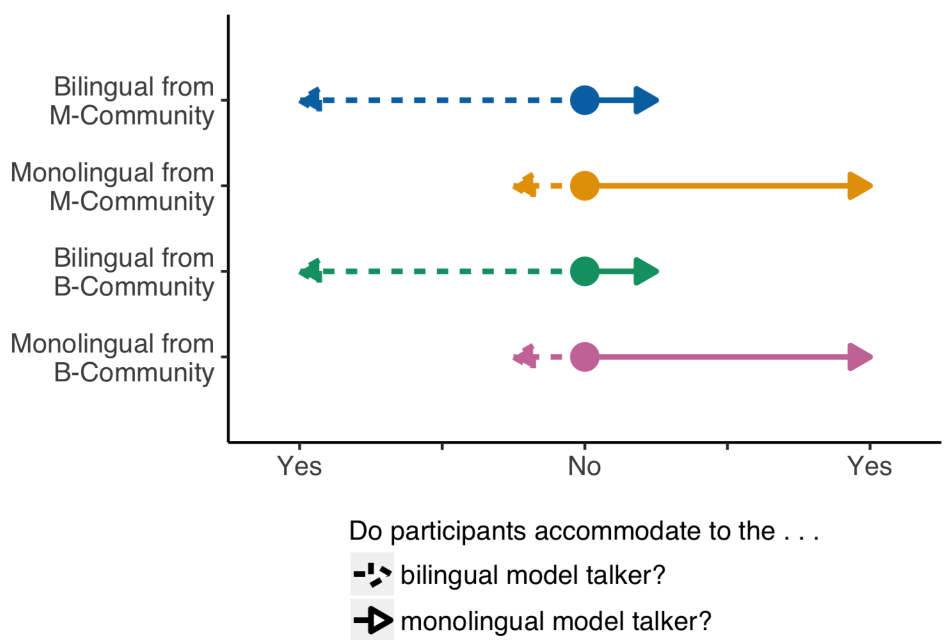


Figure 3.13: If linguistic background similarity affiliation effects occur, bilingual participants will accommodate to the bilingual model talker and monolingual participants will accommodate to the monolingual model talker.

HYPOTHESIS #1-3B: Speech Community Similarity Affiliation

- Participants from the English monolingual community will accommodate to the English monolingual model talker.
- Participants from the Spanish-English bilingual community will accommodate to the Spanish-English bilingual model talker.

PREDICTION #1-3B: Speech Community Similarity Affiliation

- Participants from the English monolingual community will produce longer VOT_{norm} when interacting with the English monolingual model talker.
- Participants from the Spanish-English bilingual community will produce shorter VOT_{norm} when interacting with the Spanish-English bilingual model talker.

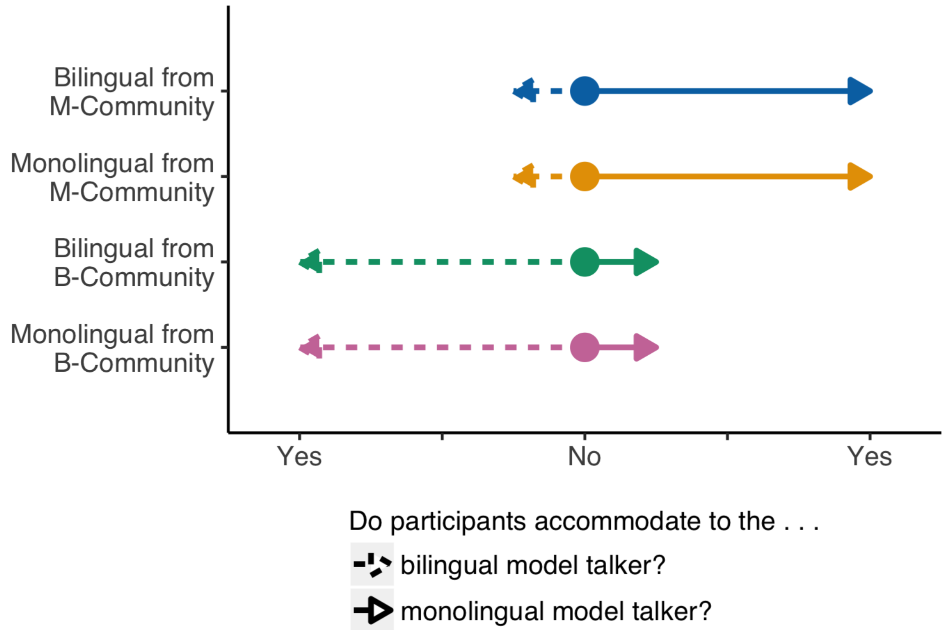


Figure 3.14: If speech community similarity affiliation effects occur, participants from the monolingual community will accommodate to the monolingual model talker, and participants from the bilingual community will accommodate to the bilingual model talker.

HYPOTHESIS #1-3C: Linguistic Background & Community Similarity Affiliation

- English monolingual participants from the English monolingual community will accommodate to the English monolingual model talker.
- Spanish-English bilingual participants from the Spanish-English bilingual community will accommodate to the Spanish-English bilingual model talker.

Prediction #1-3c: Linguistic Background & Community Similarity Affiliation

- English monolingual participants from the English monolingual community will produce longer VOT_{norm} when interacting with the English monolingual model talker.
- Spanish-English bilingual participants from the Spanish-English bilingual community will produce shorter VOT_{norm} when interacting with the Spanish-English bilingual model talker.

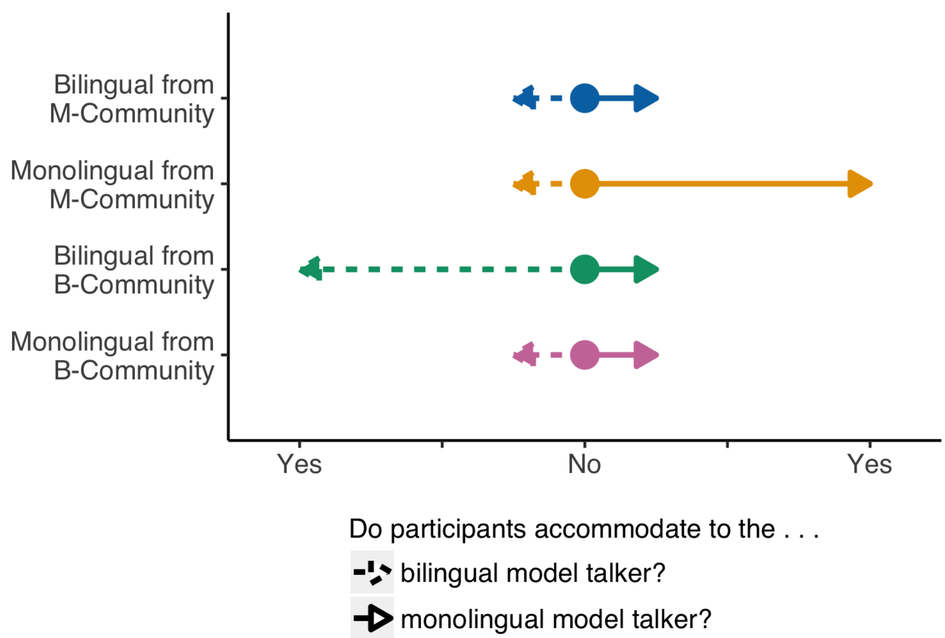


Figure 3.15: If linguistic background and speech community similarity affiliation effects occur, monolingual participants from the monolingual community will accommodate to the monolingual model talker, and bilingual participants from the bilingual community will accommodate to the bilingual model talker.

HYPOTHESIS #1-4: Social: Outsider Affiliation Effect

- Participants will accommodate to a model talker if they share one social variable with that model talker and do not share the other social variable with that model talker.

PREDICTION #1-4: Social: Outsider Affiliation Effect

- If a participant shares one social variable and does not share the other social variable with the English monolingual model talker, they will produce longer VOT_{norm} when interacting with the English monolingual model talker.
- If a participant shares one social variable and does not share the other social variable with the Spanish-English bilingual model talker, they will produce shorter VOT_{norm} when interacting with the Spanish-English bilingual model talker.

Specific hypotheses and predictions for each social variable (e.g., linguistic background and speech community) are presented and illustrated below.

HYPOTHESIS #1-4A: Linguistic Background Outsider Affiliation

- English monolingual participants from the Spanish-English bilingual community will accommodate to the English monolingual model talker.
- Spanish-English bilingual participants from the English monolingual community will accommodate to the Spanish-English bilingual model talker.

PREDICTION #1-4A: Linguistic Background Outsider Affiliation

- English monolingual participants from the Spanish-English bilingual community will produce longer VOT_{norm} when interacting with the English monolingual model talker.
- Spanish-English bilingual participants from the English monolingual community will produce shorter VOT_{norm} when interacting with the Spanish-English bilingual model bilingual model talker.

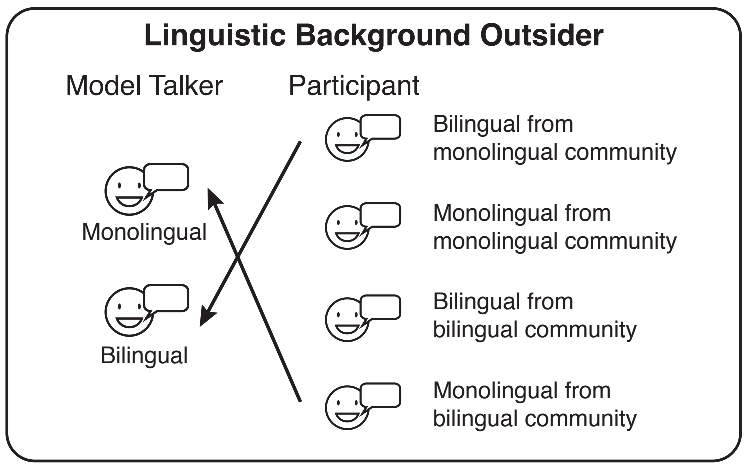


Figure 3.16: Linguistic background outsider affiliation: Participants will accommodate to model talker that shares their linguistic background but is not representative of their speech community.

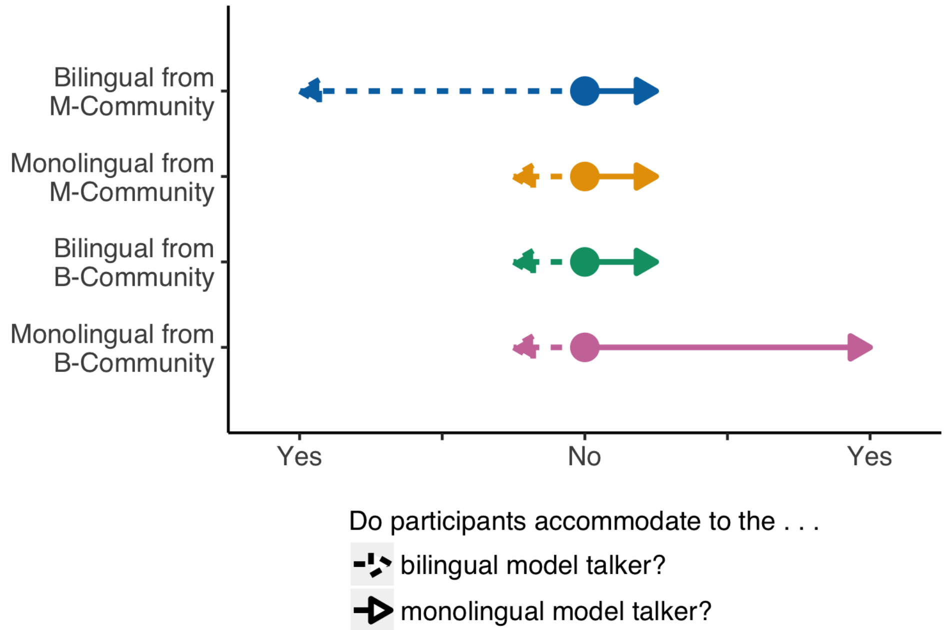


Figure 3.17: If linguistic background outsider affiliation effects occur, bilingual participants from the monolingual community will accommodate to the bilingual model talker, and monolingual participants from the bilingual community will accommodate to the monolingual model talker.

HYPOTHESIS #1-4B: Speech Community Outsider Affiliation

- English monolingual participants from the Spanish-English bilingual community will accommodate to the Spanish-English bilingual model talker.
- Spanish-English bilingual participants from the English monolingual community will accommodate to the English monolingual model talker.

PREDICTION #1-4B: Speech Community Outsider Affiliation

- English monolingual participants from the Spanish-English bilingual community will produce shorter VOT_{norm} when interacting with the Spanish-English bilingual model talker.

- Spanish-English bilingual participants from the English monolingual community will produce longer $\mathrm{VOT}_{\mathrm{norm}}$ when interacting with the English monolingual model talker.

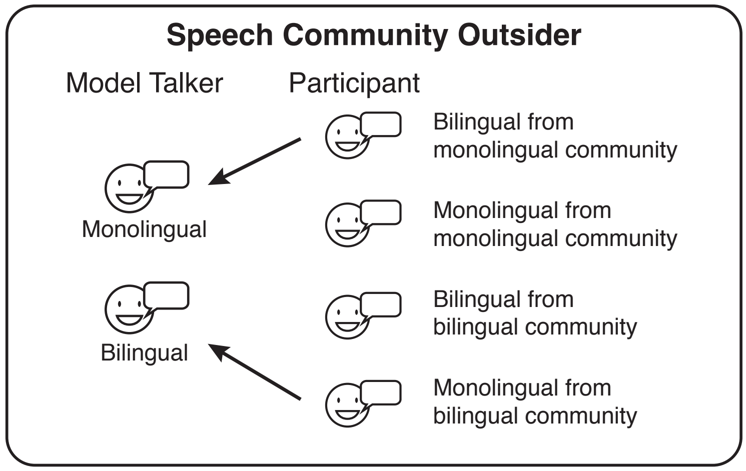


Figure 3.18: Speech community outsider affiliation: Participants will accommodate to model talker that is representative of their speech community but does not share their own linguistic background.

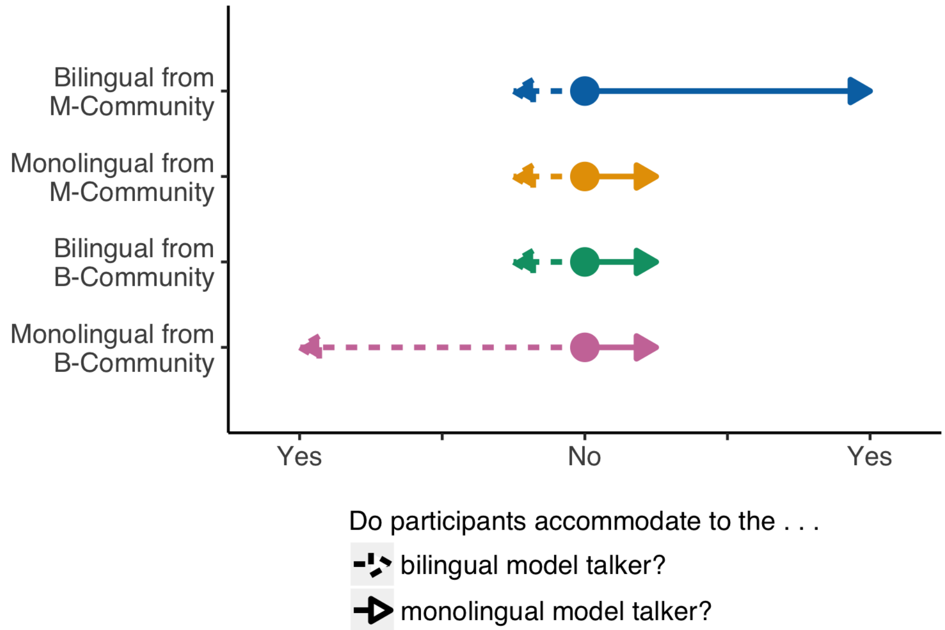


Figure 3.19: If speech community outsider affiliation effects occur, bilingual participants from the monolingual community will accommodate to the monolingual model talker, and monolingual participants from the bilingual community will accommodate to the bilingual model talker.

3.2.2 Does immediate exposure influence accommodation?

Research Question #2: Does immediate exposure to a phonetic variable (i.e., priming) increase accommodation? If so, does immediate exposure interact with social variables, causing one or more of the following effects: recency, novelty, similarity affiliation, and/or outsider affiliation?

Assuming priming increases accommodation, hypotheses and predictions related to the automatic and social effects described in (1)-(4) (summarized in Figure 3.5 above) are proposed.

HYPOTHESIS #2-1: Automatic: Recency Effect + Immediate Exposure

- Priming increases accommodation by all participants to all model talkers.

PREDICTION #2-1: Automatic: Recency Effect + Immediate Exposure

- When interacting with the English monolingual model talker, all participants will produce longer VOT_{norm} when primed.
- When interacting with the Spanish-English bilingual model talker, all participants will produce shorter VOT_{norm} when primed.

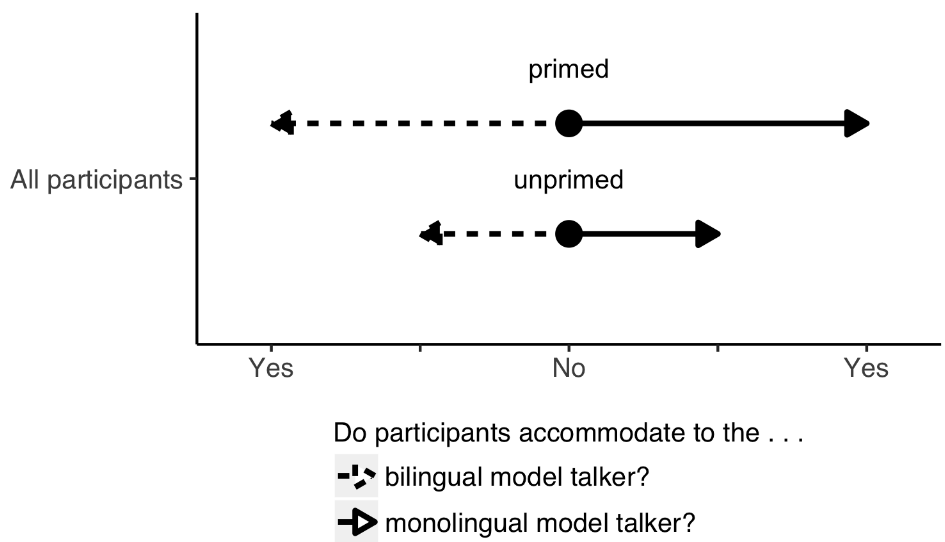


Figure 3.20: If recency effects interact with priming, all participants will accommodate to all model talkers more when primed.

HYPOTHESIS #2-2: Automatic: Novelty Effect + Immediate Exposure

- Priming will increase accommodation when the participant has less exposure to speech from a model talker of some social variable.

PREDICTION #2-2: Automatic: Novelty Effect + Immediate Exposure

- Participants with less exposure to English monolingual speech (e.g., Spanish-English bilingual participants and/or participants from the Spanish-English bilingual community) will produce longer VOT_{norm} when interacting with the English monolingual model talker and primed.
- Participants with less exposure to Spanish-English bilingual speech (e.g., English monolingual participants and/or participants from the English monolingual community) will produce shorter VOT_{norm} when interacting with the Spanish-English bilingual talker and primed.

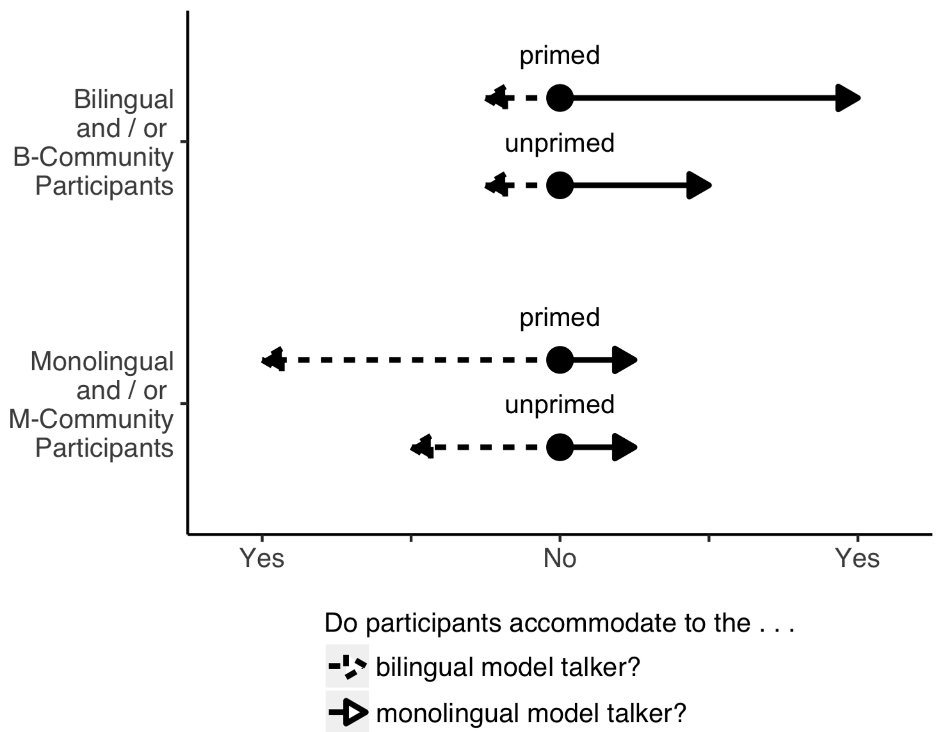


Figure 3.21: If novelty effects interact with priming, participants will accommodate to speech from a novel model talker more when primed.

HYPOTHESIS #2-3: Social: Similarity Affiliation Effect + Immediate Exposure

- Priming will increase accommodation when the participant and the model talker share a social variable.

PREDICTION #2-3: Social: Similarity Affiliation Effect + Immediate Exposure

- Participants who share a social variable with the English monolingual model talker (e.g., English monolingual participants and/or participants from the English monolingual community) will produce longer VOT_{norm} when interacting with the English monolingual model talker and primed.
- Participants who share a social variable with the Spanish-English bilingual model talker (e.g., Spanish-English bilingual participants and/or participants from the Spanish-English bilingual community) will produce shorter VOT_{norm} when interacting with the Spanish-English bilingual model talker and primed.

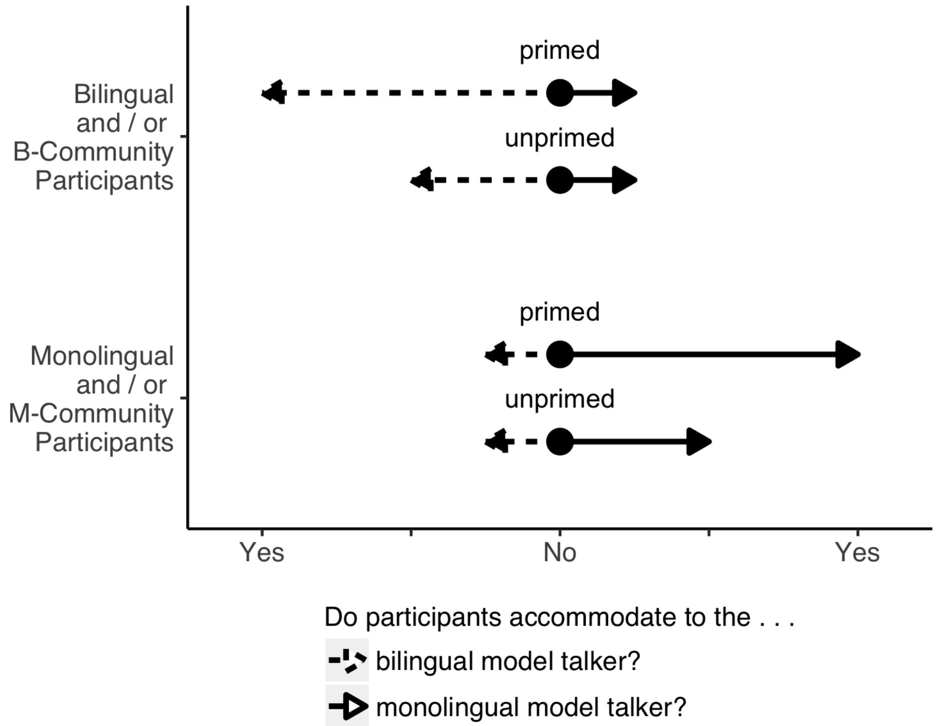


Figure 3.22: If similarity affiliation effects interact with priming, participants will accommodate to speech from a similar model talker more when primed.

HYPOTHESIS #2-4: Social: Outsider Affiliation Effect + Immediate Exposure

- Priming will increase accommodation when the participant has an outsider relationship with the model talker.

PREDICTION #2-4: Social: Outsider Affiliation Effect + Immediate Exposure

- If a participant both shares and does not share a social variable with the English monolingual model talker (e.g. English monolinguals from the Spanish-English bilingual community or Spanish-English bilinguals from the English monolingual community), they will produce longer VOT_{norm} when interacting with the English monolingual model talker and primed.

- If a participant both shares and does not share a social variable with the Spanish-English bilingual model talker (e.g. Spanish-English bilinguals from the English monolingual community or English monolinguals from the Spanish-English bilingual community), they will produce shorter VOT_{norm} when interacting with the Spanish-English bilingual model talker and primed.

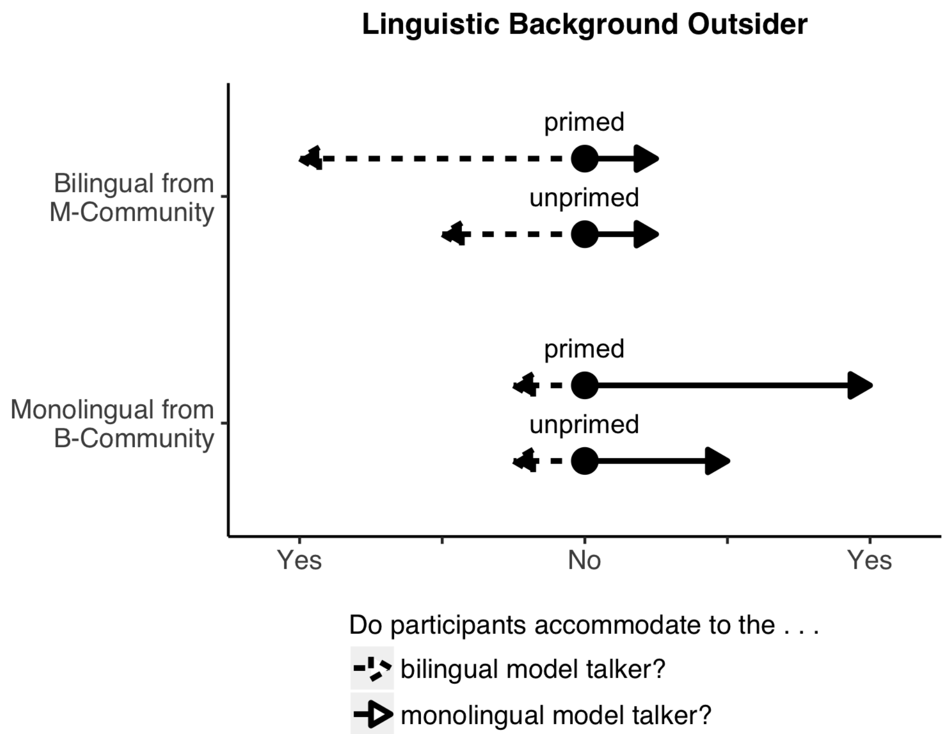


Figure 3.23: If linguistic-background outsider affiliation effects interact with priming, participants will accommodate more to speech from a model talker that they have a linguistic-background outsider relationship with when primed.

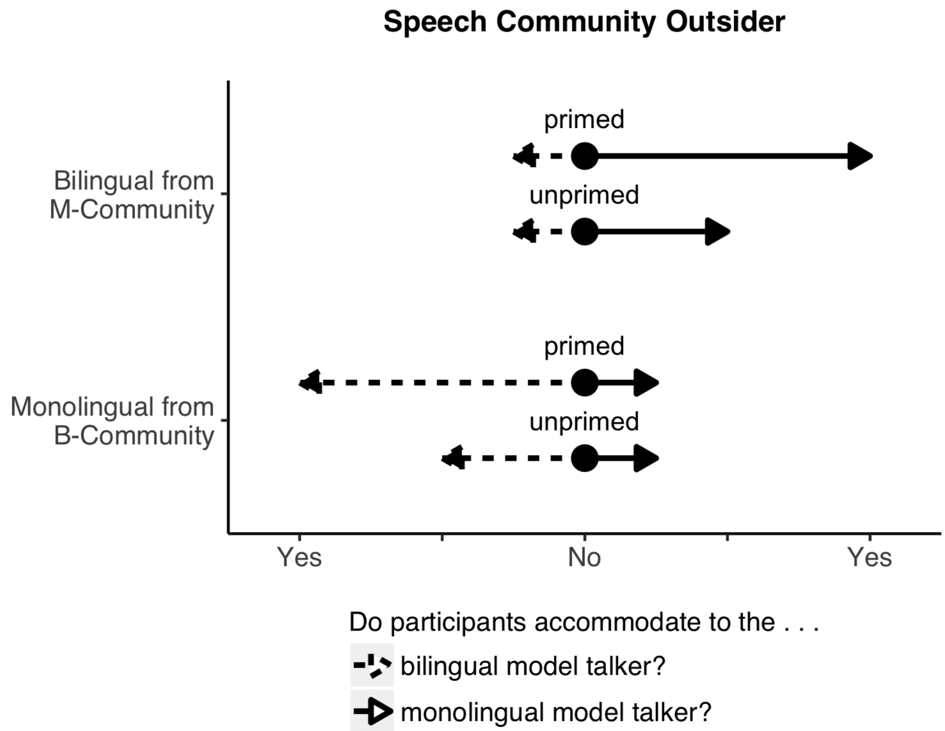


Figure 3.24: If speech-community outsider affiliation effects interact with priming, participants will accommodate more to speech from a model talker that they have a speech-community outsider relationship with when primed.

3.3 Results

This section is organized as follows: Section 3.3.1 provides results relevant to Research Question #1 (Is accommodation automatic or socially-modulated?). Section 3.3.2 provides results relevant to Research Question #2 (Does immediate exposure (i.e., priming) increase accommodation?). As a reminder, a summary of the automatic and social effects (defined in Section 3) and their hypotheses are provided in Figures 3.25 and 3.26.

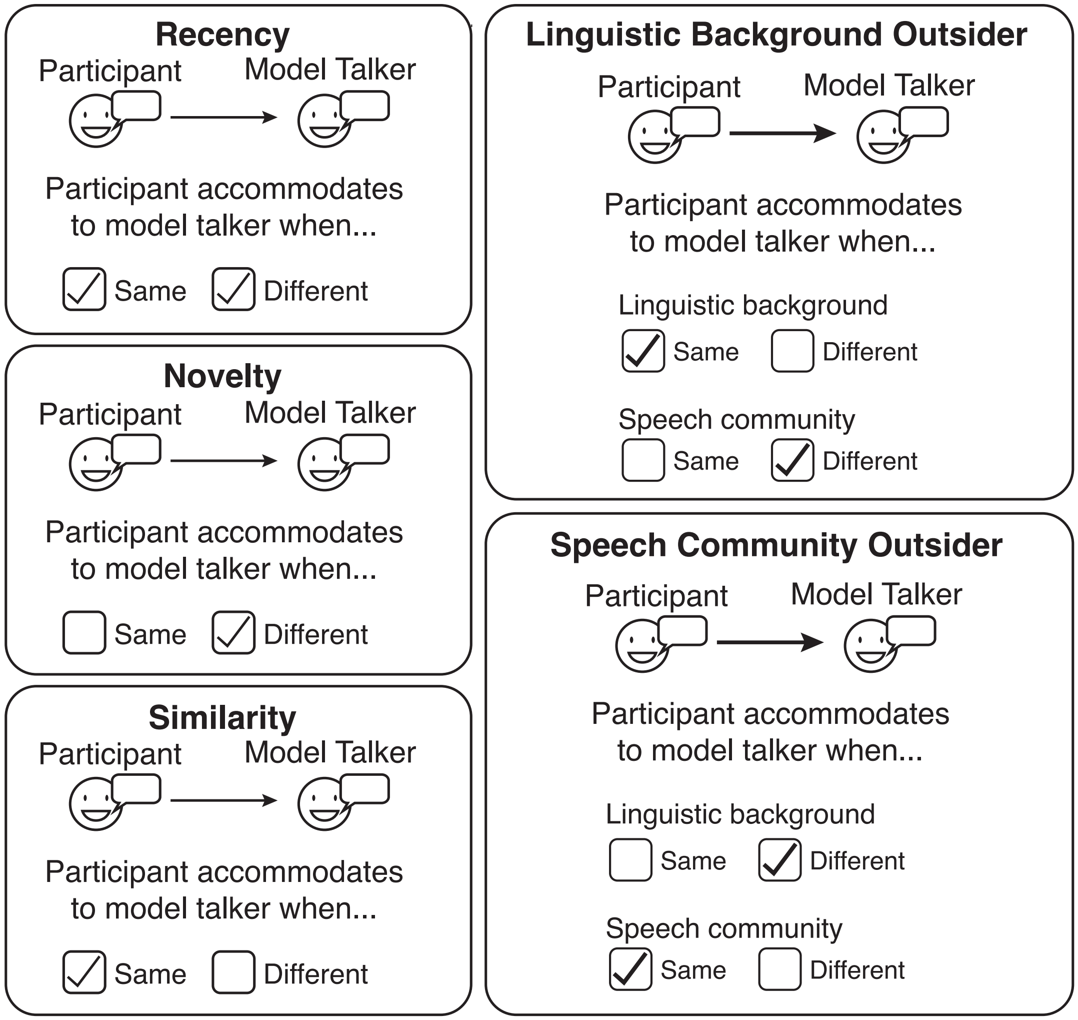


Figure 3.25: Summary of automatic and social effects

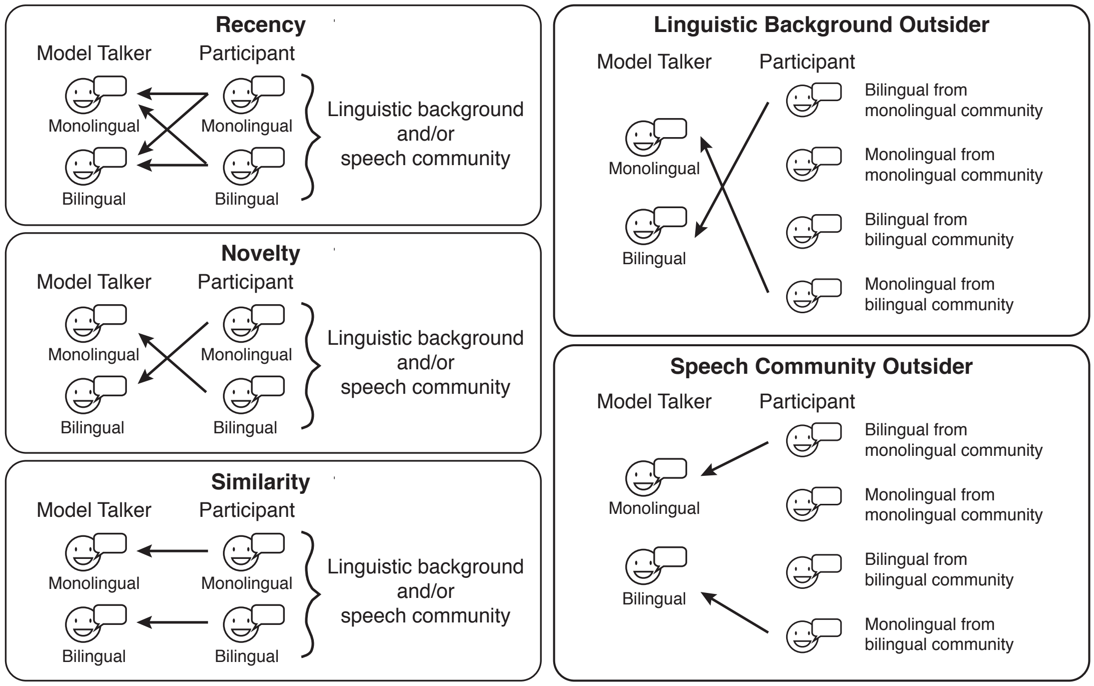


Figure 3.26: Summary of hypotheses related to automatic and social effects

The post-hoc Tukey test results from this section, as well as mean VOT_{norm} values, are provided in tables in Appendix D. Violin-and-box plots of the results are provided in Appendix E.

3.3.1 Accommodation to model talker

To examine whether accommodation is automatic and/or socially modulated, participant groups' accommodation to the monolingual and bilingual model talkers is examined—specifically, (1) within-group differences in VOT_{norm} with both model talkers and (2) between-group differences in VOT_{norm} with each model talker. Hypotheses are presented above in Figure 3.26. The results, summarized at the end of this section, provide evidence of both recency effects and speech community outsider effects.

Within-group differences in mean VOT$_{norm}$ with both model talkers When comparing *overall VOT$_{norm}$* (VOT$_{norm}$ for all stops) within groups, all participant groups had longer VOT$_{norm}$ with the monolingual model talker and shorter VOT$_{norm}$ with the bilingual model talker, suggesting that all participant groups accommodate to both model talkers. Specifically, for all participant groups, VOT$_{norm}$ with the bilingual (B) model talker was significantly shorter than with the monolingual (M) model talker (B-Ithaca B-M: -0.031 ± 0.002, $p < .0001$; M-Ithaca B-M: -0.026 ± 0.002, $p < .0001$; B-Miami B-M -0.009 ± 0.002, $p = .0007$; M-Miami B-M -0.019 ± 0.002, $p < .0001$). Results are illustrated in Figure 3.27.[5]

[5]It should be noted that the magnitude of these accommodation effects are small—only a few milliseconds difference in VOT. See Appendix D for mean VOT$_{norm}$ values and Appendix F for non-normalized VOT results.

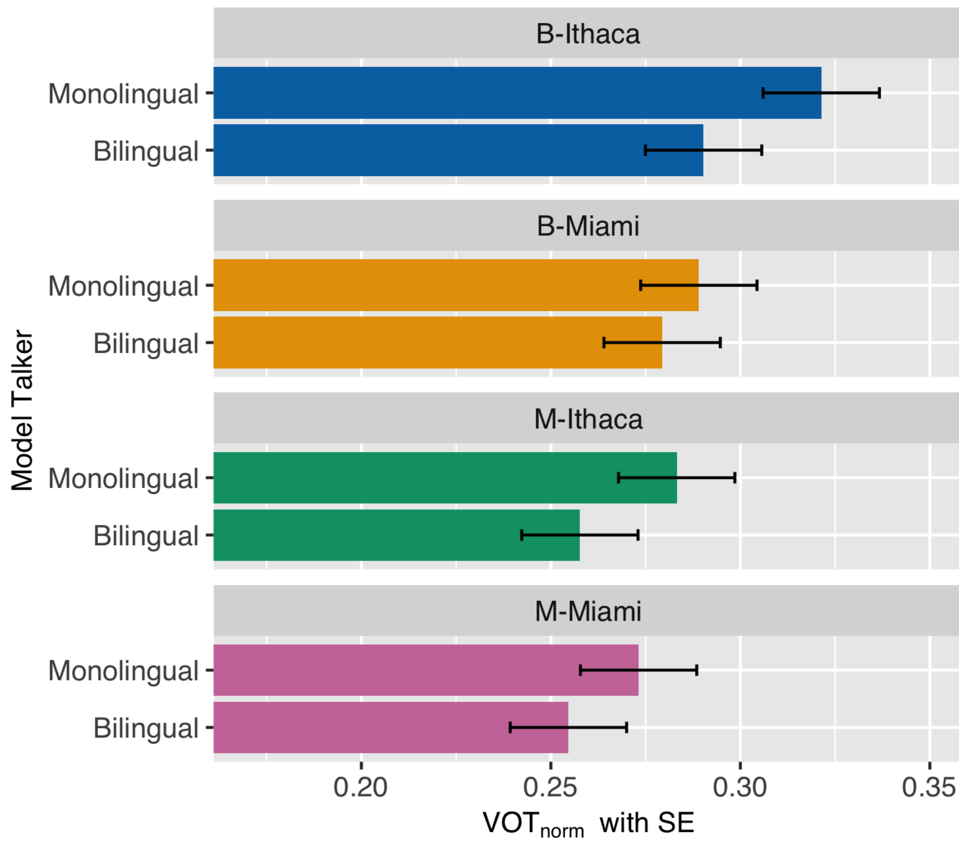


Figure 3.27: For all participant groups, overall $\mathrm{VOT}_{\mathrm{norm}}$ is greater with the monolingual model talker than with the bilingual model talker.

Similar results were found when examining within-group differences by stop. With the exception of /k/ for B-Miami, all participant groups had longer $\mathrm{VOT}_{\mathrm{norm}}$ with the monolingual model talker and shorter $\mathrm{VOT}_{\mathrm{norm}}$ with the bilingual model talker for all stops. Specifically, $\mathrm{VOT}_{\mathrm{norm}}$ with the bilingual (B) model talker was less than with the monolingual (M) model talker for B-Ithaca (/p/ B-M: -0.033 ± 0.004, $p < .0001$; /t/ B-M: -0.030 ± 0.004, $p < .0001$; /k/ B-M: -0.029 ± 0.004, $p < .0001$), M-Ithaca (/p/ B-M: -0.019 ± 0.004, $p = .0001$; /t/ B-M: -0.035 ± 0.004, $p < .0001$; /k/ B-M: -0.022 ± 0.004, $p < .0001$), and

M-Miami (/p/ B-M: -0.026 ± 0.004, p <.0001; /t/ B-M: -0.014 ± 0.004, p = .005; /k/ B-M: -0.016 ± 0.004, p = .001). For B-Miami, VOT_{norm} with the bilingual model talker was (near-) significantly less than with the monolingual model talker for /p/ and /t/ only (/p/ B-M: -0.008 ± 0.004, p = .073; /t/ B-M: -0.015 ± 0.004, p = .003. Results are illustrated in Figure 3.28.

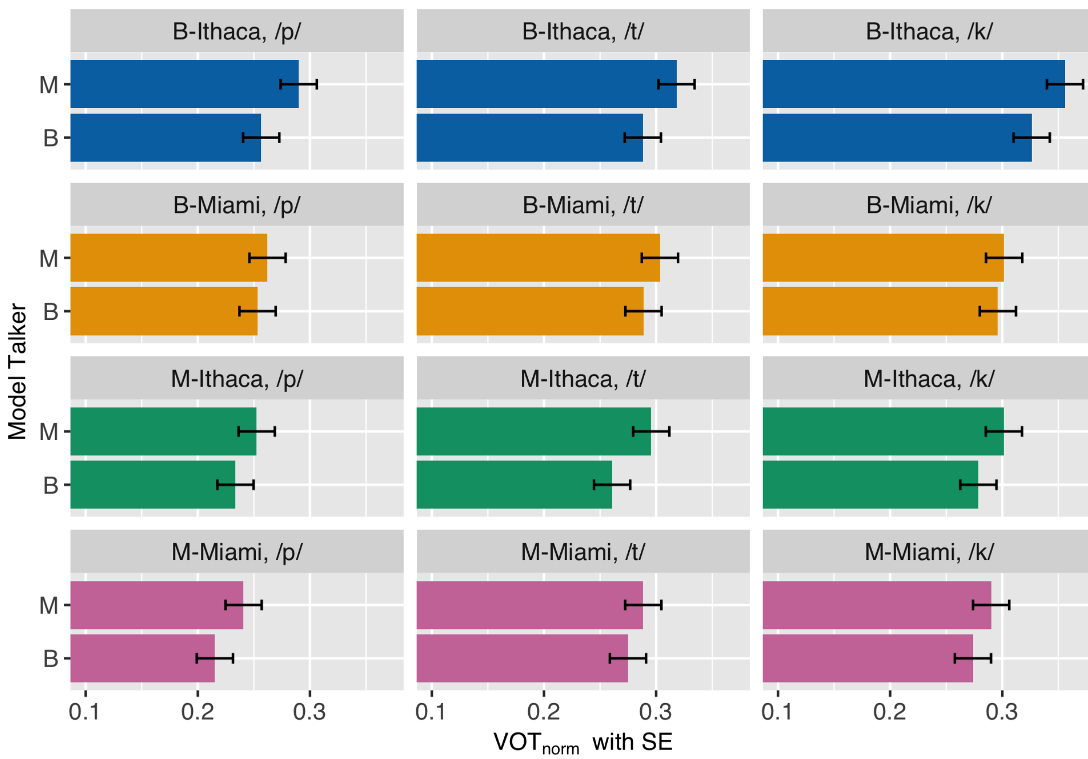


Figure 3.28: B-Miami did not have different VOT_{norm} for both model talkers for /k/. For all other stops and participant groups, VOT_{norm} was longer with the monolingual model talker and shorter with the bilingual model talker.

Between-group differences in mean VOT_{norm} by model talker When examining overall VOT_{norm} by model talker, there were no significant differences between participant groups. In other words, participant groups did not accommodate to model talkers differently from one another. This result is illustrated in Figure 3.29.

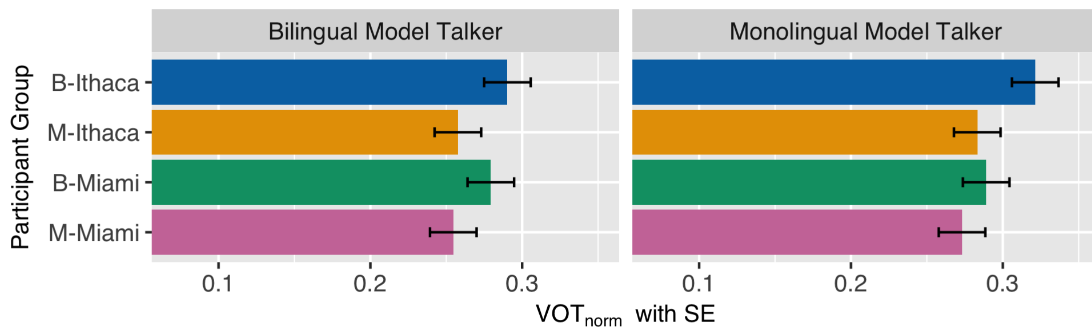


Figure 3.29: There are no significant differences in overall VOT$_{norm}$ between groups.

When examining VOT$_{norm}$ differences by stop, B-Ithaca had greater /k/ VOT$_{norm}$ than other participant groups. With the bilingual model talker, B-Ithaca had near-significantly longer VOT$_{norm}$ for /k/ than M-Miami (B-Ithaca-M-Miami: 0.052 ± 0.021, $p = .074$). When speaking with the monolingual model talker, B-Ithaca had (near-) significantly longer VOT$_{norm}$ for /k/ than all other participant groups (B-Ithaca-M-Ithaca: 0.054 ± 0.021, $p = .06$; B-Ithaca-B-Miami: 0.054 ± 0.021, $p = .058$; B-Ithaca-M-Miami: 0.065 ± 0.021, $p = .012$). These results are illustrated in Figure 3.30.

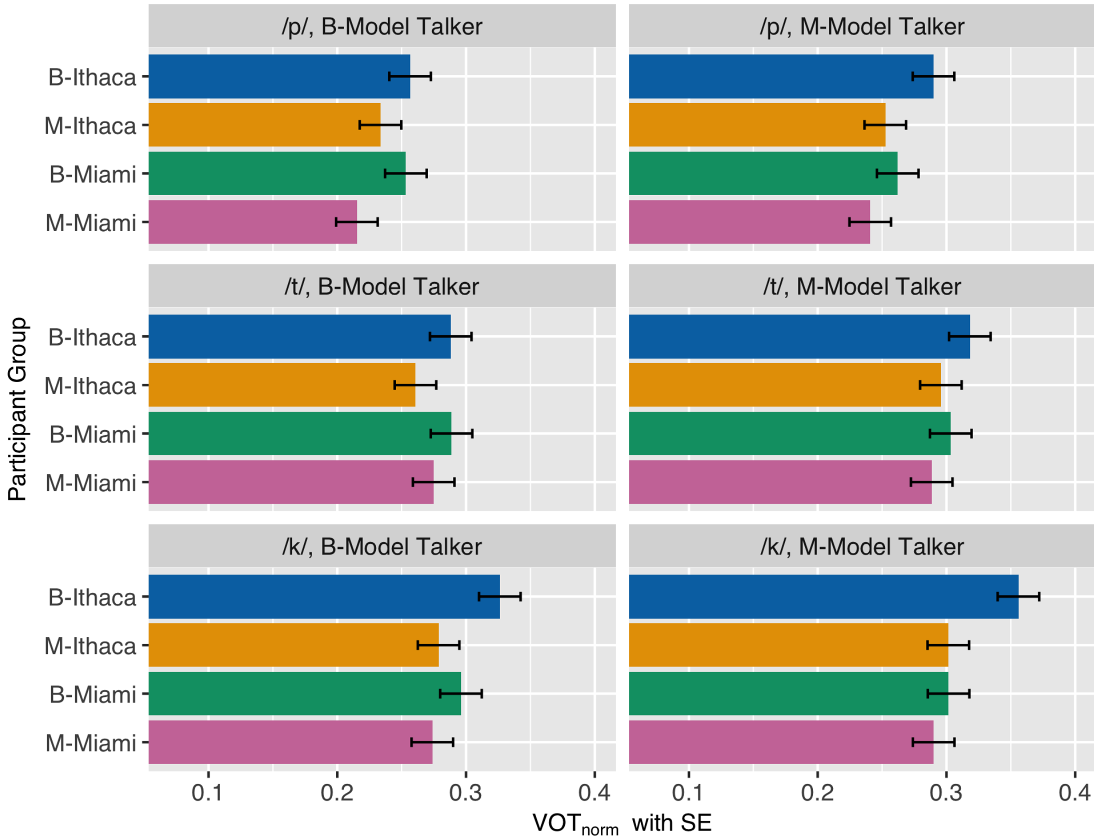


Figure 3.30: When interacting with the monolingual model talker, B-Ithaca had greater /k/ VOT_{norm} than all other participant groups. When interacting with the bilingual model talker, B-Ithaca had greater /k/ VOT_{norm} than M-Miami.

Summary In summary, all groups accommodate to both model talkers. The only exception is B-Miami, who did not accommodate both model talkers for /k/. This result supports a recency effect. However, when comparing accommodation between-groups, a speech-community outsider affiliation effect emerges. According to the results above, B-Ithaca had the longest $\mathrm{VOT}_{\mathrm{norm}}$—longer $\mathrm{VOT}_{\mathrm{norm}}$ than all other groups with the monolingual model talker and longer $\mathrm{VOT}_{\mathrm{norm}}$ than M-Miami with the bilingual model talker. Further, M-Miami had shorter $\mathrm{VOT}_{\mathrm{norm}}$ than other groups, especially when interacting with the bilingual model talker. These results, illustrated in Figure 3.31, support the hypothesis that accommodation is both automatic and socially-modulated.

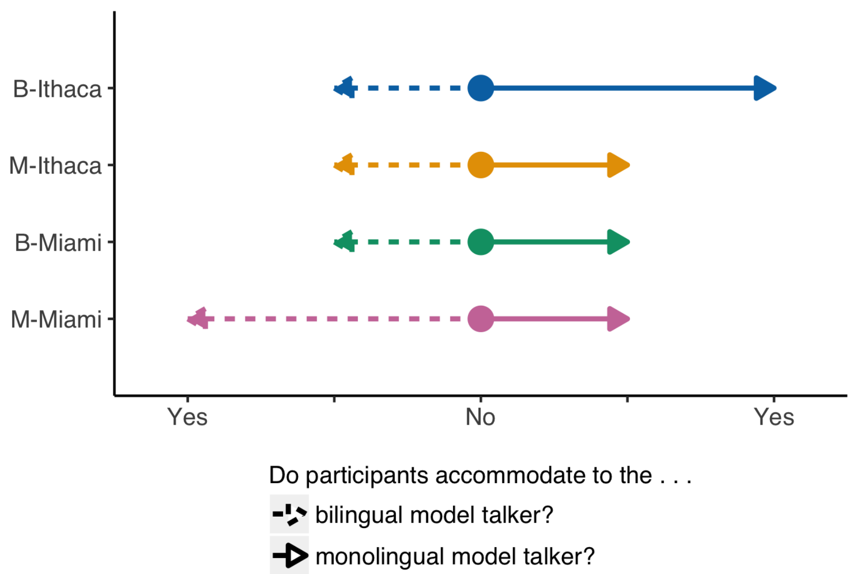


Figure 3.31: Result summary: All participant groups produced longer $\mathrm{VOT}_{\mathrm{norm}}$ with the monolingual model talker and shorter $\mathrm{VOT}_{\mathrm{norm}}$ with the bilingual model talker, suggesting an automatic-recency effect. However, participant groups accommodated more when they had a speech-community outsider relationship with a model talker, suggesting that accommodation is also socially-modulated.

3.3.2 Influence of priming on accommodation

To examine whether priming increases accommodation and whether priming interacts with automatic and/or social effects, the following comparisons are made: (1) within-group comparison of VOT_{norm} with the monolingual model talker versus the bilingual model talker, when primed and when unprimed; (2) within-group comparison of VOT_{norm} when primed versus unprimed with each model talker; (3) between-group comparison of VOT_{norm} when primed and when unprimed with each model talker. The results, summarized at the end of this section, provide evidence of an interaction between priming and automatic-novelty effects.

Within-group comparison of VOT_{norm} with both model talkers when primed and unprimed When comparing overall VOT_{norm}, all participant groups were found to have longer VOT_{norm} with the monolingual model talker and shorter VOT_{norm} with the bilingual model talker, regardless of whether they were primed or unprimed. This finding suggests that priming did not increase accommodation for VOT_{norm} overall.

Specifically, when primed, all participant groups' VOT_{norm} with the bilingual (B) model talker was significantly shorter than with the monolingual (M) model talker (B-Ithaca B-M: -0.033 ± 0.004, $p < .0001$; M-Ithaca B-M: -0.032 ± 0.004, $p < .0001$; B-Miami B-M -0.009 ± 0.004, $p = .02$; M-Miami B-M -0.023 ± 0.004, $p < .0001$). Similarly, when unprimed, all participant groups' VOT_{norm} with the bilingual model talker was significantly shorter than with the monolingual model talker (B-Ithaca B-M: -0.029 ± 0.004, $p < .0001$; M-Ithaca B-M: -0.019 ± 0.004, $p < .0001$; B-Miami B-M -0.010 ± 0.004, $p = .013$; M-Miami B-M -0.014 ±

0.004, p = .0004). These results are illustrated in Figure 3.32.

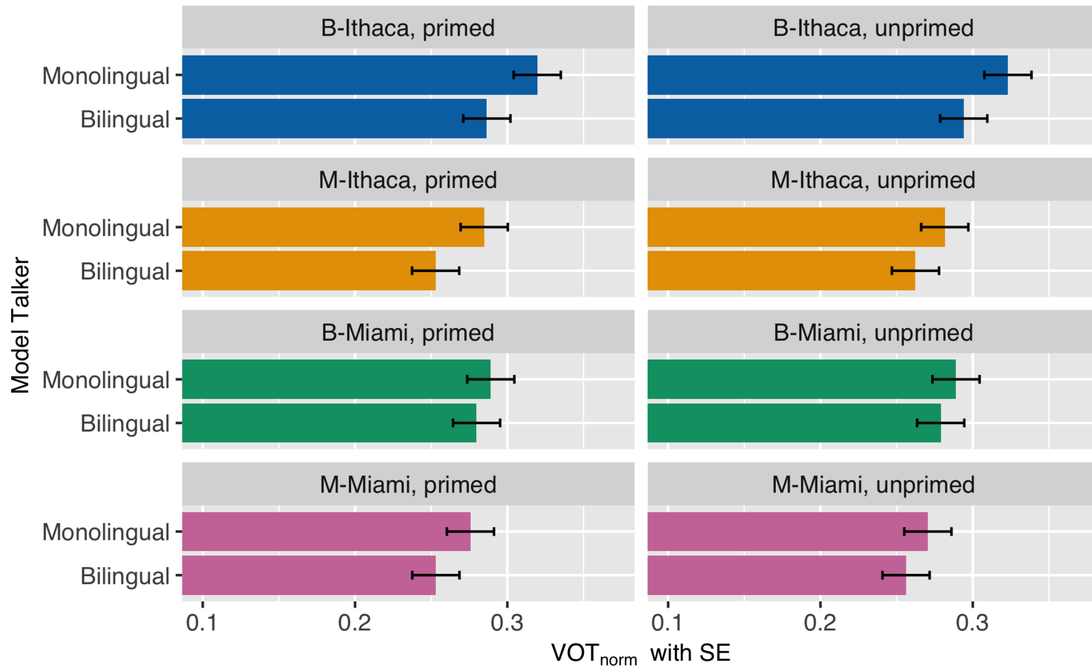


Figure 3.32: All groups produced less VOT_{norm} with the bilingual model talker than with the monolingual model talker, regardless of priming.

When comparing VOT_{norm} by stop, results indicated that priming influenced whether participant groups accommodated to both model talkers. Specifically, when primed, participants were more likely to produce longer VOT_{norm} with the monolingual model talker and shorter VOT_{norm} with the bilingual model talker. However, this was only true in some cases.

For example, when primed, M-Ithaca's VOT_{norm} for /p/ was significantly shorter with the bilingual (B) model talker than with the monolingual (M) model talker (B-M: -0.029 ± 0.007, $p < .0001$), but when unprimed there were no significant differences in VOT_{norm} with the two model talkers. For the remaining stops, however, M-Ithaca accommodated to both model talkers, regardless of priming: For /t/, VOT_{norm} was significantly shorter with the bilingual model talker than with the monolingual model talker when primed (B-M: -0.040 ± 0.007, $p < .0001$) and when unprimed (B-M: -0.030 ± 0.007, $p < .0001$). For /k/, VOT_{norm} was significantly shorter with the bilingual model talker than with the monolingual model talker when primed (B-M: -0.027 ± 0.007, p = .0001) and when unprimed (B-M: -0.020 ± 0.007, p = .0043).

Similarly, when primed, M-Miami's VOT_{norm} for /k/ was significantly shorter with the bilingual (B) model talker than with the monolingual (M) model talker (B-M: -0.025 ± 0.007, p = .0002), but when unprimed there were no significant differences in VOT_{norm} with the two model talkers. For the remaining stops, however, M-Miami accommodated to both model talkers, regardless of priming: For /p/, VOT_{norm} was significantly shorter with the bilingual model talker than with the monolingual model talker when primed (B-M: -0.028 ± 0.007, $p < .0001$) and when unprimed (B-M: -0.024 ± 0.007, p = .0005). For /t/, VOT_{norm} was significantly shorter with the bilingual model talker than with the monolingual model talker when primed (B-M: -0.015 ± 0.007, p = .023) and when unprimed (B-M: -0.014 ± 0.007, p = .042). Thus, both M-Miami and M-Ithaca were slightly more likely to have a contrast in VOT_{norm} between model talkers with primed word-pairs than unprimed word-pairs.

However, B-Miami and B-Ithaca did not accommodate more when primed. B-Miami, for example, did not produce different VOT_{norm} for the two model talkers for /p/ or /k/, regardless of whether primed or unprimed. For /t/, B-Miami's VOT_{norm} was near-significantly shorter with the bilingual (B) model talker than the monolingual (M) model talker when primed (B-M: -0.012 ± 0.007, p = .067) and when unprimed (B-M: -0.012 ± 0.007, p = .015).

B-Ithaca accommodated to both talkers for all stops, regardless of priming. For /p/, B-Ithaca's VOT_{norm} was significantly shorter with the bilingual (B) model talker than the monolingual (M) model talker when primed (B-M: -0.042 ± 0.007, $p < .0001$) and when unprimed (B-M: -0.025 ± 0.007, $p = .0004$). For /t/, B-Ithaca's VOT_{norm} was significantly shorter with the bilingual model talker than the monolingual model talker when primed (B-M: -0.025 ± 0.007, $p = .0002$) and when unprimed (B-M: -0.034 ± 0.007, $p < .0001$). For /k/, B-Ithaca's VOT_{norm} was significantly shorter with the bilingual model talker than the monolingual model talker when primed (B-M: -0.031 ± 0.007, $p < .0001$) and when unprimed (B-M: -0.028 ± 0.007, $p = .0001$). These results are illustrated in Figure 3.33.

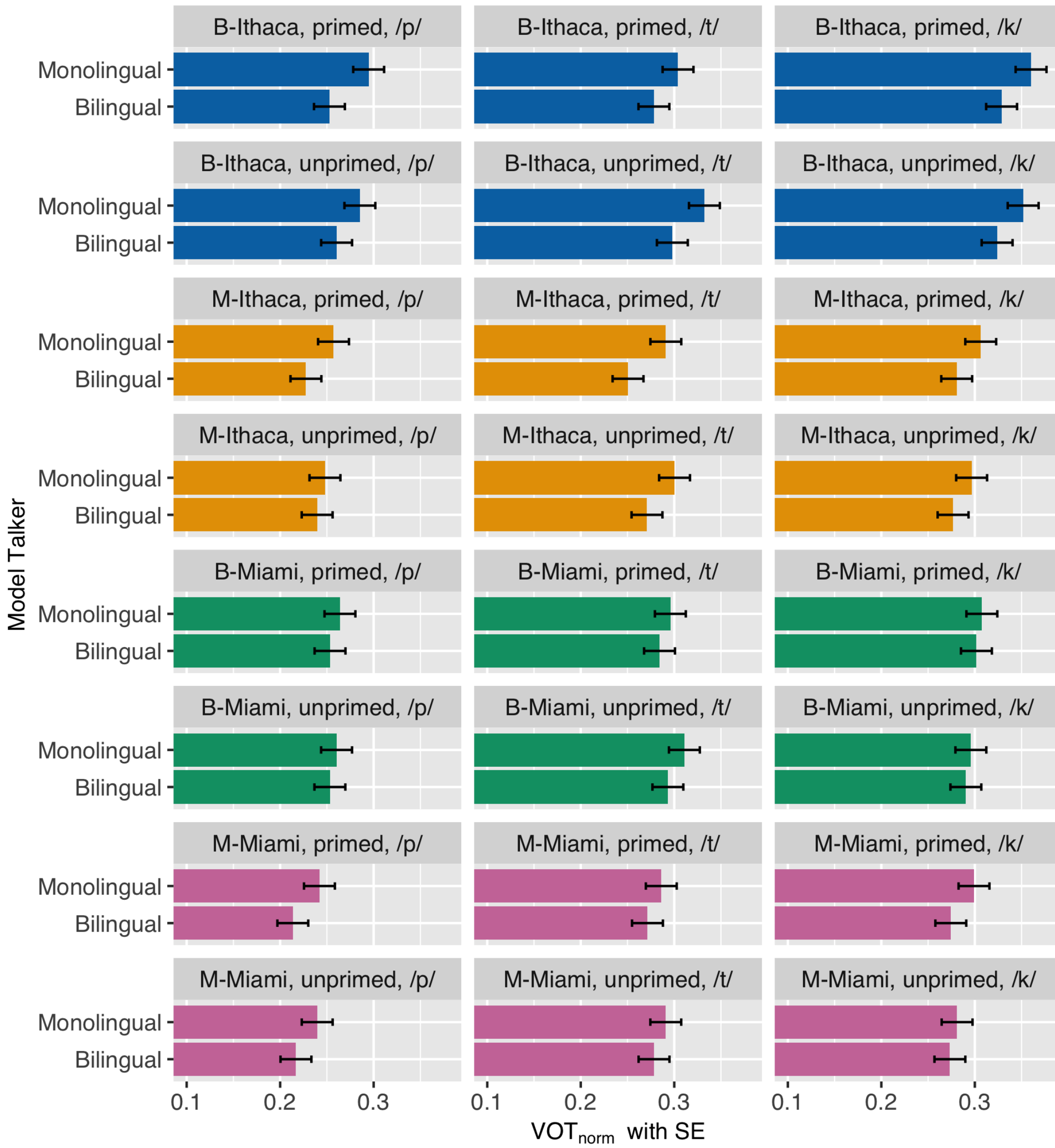


Figure 3.33: Priming slightly increased accommodation, particularly for monolingual participant groups.

Within-group comparison of VOT$_{norm}$ when primed versus unprimed by model talkers When examining overall VOT$_{norm}$, both participant groups from the monolingual community (B-Ithaca, M-Ithaca) produced shorter

VOT_{norm} when primed by the bilingual model talker, compared to when unprimed. Specifically, M-Ithaca produced significantly shorter VOT_{norm} when primed by the bilingual model talker (primed-unprimed: -0.009 ± 0.004, $p = .019$). Also, B-Ithaca produced near-significantly shorter VOT_{norm} when primed by the bilingual model talker (primed-unprimed: -0.007 ± 0.004, $p = .061$). These results are illustrated in Figure 3.34.

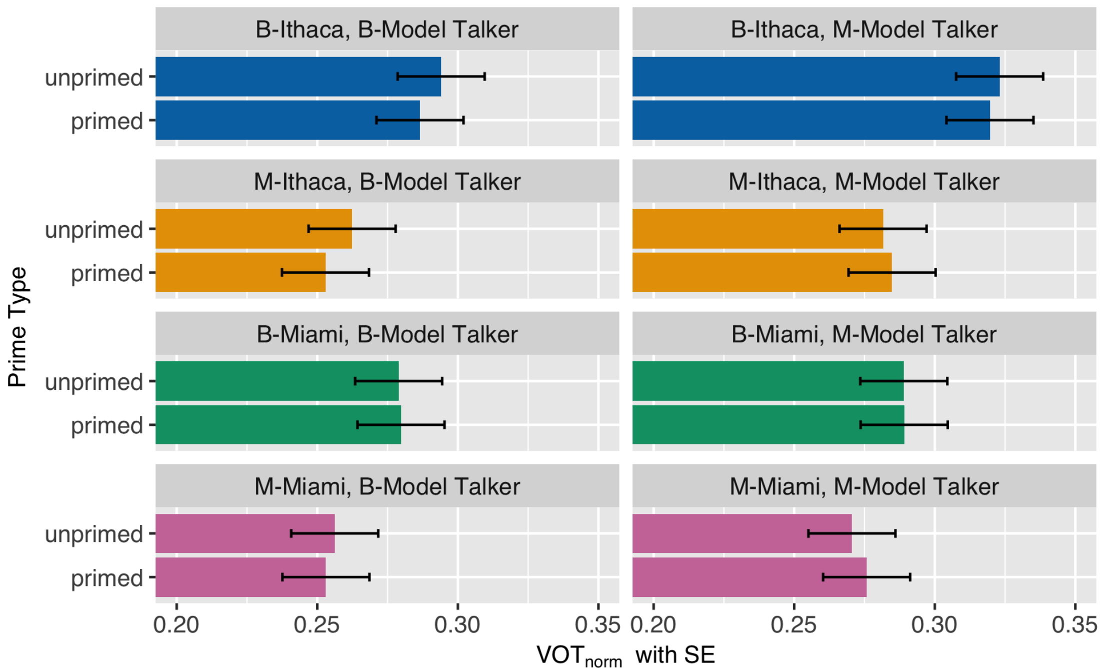


Figure 3.34: Within-group differences in VOT_{norm} for Linguistic Group, Community, model talker, and PrimeType: Speakers from the monolingual community (B-Ithaca, M-Ithaca) had shorter VOT_{norm} when primed by the bilingual model talker.

When examining VOT_{norm} by stop, both monolingual groups were influenced by priming, when interacting with the model talker who was not representative of the majority in their community. For example, M-Ithaca—

the monolingual group from the monolingual community—had significantly shorter VOT_{norm} for /t/ when primed by the bilingual model talker, compared to when unprimed (/t/ primed-unprimed: -0.020 ± 0.007, $p = .004$). Similarly, M-Miami—the monolingual group from the bilingual community—had longer VOT_{norm} for /k/ when primed by the monolingual model talker, compared to when unprimed (/k/ primed-unprimed: 0.018 ± 0.007, $p = .009$). These results, along with the overall VOT_{norm} results above, suggest that priming interacts with novelty effects during accommodation.

However, unexpectedly, B-Ithaca produced significantly shorter VOT_{norm} for /t/ when primed, compared to unprimed, regardless of model talker (M-Model Talker primed-unprimed: -0.028 ± 0.007, $p = .0001$; B-Model Talker primed-unprimed: -0.019 ± 0.007, $p < .005$).[6] These results are illustrated in Figure 3.35.

[6]In this section, bilingual participant groups have several significant, unexpected results related to /t/. These findings may be influenced by differences in /t/ place of articulation in Spanish and English. This should be examined further in future research.

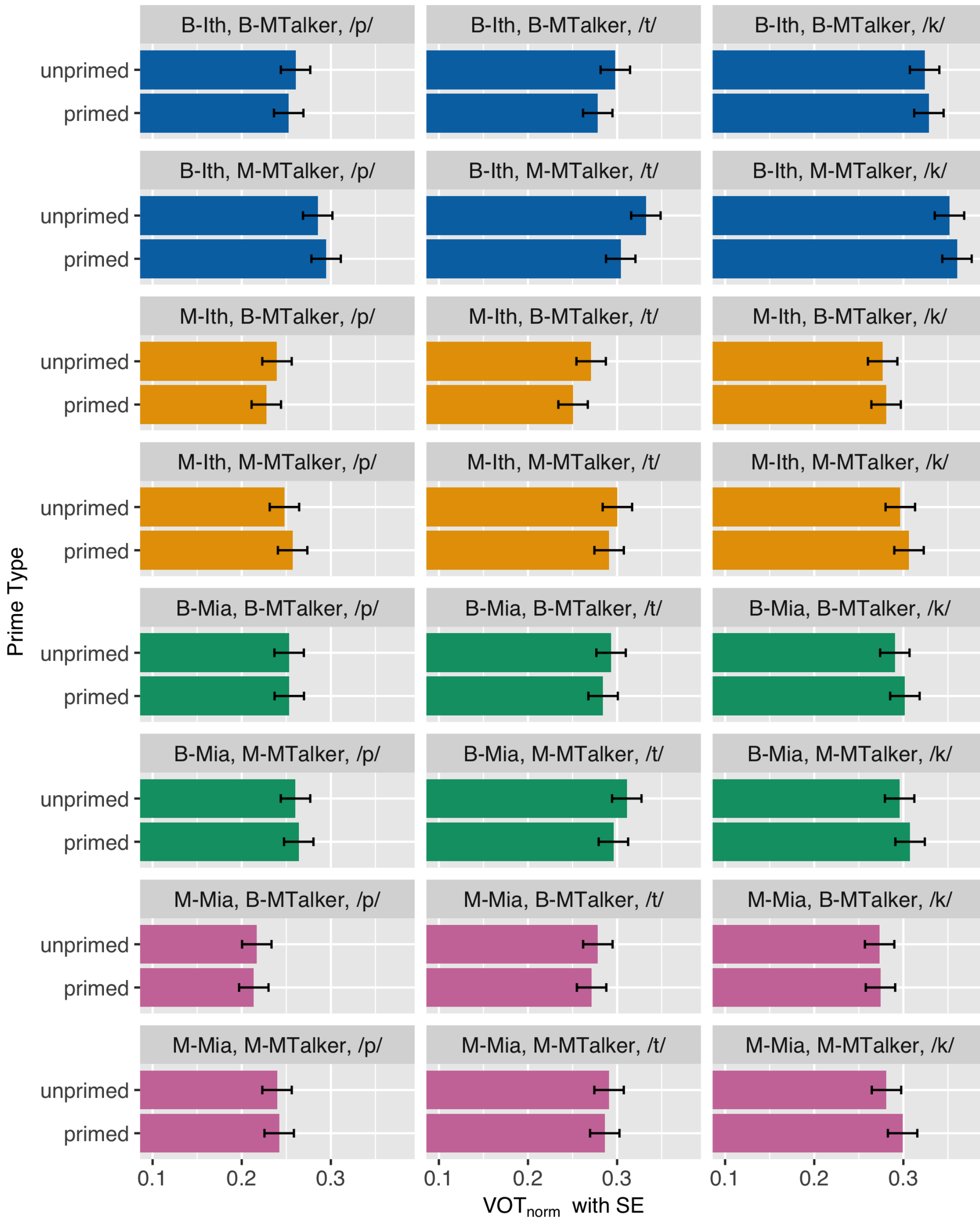


Figure 3.35: Priming interacted slightly with automatic-novelty effects.

Between-group comparison of VOT_{norm} with each model talker primed and unprimed When examining overall VOT_{norm}, results showed that B-Ithaca had greater VOT_{norm} than M-Miami. Specifically, when unprimed and interacting with the monolingual model talker, B-Ithaca's VOT_{norm} was near-significantly longer than M-Miami's VOT_{norm} (B-Ithaca-M-Miami: 0.053 ± 0.021, p = .069). These results are illustrated in Figure 3.36.

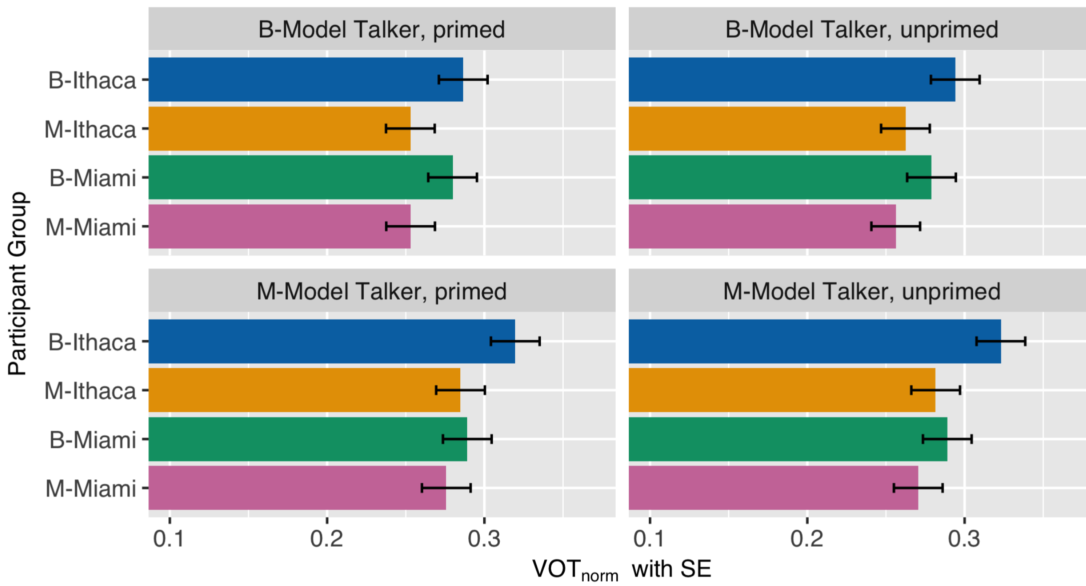


Figure 3.36: B-Ithaca's VOT_{norm} was greater than M-Miami's VOT_{norm} when unprimed and interacting with the monolingual model talker.

When examining VOT_{norm} by stop, results showed that B-Ithaca had longer VOT_{norm} than M-Miami, when interacting with both model talkers. For example, when interacting with the monolingual model talker, B-Ithaca's /k/ VOT_{norm} was significantly longer than M-Miami's when primed (B-Ithaca-M-Miami: 0.061 ± 0.022, p = .031) and when unprimed (B-Ithaca-M-Miami: 0.070 ± 0.022, p = .008). Additionally, when interacting with the bilingual model talker, B-Ithaca's /k/ VOT_{norm} was near-significantly longer than M-Miami's when primed (B-Ithaca-M-Miami: 0.054 ± 0.022, $p = .069$).

Additionally, B-Ithaca had longer VOT_{norm} than M-Ithaca and B-Miami, when interacting with the monolingual model talker: B-Ithaca's /k/ VOT_{norm} was near-significantly longer than M-Ithaca's and B-Miami's /k/ VOT_{norm}, when primed (B-Ithaca-M-Ithaca: 0.054 ± 0.022, $p = .073$; B-Ithaca-B-Miami: 0.053 ± 0.022, $p = .084$) and when unprimed (B-Ithaca-M-Ithaca: 0.055 ± 0.022, $p = .063$; B-Ithaca-B-Miami: 0.056 ± 0.022, $p = .058$).

While these between-group differences do not show evidence of any predicted interaction between priming and automatic/social effects, the results provide further evidence of a speech community outsider affiliation effect. These results are illustrated in Figure 3.37.

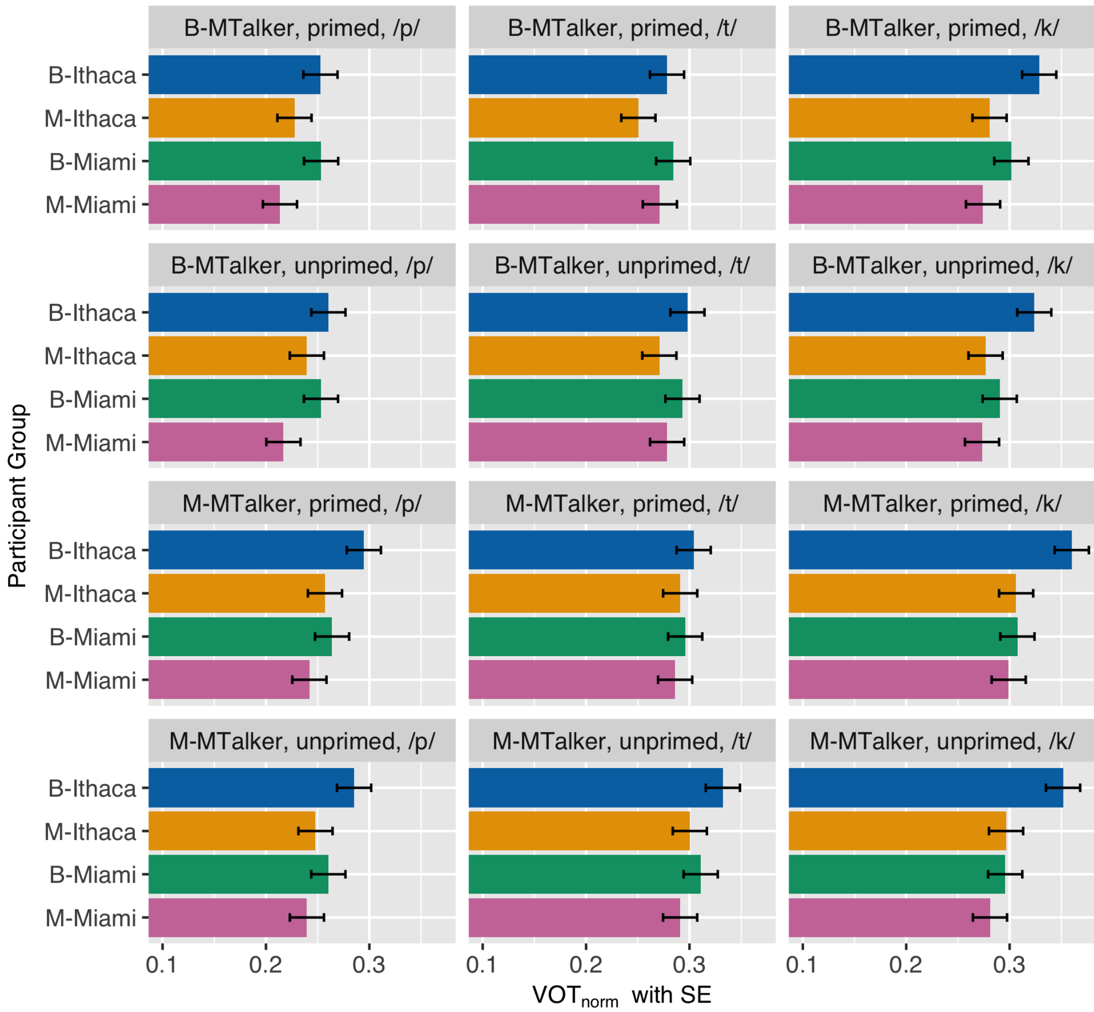


Figure 3.37: When interacting with both model talkers, B-Ithaca's and M-Miami's /k/ VOT$_{norm}$ significantly differ.

Summary In summary, immediate exposure to monolingual or bilingual speech through priming influenced accommodation, albeit minimally. While the differences between primed and unprimed VOT$_{norm}$ were small, there was a slight trend for priming to increase accommodation when participants groups had a novelty relationship with the model talker. For example, groups from the monolingual community (M-Ithaca, B-Ithaca) had shorter VOT$_{norm}$

when primed by the bilingual model talker, compared to when unprimed by the bilingual model talker. Additionally, priming increased accommodation by monolinguals when interacting with the model talker who was not representative of their community (e.g., M-Miami with the monolingual model talker and M-Ithaca with the bilingual model talker). The only participant group unaffected by priming was B-Miami. Thus, these results, illustrated in Figure 3.38, support the hypothesis that priming interacts with automatic-novelty effects during accommodation.

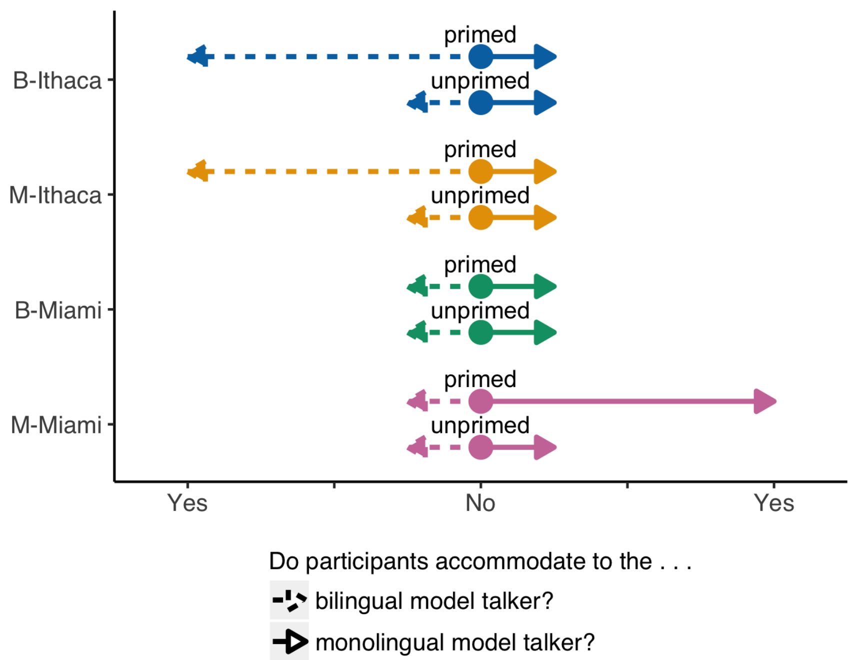


Figure 3.38: Result summary: Participant groups from the monolingual community (B-Ithaca, M-Ithaca) accommodate more to the bilingual model talker when primed. Monolingual participant groups (M-Miami, M-Ithaca) accommodate more to the model talker that is not representative of the majority in their communities. This suggests that priming interacts with novelty during accommodation.

3.4 Discussion

Accommodation is both automatic and socially-modulated Research Question #1 was, "Is accommodation automatic or socially-modulated?" To answer this question, I examined whether English monolinguals and Spanish-English bilinguals from a majority monolingual community (Ithaca) or a majority bilingual community (Miami) accommodated more to a monolingual or bilingual model talker. Depending on who accommodated to whom, I hypothesized that either automatic effects (i.e., recency and novelty) or social effects (i.e., similarity affiliation, outsider affiliation), summarized in Figure 3.39, would occur.

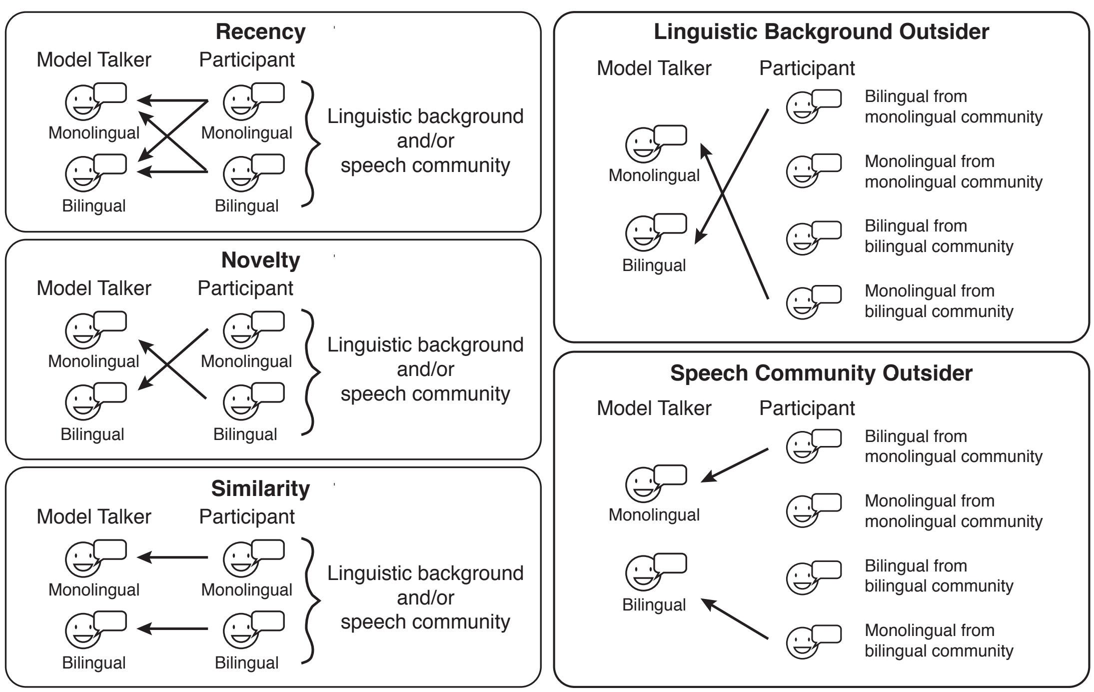


Figure 3.39: Hypotheses related to automatic effects—recency and novelty—and social effects—similarity, linguistic background outsider, and speech community outsider affiliation

The results provided evidence that accommodation is both automatic and socially-modulated. When examining VOT_{norm}, all participant groups produced longer VOT_{norm} with the monolingual model talker and shorter VOT_{norm} with the bilingual model talker. In other words, regardless of linguistic background and speech community, participants produced different VOT_{norm} while interacting with the two model talkers—indicating that a recency effect occurred.

However, a speech-community outsider affiliation effect also occurred. Bilinguals from the monolingual community (B-Ithaca) produced the longest VOT_{norm}, with both model talkers. Monolinguals from the bilingual community (M-Miami) produced the shortest VOT_{norm}, especially with the bilingual model talker. In other words, participants who accommodated the most with either model talker were participants with speech-community outsider relationships with those model talkers. This result gives us insight into the social motivations underlying accommodation—namely, a driving factor of accommodation is the need to associate with a social group that you/a speaker is not a part of.

This outsider effect can be used to explain the results of other studies. For example, in Enzinna, 2015, 2016, English monolinguals from Miami produced English with Spanish-influenced rhythm and pitch charactertistics. When comparing speech within the Miami English monolingual group, participants with English-monolingual parents—not those with Spanish-speaking parents—had more Spanish-like rhythm and pitch. In other words, Miami English monolinguals who had the least-direct ties to the majority population in their speech community were the most likely to have acquired Spanish-influenced prosody. Similarly, the influence of native-bias on accommodation, as seen in Hwang et al., 2015 and other studies described in Section 1.1.2, might be explained as an outsider effect. L2 speakers are on the outside of a native-speaker speech community and thus, have a need to create social affiliation with that community.

Priming increases accommodation when a prime is novel Research Question #2 was, "Does immediate exposure (i.e., priming) increase accommodation?" Previous research has shown accommodation occurring under priming conditions. This dissertation aimed to examine this again, while also investigating whether priming is more likely to occur automatically (e.g., due to a recency or novelty effect) or for social reasons (e.g., similarity or outsider affiliation). To answer this question, I examined whether participants were more likely to converge with a model talker when primed.

Priming increased accommodation slightly when there was a novelty relationship between the participant and the model talker. Specifically, participant groups from the monolingual community (B-Ithaca, M-Ithaca) had shorter VOT_{norm} with the bilingual model talker when primed, compared to when unprimed. Also, both monolingual participant groups (M-Ithaca, M-Miami) accommodated more when primed by the model talker who is not representative of the majority in their speech community. These results provide evidence of novel speech triggering automatic accommodation.

While these results are significant, the impact of priming on VOT_{norm} was minimal, and even produced some unexpected significant results. This may be due to the generalizability of VOT priming (as described in Section 1.4.2). As previous research has shown, participants' VOT can be primed by VOT in a different stop (e.g., VOT in /t/ can be primed by /k/, etc.). On each game board, participants produced /p/, /t/, and /k/ once, either primed or unprimed. While participants could not be primed by the same stop twice on the same board, they may have been unintentionally primed by a different stop on the board. If this is the case, then VOT_{norm} in primed and unprimed conditions would not differ. However, a novelty-effect did still occur. A future research area may be to examine the influence of novelty on VOT generalizability.

CHAPTER 4

EXPERIMENT 2: TIME-COURSE OF ACCOMMODATION

Experiment 2 examines the time-course of accommodation—both how accommodation changes within a short-term interaction, as well as the lasting impact of the most-recent, previous interaction on the interaction that follows. Additionally, Experiment 2 investigates the automatic and social mechanisms that influence the time-course of accommodation. Examining the time-course of accommodation, particularly using the methods presented in this dissertation, is novel and provides crucial, new information about the persistence of social and automatic effects on accommodation.

Experiment 2 addresses the following two questions: (1) What is the time-course of accommodation? Specifically, how quickly do participants accommodate to a model talker, and how long does accommodation last within a short-term interaction? To address this question, each short-term interaction with a model talker is divided into four blocks, and accommodation is compared by block. Using block as a measure of time, the aim of this research question is to determine whether the onset of accommodation occurs rapidly or slowly, and whether the lifespan of accommodation is persistent, transient, or continuous.

(2) Will the most-recent, previous short-term interaction influence accommodation during the following short-term interaction? To address this question, I examine whether accommodation is influenced by the order in which participants interacted with the model talkers. If the order of model talkers influences whether participants accommodate, then accommodation within one short-term interaction has lasting effects that influence following interactions;

otherwise, previous interactions do not influence following interactions, and accommodation effects are transient.

Both questions are examined in the context of both automatic and social effects on accommodation. If recency or novelty effects occur during accommodation, accommodation is considered automatic. If similarity affiliation or outsider affiliation effects occur during accommodation, accommodation is considered socially-modulated. These effects, defined in (1)-(4) above, are summarized in Figure 4.1.

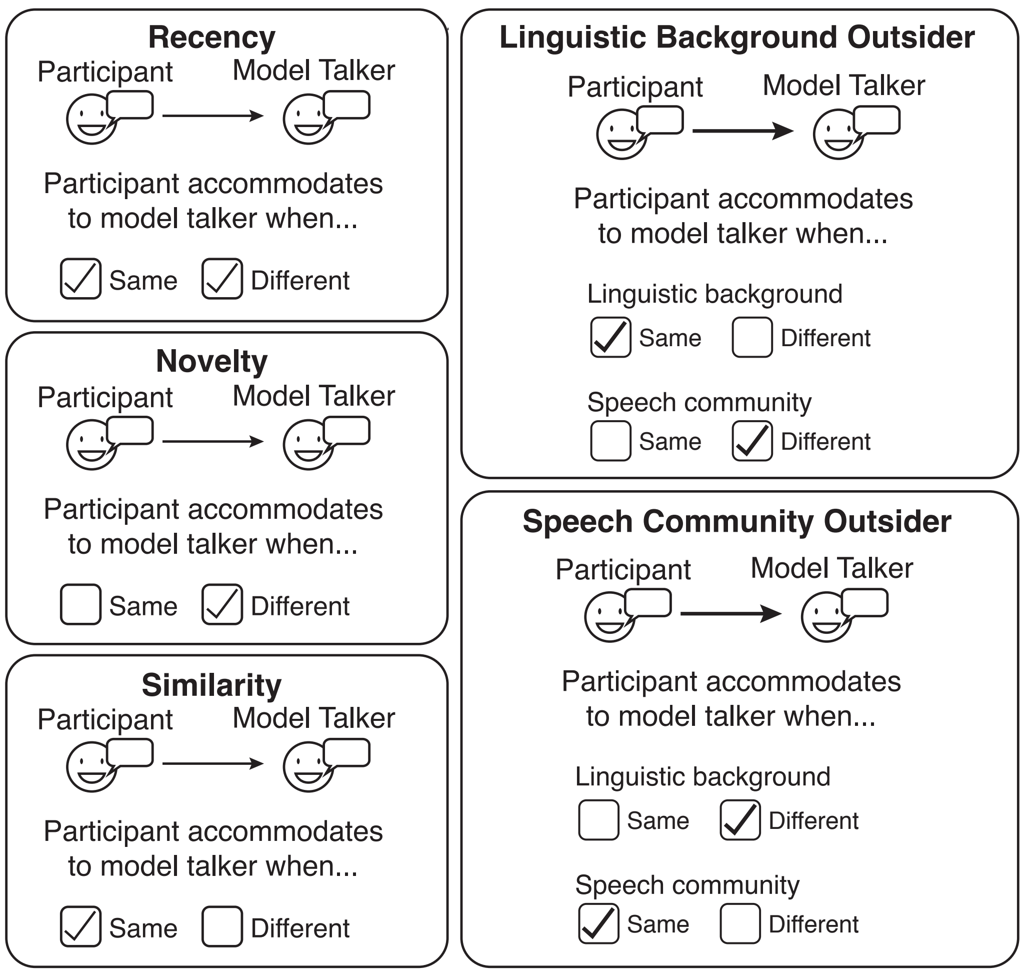


Figure 4.1: Summary of automatic and social effects

As a reminder, the social variables examined are (1) the model talker's linguistic background, (2) the participant's linguistic background, (3) the participant's speech community, and (4) the interaction between these variables. The linguistic backgrounds examined are English monolingual and Spanish-English bilingual, and the speech communities examined are a majority English monolingual community (Ithaca) and a majority Spanish-English bilingual community (Miami). Additionally, the model talkers are an English monolingual model talker and a Spanish-English bilingual model talker. A model talker is considered similar to a participant if the participant and the model talker share linguistic backgrounds (e.g., the model talker is an English monolingual and the participant is an English monolingual) or if the model talker's linguistic background is the same as the majority of speakers in the participant's speech community (e.g., the model talker is an English monolingual and the participant is from a majority monolingual community). The dependent variable is VOT in voiceless stops in English.

The remainder of this chapter is organized as follows: Methods related to Experiment 2 are detailed in Section 4.1. Research questions, hypotheses, and predictions are presented in Section 4.2. Last, results are provided in Section 4.3 and discussed in Section 4.4.

4.1 Methods

This section details the methods used in Experiment 2: the participants (4.1.1), the procedure (4.1.2), and the data analysis (4.1.3).

4.1.1 Participants

The participants in Experiment 2 are the same participants as in Experiment 1. As in Experiment 1, the participants were English monolinguals and Spanish-English bilinguals from either a majority English monolingual community or a majority Spanish-English bilingual community. The majority Spanish-English bilingual community is Miami, Florida. The majority English monolingual community is Ithaca, New York. Thus, there are four participant groups: (1) Spanish-English bilinguals from Ithaca (B-Ithaca), (2) English monolinguals from Ithaca (M-Ithaca), (3) Spanish-English Bilinguals from Miami (B-Miami), and (4) English Monolinguals from Miami (M-Miami)—as presented in Table 4.1. There were 40 total participants, with 10 participants in each participant group. (See Section 3.1.1 for more information on these participants.)

Table 4.1: Participant group abbreviations

Speech Community	**Linguistic Background**	
	Monolingual	Bilingual
Monolingual	M-Ithaca	B-Ithaca
Bilingual	M-Miami	B-Miami

4.1.2 Procedure

The procedure of Experiment 2 is the same as in Experiment 1: First, participants complete a consent form. Then, participants are seated in front of a laptop computer in a quiet room. Connected to the laptop computer is a headset, which has both audio and recording capabilities, and a mouse. At this time, participants read the instructions and are encouraged to ask questions. After the instructions, participants complete three practice boards. While they complete the practice boards, I listen and correct them if they make mistakes, and I answer any questions they have. Once the practice boards are complete and all of their questions are answered, they begin the main portion of the experiment. At this point, the participants are given privacy to complete the experiment on their own.

Once the task begins, they hear one of the two pre-recorded model talkers and complete 36 boards with that model talker. After interacting with the first model talker, participants are allowed to take a break if they wish. There is no restriction on the amount of time they can take for their break, only that they cannot speak to anyone during this period.[1] After the break, they complete the rest of the task (36 more boards) with the second model talker. After the task is finished, they complete a language background questionnaire (provided in Appendix B). The entire experiment, including instructions and the questionnaire, took around 1 to 1.5 hours to complete, and participants were paid $15 for their involvement.

4.1.3 Data analysis

The variables included in the linear mixed-effects model (presented in Section 2.3.6) that are relevant for Experiment 2 are: VOT_{norm}, Participant, Word, Stop, Ling Background, Community, Model Talker, Block, and Model Talker Order. Descriptions are provided in Table 3.2.

[1] No participant took longer than a few minutes in between model talkers (e.g., for a bathroom break).

Table 4.2: Description of variables

Variable Name	**Description**	**Continuous/ Categorical?**	**Variable/Effect Type**
VOT_{norm}	VOT is normalized for speech rate by dividing a participant's VOT by their average "word" duration per board	Continuous	Dependent
Participant	Participant ID#	Categorical	Random effect
Word	Target word: Each repeated 4 times per participant	Categorical	Random effect
Stop	/p/, /t/, /k/	Categorical	Fixed effect
LingBackground	monolingual, bilingual	Categorical	Fixed effect
Community	Ithaca, Miami	Categorical	Fixed effect
Model Talker	monolingual, bilingual	Categorical	Fixed effect
Block	Boards are divided into 4 blocks per model talker	Categorical	Fixed effect & random slope
Model Talker Order	Order that participants heard model talker voices in (monolingual-bilingual or bilingual-monolingual)	Categorical	Fixed effect

As described in Section 2.3.6, a LME regression was conducted. The results section of this chapter (Section 4.3) presents post-hoc Tukey test results, comparing VOT_{norm} by block, both within-groups and between-groups. To examine the time-course of accommodation within a short-term interaction, VOT_{norm} values were divided into 4 blocks, as described in Section 2.3.4. To examine the lasting effects of the previous interaction on the following interaction, the order in which the participants interacted with the model talkers was examined. Thus, Block and Model Talker Order are included in the post-hoc analyses. Prime Type—examined in the previous experiment—is not examined in Experiment 2.[2] All post-hoc analyses are conducted by examining VOT_{norm} with all stops combined (*overall VOT_{norm}*) and VOT_{norm} by Stop.

[2]The influence of Prime Type was examined, but no clear patterns emerged from the results.

4.2 Research questions and hypotheses

In this section, the following research questions are presented: (1) What is the time-course of accommodation? (2) Will the most-recent, previous interaction influence accommodation during the following interaction? These questions are discussed in Sections 4.2.1 and 4.2.2, respectively. Hypotheses and predictions related to these questions are also provided. "Accommodation" is used in the hypotheses and predictions below to describe convergence effects, but divergence may also be expected.

4.2.1 What is the time-course of accommodation?

RESEARCH QUESTION #1: What is the time-course of accommodation? Specifically, how quickly do participants accommodate to a model talker, and how long does accommodation last within a short-term interaction? Is accommodation *rapid and persistent*, *rapid but transient*, or *slow and continuous*?

To address this question, short-term interactions with each model talker are split into four blocks (described in Section 2.3.4) and accommodation differences between blocks are examined. Hypotheses and predictions are presented and illustrated below.

HYPOTHESIS #1-1: Rapid and Persistent

- Participants will accommodate to a model talker at the start of an interaction (i.e., block 1-2) and maintain accommodation throughout the remainder of the interaction (i.e., block 4).

PREDICTION #4-1: Rapid and Persistent

- When accommodating to the English monolingual model talker, participants will begin producing longer VOT_{norm} starting in blocks 1-2 and will maintain longer VOT_{norm} until block 4.
- When accommodating to the Spanish-English bilingual model talker, participants will begin producing shorter VOT_{norm} in blocks 1-2 and will maintain shorter VOT_{norm} until block 4.

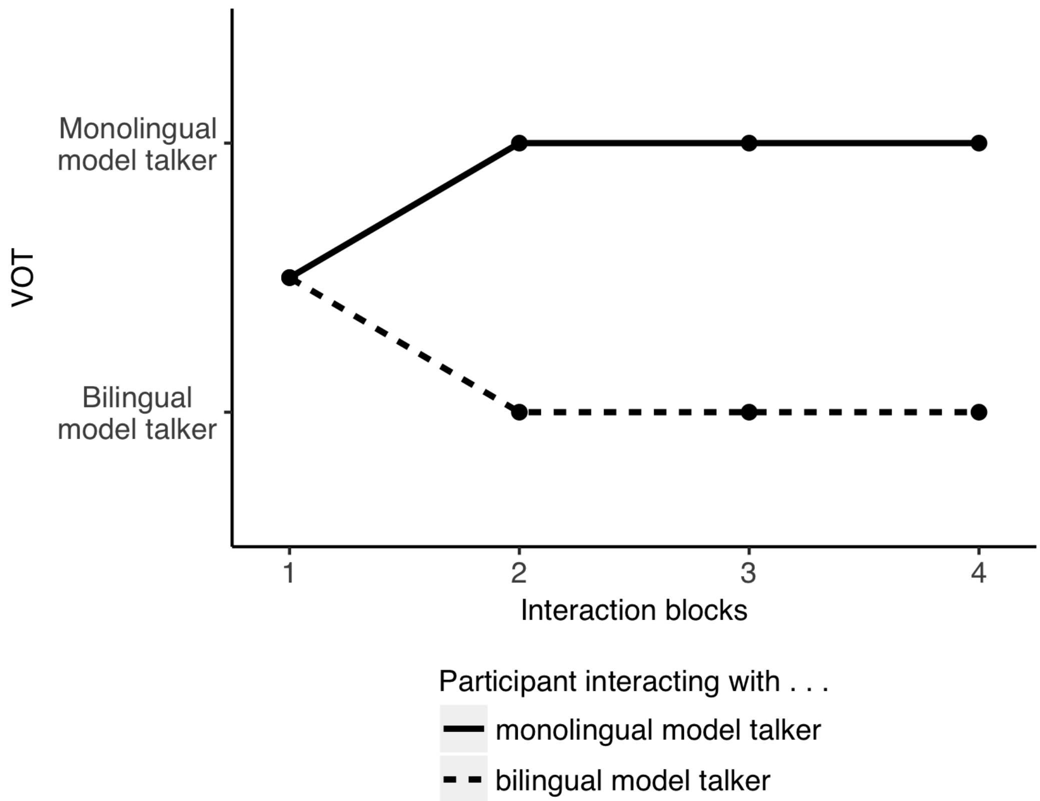


Figure 4.2: If the time-course of accommodation is rapid and persistent, participants will accommodate to a model talker in blocks 1 or 2 and maintain accommodation until block 4.

Hypothesis #1-2: Rapid but Transient

- Participants will accommodate to a model talker at the start of an interaction (i.e., block 1-2) but will stop accommodating soon thereafter (i.e., blocks 2-3).

Prediction #1-2: Rapid but Transient

- When accommodating to the English monolingual model talker, participants will produce longer VOT_{norm} in blocks 1-2 but not in blocks 2-4.
- When accommodating to the Spanish-English bilingual model talker, participants will produce shorter VOT_{norm} in blocks 1-2 but not in blocks 2-4.

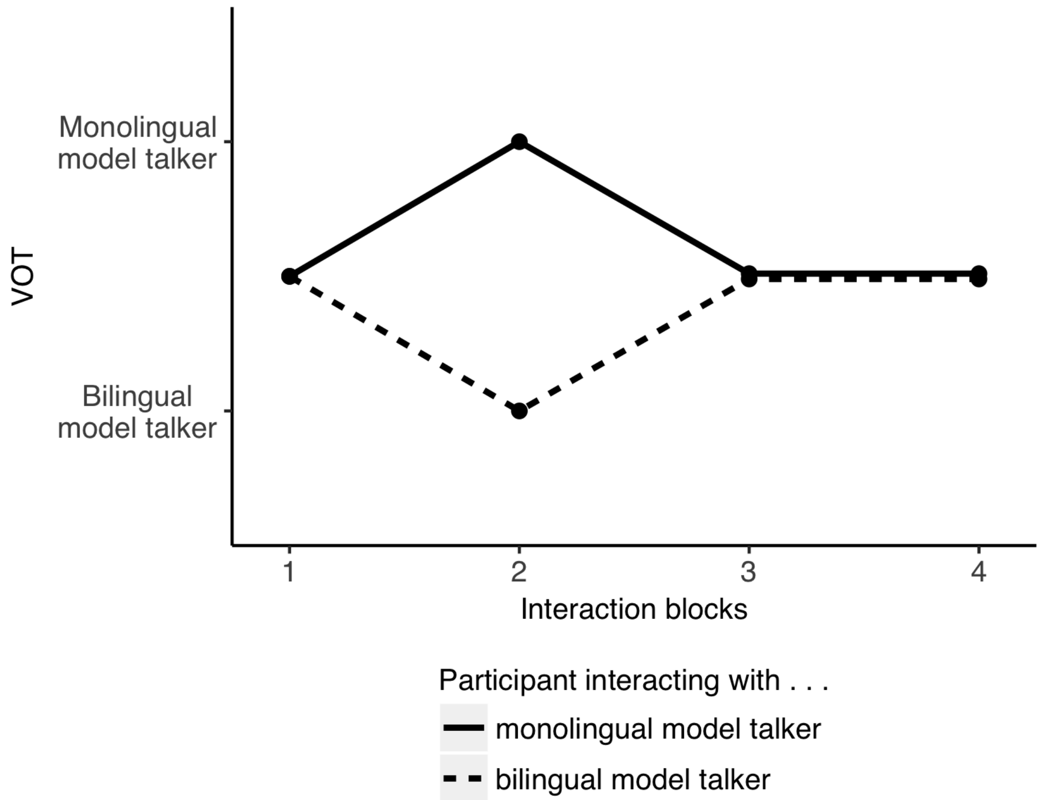


Figure 4.3: If the time-course of accommodation is rapid but transient, participants will accommodate to a model talker in blocks 1 or 2 but will stop accommodating soon thereafter.

HYPOTHESIS #1-3: Slow and Continuous

- Participants will accommodate to a model talker gradually throughout an interaction.

PREDICTION #1-3: Slow and Continuous

- When accommodating to the English monolingual model talker, participants will increase VOT_{norm} block-by-block, producing the shortest VOT_{norm} in block 1 and the longest VOT_{norm} in block 4.

- When accommodating to the Spanish-English bilingual model talker, participants will decrease VOT_{norm} block-by-block, producing the longest VOT_{norm} in block 1 and the shortest VOT_{norm} in block 4.

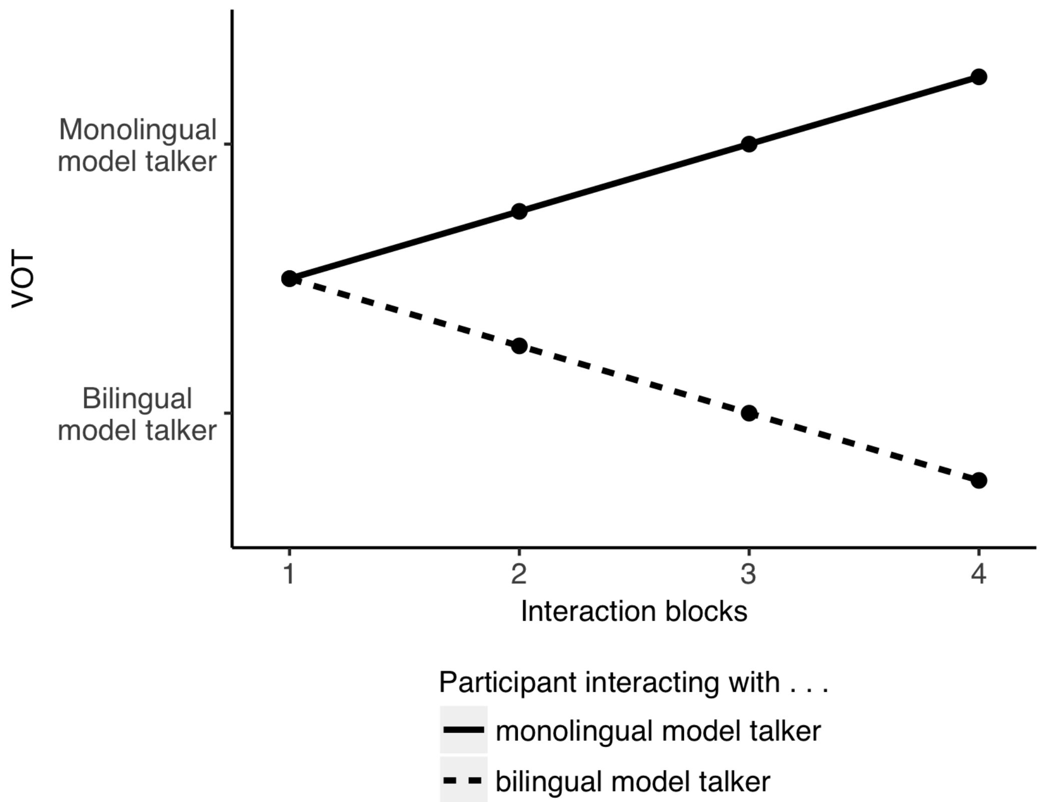


Figure 4.4: If the time-course of accommodation is slow and continuous, participants will accommodate to a model talker gradually block-by-block.

Additionally, of interest is whether there is an interaction between the time-course of accommodation and the automatic and social effects described in (1)-(4).

4.2.2 Will the most-recent, previous interaction influence accommodation during the following interaction?

RESEARCH QUESTION #2: Will the most-recent, previous interaction influence accommodation during the following interaction? Specifically, do participants accommodate to a model talker regardless of whom they interacted with immediately prior? If so, a *style flexibility effect* occurs. Contrastingly, does a participant's previous interaction with a different model talker cause the participant to accommodate less to the following model talker? If so, a *style setting effect* occurs. Hypotheses and predictions for each effect are presented and illustrated below.

HYPOTHESIS #2-1: Style Flexibility Effect

- Accommodation to a model talker is not influenced by a participant's interaction with a previous model talker.

PREDICTION #2-1: Style Flexibility Effect

- Regardless of whether the participant interacted with the English monolingual model talker immediately prior, the participant will produce shorter VOT_{norm} when interacting with the Spanish-English bilingual model talker.
- Regardless of whether the participant interacted with the Spanish-English bilingual model talker immediately prior, the participant will produce longer VOT_{norm} when interacting with the English monolingual model talker.

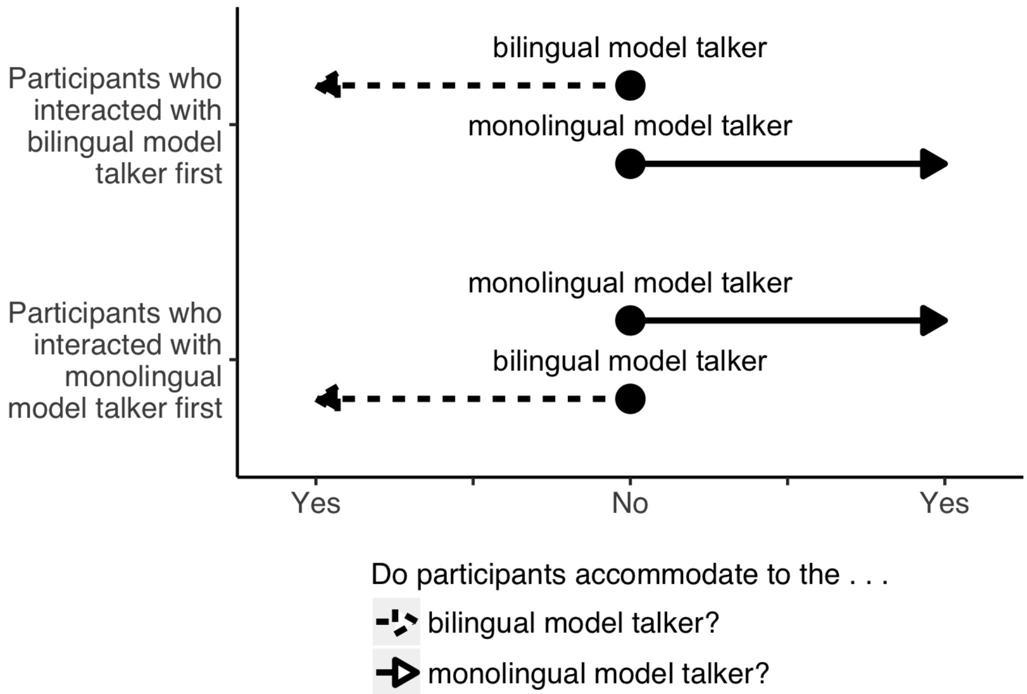


Figure 4.5: If a style flexibility effect occurs, accommodation to a model talker is not influenced by a participant's interaction with a previous model talker.

HYPOTHESIS #2-2: Style Setting Effect

- Accommodation to a model talker is influenced by a participant's interaction with a previous model talker.

PREDICTION #2-2: Style Setting Effect

- If the participant interacted with the English monolingual model talker immediately prior, the participant will not produce shorter VOT_{norm} when interacting with the Spanish-English bilingual model talker.
- If the participant interacted with the Spanish-English bilingual model talker immediately prior, the participant will not produce longer VOT_{norm} when interacting with the English monolingual model talker.

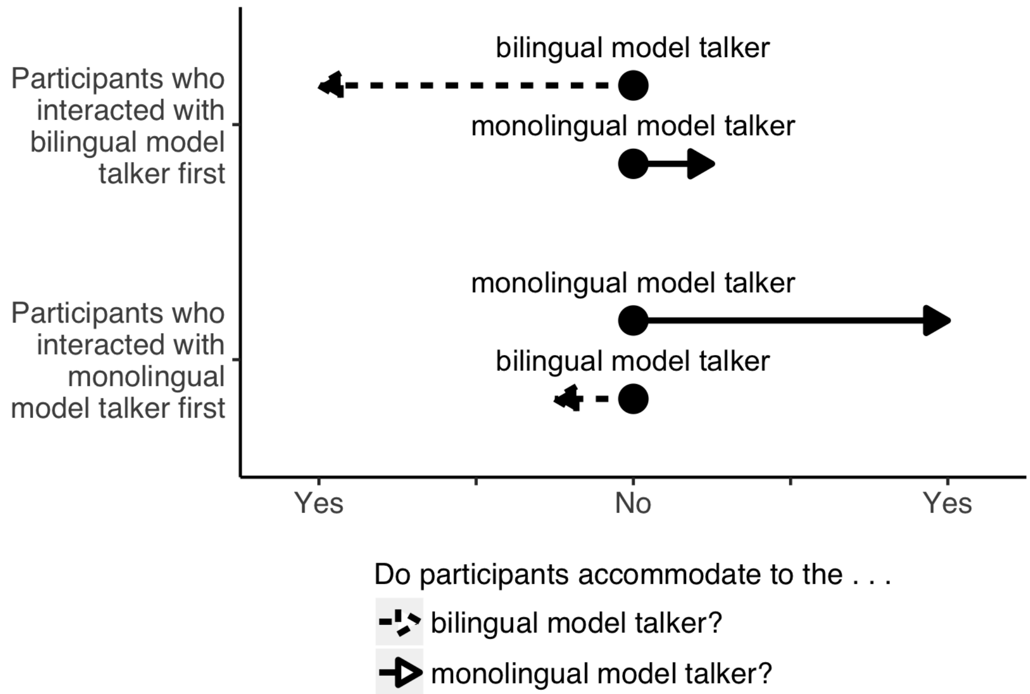


Figure 4.6: If a style setting effect occurs, accommodation to a model talker is influenced by a participant's interaction with a previous model talker.

If style flexibility or style setting effects occur, of interest is whether there is an interaction with the automatic and social effects described in (1)–(4).

4.3 Results

This section is organized as follows: Section 4.3.1 provides results relevant to Research Question #1 (What is the time-course of accommodation?). Section 4.3.2 provides results relevant to Research Question #2 (Will the most-recent, previous interaction influence accommodation during the following interaction?). The results in these sections are examined in the context of both automatic and social effects on accommodation, as described in (1)–(4).

The post-hoc Tukey test results from this section, as well as mean VOT_{norm} values, are provided in tables in Appendix D. Violin-and-box plots of the results are provided in Appendix E.

4.3.1 Accommodation changes within a short-term interaction

In this section, the time-course of accommodation is examined by comparing VOT_{norm} across blocks (refer to Section 2.3.4 for discussion of the variable Block). The results in this section give insight into whether the time-course of accommodation is rapid and persistent, rapid but transient, or slow and continuous (defined in Section 4.2.1). The section is organized as follows: (1) within-group differences in VOT_{norm} with the monolingual model talker versus the bilingual model talker for each block, (2) within-group comparison of VOT_{norm} between blocks for each model talker, and (3) between-group differences in VOT_{norm} by model talker and block. These results, summarized at the end of this section, provide evidence that the time-course of accommodation is generally rapid but transient, but persistent when socially-modulated.

Within-group comparison of VOT_{norm} with both model talkers for each block
When comparing overall VOT_{norm} (VOT_{norm} for all stops combined), all groups except B-Miami had longer VOT_{norm} with the monolingual model talker and shorter VOT_{norm} with the bilingual model talker for all four blocks. In other words, B-Ithaca, M-Ithaca, and M-Miami converged with both model talkers rapidly and convergence persisted throughout the study.

Specifically, in all four blocks, the following participant groups' VOT_{norm} were significantly shorter when interacting with the bilingual (B) model talker compared to the monolingual (M) model talker: B-Ithaca (Block 1 B-M: -0.038 ± 0.005, $p < .0001$; Block 2 B-M: -0.038 ± 0.005, $p < .0001$; Block 3 B-M: -0.023 ± 0.005, $p < .0001$; Block 4 B-M: -0.024 ± 0.005, $p < .0001$); M-Ithaca (Block 1 B-M: -0.034 ± 0.005, $p < .0001$; Block 2 B-M: -0.032 ± 0.005, $p < .0001$; Block 3 B-M: -0.015 ± 0.005, $p = .007$; Block 4 B-M: -0.021 ± 0.005, $p = .0002$); and M-Miami (Block 1 B-M: -0.030 ± 0.005, $p < .0001$; Block 2 B-M: -0.021 ± 0.005, $p = .0002$; Block 3 B-M: -0.012 ± 0.005, $p = .032$; Block 4 B-M: -0.010 ± 0.005, $p = .063$);

Contrastingly, B-Miami only had longer VOT_{norm} with the monolingual model talker and shorter VOT_{norm} with the bilingual model talker in the second block. Specifically, in Block 2, B-Miami's VOT_{norm} was significantly shorter when interacting with the bilingual (B) model talker than when interacting with the monolingual (M) model talker: B-M: -0.028 ± 0.005, $p < .0001$). In other words, B-Miami converged rapidly but accommodation was transient. These results are illustrated in Figure 4.7.

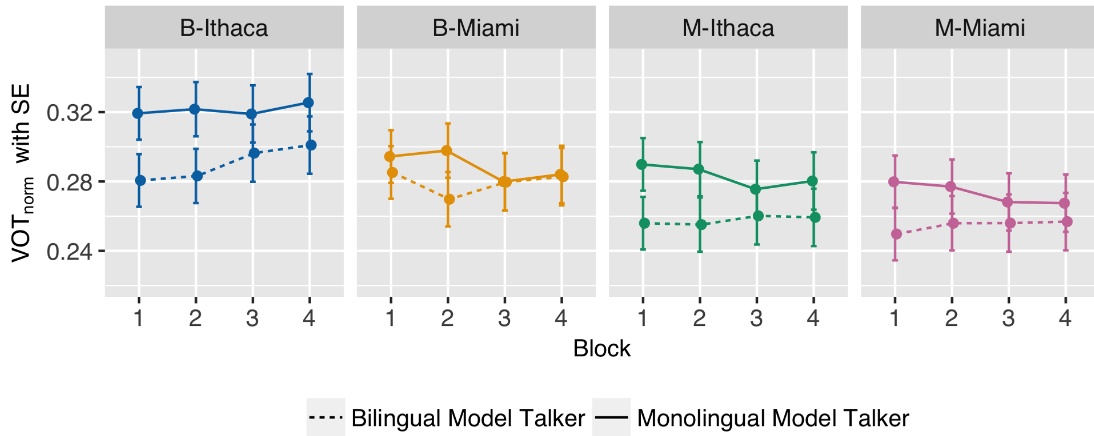


Figure 4.7: All participant groups other than B-Miami accommodated throughout all four blocks. B-Miami only accommodated during the second block.

When comparing VOT_{norm} by stop, however, there was less accommodation to both model talkers in later blocks. For example, M-Miami accommodated to both model talkers more in earlier blocks. For example, Miami's /p/ VOT_{norm} with the bilingual model talker was significantly shorter than with the monolingual model talker in Blocks 1, 2, and 3 only (Block 1 B-M: -0.034 ± 0.009, p = .0005; Block 2 B-M: -0.032 ± 0.009, p = .0009; Block 3 B-M: -0.018 ± 0.009, p = .06). Also, M-Miami's /t/ VOT_{norm} with the bilingual (B) model talker was significantly shorter than with the monolingual (M) model talker in Block 1 only (B-M: -0.028 ± 0.009, p = .004). Last, M-Miami's /k/ VOT_{norm} with the bilingual model talker was significantly shorter than with the monolingual model talker in Blocks 1 and 2 only (Block 1 B-M: -0.027 ± 0.009, p = .004; Block 2 B-M: -0.020 ± 0.009, p = .036), not Blocks 3 and 4.

Similarly, M-Ithaca's /p/ VOT_{norm} with the bilingual (B) model talker was significantly shorter than with the monolingual (M) model talker in Blocks 1, 2, and 4 only (Block 1 B-M: -0.027 ± 0.009, $p = .007$; Block 2 B-M: -0.026 ± 0.009, $p = .007$; Block 4 B-M: -0.020 ± 0.009, $p = .043$), not in Block 3. Similarly, M-Ithaca's /k/ VOT_{norm} with the bilingual model talker was significantly shorter than with the monolingual model talker in Blocks 1 and 2 only (Block 1 B-M: -0.035 ± 0.010, $p = .0005$; Block 2 B-M: -0.032 ± 0.009, $p = .001$), not Blocks 3 and 4. For /t/, however, M-Ithaca's VOT_{norm} with the bilingual model talker was significantly shorter than with the monolingual model talker for all four blocks (Block 1 B-M: -0.040 ± 0.009, $p < .0001$; Block 2 B-M: -0.038 ± 0.009, $p = .0001$; Block 3 B-M: -0.029 ± 0.009, $p = .002$; Block 4 B-M: -0.032 ± 0.009, $p = .001$).

B-Miami also had different VOT_{norm} with both model talkers in earlier blocks; however, this difference occurred only in Block 2. Specifically, B-Miami's VOT_{norm} with the bilingual (B) model talker was significantly shorter than with the monolingual (M) model talker in Block 2 for /p/ (B-M: -0.020 ± 0.009, $p = .034$), /t/ (B-M: -0.039 ± 0.009, $p = .0001$), and /k/ (B-M: -0.024 ± 0.009, $p = .014$).

However, for nearly every block and stop, B-Ithaca maintained different VOT_{norm} with the two model talkers, with /k/ in Block 3 as the one exception. Specifically, B-Ithaca's VOT_{norm} with the bilingual model talker was significantly shorter than with the monolingual model talker for /p/ for Blocks 1-4 (Block 1 B-M: -0.039 ± 0.009, $p = .0001$; Block 2 B-M: -0.038 ± 0.009, $p = .0001$; Block 3 B-M: -0.034 ± 0.009, $p = .0004$; Block 4 B-M: -0.021 ± 0.009, $p = .030$), for /t/ Blocks 1-4 (Block 1 B-M: -0.035 ± 0.009, $p = .0003$; Block 2 B-M: -0.036 ± 0.009, $p = .0002$; Block 3 B-M: -0.020 ± 0.009, $p = .039$; Block 4 B-M: -0.028 ± 0.009, $p = .004$); and for /k/ Blocks 1, 2, and 4 (Block 1 B-M: -0.041 ± 0.009, $p < .0001$; Block 2 B-M: -0.040 ± 0.009, $p < .0001$; Block 4 B-M: -0.024 ± 0.009, $p = .015$).

These results, illustrated in Figure 4.8, provide evidence that the time-course of accommodation is rapid and either transient or persistent, depending on the participant group.

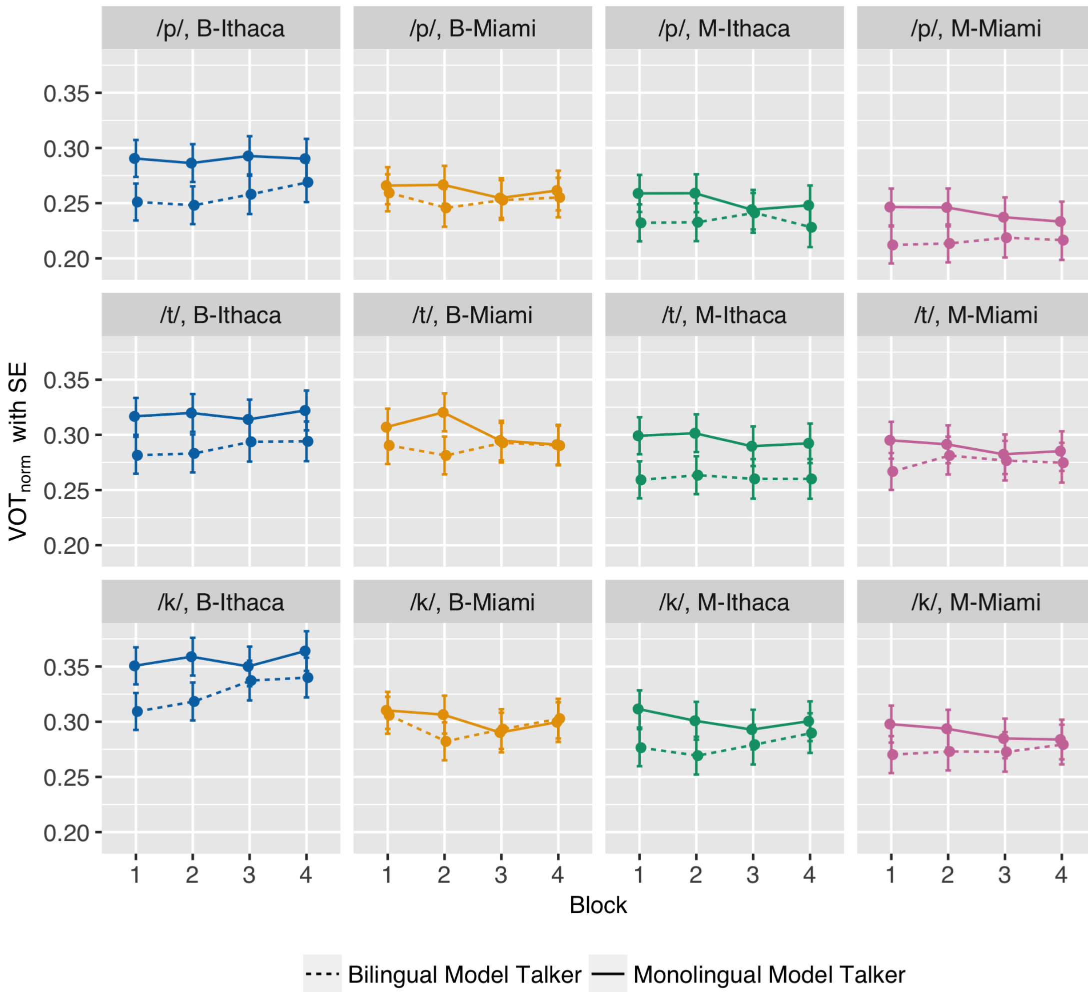


Figure 4.8: For nearly all stops, B-Ithaca accommodated to both model talkers for all 4 blocks, while all other participant groups accommodated less during later blocks.

Within-group comparison of VOT_{norm} between blocks for each model talker

When comparing overall VOT_{norm}, results showed that only the bilingual participant groups (B-Ithaca, B-Miami) produced different VOT_{norm} between blocks. B-Ithaca's VOT_{norm} with the bilingual model talker in Blocks 3 and 4 were (near-) significantly longer than in Block 1 (Block 1-Block 3: -0.016 ± 0.007, p = .075; Block 1-Block 4: -0.020 ± 0.007, p = .035). In other words, B-Ithaca produced shorter VOT_{norm} with the bilingual model talker in Block 1 but then diverged, producing longer, more monolingual-like VOT_{norm} in Blocks 3 and 4. This finding suggests that B-Ithaca's accommodation to the bilingual model talker (who shares a similar linguistic background but is not representative of B-Ithaca's speech community) was rapid but transient, leading to divergence away from the bilingual model talker quickly after convergence.

B-Miami also changed VOT_{norm} between blocks. When interacting with the bilingual model talker, B-Miami's VOT_{norm} in Block 1 was near-significantly longer than in Block 2 (Block 1-Block 2: 0.015 ± 0.006, p = .079). In other words, B-Miami converged to the bilingual model talker from Block 1 to Block 2. Similarly, when interacting with the monolingual model talker, B-Miami's VOT_{norm} in Block 2 was significantly longer than in Block 3 (Block 2-Block 3: 0.018 ± 0.006, p = .047). In other words, B-Miami converged with the monolingual model talker in Block 2 but then decreased VOT_{norm} in Block 3. These results reaffirm the finding above, that B-Miami had different VOT_{norm} for both model talkers in Block 2 only. It also supports a rapid-but-transient time-course for accommodation by B-Miami.

For both monolingual groups, there were no significant changes in VOT_{norm} between blocks. This suggests that monolingual groups maintained overall VOT_{norm} for all blocks, and it supports a rapid-and-persistent time-course for accommodation. These results are illustrated in Figure 4.9 below.

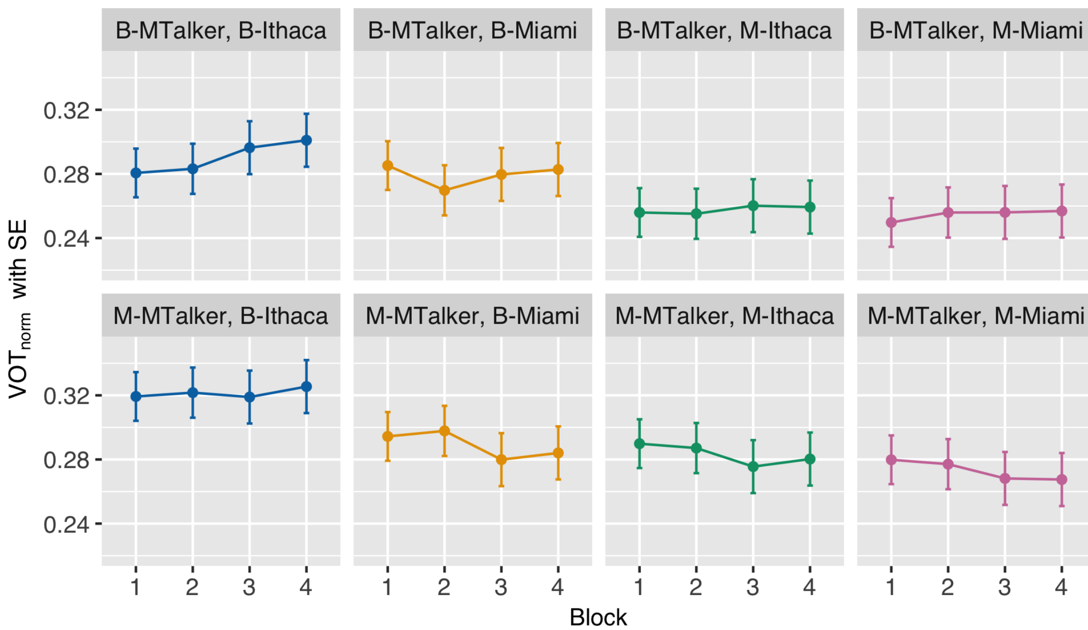


Figure 4.9: There were significant differences in VOT$_{norm}$ for: B-Ithaca in Block 1 and Blocks 3-4 with the bilingual model talker (B-MTalker), B-Miami in Block 1 and Block 2 with the bilingual model talker, and B-Miami in Block 2 and Block 3 with the monolingual model talker (M-MTalker).

When comparing VOT$_{norm}$ by stop, results showed that B-Ithaca's VOT$_{norm}$ for /k/ diverged from the bilingual model talker. Specifically, B-Ithaca's /k/ VOT$_{norm}$ with the bilingual model talker in Block 1 was significantly shorter than in Block 3 (Block 1-Block 3: -0.028 ± 0.010, $p = .037$) and significantly shorter than in Block 4 (Block 1-Block 4: -0.030 ± 0.011, $p = .029$). Thus, while B-Ithaca's /k/ VOT$_{norm}$ was shorter with the bilingual model talker in earlier blocks, it was longer it later blocks. This again suggests that B-Ithaca's accommodation to the bilingual model talker (who shares a similar linguistic background but is not representative of B-Ithaca's speech community) was rapid but transient, leading to divergence after brief convergence.

Additionally, B-Miami's /t/ VOT_{norm} converges with the monolingual model talker in Block 2, but then diverges afterward. Specifically, B-Miami's /t/ VOT_{norm} with the monolingual model talker in Block 2 was near-significantly longer than in Block 3 (Block 2-Block 3: -0.025 ± 0.010, $p = .076$) and Block 4 (Block 2-Block 4: -0.029 ± 0.012, $p = .076$). Thus, B-Miami converged with the monolingual model talker in earlier blocks, producing longer VOT_{norm}, but then stopped converging. In other words, B-Miami's accommodation to the monolingual model talker was rapid but transient, leading to divergence after brief convergence.

There were no other significant changes in VOT_{norm} between blocks by stop. These results are illustrated in Figure 4.10 below.

Between-group differences in VOT_{norm} by model talker and block When comparing overall VOT_{norm} between groups, B-Ithaca and M-Miami differed from each other when interacting with the monolingual model talker in Block 4. Specifically, B-Ithaca's VOT_{norm} was significantly longer than M-Miami (B-Ithaca-M-Miami: 0.058 ± 0.023, $p = .057$). In other words, in later blocks, B-Ithaca converged with the monolingual model talker the most, while M-Miami converged with the monolingual model talker the least (or diverged). This result suggests that the speech community outsider effect, shown previously in Section 3.3.1, occurs in later blocks of a short-term interaction. This result is illustrated in Figure 4.11.

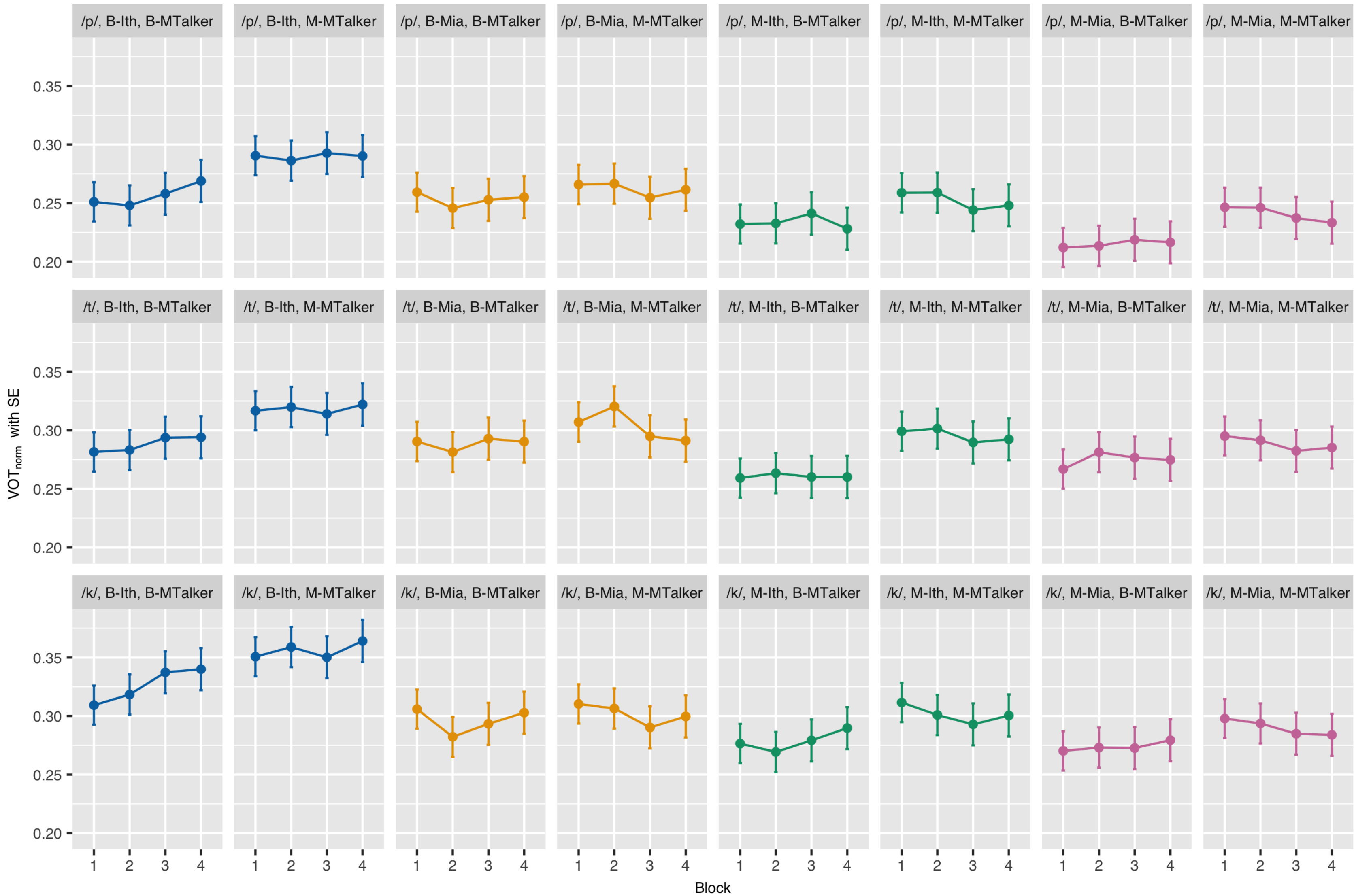


Figure 4.10: When interacting with the bilingual model talker (B-MTalker), B-Ithaca's /k/ VOT_{norm} in Block 1 was longer than in Blocks 3 and 4. When interacting with the monolingual model talker (M-MTalker), B-Miami's /t/ VOT_{norm} in Block 2 was longer than in Blocks 3 and 4.

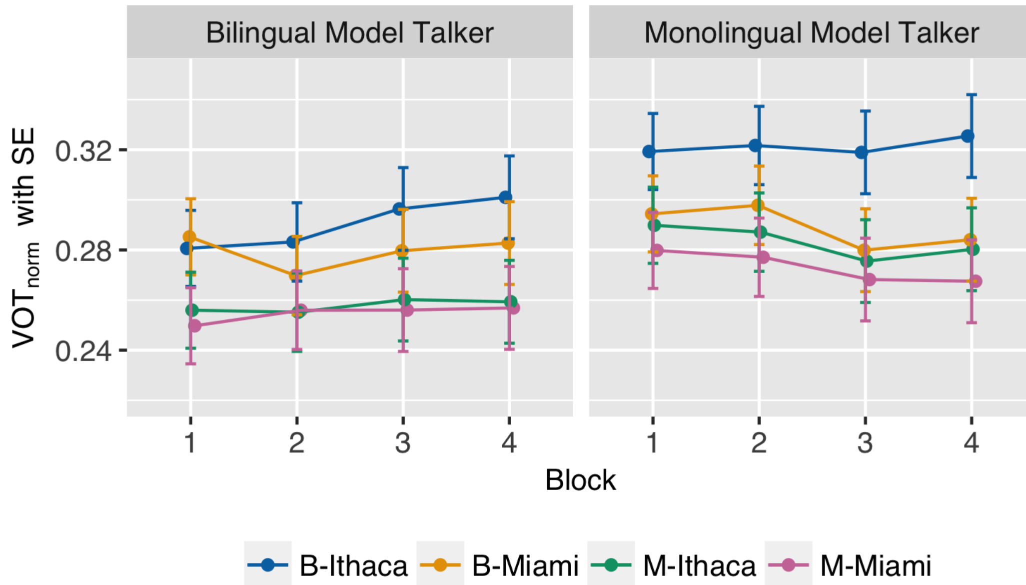


Figure 4.11: B-Ithaca and M-Miami differed in VOT_{norm} in Block 4 with monolingual model talker.

When comparing VOT_{norm} by stop, similar results were found for /k/. When interacting with the bilingual model talker, B-Ithaca and M-Miami differed from each other in later blocks. B-Ithaca's /k/ VOT_{norm} was (near-) significantly longer than M-Miami's /k/ VOT_{norm} in Blocks 3 and 4 (Block 3 B-Ithaca-M-Miami: 0.064 ± 0.024, p = .040; Block 4 B-Ithaca-M-Miami: 0.060 ± 0.024, p = .062). When interacting with the monolingual model talker, B-Ithaca's /k/ VOT_{norm} was (near-) significantly longer than M-Miami's /k/ VOT_{norm} in all four Blocks (Block 1 B-Ithaca-M-Miami: 0.052 ± 0.022, p = .090; Block 2 B-Ithaca-M-Miami: 0.065 ± 0.023, p = .025; Block 3 B-Ithaca-M-Miami: 0.065 ± 0.024, p = .037; Block 4 B-Ithaca-M-Miami: 0.080 ± 0.024, p = .005).

Additionally, when interacting with the monolingual model talker, B-Ithaca differed from B-Miami and M-Ithaca in later blocks. Specifically, B-Ithaca's /k/

VOT_{norm} was (near-) significantly longer than B-Miami in Blocks 3 and 4 (Block 3 B-Ithaca-B-Miami: 0.059 ± 0.024, p = .067; Block 4 B-Ithaca-B-Miami: 0.064 ± 0.024, p = .041). Also, B-Ithaca's /k/ VOT_{norm} was significantly longer than M-Ithaca in Blocks 2 and 4 (Block 2 B-Ithaca-M-Ithaca: 0.058 ± 0.023, p = .059, Block 4 B-Ithaca-M-Ithaca: 0.063 ± 0.024, p = .045).

These results reaffirm the finding that B-Ithaca converged the most with the monolingual model talker and M-Miami converged the most with the bilingual model talker. It also provides further evidence of the speech-community outsider affiliation effect occurring in later blocks. These findings are illustrated in Figure 4.12.

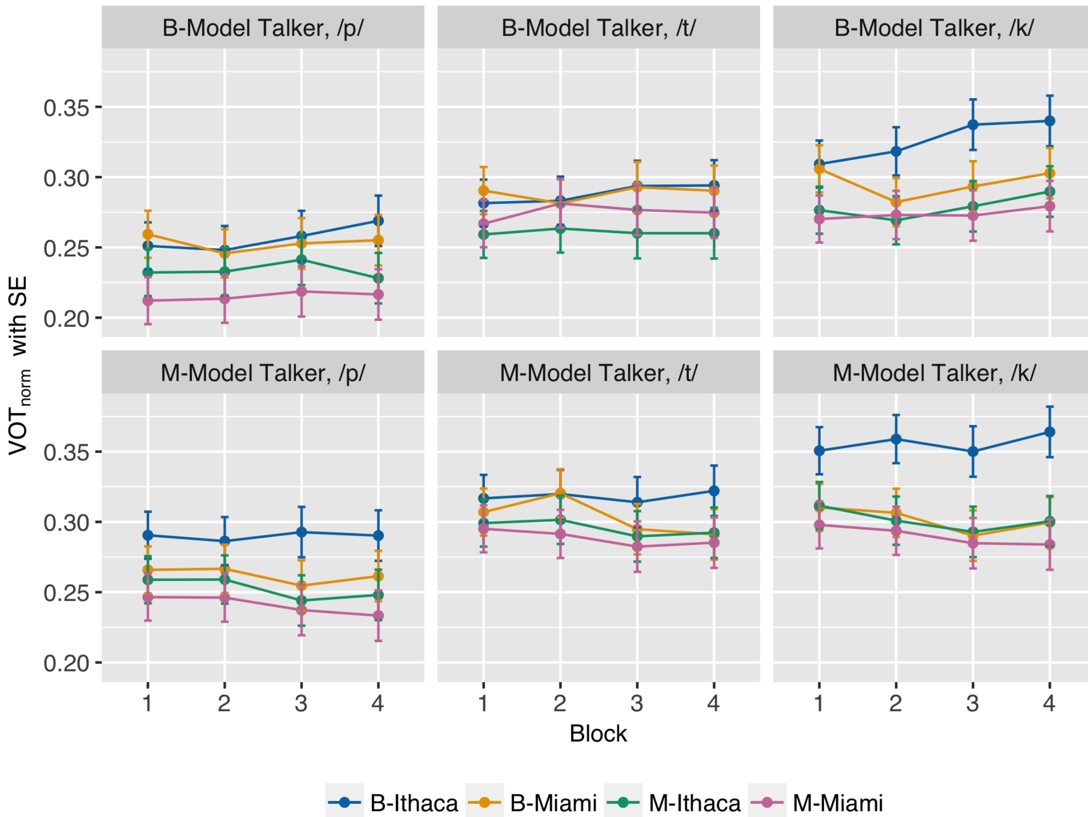


Figure 4.12: B-Ithaca had longer /k/ VOT$_{norm}$ than M-Miami with both model talkers, especially in later blocks.

Summary This section examined whether the time-course of accommodation was rapid and persistent, rapid but transient, or slow and continuous. The results suggest that accommodation is rapid but transient in most cases. For example, when examining whether participants produce different VOT$_{norm}$ with the two model talkers in each block, the results showed that, when examining accommodation by stop, participant groups converged with both talkers more in earlier blocks and less in later blocks. This was especially true for B-Miami, who converged with the two model talkers the least (only in Block 2).

Further evidence of the time-course of accommodation being rapid but transient is found when examining VOT_{norm} between blocks. The results showed that bilingual participant groups (B-Ithaca, B-Miami) converged briefly with model talkers in earlier blocks. B-Ithaca converged with the bilingual model talker in Block 1 but then diverged, increasing VOT_{norm} significantly by Blocks 3 and 4. B-Miami converged with both model talkers only in Block 2. Thus, accommodation occurred rapidly within the first two blocks, and then discontinued afterward.

The accommodation effects that occurred in later blocks were speech-community outsider affiliation effects. For example, B-Ithaca (who has a speech community outsider relationship with the monolingual model talker) diverged from the bilingual model talker, increasing VOT_{norm} in later blocks. Similarly, though less extreme,[3] M-Miami (who has a speech community outsider relationship with the bilingual model talker) produced significantly shorter VOT_{norm} than B-Ithaca in later blocks, with both model talkers. This suggests that, while accommodation is generally rapid but transient, social motivations (in this case, speech community outsider affiliation) cause accommodation to persist longer. These results, illustrated in Figure 4.13, are discussed further in Section 4.4.

[3]B-Ithaca may accommodate to the monolingual model talker more than M-Miami accommodates to the bilingual model talker because lengthening VOTs does not have the same consequences for phonemic contrasts that shortening does (Nielsen, 2011; see Section 1.4.2).

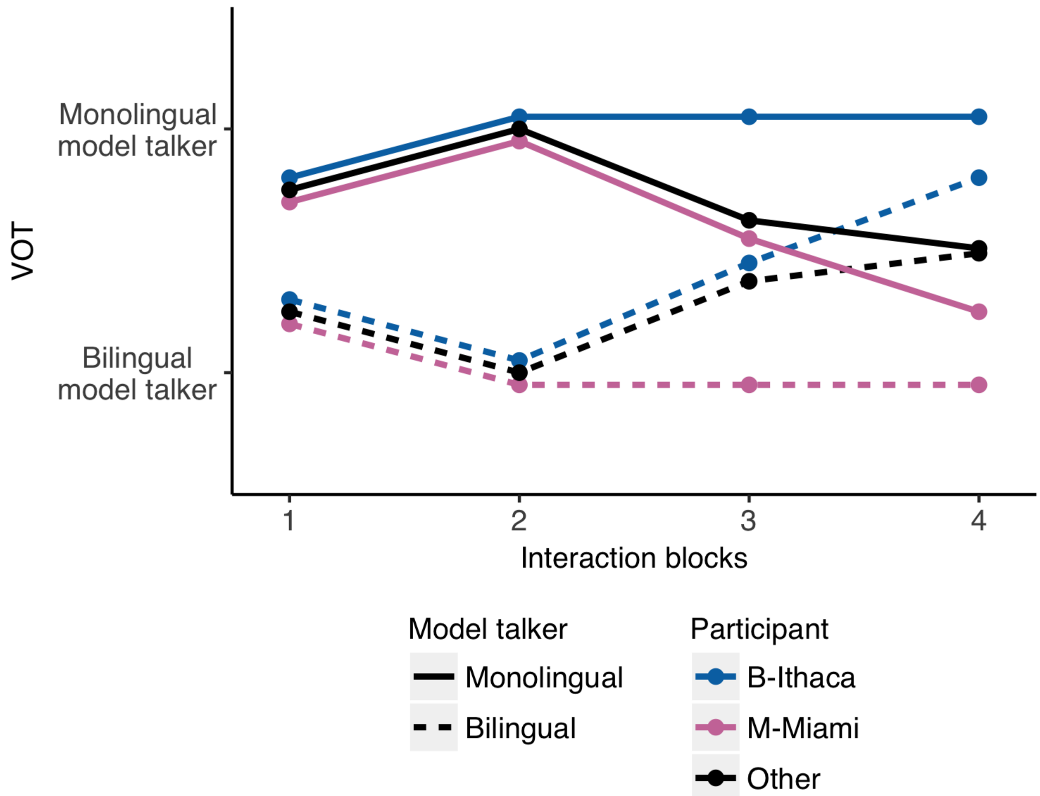


Figure 4.13: Result summary: In general, the time-course of accommodation is rapid but transient, unless it is socially-motivated. Results in this study showed that speech community outsider affiliation effects continued into later blocks, while other, more-automatic accommodation effects (e.g., recency) discontinued in earlier blocks.

4.3.2 Influence of most-recent, previous interaction on accommodation

In the experimental study, participants interacted with both a monolingual model talker and a bilingual model talker. If participants interacted with the monolingual model talker first and the bilingual model talker second, their

Model Talker Order was *Monolingual-First*. If participants interacted with the bilingual model talker first and the monolingual model talker second, their Model Talker Order was *Bilingual-First*. In this section, I examine whether a style setting effect or a style flexibility effect (defined in Section 4.2.2) occurs during consecutive interactions with model talkers. The results, summarized at the end of this section, provide evidence of a style setting effect occurring when socially-motivated.

To examine this, the following comparisons of Model Talker Order were conducted: (1) within-group comparisons of VOT_{norm} with the monolingual model talker versus the bilingual model talker for each Model Talker Order, (2) within-group comparison of VOT_{norm} for participants with Monolingual-First versus Bilingual-First Model Talker Orders for each model talker, (3) between-group comparisons of VOT_{norm} by model talker and Model Talker Order. At the end of this section, the importance of normalizing VOT for speech rate when examining Model Talker Order is explained.

Within-group comparisons of VOT_{norm} with the monolingual model talker versus the bilingual model talker for each Model Talker Order When comparing overall VOT_{norm}, all participants groups other than B-Miami accommodated to both model talkers, regardless of Model Talker Order. B-Miami, however, only accommodated to both model talkers if they interacted with the bilingual model talker first. If they interacted with the bilingual model talker first, B-Miami's VOT_{norm} was significantly shorter with the bilingual (B) model talker than the monolingual (M) model talker (B-M: -0.022 ± 0.004, $p < .0001$). If B-Miami interacted with the monolingual model talker first, there were no significant differences in VOT_{norm} between model talkers. In other words, a style setting effect occurred for B-Miami when they interacted with a monolingual model talker first, causing them not to converge with the bilingual talker afterward.

Model Talker Order did not influence accommodation for all other participant groups. Regardless of which model talker was interacted with first, the following participant groups' VOT_{norm} were significantly shorter with the bilingual model talker than with the monolingual model talker: B-Ithaca (Monolingual-First B-M: -0.010 ± 0.004, $p = .009$; Bilingual-First B-M: -0.051 ± 0.004, $p < .0001$); M-Ithaca (Monolingual-First B-M: -0.028 ± 0.004, $p < .0001$; Bilingual-First B-M: -0.022 ± 0.004, $p < .0001$); M-Miami (Monolingual-First B-M: -0.015 ± 0.004, $p = .0001$; Bilingual-First B-M: -0.021 ± 0.004, $p < .0001$). In other words, a style flexibility effect occurred for all other participant groups. These results are illustrated in Figure 4.14.

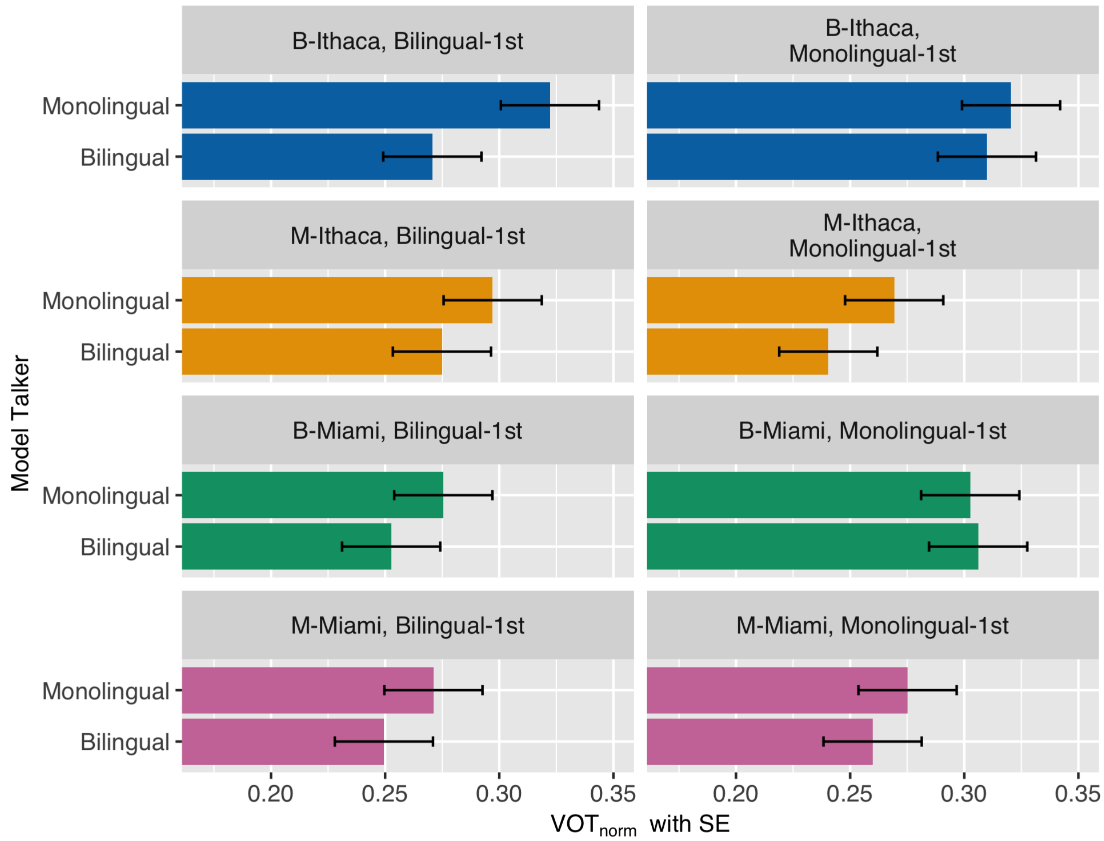


Figure 4.14: Monolingual-First B-Miami did not produce shorter VOT_{norm} with the bilingual model talker after interacting with the monolingual model talker.

When examining VOT_{norm} by stop, both bilingual groups (B-Ithaca, B-Miami) were influenced by Model Talker Order. When B-Ithaca and B-Miami interacted with the monolingual model talker first, they were less likely to accommodate to the bilingual model talker afterward. Specifically, B-Miami's /p/ and /t/ VOT_{norm} were significantly shorter with the bilingual (B) model talker than the monolingual (M) model talker when they interacted with the bilingual model talker first (/p/ B-M: -0.017 ± 0.007, $p = .015$; /t/ B-M: -0.026 ± 0.007, $p = .0001$). However, if B-Miami interacted with the monolingual model talker first, there were no significant differences in /p/ and /t/ VOT_{norm}

between model talkers. For /k/, B-Miami accommodated to both model talkers regardless of order (Monolingual-First B-M: -0.013 ± 0.007, $p = .054$; Bilingual-First B-M: -0.024 ± 0.007, p .0004).

Similarly, B-Ithaca's /t/ and /k/ VOT_{norm} were significantly shorter with the bilingual (B) model talker than the monolingual (M) model talker when they interacted with the bilingual model talker first (/t/ B-M: -0.050 ± 0.007, $p < .0001$; /k/ B-M: -0.057 ± 0.007, $p < .0001$). However, if B-Ithaca interacted with the monolingual model talker first, there were no significant differences between model talkers in VOT_{norm} for /t/ and /k/. For /p/, B-Ithaca accommodated to both model talkers regardless of order (Monolingual-First B-M: -0.019 ± 0.006, $p = .005$; Bilingual-First B-M: -0.047 ± 0.007, $p < .0001$). These results, combined with the results for overall VOT_{norm} above, suggest that a style setting effect occurs during accommodation for bilingual participants who interacted with a monolingual model talker previously.

For monolingual participant groups, there was not a clear influence of Model Talker Order on accommodation. For M-Ithaca, for all stops except /p/, participants accommodated to both model talkers regardless of which model talker they interacted with first. Specifically, regardless of Model Talker Order, M-Ithaca's /t/ VOT_{norm} was significantly shorter when interacting with the bilingual (B) model talker for /t/ than with the monolingual (M) model talker (Monolingual-First B-M: -0.032 ± 0.006, $p < .0001$; Bilingual-First B-M: -0.037 ± 0.007, $p < .0001$) and /k/ (Monolingual-First B-M: -0.022 ± 0.007, $p = .001$; Bilingual-First B-M: -0.022 ± 0.007, $p = .001$). However, for /p/, M-Ithaca only had significantly shorter VOT_{norm} with the bilingual talker when interacting with the monolingual model talker first (B-M: -0.031 ± 0.006, $p < .0001$). If

M-Ithaca interacted the bilingual model talker first, there were no significant differences in VOT_{norm} between model talkers for /p/.

M-Miami, similarly, accommodated to both model talkers regardless of which model talker they interacted with first, for all stops except /k/. Specifically, regardless of Model Talker Order M-Miami's VOT_{norm} was significantly shorter when interacting with the bilingual (B) model talker for /p/ (Monolingual-First B-M: -0.022 ± 0.007, p = .001; Bilingual-First B-M: -0.028 ± 0.007, $p < .0001$) and /t/ (Monolingual-First B-M: -0.013 ± 0.007, p = .052; Bilingual-First B-M: -0.013 ± 0.007, p = .048), compared with the monolingual (M) model talker. However, for /k/, M-Miami only had significantly shorter VOT_{norm} with the bilingual talker when interacting with the bilingual model talker first (B-M: -0.022 ± 0.007, p = .001). If M-Miami interacted the monolingual model talker first, there were no significant differences in VOT_{norm} between model talkers for /k/. Results are illustrated in Figure 4.15.

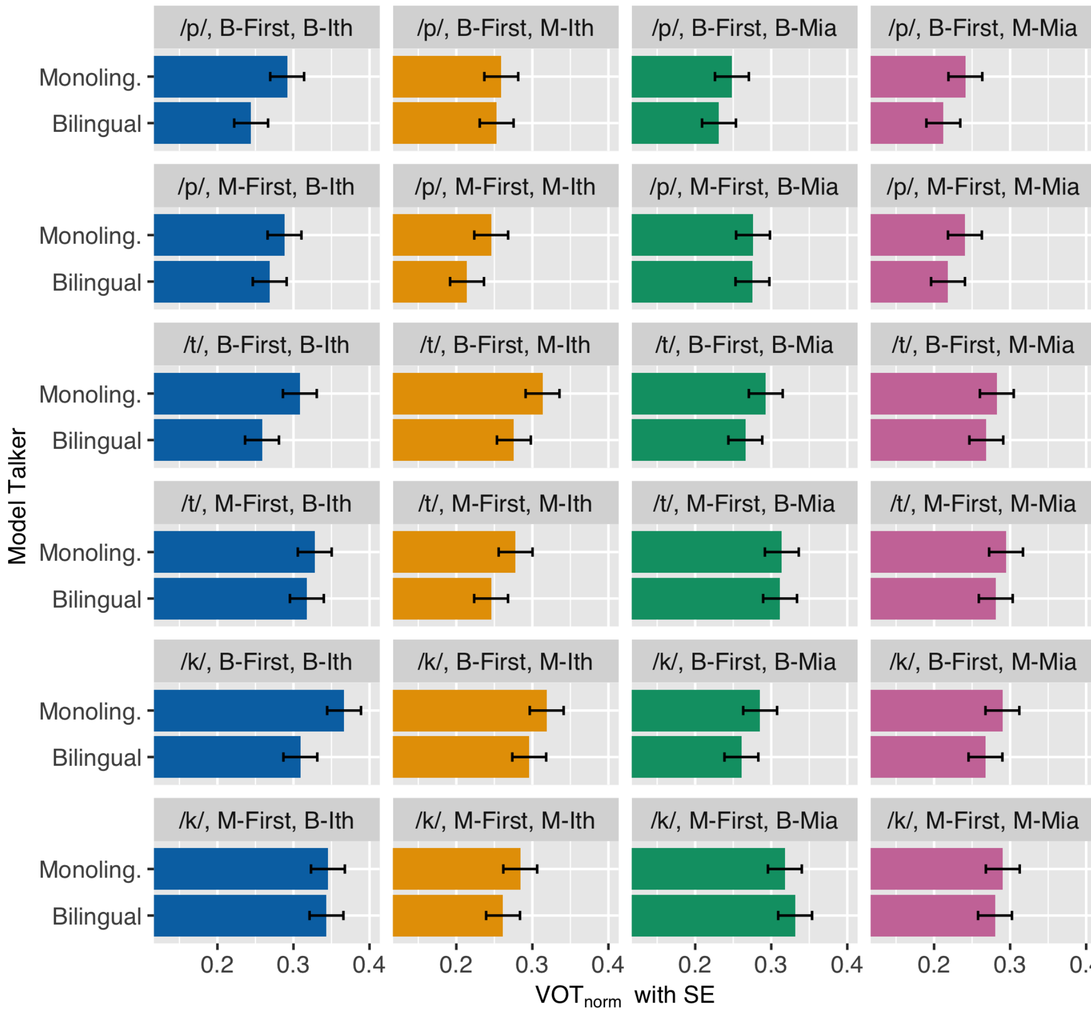


Figure 4.15: B-Ithaca and B-Miami were less likely to accommodate to the bilingual model talker if they interacted with the monolingual model talker first (M-First). If they interacted with the bilingual model talker first (B-First), this was not the case.

Within-group comparisons of VOT_{norm} for participants with Monolingual-First versus Bilingual-First Model Talker Orders When examining overall VOT_{norm}, results showed that B-Miami's accommodation to the bilingual model talker was influenced by Model Talker Order. Specifically, when interacting with the bilingual model talker, Bilingual-First B-Miami participants' VOT_{norm} was near-significantly shorter than Monolingual-First B-Miami participants' VOT_{norm} (Bilingual First-Monolingual First: -0.053 ± 0.030, p = .076). In other words, a style setting effect occurred when B-Miami interacted with a monolingual model talker first, influencing the following interaction with the bilingual model talker. For all other participant groups and model talkers, there were no significant differences. These results are illustrated in Figure 4.16.

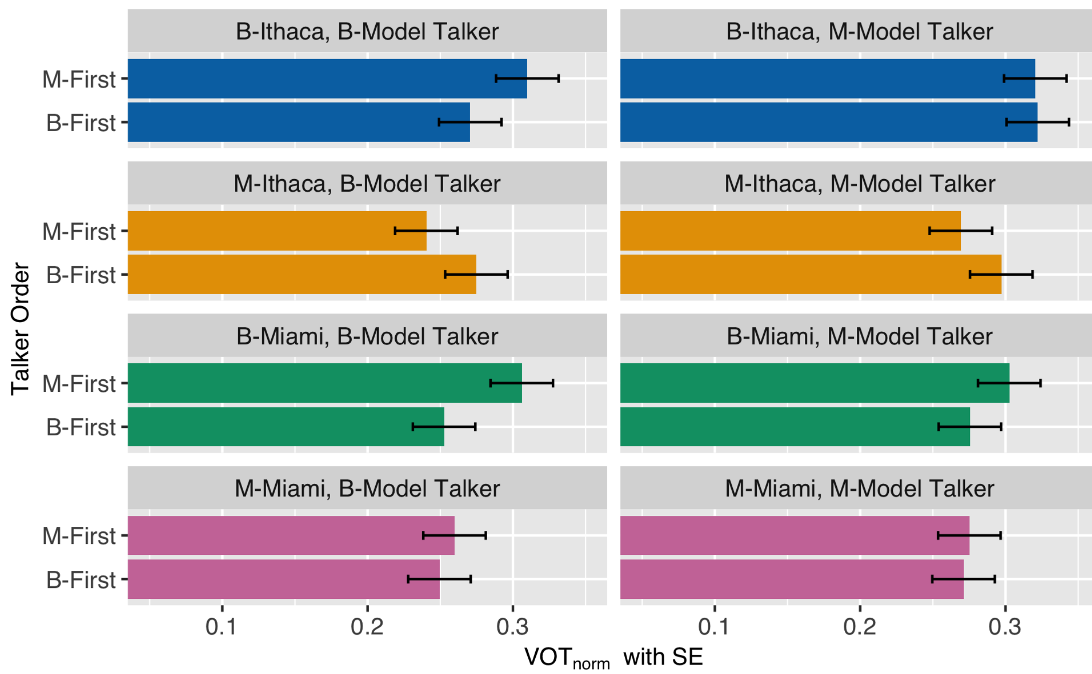


Figure 4.16: When interacting with the bilingual model talker, Bilingual-First B-Miami participants had shorter VOT_{norm} than Monolingual-First B-Miami participants.

When examining VOT_{norm} by stop, results showed that both bilingual groups' (B-Miami, B-Ithaca) VOT_{norm} with the bilingual model talker were influenced by Model Talker Order. Specifically, when interacting with the bilingual model talker, Bilingual-First B-Miami participants' /k/ VOT_{norm} was significantly shorter than Monolingual-First B-Miami participants' VOT_{norm} (Bilingual First-Monolingual First: -0.070 ± 0.030, $p = .021$). Similarly, Bilingual-First B-Ithaca participants' /t/ VOT_{norm} was significantly shorter than Monolingual-First B-Ithaca participants' VOT_{norm} (Bilingual First-Monolingual First: -0.058 ± 0.030, $p = .054$). This provides further evidence that a style setting effect occurs when bilingual participant groups (B-Ithaca, B-Miami) interact with a monolingual model talker first. For all other participant groups, model talkers, and stops, there were no significant differences in VOT_{norm}. These results are illustrated in Figure 4.17.

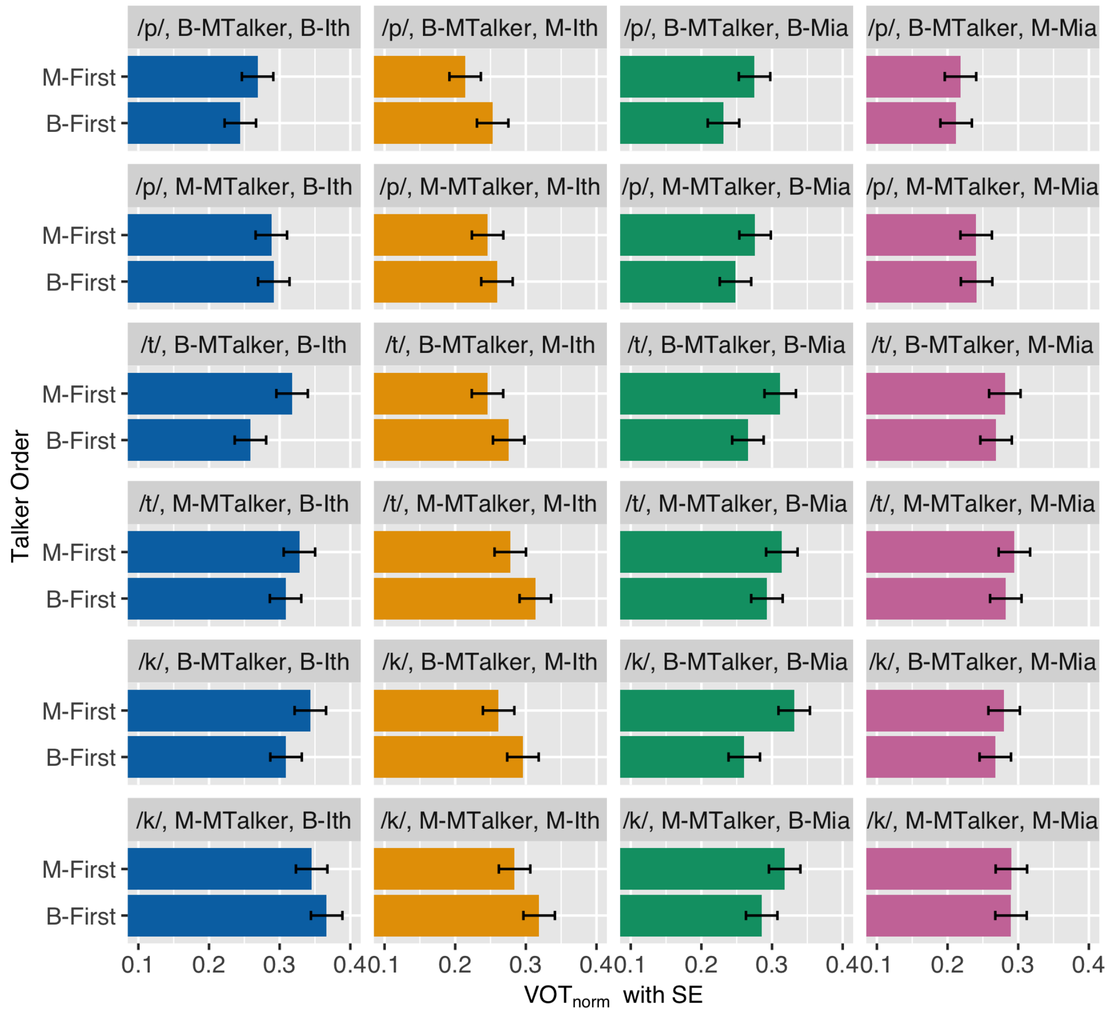


Figure 4.17: When interacting with the bilingual model talker (B-MTalker), Bilingual-First (B-First) B-Ithaca participants had shorter VOT_{norm} for /t/ than Monolingual-First (M-First) B-Ithaca participants.

Between-group comparison of VOT_{norm} for each model talker and Model Talker Order When examining overall VOT_{norm}, there were no significant differences between groups by model talker and Model Talker Order. This result is illustrated in Figure 4.18.

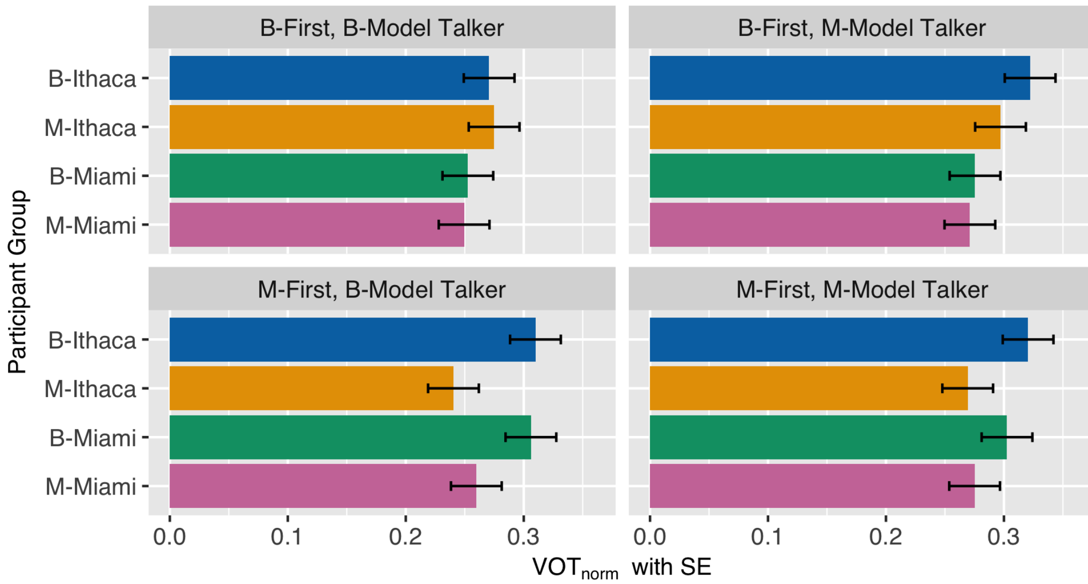


Figure 4.18: There were no significant differences between groups.

When examining VOT_{norm} by stop, results showed that Monolingual-First B-Ithaca participants had significantly longer /k/ VOT_{norm} than Monolingual-First M-Ithaca participants when interacting with the bilingual model talker (B-Ithaca-M-Ithaca: 0.082 ± 0.030, p = .037). This result is likely related to the style setting effects described above.

Additionally, both Bilingual-First Miami groups (B-Miami and M-Miami) had (near-) significantly shorter /k/ VOT_{norm} than Bilingual-First B-Ithaca participants when interacting with the monolingual model talker (B-Ithaca-B-Miami: 0.081 ± 0.030, p = .040; B-Ithaca-M-Miami: 0.076 ± 0.030, p = .059). This may suggest a style setting effect for participants from the bilingual community (Miami). In this instance, a previous interaction with the bilingual model talker influenced participants to produce shorter VOT_{norm} with the monolingual model talker afterward. These results are illustrated in Figure 4.19.

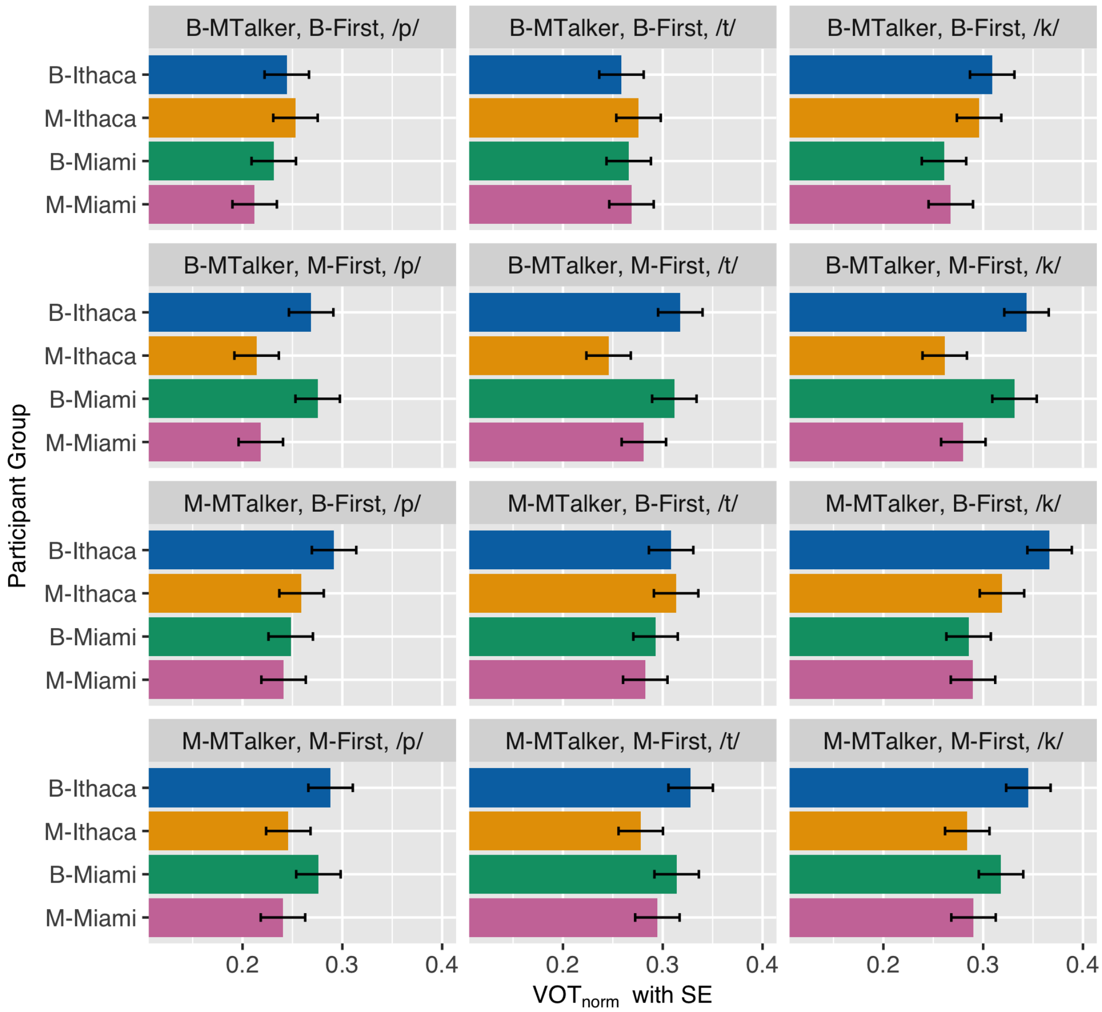


Figure 4.19: Monolingual-First (M-First) B-Ithaca had longer /k/ VOT_{norm} than Monolingual-First M-Ithaca when interacting with the bilingual model talker (B-MTalker). Also, Bilingual-First (B-First) Miami groups had shorter VOT_{norm} than Bilingual-First B-Ithaca when interacting with the monolingual model talker (M-MTalker).

Summary In summary, the results in this section showed that, in some instances, a previous interaction will influence the following interaction. Specifically, which model talker was heard first influenced whether groups accommodated to the following model talker. Participants in the bilingual groups (B-Ithaca, B-Miami) who heard the monolingual model talker first (1) did not have different VOT_{norm} for the two model talkers, (2) had longer VOT_{norm} with the bilingual model talker than those who heard the bilingual model talker first, and (3) had greater VOT_{norm} with the bilingual model talker than other groups. Thus, bilinguals who interacted with the monolingual model talker first were less likely to accommodate to a bilingual model talker afterward. Additionally, participants from the majority bilingual community (B-Miami, M-Miami) who interacted with the bilingual model talker first had shorter VOT_{norm} than other groups when speaking with the monolingual model talker. These results, illustrated in Figure 4.20, suggest that a style setting effect occurs during accommodation. Specifically, it occurs when socially motivated. This finding will be discussed further in Section 4.4.

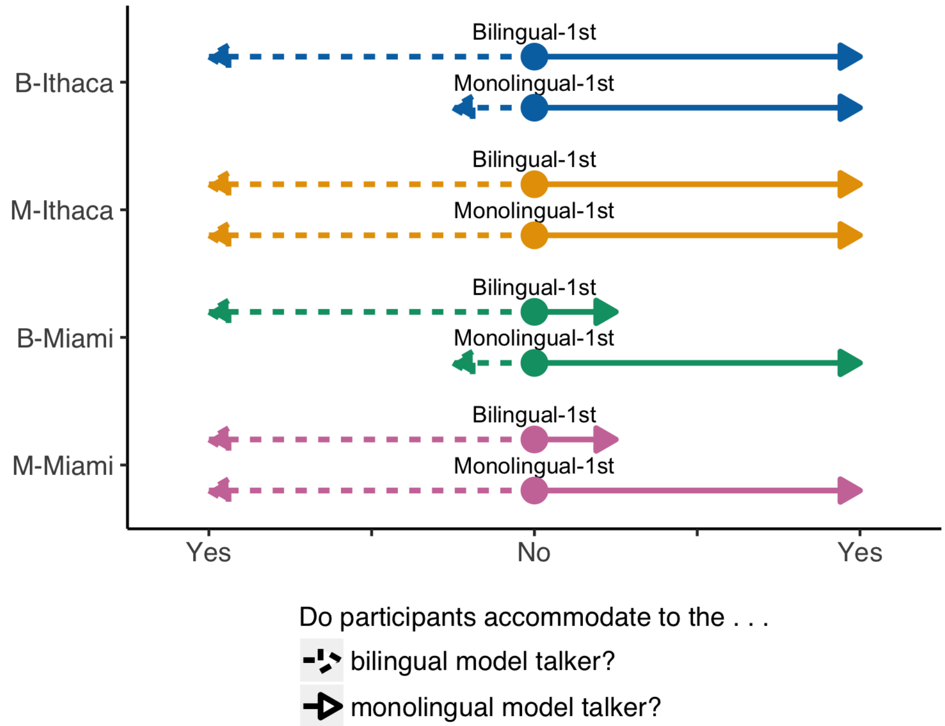


Figure 4.20: Result summary: Monolingual-First bilingual participants (B-Ithaca, B-Miami) were less likely to accommodate to a bilingual model talker afterward. Bilingual-First participants from the bilingual community (B-Miami, M-Miami) had shorter VOT_{norm} than other groups when interacting with the monolingual model talker.

Model Talker Order and the importance of normalizing VOT for speech rate

Over the course of the experimental study, participants began to speak faster in an attempt to finish the task quicker. For example, as shown in Figure 4.21, participants' productions of "word" became faster throughout the study. While the difference in minimal, it is important because VOT duration is influenced by speech rate, as explained in Section 2.3.3. Thus, as participants spoke faster throughout the study, their non-normalized VOTs also became shorter, regardless of accommodation.

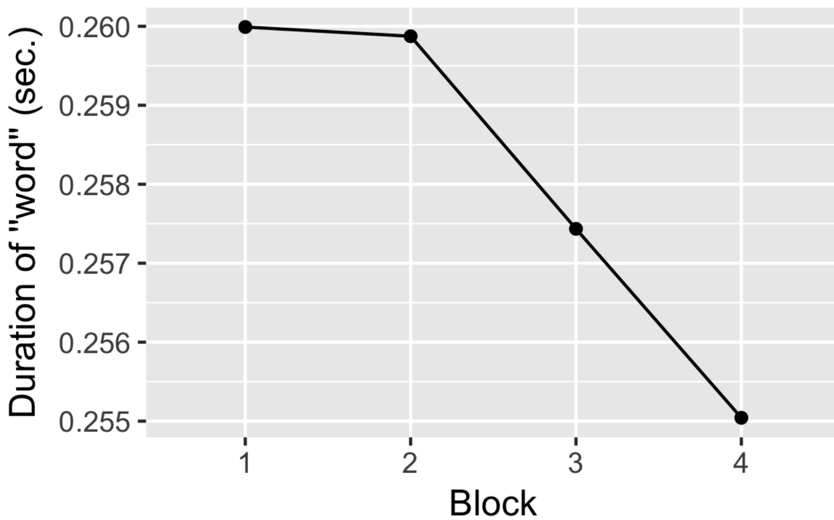


Figure 4.21: Duration of “word” by block: Participants spoke faster over time.

When using non-normalized VOTs to examine accommodation, participants who interacted with the monolingual model talker first had longer VOTs with the monolingual model talker and shorter VOTs with the bilingual model talker due to changes of speech rate over time, regardless of whether they accommodated to the model talkers. Contrastingly, participants who interacted with the bilingual model talker first had shorter non-normalized VOTs earlier in the study (due to accommodation), and again shorter non-normalized VOTs with the monolingual model talker later in the study (due to increased speech rate). In other words, participants who interacted with the bilingual model talker first were less likely to have shorter VOTs with the bilingual model talker first and then longer VOTs with the monolingual model talker afterward. Thus, participants who interacted with the monolingual model talker first appeared to be accommodating to both model talkers, while participants who interacted with the bilingual model talker first did not.

Note that this result is the opposite to what was reported with VOT_{norm}. With VOT_{norm}, bilingual groups who heard the monolingual model talker first did not have shorter VOT_{norm} with the bilingual model talker afterward; VOT_{norm} remained longer into the later blocks. With the exception of the results in this section (Section 4.3.2), the main findings of this dissertation are more or less the same, regardless of whether VOT was normalized for speech rate.[4] However, the influence of Model Talker Order on accommodation is lost without normalizing VOT for speech rate. For this reason, it was important to normalize VOTs for speech rate, especially in order to study accommodation in an experimental study of this length.

4.4 Discussion

Accommodation occurs rapidly but lasts longer when socially-motivated
Research Question #1 was, "What is the time-course of accommodation?" This dissertation investigated the time-course of accommodation in short-term interactions by examining how accommodation changed over four blocks of an experimental study. I hypothesized that accommodation would be either rapid and persistent, rapid but transient, or slow and continuous.

The results indicated that the time-course of accommodation is rapid but transient, unless participants had social reasons to accommodate to a model talker. Specifically, all participants groups accommodated earlier in an interaction (Blocks 1 and 2) and less later (Blocks 3 and 4). Thus, accommodation occurred rapidly, but then discontinued soon thereafter.

[4]Non-normalized VOT results are provided in Appendix F.

Accommodation may have become transient in later blocks for the following reasons: (1) Participants became used to the task. (2) The model talker's speech was no longer novel to the participant. (3) The target words repeated after the second block (as described in Sections 2.2.4 and 2.2.5); thus, the target words being said by a model talker were no longer entirely novel. Therefore, accommodation may have occurred automatically for reasons related to recency and novelty, and it may have become transient as automatic effects diminished.

However, for participant groups with a speech-community outsider relationship with a model talker, accommodation to those model talkers persisted into later blocks. Specifically, B-Ithaca and M-Miami had significantly different VOT_{norm} from each other with both model talkers in later blocks, with B-Ithaca having the greatest, most English-like VOT_{norm}, and M-Miami having the shortest, most Spanish-like VOT_{norm}. Additionally, when speaking with the bilingual model talker, B-Ithaca diverged from the bilingual model talker, increasing VOT_{norm} in later blocks. These results suggest that accommodation occurs rapidly automatically, but accommodation persists when it is socially motivated to do so.

When socially-motivated, a style setting effect occurs Research Question #2 was, "Will the most-recent, previous interaction influence accommodation during the following interaction?" To examine this question, participants interacted with both the monolingual model talker and the bilingual model talker, one at a time, counterbalanced for which model talker was heard first. Then, the influence of Model Talker Order on accommodation was examined. I hypothesized that either a style setting effect or a style flexibility effect would occur.

The results indicated that a style setting effect occurred for some model talker-participant group pairs. Specifically, Miami groups (M-Miami, B-Miami) who interacted with the bilingual model talker first had shorter VOT_{norm} than other groups when interacting with the monolingual model talker. This result is likely due to speech community similarity affiliation effects: Miami participant groups accommodated to the bilingual model talker first, and because the model talker is representative of the majority in their speech community, a style setting effect occurred, causing accommodation to persist into the following interaction.

Additionally, bilingual groups (B-Ithaca, B-Miami) who interacted with a monolingual model talker first were less likely to accommodate to a bilingual model talker afterward. This result is likely tied to native-bias and suspicion regarding the purpose of the study. Specifically, when participants interacted with the monolingual talker first, they did not accommodate to the bilingual talker afterward for two reasons: (1) Switching from a monolingual English model talker to a Spanish-English bilingual model talker (with a heavy Spanish accent) brought attention to the contrast being examined in the experiment. Consequently, bilingual participants thought their English fluency was being tested. (2) This issue was amplified by the fact that the study was conducted in English, not Spanish or both Spanish and English.

Contrastingly, when participants interacted with the bilingual model talker first, they did not know that there would be a native/non-native English contrast in the study, and thus they accommodated to the bilingual model talker. Importantly, I do not believe that this is a linguistic background novelty effect, because I believe a novelty effect would occur for both Model Talker Orders.

Regardless, these results indicate that style setting does occur in some cases, and that social factors—either implicit or explicit—motivate the persistence of accommodation.

CHAPTER 5

GENERAL DISCUSSION

As evidenced by the results of this dissertation research, speech accommodation occurs both automatically and as a result of social affiliation. Regarding automatic causes of accommodation, participants converged with model talkers due to recency and novelty. Specifically, all participant groups produced longer VOT_{norm} with the monolingual model talker and shorter VOT_{norm} with the bilingual model talker, regardless of linguistic background or speech community. Thus, all participant groups accommodated to a model talker that they recently interacted with.

Additionally, novelty effects were found when participant groups were primed by model talkers who did not represent the majority population in their community. For example, participant groups from the monolingual community (M-Ithaca, B-Ithaca) produced shorter VOT_{norm} when primed by the bilingual model talker. In other words, when primed, participants converged with speech that they heard less frequently in their community.

Regarding social affiliation, participants converged to model talkers who were representative of the majority population in their community but not representative of their own linguistic background—a speech community outsider effect. Specifically, B-Ithaca converged with the monolingual model talker, and M-Miami converged with the bilingual model talker. In other words, participants accommodated to model talkers who were representative of their speech community, when their own linguistic background did not match that of their speech community. This effect shows that accommodation is motivated by a *need* to affiliate.

These automatic and social-affiliation effects had different time-courses within short-term interactions. In particular, automatic effects occurred during earlier blocks, while social-affiliation effects were found during later blocks. This finding suggests that automatic effects occur quickly within a short-term interaction but do not last long; thus, the time-course of automatic accommodation is rapid but transient. Contrastingly, accommodation effects related to social affiliation were longer lasting, or rapid and persistent.

This is true both within a short-term interaction, as well as into the following interaction. When socially motivated, the previous interaction influenced whether participants accommodated to a model talker in the following interaction. For example, Miami groups (M-Miami, B-Miami) who interacted with the bilingual model talker first had shorter VOT_{norm} than other groups when interacting with the monolingual model talker. This result is likely caused by speech community similarity affiliation effects. Thus, a style-setting effect occurred due to social factors.

If these results are indicative of how accommodation occurs outside of an experimental environment, then it suggests that social motivations cause longer-lasting accommodation. Thus, these findings give us insight into the mechanisms underlying accommodation and insight into how accommodation becomes a vehicle for language change.

CHAPTER 6

CONCLUSIONS

In this chapter, I explore the implications of this research and address a few remaining questions. Specifically, exemplar-based modeling is used to explain the difference in the time-course of automatic and socially-modulated accommodation within short-term interactions. Then, the relevance of this dissertation's findings for language change research is discussed, focusing on language change in bilingual communities like Miami. Next, remaining questions are explored, such as why B-Miami accommodated less than other groups and why /k/ VOT_{norm} was adjusted more than other stops. Last, the implications of this research for future accommodation studies is briefly discussed, including suggestions for additional areas to explore.

This chapter is organized as follows: In Section 6.1, the results are accounted for using exemplar-based modeling. In Section 6.2, the impact of this research on our knowledge of language change is discussed. Pending issues are explored in Section 6.3. Finally, in Section 6.4, future implications of this research are proposed.

6.1 Explaining results using exemplar-based modeling

In this section, the results of this dissertation are explained using my approach to exemplar-based modeling. As described in Section 1.3, exemplar tokens of linguistic experiences are stored and categorized based on similarity (e.g., phonetic and non-phonetic properties) to other exemplar tokens (Figure 6.1).

Exemplar token activation, which influences speech perception and production, is determined by exemplar recency, novelty, and social preference.

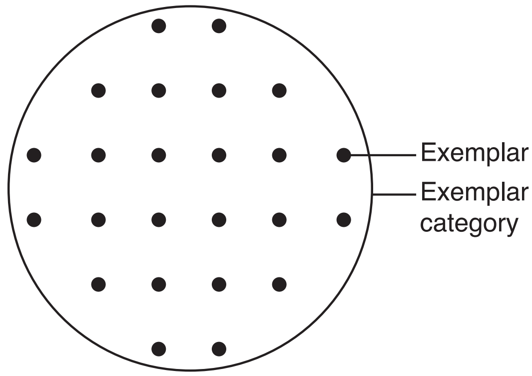


Figure 6.1: Illustration of an exemplar category containing exemplars

When interacting with a model talker, the model talker's speech becomes recently-activated exemplar tokens for the participant. Recent tokens have higher activation levels than other exemplar tokens in the same category, and consequently, during production, selection of exemplars from an exemplar category narrows to those that are similar to those recently-activated tokens. Because the pool of exemplars is smaller and similar to the model talker's, the participant produces speech that is similar to the model talker. This is how a recency effect occurs, and is why all participant groups accommodate to both model talkers. It should be noted, however, that participants do not necessarily reproduce the model talker's tokens (also noted in Pardo, 2006); rather, they produce speech similar to the model talker's. This occurs because the exemplar category pool is smaller, containing speech similar to the model talker's, but the participant still may select any exemplar token within that restricted pool.

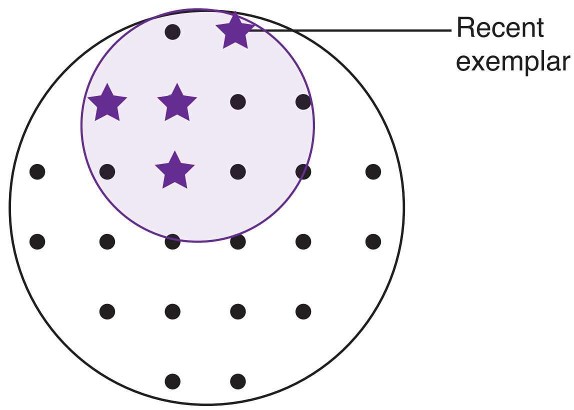


Figure 6.2: Recent exemplar tokens have higher activation levels in an exemplar category and thus become more likely to be produced.

When a model talker's speech is novel to the participant, those novel tokens are even more highly activated than recent tokens. This is because, by definition, novel tokens are both novel and recent. Also, novel tokens expand the exemplar category, not only narrowing the selection pool but also shifting it. For this reason, a novelty effect occurs, increasing accommodation when the model talker's speech is novel to the participant (e.g., priming increased accommodation when groups from the monolingual community interacted with the bilingual model talker).

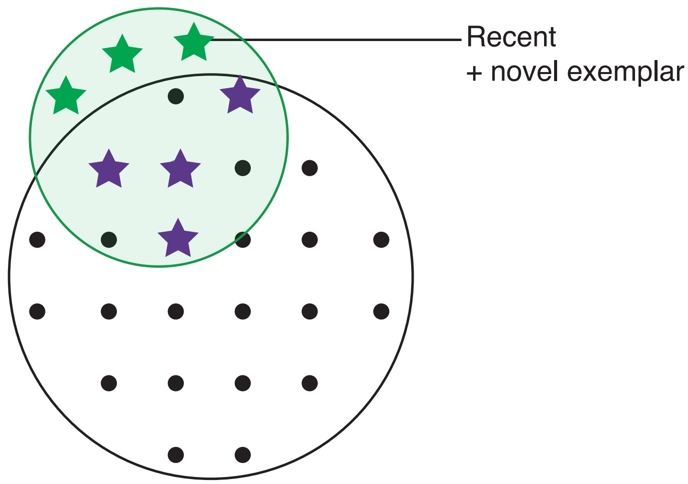


Figure 6.3: Novel exemplar tokens both narrow and shift the selection pool within the exemplar category.

While both recency and novelty increase accommodation, both effects are transient because they are tied to distance in time. As time passes, a recent exemplar is no longer recent, and a novel exemplar is no longer novel. Thus, participants stop accommodating for automatic reasons after a brief period of time within a short-term interaction. By this point, these exemplars have been stored and categorized by non-phonetic properties, such as those related to social factors.

However, social effects (e.g., speech community outsider affiliation) are not directly tied to distance in time. Socially-preferred exemplars receive additional attentional weighting that lasts as long as those (implicit or explicit) social preferences last. This attentional weighting causes participants to produce speech similar to those exemplar tokens.

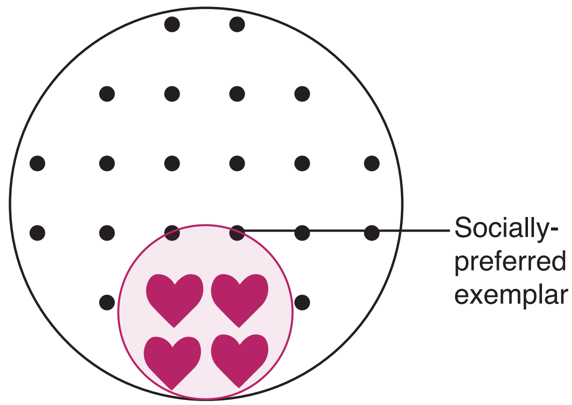


Figure 6.4: Socially-preferred exemplar tokens receive additional attentional weighting that causes participants to produce similar tokens.

Despite social preferences, participants' speech can still be influenced by recency and novelty effects. However, those effects wear off as time passes, and once they do, participants will produce exemplars that are similar to those that are socially-preferred once again. This explains why B-Ithaca converged with the bilingual model talker at first, but then diverged. Figure 6.5 illustrates the time-course of short-term accommodation using this exemplar approach.

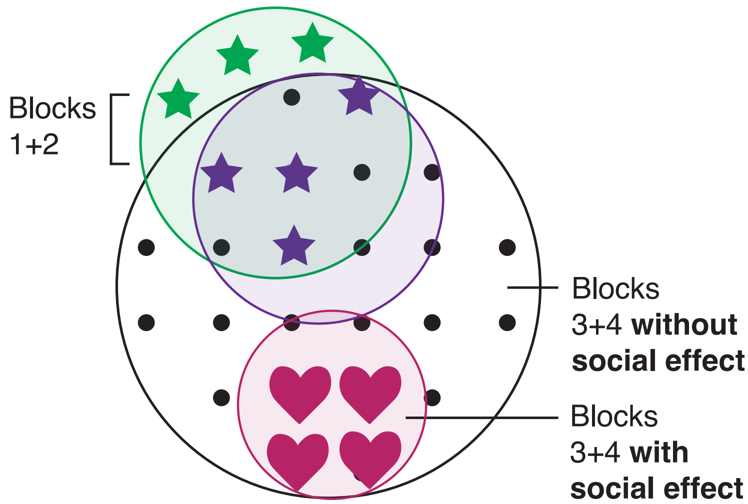


Figure 6.5: The time-course of short-term accommodation using an exemplar approach

6.2 Consequences for language change research

This research highlights the importance of social factors in creating long-term language change. While results indicate that accommodation occurs automatically during language contact, socially-motivated accommodation is more persistent. Specifically, social effects persist both into later portions of a short-term interaction and into the following interaction. Thus, these results suggest that in order for accommodation to persist long enough to cause language change, accommodation must be socially motivated, not merely automatic.

Importantly, a strong social motivator is the need to affiliate with a group that you are outside of. This can explain both native-bias accommodation and language change in Miami. Regarding native-bias, L2 learners often accommodate to a native L2 speaker and not to a non-native L2 speaker (as in Hwang et al., 2015). This result occurs because the L2 learner wants to affiliate with native speakers, who (1) are inside the speech community that speaks the L2, and (2) are in a group that the L2 learner is on the outside of. The L2 learner often desires to sound native-like due to social pressures, and thus accommodates to the native speaker. This is true for B-Ithaca, who live in a monolingual speech community and thus, must feel these social pressures. Contrastingly, B-Miami live in a bilingual speech community and consequently feel these social pressures much less.

Regarding language change in Miami, previous research has shown that Spanish-influenced English is spoken by English monolinguals in Miami (Enzinna, 2015, 2016). This is especially true for English monolinguals with English monolingual parents, not Spanish-speaking parents. Thus, Miami English monolinguals, especially those with English monolingual parents, have adjusted their speech in order to affiliate with the bilingual speech community. Socially-motivated accommodation by M-Miami, as shown in this study, has likely initiated this language change.

As the demographics of the U.S. begin to change, the U.S. may look and sound more like Miami. According to a study by the U.S. Census, "By 2044, more than half of all Americans are projected to belong to a minority group (any group other than non-Hispanic White alone); and by 2060, nearly one in five of the nation's total population is projected to be foreign born" (Colby & Ortman, 2015, p. 1). Regarding language, this demographic shift could mean that more Americans will be bilingual. In speech communities like Miami, speakers who are outsiders in their speech community may begin to speak more like the majority over time. This research gives us insight into why.

6.3 Further issues to address

There are three issues that have not yet been addressed. First, unlike other accommodation studies, participants do not accommodate for reasons related to similarity affiliation.[1] This finding is in contrast to the results found in Kim, Horton, & Bradlow, 2011, for example. In this study, native-English and native-Korean speaking participants interacted with speakers who (1) share the same native language and regional dialect, (2) share the same native language but have different regional dialects, and (3) have different native languages. The results showed that participants converged the most with speakers who shared both the same native language and regional dialect as themselves. Thus, this study provides evidence of similarity affiliation effects.

Contrastingly, in this dissertation research, a speech community outsider affiliation effect was found. This is different to Kim et al., 2011, but it is similar to Hwang et al., 2015. In Hwang et al., 2015, the participants were Korean non-native speakers of English and students from Stony Brook University. Stony Brook University is located in Stony Brook, NY, which is approximately 82% white (U.S. Census Bureau, 2016), and thus, most likely a majority English monolingual community. The model talkers were an English monolingual and a Korean-English bilingual. Their results showed that the participants converged

[1]The only exceptions are Miami groups who interacted with the bilingual model talker first. These participant groups produced shorter VOT_{norm} when interacting when the monolingual model talker afterward.

with the monolingual model talker. Contrastingly, they did not converge with the Korean-English bilingual model talker. Thus, the participants in Hwang et al., 2015 were speech community outsiders who accommodated to the model talker who represents their speech community—a speech community outsider effect.

There are several possible reasons for why the results in this dissertation are different from Kim et al., 2011, but similar to Hwang et al., 2015, specifically when discussing why the bilingual participants did not accommodate to the bilingual model talker. First, the results in this dissertation may differ from Kim et al., 2011 because the bilingual model talker's Spanish variety is not a common variety (i.e., regional dialect) in either Ithaca or Miami. Specifically, the bilingual model talker is from Mexico City, Mexico, and there is not a large Mexican population in either Miami or Ithaca. In other words, the bilingual model talker's speech may not have been similar enough to trigger a similarity affiliation effect for the bilingual participants. Second, Hwang et al. (2015) argue that their findings differ from those in Kim et al., 2011 because the Korean bilingual model talker has heavily-accented English speech, which may reinforce their native bias. The same argument may be true for the present dissertation research, as the bilingual model talker also has heavily accented English. Thus, these reasons may explain why we do not see a similarity affiliation effect for bilinguals who are interacting with the bilingual model talker.

However, these arguments do not explain why the monolingual participants did not accommodate to the monolingual model talker. This is particularly true for the English monolinguals from Ithaca, because the monolingual model talker had lived in Ithaca for many years and spoke an English variety common to Ithaca. Additionally, these arguments do not explain why the priming results in this dissertation differ from those in Hwang et al., 2015. Specifically, the results in this dissertation show the Ithaca participants groups (B-Ithaca, M-Ithaca) converging with the bilingual model talker when primed, indicating a novelty effect. Contrastingly, in Hwang et al., 2015, the bilingual participants converged with the monolingual model talker when primed (and also in pragmatic conditions), which is not a novelty effect. One possible reason for these discrepancies is the difference in experimental designs. In Kim et al., 2011, and in Hwang et al., 2015, the model talkers interact with the participants face-to-face; in this study, participants interact with recordings of the model talkers. It may be the case that accommodation effects in interactions with a model talker in-person differ from those in interactions with a model talker's recorded voice. This is a possible area for future exploration.

Second, the participant group that accommodates to the model talkers the least is B-Miami. This finding makes sense given the automatic and social effects that were found in the results. For example, a speech community outsider affiliation effect was found. B-Miami is not in a speech community outsider relationship with either model talker, so B-Miami does not accommodate to the model talkers for this reason. Also, in the results, priming influenced accommodation when the model talker's speech was novel to a participant group (e.g., accommodation increased for both Ithaca groups when primed by the bilingual model talker). However, B-Miami is not truly in a novelty relationship with either model talker. In Miami, B-Miami has frequent exposure to bilingual speech in their speech community, as well as frequent exposure to monolingual English through national media. Thus, unlike other participant groups, B-Miami is neither in a novelty relationship, nor in a speech community outsider relationship, with either model talker; consequently, they did not pattern similar to other groups.

Additionally, B-Miami did not accommodate for reasons related to similarity affiliation. This may be due to the bilingual model talker's Spanish variety being different than that of the majority bilingual population in Miami. As mentioned above, the bilingual model talker is from Mexico City, Mexico, while the largest Spanish-speaking population in Miami is of Cuban heritage. For this reason, B-Miami and the bilingual model talker may not have been similar enough to trigger a similarity affiliation effect. The only hypothesized[2] effect that influences B-Miami is a recency effect. For these reasons, B-Miami only accommodates briefly in Block 2.

Third, when examining accommodation by stop, accommodation occurs more with /k/ than other stops, especially for B-Ithaca. This result is somewhat unexpected because Spanish and English /k/ VOT ranges overlap (as described in Section 1.4.2). Spanish /k/ has a mean VOT of 29 ms with a range of 15-55 ms, and English /k/ has a mean VOT of 80 ms with a range of 30-150 ms (Lisker & Abramson, 1964). In González López, 2012, bilingual participants produced L2 /k/ VOTs within the overlapping range (30-55 ms). Thus, it may be expected that bilingual participant groups in the present study would also produce /k/ VOTs within the overlapping range. However, B-Ithaca not only produced VOTs that exceeded this range, but also produced the longest VOTs of all participant groups. I offer three explanations for this finding below.

First, /k/ VOT may have been accommodated to the most because

[2]Both bilingual groups were influenced by native-bias as well, as discussed in Chapter 4.

convergence to longer VOTs is more likely than accommodation to shorter VOTs (Nielsen, 2011). As explained in Section 1.4.2, shortening VOTs may reduce essential phonemic contrasts and increase semantic ambiguity, while lengthening VOTs would not affect phonemic contrasts. For these reasons, accommodating to longer VOTs may be easier than accommodating to shorter VOTs. Because /k/ VOTs are the longest of all stops, it may be the case that accommodating to longer /k/ VOTs is the easiest of all stops.

Second, B-Ithaca's /k/ VOTs may be the longest of all participant groups for reasons related to polarization. According to Keating (1984), cross-linguistic differences in VOT for the three stop categories (voiced, voiceless unaspirated, voiceless aspirated) occurs in order to enhance phonemic contrasts between the stops in a particular language. Flege and Eefting (1987) argue that polarization may also influence bilingual VOTs. In their study, early Spanish-English bilinguals had shorter VOTs in their L1 (Spanish) than monolingual Spanish speakers. They argue that this occurred due to polarization: "If universal principles affect the speech of individuals, . . . [bilingual participants] may have realized /p, t, k/ in Spanish in such a way as to enhance the acoustic difference between the short-lag categories used to implement /p, t, k/ in Spanish and the long-lag categories used to implement /p, t, k/ in English" (p. 80). In other words, their L1-Spanish short-lag VOTs were shortened in order to "polarize" away from the long-lag VOTs in their L2-English.

A similar polarization effect may explain B-Ithaca's results for /k/. B-Ithaca's VOT in English is longer than the monolingual English groups (M-Miami, M-Ithaca), which may be because B-Ithaca's long-lag English stops are polarizing away from their short-lag Spanish stops. This polarization effect may be the most extreme for /k/ because short-lag /k/ VOT in Spanish is higher in range (up to 55 ms) and overlaps with English /k/ VOT (Lisker & Abramson, 1964). Additionally, (despite Flege & Eefting's (1987) findings) bilingual speakers' L1 VOTs are often influenced by their L2 (see Section 1.4.2; Yavaş & Byers, 2014). Thus, B-Ithaca's Spanish /k/ VOTs may be long due to L2 interference. In order to polarize away from these lengthy Spanish VOTs, B-Ithaca's would need to lengthen their English VOTs considerably. This polarization effect may influence B-Ithaca (and importantly, not B-Miami) because of B-Ithaca's speech community outsider relationship with English. Also, B-Ithaca receives more monolingual English input than B-Miami. Thus, B-Ithaca's /k/ VOT may converge with monolingual English more than other participant groups for reasons related to polarization.

Third, /k/ VOT may be influenced by palatalization/affrication. According to Johnson, 2012, /k/ often becomes /tʃ/ after front vowels (particularly after /i/, but also /e/ and /æ/). In order to examine whether /k/-affrication influenced VOTs, all /k/ VOT_{norm} were compared by vowel. As shown in Figure 6.6, B-Ithaca's (and other participant groups) /k/ VOT_{norm} is greater after /i/ (IY1) than after other vowels. (Vowels are transcribed using ARPAbet transcription.) This result is strongest when B-Ithaca is interacting with the monolingual model talker, suggesting that B-Ithaca may be using palatalization of /k/ as a technique to accommodate to the monolingual model talker.

Figure 6.6: /k/ VOT$_{norm}$ is greater after /i/ (IY1) with the monolingual model talker, suggesting /k/-affrication may have occurred.

However, regardless of whether /k/ is being palatalized, it should be noted that B-Ithaca's VOT$_{norm}$ are greater than other participant groups for all vowels. This is illustrated in Figure 6.7. Thus, /k/-affrication may play some role in /k/ being accommodated more than other stops, but it is not the only influencing factor and should be addressed further in future studies.

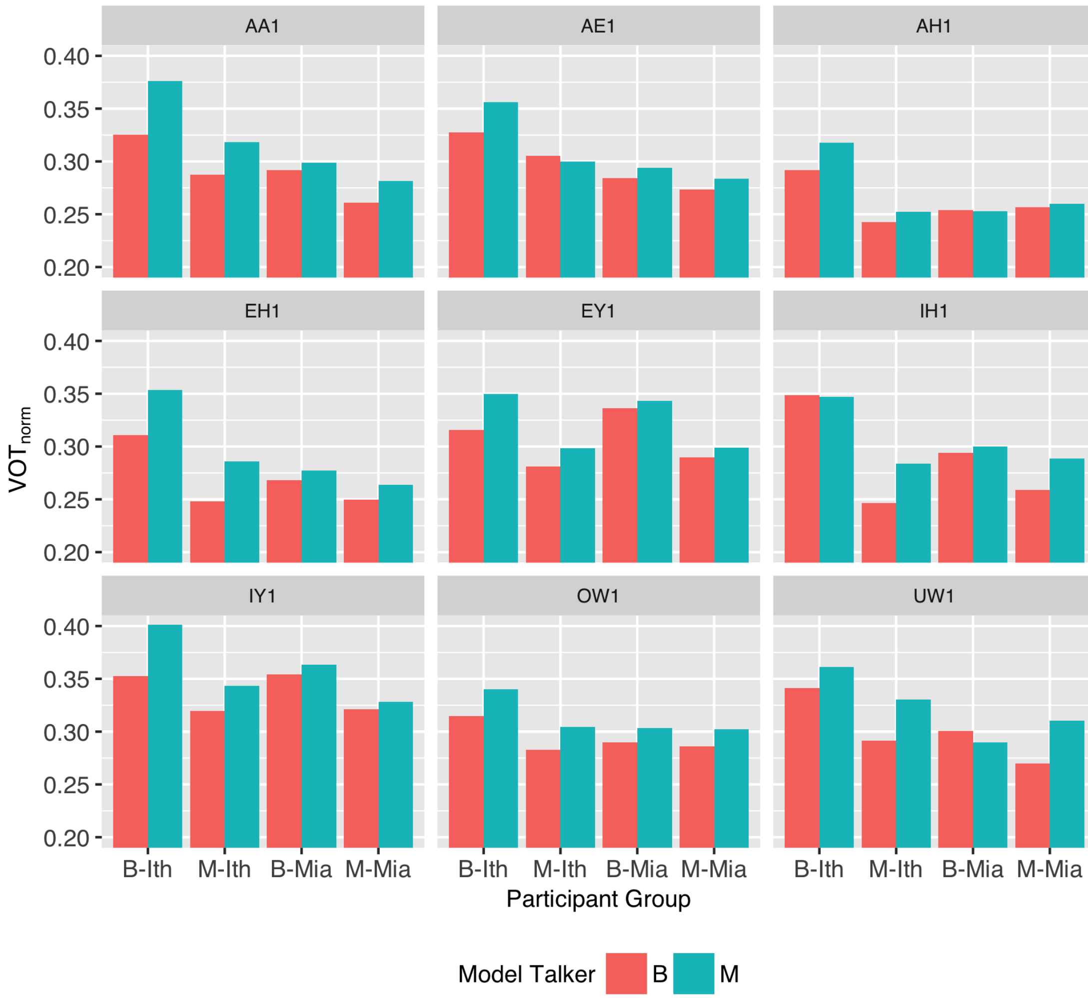


Figure 6.7: B-Ithaca's VOT_{norm} is greater than other participant groups, regardless of the preceding vowel.

6.4 Future implications

In this dissertation, a novel approach to accommodation was implemented by examining the time-course of accommodation within a short-term interaction. Specifically, I examined how participants' VOT_{norm} varied at four different points (i.e., blocks) within a short-term interaction, as well as the influence of a variety of different automatic and social factors on that variation. Using this novel approach provided insight into the mechanisms underlying accommodation, and ultimately language change—in particular, that socially-motivated accommodation is persistent and, thus, more likely to lead to long-term accommodation. In previous accommodation studies, where the time-course of accommodation is not examined, the important differences in automatic and social accommodation effects, and their time-course, are unknown. Thus, in future studies, more research into the time-course of accommodation must be conducted—examining additional linguistic and social variables; different, diverse speech communities; and more.

Further, this research on the time-course of accommodation provides us with insight into how long an interaction must be before social accommodation might be found. If all participants accommodate to all recent model talkers within the first two blocks of an interaction (approximately 15 minutes in duration), then it will be approximately 15 minutes before automatic effects become transient and social affiliation effects begin to emerge. Because the present research experiment took an hour to complete—approximately 25-30 minutes with each model talker—future accommodation studies must be designed to allow for at least 30 minutes per model talker to guarantee both automatic and social effects are found. If this dissertation study were designed to allow for only 15 minutes of interaction with each model talker, social accommodation effects may not have been found. Furthermore, previous research that only found automatic effects, not social effects, may have been influenced by how long participants interacted with a model talker. Thus, more research into the time-course of accommodation should be conducted, with experiments being long enough to examine both automatic and social effects.

APPENDIX A

INSTRUCTIONS

Provided below are images of the instructions that participants received, which were displayed on a computer screen through the BARCoT program.

On your screen, you will see a board filled with white squares and colored squares.
The colored squares will appear in pairs, with two squares of the same color occurring next to each other. These square pairs will be filled with words.

An example screen is shown below.

		fubby			
macey		north			
might			morph	sibby	meeb
					about
		died		seg	noisy
		chab			

BACK NEXT

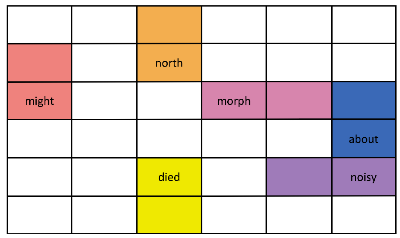
In this study, there are two roles: the role of the Helper and the Matcher.
You have been assigned the role of the Helper.

You will complete a task with the Matcher.
The Matcher will speak to you over the headset.

BACK NEXT

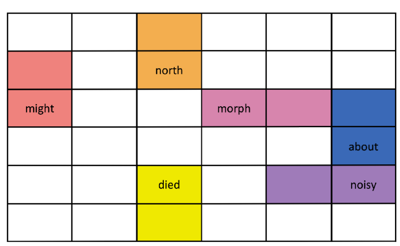
The Matcher's screen looks like the one below.

Some of the Matcher's colored squares are blank.



BACK NEXT

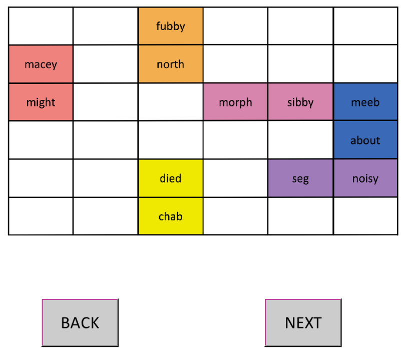
Your goal is to help the Matcher fill the blank colored squares with the corresponding words on your screen. To do this, the Matcher is going to ask you what words appear on your screen.



BACK NEXT

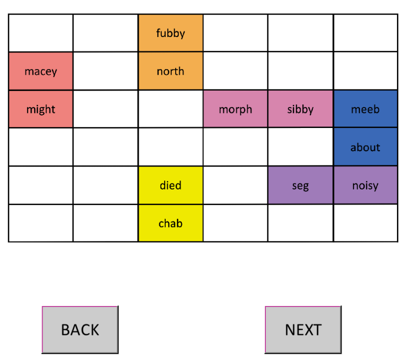
For example, if your screen were the one below, you would hear the Matcher ask,
"What is by the word NORTH?"

Nearby NORTH is the word FUBBY so you would respond by saying,
"FUBBY is by the word NORTH."



Note that NORTH and FUBBY are in squares of the same color. This means that these words are paired.

The Matcher will always ask you for a word by referencing the other word in a pair. This means you should respond with the word that shares the same color square as the one referenced.



Some of the words on the board are real words, and some are not. If you don't know how to say a word, don't worry. Just say it however feels natural to you.

		fubby			
macey		north			
might			morph	sibby	meeb
					about
		died		seg	noisy
		chab			

BACK NEXT

Once you click on the correct square, the Matcher will ask you about another word on the board.

After the Matcher has matched all of the missing words on the board, a new board will begin.

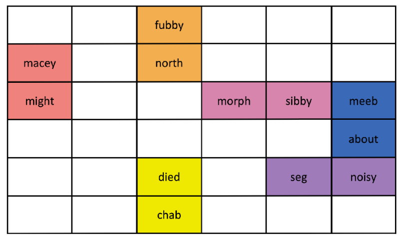
		fubby			
macey		north			
might			morph	sibby	meeb
					about
		died		seg	noisy
		chab			

BACK NEXT

If you accidentally click on the wrong square, the board will flash red three times.
If this happens, click on the correct square to move on to the next word.

If you accidentally said the wrong word, please repeat the phrase with the correct word (e.g., "FUBBY is by the word NORTH") before clicking.

If you would like the Matcher to repeat what they just said, right click anywhere on the screen.



BACK NEXT

To practice this, you will first complete 3 practice boards. The Matcher for the practice boards is the experimenter, so you will hear her voice over the headset.

Then you will complete 72 boards with 2 different Matchers (36 boards per Matcher).

BACK NEXT

When you are ready, click the NEXT button to begin the practice boards.

Note: The board may take a few seconds to load. Please be patient.

BACK NEXT

APPENDIX B

LANGUAGE BACKGROUND QUESTIONNAIRE

About you

1. Participant ID#:
2. Gender:
3. Age:
4. Were you born in the USA?

   Yes No
5. If you were not born in the USA, where were you born?
6. If you were not born in the USA, at what age did you move to the USA?
7. If you were born in the USA, What state were you born in?
8. What city and state do you currently reside in?
9. At what age did you begin living in your current city?
10. List the other areas that you have lived for significant periods (more than a year) of your life, along with the age(s) you were when you lived there. Example: North Miami (birth-10), Chicago (10-now).
11. What is your heritage background? Example: Cuban, Italian, German, American, etc.
12. Occupation:
13. Are you a student?

    Yes No

14. What is your highest level of education?

    High school or equivalent

    2-year college

    4-year university

    Graduate school

15. Have you undergone speech or language therapy?

    Yes No

16. Have you ever been treated for a hearing problem?

    Yes No

17. Have you ever been treated for a vision problem?

    Yes No

Language

18. What is your first language? (Your first language is the first language you learned at home.)

    English

    Spanish

    English and Spanish

    Other:

19. At what age did you begin speaking **English**? (If English is your first language, write '0'.)

20. How well can you speak **English**?

    1 = Only know basic words and expressions

    2 = Can hold simple conversations

3 = Can hold extended conversations

4 = Can hold any kind of conversation

21. At what age did you begin speaking **Spanish**? (If Spanish is your first language, write ‘0’. If you don’t speak Spanish, write ‘NA’.)

22. How well can you speak **Spanish**?

    1 = Don’t know any Spanish

    2 = Only know basic words and expressions

    3 = Can hold simple conversations

    4 = Can hold extended conversations

    5 = Can hold any kind of conversation

23. Do you speak any **other languages**?

    Yes No

24. If yes, what **other languages** do you speak?

25. When did you begin speaking those **other languages**?

26. Which language did you primarily speak **as a child** with **friends**?

    Mostly English

    Mostly Spanish

    English and Spanish equally

    Other:

27. Which language did you primarily speak **as a child** with **family**?

    Mostly English

    Mostly Spanish

    English and Spanish equally

    Other:

28. Which language did you primarily speak **as a child** with **teachers**?

Mostly English

Mostly Spanish

English and Spanish equally

Other:

29. Which language did you primarily speak **as a teenager** with **friends**?

Mostly English

Mostly Spanish

English and Spanish equally

Other:

30. Which language did you primarily speak **as a teenager** with **family**?

Mostly English

Mostly Spanish

English and Spanish equally

Other:

31. Which language did you primarily speak **as a teenager** with **teachers**?

Mostly English

Mostly Spanish

English and Spanish equally

Other:

32. Which language did you primarily speak **as a teenager** with **coworkers**?

Mostly English

Mostly Spanish

English and Spanish equally

Not applicable

Other:

33. Which language do you primarily speak **now** with **friends**?

    Mostly English

    Mostly Spanish

    English and Spanish equally

    Other:

34. Which language do you primarily speak **now** with **family**?

    Mostly English

    Mostly Spanish

    English and Spanish equally

    Other:

35. Which language do you primarily speak **now** with **teachers**?

    Mostly English

    Mostly Spanish

    English and Spanish equally

    Not applicable

    Other:

36. Which language do you primarily speak **now** with **coworkers**?

    Mostly English

    Mostly Spanish

    English and Spanish equally

    Not applicable

    Other:

37. Which language does/did your **mother** primarily speak with you?

    Mostly English

    Mostly Spanish

    English and Spanish equally

Not applicable

Other:

38. Which language does/did your **father** primarily speak with you?

    Mostly English

    Mostly Spanish

    English and Spanish equally

    Not applicable

    Other:

39. Which language do/did you primarily speak with your **mother**?

    Mostly English

    Mostly Spanish

    English and Spanish equally

    Not applicable

    Other:

40. Which language do/did you primarily speak with your **father**?

    Mostly English

    Mostly Spanish

    English and Spanish equally

    Not applicable

    Other:

41. What was your **mother**'s first language?

    Mostly English

    Mostly Spanish

    English and Spanish equally

    Not applicable

    Other:

42. What other language(s) does your **mother** speak, if any?

43. What was your **father**'s first language?

    Mostly English

    Mostly Spanish

    English and Spanish equally

    Not applicable

    Other:

44. What other language(s) does your **father** speak, if any?

45. If your family is Hispanic/Latinx, who was the first person to move to the USA? For example, your grandmother, mother, you, etc. Note: If your grandmother and mother moved to the U.S. at the same time, list your grandmother.

Language attitudes

Note: In the following 4 questions, you will be asked how important English/Spanish is to you in different situations. What we mean by "important" here is how necessary it is for you to know English/Spanish in those contexts, either because it is a requirement or because it can be helpful socially, professionally, etc.

46. In your **professional life**, how important is it to you to know **English**?

    Extremely important

    Very important

    Moderately important

    Slightly important

    Not at all important

47. In your **professional life**, how important is it to you to know **Spanish**?

    Extremely important

    Very important

    Moderately important

    Slightly important

    Not at all important

48. In your **personal life**, how important is it to you to know **English**?

    Extremely important

    Very important

    Moderately important

    Slightly important

    Not at all important

49. In your **personal life**, how important is it to you to know **Spanish**?

    Extremely important

    Very important

    Moderately important

    Slightly important

    Not at all important

50. Do you think people judge your **English** in a positive or negative way?

    Positive

    Negative

    Neither/Neutral

51. Do you think people judge your **Spanish** in a positive or negative way?

    Positive

    Negative

    Neither/Neutral

Not applicable

52. Do you feel comfortable speaking **English** with someone who speaks **only English**?

    Definitely yes

    Probably yes

    Might or might not

    Probably not

    Definitely not

53. Do you feel comfortable speaking **Spanish** with someone who speaks **only Spanish**?

    Definitely yes

    Probably yes

    Might or might not

    Probably not

    Definitely not

54. Do you feel comfortable speaking **English** with someone who speaks **both English and Spanish**?

    Definitely yes

    Probably yes

    Might or might not

    Probably not

    Definitely not

55. Do you feel comfortable speaking **Spanish** with someone who speaks **both English and Spanish**?

    Definitely yes

    Probably yes

Might or might not

Probably not

Definitely not

56. Do you adjust your **English** when speaking with someone who speaks **only English**? If so, how?

57. Do you adjust your **English** when speaking with someone who speaks **both English and Spanish**? If so, how?

58. Do you think of yourself more as an English speaker, a Spanish speaker, or a bilingual?

    English speaker

    Spanish speaker

    Bilingual

APPENDIX C

MAIN EFFECTS

C.1 Stops

Table C.1: VOT_{norm} mean and standard deviation for each stop

Stop	VOT_{norm} Mean	(SD)
/p/	0.250	(0.091)
/t/	0.289	(0.085)
/k/	0.302	(0.090)

Table C.2: Post-hoc Tukey test results: VOT_{norm} is significantly shorter for /p/, compared to /t/ and /k/. There is no difference between /t/ and /k/.

contrast	estimate	SE	df	z.ratio	p.value
p - t	-0.039	0.007	Inf	-5.312	.0001
k - p	0.052	0.007	Inf	7.106	<.0001
k - t	0.013	0.007	Inf	1.795	0.171

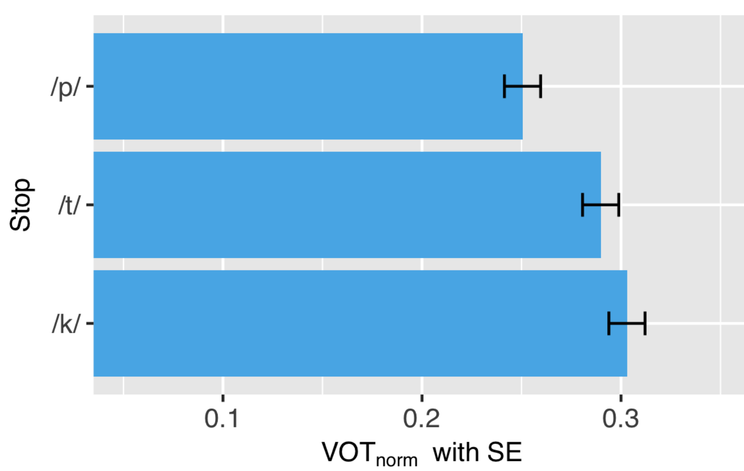


Figure C.1: Mean VOT_{norm} by Stop

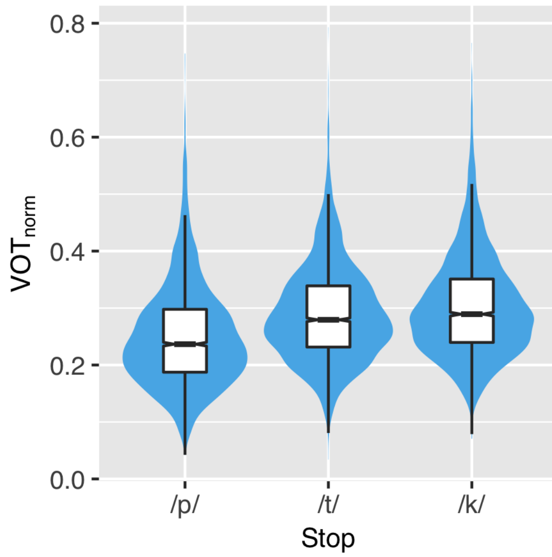


Figure C.2: VOT_{norm} by Stop

C.2 Linguistic Background

Overall VOT_{norm}

Table C.3: VOT_{norm} mean and standard deviation for each linguistic background

Linguistic Background	VOT_{norm} Mean	(SD)
Bilingual	0.294	(0.103)
Monolingual	0.267	(0.076)

Table C.4: Post-hoc Tukey test results: Monolingual participants' VOT_{norm} are near-significantly shorter than bilingual participants' VOT_{norm}.

contrast	estimate	SE	df	z.ratio	p.value
Bilingual - Monolingual	0.027	0.015	Inf	1.853	0.063

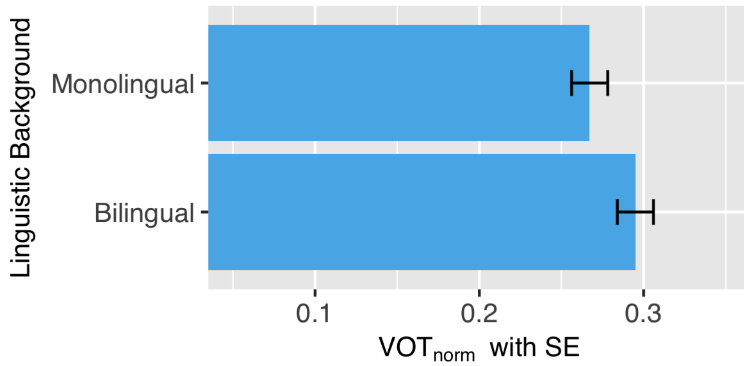


Figure C.3: Mean VOT_{norm} by Linguistic Background

Figure C.4: VOT_{norm} by Linguistic Background

VOT$_{norm}$ by Stop

Table C.5: VOT$_{norm}$ mean and standard deviation for each linguistic background and stop

Linguistic Background	Stop	VOT$_{norm}$ Mean	(SD)
Bilingual	/p/	0.265	(0.104)
Monolingual	/p/	0.235	(0.073)
Bilingual	/t/	0.299	(0.097)
Monolingual	/t/	0.280	(0.071)
Bilingual	/k/	0.319	(0.100)
Monolingual	/k/	0.286	(0.074)

Table C.6: Post-hoc Tukey test results: For stops /p/ and /k/, monolingual participants' VOT$_{norm}$ are significantly shorter than bilingual participants' VOT$_{norm}$.

	contrast	estimate	SE	df	z.ratio	p.value
Stop = /p/:	Bilingual - Monolingual	0.030	0.015	Inf	1.989	0.046
Stop = /t/:	Bilingual - Monolingual	0.019	0.015	Inf	1.285	0.198
Stop = /k/:	Bilingual - Monolingual	0.033	0.015	Inf	2.234	0.025

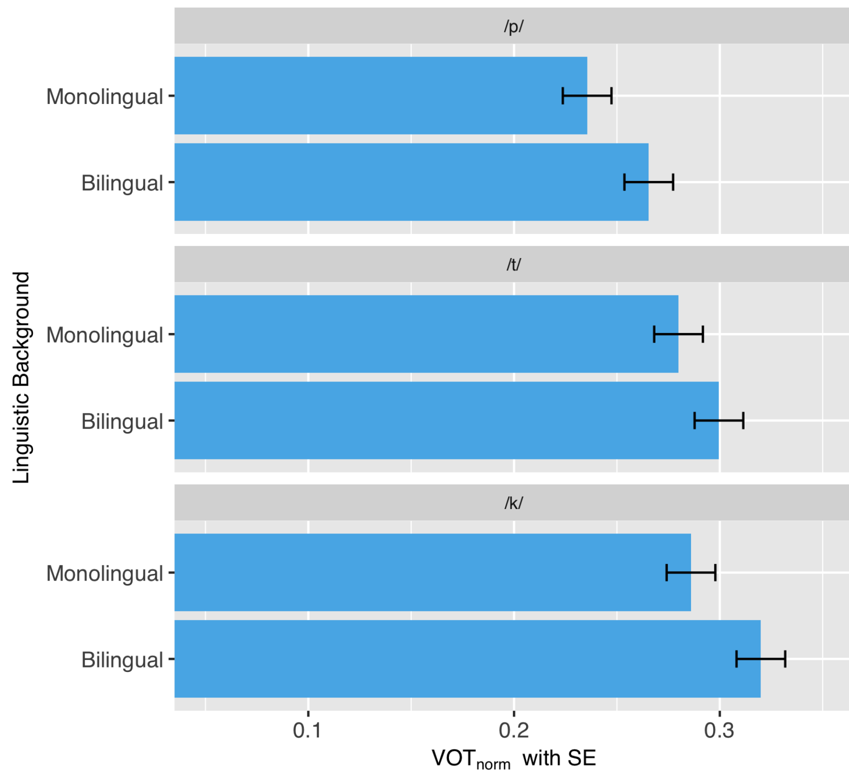


Figure C.5: Mean VOT_{norm} by Linguistic Background and Stop

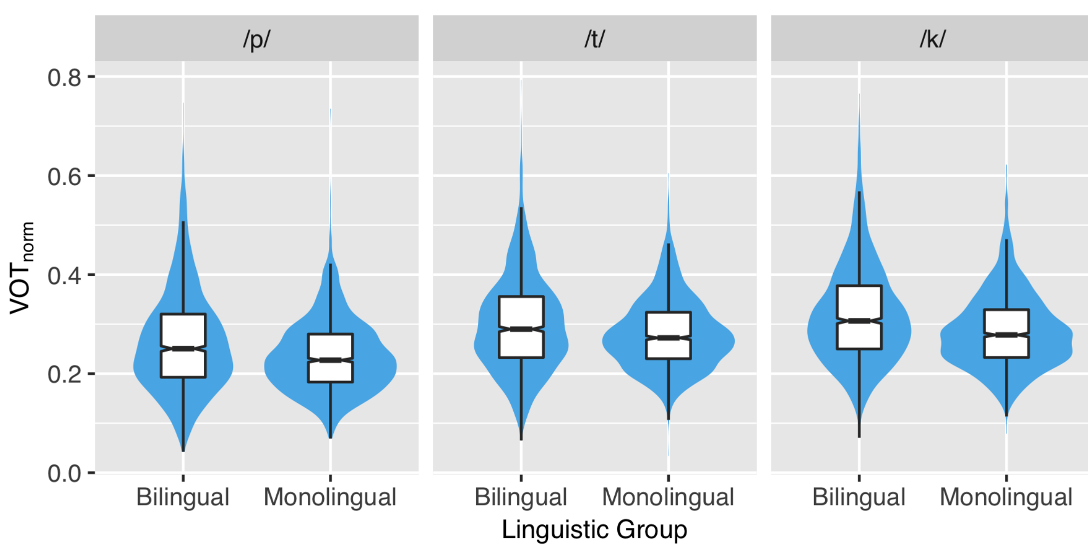


Figure C.6: VOT_{norm} by Linguistic Background and Stop

C.3 Speech Community

Overall VOT_{norm}

Table C.7: VOT_{norm} mean and standard deviation for each speech community

Speech Community	VOT_{norm} Mean	(SD)
Ithaca	0.287	(0.097)
Monolingual	0.274	(0.085)

Table C.8: Post-hoc Tukey test results: There were no significant differences between Ithaca participants' VOT_{norm} and Miami participants' VOT_{norm}.

contrast	estimate	SE	df	z.ratio	p.value
Ithaca - Miami	0.013	0.015	Inf	0.93	0.352

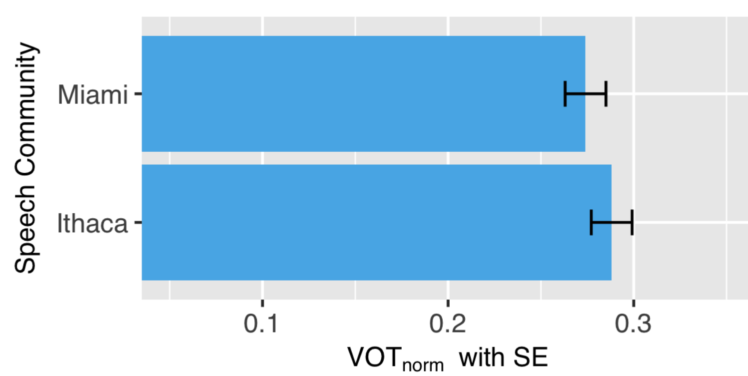


Figure C.7: Mean VOT_{norm} by Speech Community

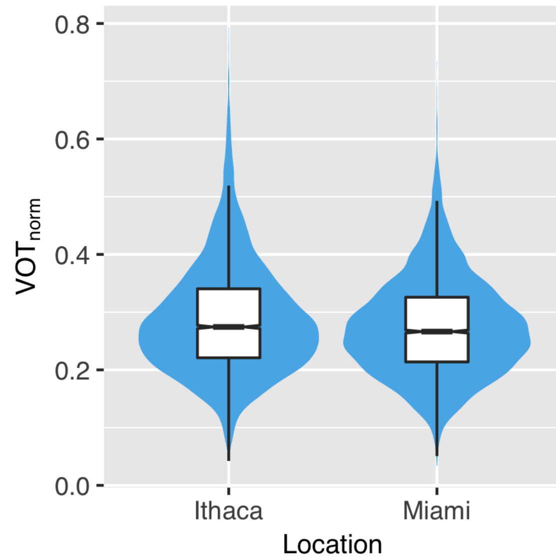


Figure C.8: VOT_{norm} by Speech Community

VOT_{norm} by Stop

Table C.9: VOT_{norm} mean and standard deviation for each speech community and stop

Speech Community	Stop	VOT_{norm} Mean	(SD)
Ithaca	/p/	0.257	(0.097)
Miami	/p/	0.242	(0.084)
Ithaca	/t/	0.290	(0.089)
Miami	/t/	0.288	(0.081)
Ithaca	/k/	0.315	(0.095)
Miami	/k/	0.290	(0.082)

Table C.10: Post-hoc Tukey test results: There were no significant differences between Ithaca participants' VOT_{norm} and Miami participants' VOT_{norm} for all stops.

	contrast	estimate	SE	df	z.ratio	p.value
Stop = /p/:	Ithaca - Miami	0.014	0.015	Inf	0.990	0.322
Stop = /t/:	Ithaca - Miami	0.001	0.015	Inf	0.111	0.9118
Stop = /k/:	Ithaca - Miami	0.025	0.015	Inf	1.665	0.0959

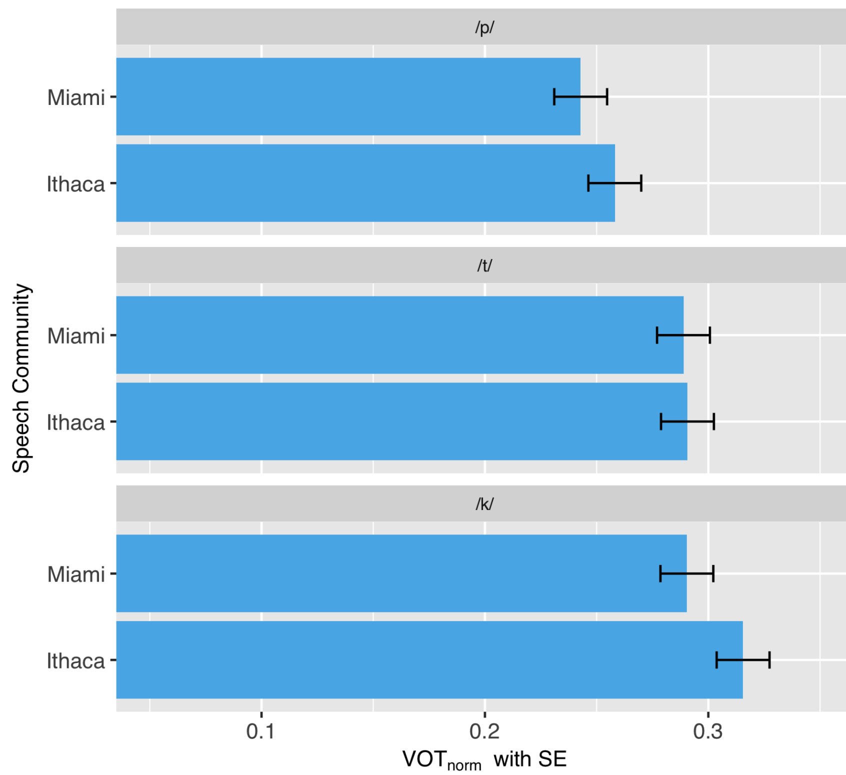


Figure C.9: Mean VOT_{norm} by Speech Community and Stop

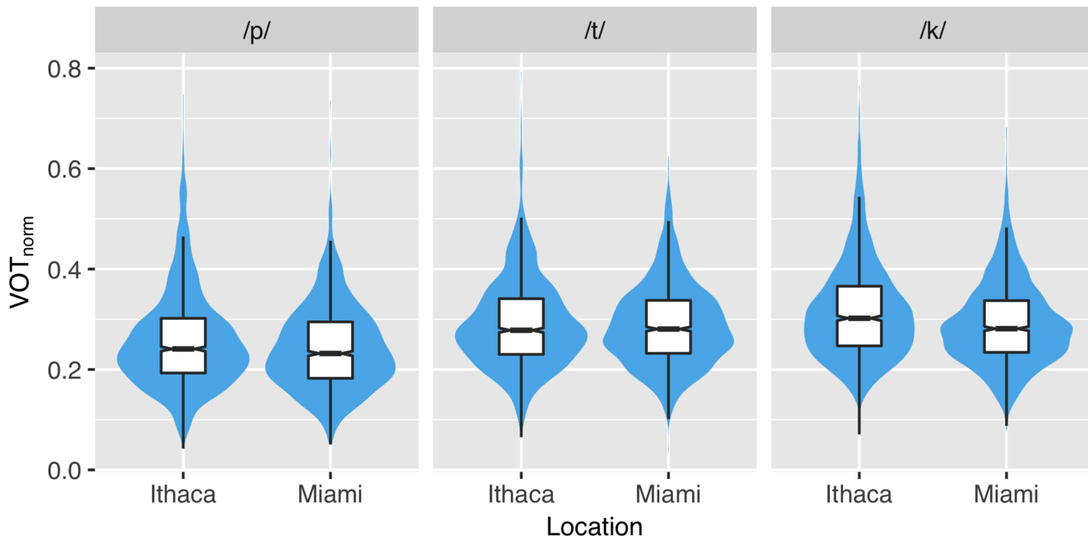


Figure C.10: $\mathrm{VOT}_{\mathrm{norm}}$ by Speech Community and Stop

C.4 Speech Community * Linguistic Background (Participant Group)

Overall $\mathrm{VOT}_{\mathrm{norm}}$

Table C.11: $\mathrm{VOT}_{\mathrm{norm}}$ mean and standard deviation for each participant group (speech community * linguistic background)

Participant Group	$\mathrm{VOT}_{\mathrm{norm}}$ Mean	(SD)
B-Ithaca	0.305	(0.111)
M-Ithaca	0.270	(0.075)
B-Miami	0.284	(0.092)
M-Miami	0.264	(0.077)

Table C.12: Post-hoc Tukey test results: There were no significant differences between participant groups' overall VOT_{norm}.

contrast	estimate	SE	df	z.ratio	p.value
B-Ithaca - B-Miami	0.0217	0.021	Inf	1.027	0.733
B-Ithaca - M-Ithaca	0.035	0.021	Inf	1.679	0.334
B-Ithaca - M-Miami	0.041	0.021	Inf	1.968	0.200
B-Miami - M-Ithaca	0.013	0.021	Inf	0.652	0.914
B-Miami - M-Miami	0.019	0.021	Inf	0.941	0.782
M-Ithaca - M-Miami	0.006	0.021	Inf	0.289	0.991

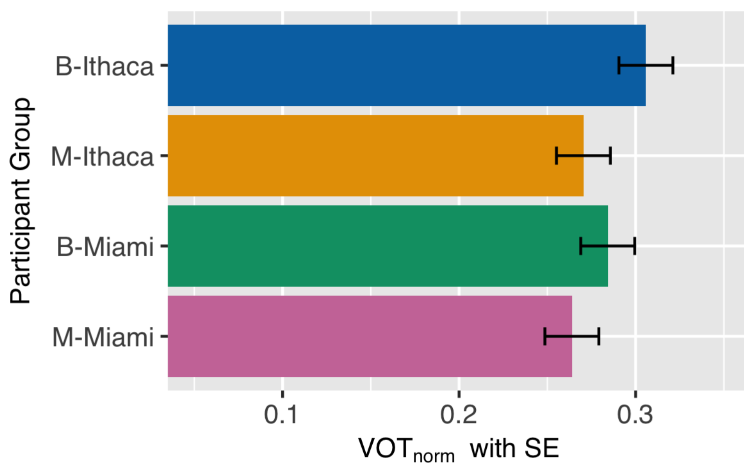


Figure C.11: Mean VOT_{norm} by Participant Group

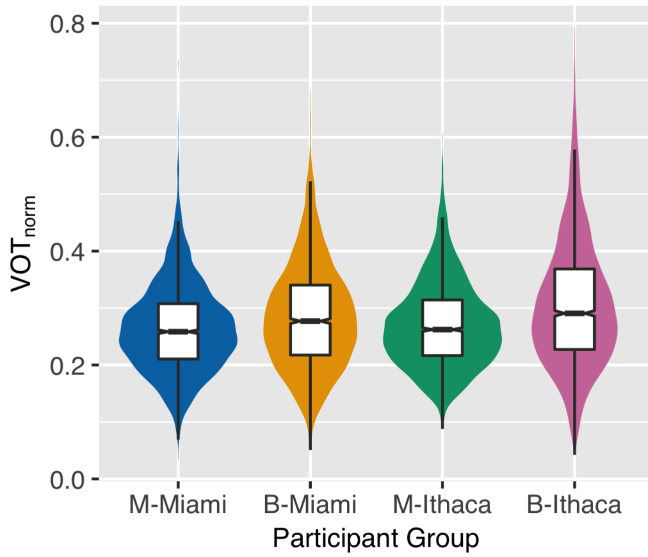


Figure C.12: VOT_{norm} by Participant Group

VOT_{norm} by Stop

Table C.13: VOT_{norm} mean and standard deviation for each participant group and stop

Participant Group	Stop	VOT_{norm} Mean	(SD)
B-Ithaca	/p/	0.272	(0.114)
M-Ithaca	/p/	0.242	(0.072)
B-Miami	/p/	0.257	(0.092)
M-Miami	/p/	0.228	(0.072)
B-Ithaca	/t/	0.303	(0.104)
M-Ithaca	/t/	0.278	(0.068)
B-Miami	/t/	0.295	(0.088)
M-Miami	/t/	0.281	(0.073)
B-Ithaca	/k/	0.340	(0.105)
M-Ithaca	/k/	0.290	(0.076)
B-Miami	/k/	0.298	(0.089)
M-Miami	/k/	0.282	(0.073)

Table C.14: Post-hoc Tukey test results: B-Ithaca's /k/ VOT_{norm} is significantly longer than M-Miami's VOT_{norm}. There are no other significant differences by participant group and stop.

	contrast	estimate	SE	df	z.ratio	p.value
Stop = /p/:	B-Ithaca - B-Miami	0.015	0.021	Inf	0.733	0.883
Stop = /p/:	B-Ithaca - M-Ithaca	0.030	0.021	Inf	1.440	0.474
Stop = /p/:	B-Ithaca - M-Miami	0.0451	0.021	Inf	2.107	0.150
Stop = /p/:	B-Miami - M-Ithaca	0.0151	0.021	Inf	0.706	0.894
Stop = /p/:	B-Miami - M-Miami	0.029	0.021	Inf	1.373	0.516
Stop = /p/:	M-Ithaca - M-Miami	0.014	0.021	Inf	0.667	0.909
Stop = /t/:	B-Ithaca - B-Miami	0.007	0.021	Inf	0.343	0.9861
Stop = /t/:	B-Ithaca - M-Ithaca	0.025	0.021	Inf	1.173	0.643
Stop = /t/:	B-Ithaca - M-Miami	0.021	0.021	Inf	0.987	0.757
Stop = /t/:	B-Miami - M-Ithaca	0.017	0.021	Inf	0.830	0.840
Stop = /t/:	B-Miami - M-Miami	0.013	0.021	Inf	0.644	0.917
Stop = /t/:	M-Ithaca - M-Miami	-0.003	0.021	Inf	-0.186	0.997
Stop = /k/:	B-Ithaca - B-Miami	0.042	0.021	Inf	1.976	0.1971
Stop = /k/:	B-Ithaca - M-Ithaca	0.050	0.021	Inf	2.378	0.0812
Stop = /k/:	B-Ithaca - M-Miami	0.059	0.021	Inf	2.757	0.0297
Stop = /k/:	B-Miami - M-Ithaca	0.008	0.021	Inf	0.403	0.9779
Stop = /k/:	B-Miami - M-Miami	0.016	0.021	Inf	0.781	0.8630
Stop = /k/:	M-Ithaca - M-Miami	0.008	0.021	Inf	0.379	0.9815

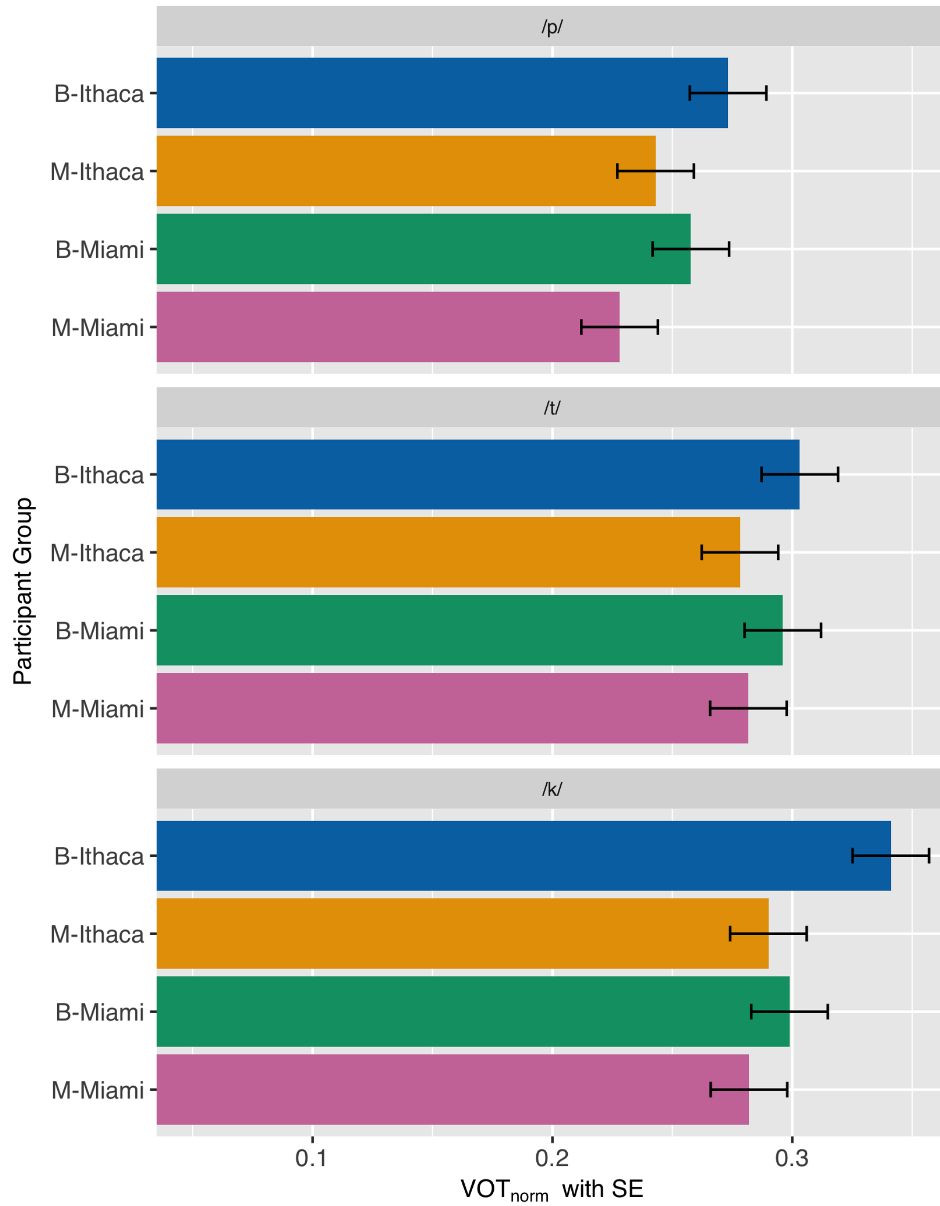


Figure C.13: Mean VOT_{norm} by Participant Group

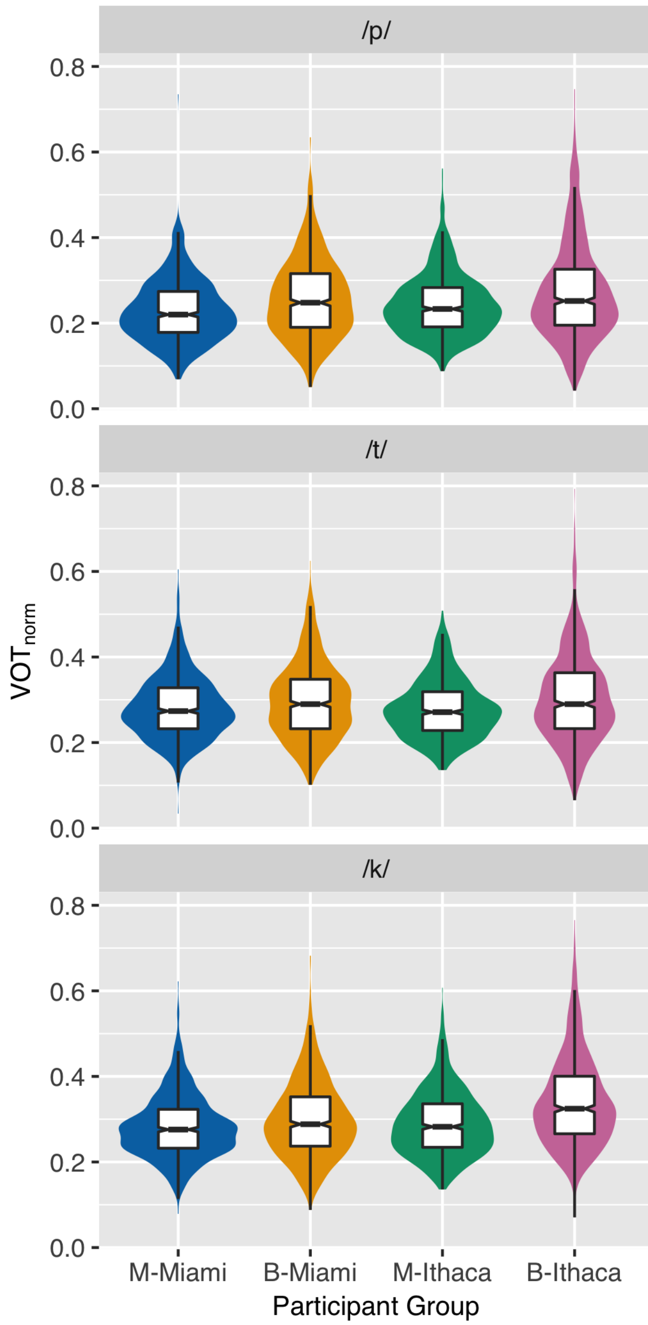


Figure C.14: VOT$_{norm}$ by Participant Group and Stop

APPENDIX D

EXPERIMENTS 1 AND 2: POST-HOC TUKEY TEST RESULTS AND VOT_{NORM} MEANS

Post-hoc Tukey test results from Experiments 1 and 2 are presented in this appendix, along with VOT_{norm} means and standard deviations. Post-hoc results are only presented if significant, unless otherwise noted. Means and standard deviations are only presented once, for brevity.

Also, it should be noted that “Group” is not a variable in the mixed model. Rather, Linguistic Background (monolingual or bilingual) and Community (Miami or Ithaca) are variables in the model, and the interaction between Linguistic Background and Community (LingBackground*Community) is examined in the post-hoc tests. However, “Group” is listed below in the tables, instead of both Linguistic Background and Community separately, for clarity and brevity.

D.1 Experiment 1: Accommodation in short-term interactions

D.1.1 Accommodation to model talker

Within-group differences in mean VOT_{norm} with both model talkers

Overall VOT_{norm}

Table D.1: VOT_{norm} mean and standard deviation for each participant group and model talker

Group	Bilingual Model Talker VOT_{norm} Mean	(SD)	Monolingual Model Talker VOT_{norm} Mean	(SD)
B-Ithaca	0.290	(0.114)	0.321	(0.107)
M-Ithaca	0.257	(0.071)	0.283	(0.076)
B-Miami	0.279	(0.093)	0.289	(0.090)
M-Miami	0.254	(0.075)	0.273	(0.078)

Table D.2: Post-hoc Tukey test results: All participant groups had significantly greater VOT_{norm} when interacting with the monolingual model talker (M) than when interacting with the bilingual model talker (B).

	contrast	estimate	SE	df	z.ratio	p.value
Group = B-Ithaca,	B - M	-0.031	0.002	Inf	-10.887	<.0001
Group = M-Ithaca,	B - M	-0.025	0.002	Inf	-8.947	<.0001
Group = B-Miami,	B - M	-0.009	0.002	Inf	-3.390	0.0007
Group = M-Miami,	B - M	-0.018	0.002	Inf	-6.499	<.0001

VOT$_{norm}$ by Stop

Table D.3: VOT$_{norm}$ mean and standard deviation for each participant group, model talker, and stop

		Bilingual Model Talker		Monolingual Model Talker	
Group	Stop	VOT$_{norm}$ Mean	(SD)	VOT$_{norm}$ Mean	(SD)
B-Ithaca	/p/	0.256	(0.113)	0.289	(0.114)
M-Ithaca	/p/	0.233	(0.070)	0.252	(0.074)
B-Miami	/p/	0.253	(0.091)	0.262	(0.092)
M-Miami	/p/	0.215	(0.066)	0.240	(0.076)
B-Ithaca	/t/	0.288	(0.107)	0.318	(0.099)
M-Ithaca	/t/	0.260	(0.062)	0.295	(0.070)
B-Miami	/t/	0.288	(0.089)	0.303	(0.087)
M-Miami	/t/	0.274	(0.072)	0.289	(0.074)
B-Ithaca	/k	0.325	(0.111)	0.356	(0.097)
M-Ithaca	/k	0.278	(0.073)	0.301	(0.076)
B-Miami	/k	0.296	(0.095)	0.301	(0.084)
M-Miami	/k	0.273	(0.070)	0.290	(0.075)

Table D.4: Post-hoc Tukey test results: All participant groups except B-Miami had significantly greater VOT_{norm} for all stops when interacting with the monolingual model talker (M) than when interacting with the bilingual model talker (B).

	contrast	estimate	SE	df	z.ratio	p.value
Stop = /p/:						
Group = B-Ithaca,	B - M	-0.033	0.004	Inf	-6.783	$<.0001$
Group = M-Ithaca,	B - M	-0.018	0.004	Inf	-3.831	0.0001
Group = B-Miami,	B - M	-0.009	0.004	Inf	-1.792	0.073
Group = M-Miami,	B - M	-0.025	0.004	Inf	-5.182	$<.0001$
Stop = /t/:						
Group = B-Ithaca,	B - M	-0.030	0.004	Inf	-6.088	$<.0001$
Group = M-Ithaca,	B - M	-0.035	0.004	Inf	-7.083	$<.0001$
Group = B-Miami,	B - M	-0.015	0.004	Inf	-2.954	0.003
Group = M-Miami,	B - M	-0.014	0.004	Inf	-2.772	0.005
Stop = /k/:						
Group = B-Ithaca,	B - M	-0.030	0.005	Inf	-5.987	$<.0001$
Group = M-Ithaca,	B - M	-0.023	0.005	Inf	-4.587	$<.0001$
Group = B-Miami,	B - M	-0.005	0.004	Inf	-1.127	0.259
Group = M-Miami,	B - M	-0.016	0.004	Inf	-3.300	0.001

Between-group differences in mean VOT_{norm} by model talker

Overall VOT_{norm}

There were no significant differences.

VOT_{norm} by Stop

Table D.5: Post-hoc Tukey test results: B-Ithaca had significantly greater /k/ VOT_{norm} than all other participant groups when interacting with the monolingual model talker, and near-significantly greater /k/ VOT_{norm} than M-Miami when interacting with the bilingual model talker.

contrast	estimate	SE	df	z.ratio	p.value
Model Talker = Bilingual, Stop = /k/:					
B-Ithaca - M-Miami	0.052	0.021	Inf	2.417	0.074
Model Talker = Monolingual, Stop = /k/:					
B-Ithaca - B-Miami	0.054	0.021	Inf	2.502	0.059
B-Ithaca - M-Ithaca	0.054	0.021	Inf	2.511	0.058
B-Ithaca - M-Miami	0.065	0.021	Inf	3.036	0.012

D.1.2 Influence of priming on accommodation

Within-group comparison of $\mathrm{VOT}_{\mathrm{norm}}$ with both model talkers when primed and unprimed

Overall $\mathrm{VOT}_{\mathrm{norm}}$

Table D.6: $\mathrm{VOT}_{\mathrm{norm}}$ mean and standard deviation for each participant group, model talker, and prime type

Group	Bilingual Model Talker $\mathrm{VOT}_{\mathrm{norm}}$ Mean	(SD)	Monolingual Model Talker $\mathrm{VOT}_{\mathrm{norm}}$ Mean	(SD)
PrimeType = primed:				
B-Ithaca	0.285	(0.114)	0.319	(0.108)
M-Ithaca	0.252	(0.072)	0.284	(0.078)
B-Miami	0.279	(0.094)	0.288	(0.089)
M-Miami	0.252	(0.073)	0.276	(0.079)
PrimeType = unprimed:				
B-Ithaca	0.294	(0.113)	0.323	(0.106)
M-Ithaca	0.262	(0.070)	0.281	(0.075)
B-Miami	0.278	(0.092)	0.289	(0.091)
M-Miami	0.256	(0.076)	0.270	(0.077)

Table D.7: Post-hoc Tukey test results: In both priming and non-priming conditions, all participant groups had significantly greater VOT_{norm} when interacting with the monolingual model talker than when interacting with the bilingual model talker.

	contrast	estimate	SE	df	z.ratio	p.value
PrimeType = primed:						
Group = B-Ithaca,	B - M	-0.033	0.004	Inf	-8.218	<.0001
Group = M-Ithaca,	B - M	-0.031	0.004	Inf	-7.907	<.0001
Group = B-Miami,	B - M	-0.009	0.004	Inf	-2.310	0.020
Group = M-Miami,	B - M	-0.022	0.004	Inf	-5.637	<.0001
PrimeType = unprimed:						
Group = B-Ithaca,	B - M	-0.029	0.004	Inf	-7.181	<.0001
Group = M-Ithaca,	B - M	-0.019	0.004	Inf	-4.750	<.0001
Group = B-Miami,	B - M	-0.010	0.004	Inf	-2.485	0.013
Group = M-Miami,	B - M	-0.014	0.004	Inf	-3.555	0.0004

VOT_{norm} by Stop

Table D.8: VOT_{norm} mean and standard deviation for each participant group, model talker, prime type, and stop

Group	Stop	Bilingual Model Talker VOT_{norm} Mean	(SD)	Monolingual Model Talker VOT_{norm} Mean	(SD)
PrimeType = primed:					
B-Ithaca	/p/	0.252	(0.114)	0.294	(0.114)
M-Ithaca	/p/	0.227	(0.067)	0.256	(0.079)
B-Miami	/p/	0.253	(0.093)	0.263	(0.091)
M-Miami	/p/	0.213	(0.065)	0.242	(0.072)
B-Ithaca	/t/	0.278	(0.103)	0.304	(0.092)
M-Ithaca	/t/	0.250	(0.059)	0.291	(0.070)
B-Miami	/t/	0.284	(0.088)	0.295	(0.084)
M-Miami	/t/	0.271	(0.066)	0.286	(0.074)
B-Ithaca	/k/	0.327	(0.113)	0.359	(0.105)
M-Ithaca	/k/	0.280	(0.078)	0.306	(0.077)
B-Miami	/k/	0.302	(0.096)	0.307	(0.086)
M-Miami	/k/	0.274	(0.072)	0.299	(0.080)
PrimeType = unprimed:					
B-Ithaca	/p/	0.260	(0.111)	0.284	(0.113)
M-Ithaca	/p/	0.238	(0.072)	0.247	(0.068)
B-Miami	/p/	0.252	(0.089)	0.260	(0.094)
M-Miami	/p/	0.217	(0.066)	0.239	(0.081)
B-Ithaca	/t/	0.298	(0.111)	0.333	(0.103)
M-Ithaca	/t/	0.270	(0.064)	0.300	(0.069)
B-Miami	/t/	0.293	(0.089)	0.310	(0.090)
M-Miami	/t/	0.278	(0.078)	0.291	(0.073)
B-Ithaca	/k/	0.324	(0.109)	0.352	(0.088)
M-Ithaca	/k/	0.276	(0.068)	0.296	(0.076)
B-Miami	/k/	0.289	(0.093)	0.295	(0.082)
M-Miami	/k/	0.273	(0.069)	0.281	(0.068)

Table D.9: Post-hoc Tukey test results: All participant groups except B-Miami had significantly greater VOT_{norm} when interacting with the monolingual model talker, compared to when interacting with the bilingual model talker, for some—if not all—stops. This difference was more common in priming conditions.

	contrast	estimate	SE	df	z.ratio	p.value
PrimeType = primed:						
Stop = /p/:						
Group = B-Ithaca,	B - M	-0.042	0.007	Inf	-6.002	<.0001
Group = M-Ithaca,	B - M	-0.028	0.007	Inf	-4.233	<.0001
Group = B-Miami,	B - M	-0.009	0.007	Inf	-1.523	0.127
Group = M-Miami,	B - M	-0.028	0.007	Inf	-4.083	<.0001
Stop = /t/:						
Group = B-Ithaca,	B - M	-0.026	0.007	Inf	-3.703	0.0002
Group = M-Ithaca,	B - M	-0.040	0.007	Inf	-5.785	<.0001
Group = B-Miami,	B - M	-0.013	0.007	Inf	-1.653	0.098
Group = M-Miami,	B - M	-0.015	0.007	Inf	-2.121	0.033
Stop = /k/:						
Group = B-Ithaca,	B - M	-0.031	0.007	Inf	-4.506	<.0001
Group = M-Ithaca,	B - M	-0.026	0.007	Inf	-3.676	0.0002
Group = B-Miami,	B - M	-0.004	0.007	Inf	-0.827	0.408
Group = M-Miami,	B - M	-0.025	0.007	Inf	-3.5558	0.0004
PrimeType = unprimed:						
Stop = /p/:						
Group = B-Ithaca,	B - M	-0.024	0.007	Inf	-3.568	0.0004
Group = M-Ithaca,	B - M	-0.008	0.007	Inf	-1.192	0.233
Group = B-Miami,	B - M	-0.008	0.007	Inf	-1.1014	0.310
Group = M-Miami,	B - M	-0.0228	0.007	Inf	-3.246	0.001
Stop = /t/:						
Group = B-Ithaca,	B - M	-0.033	0.007	Inf	-4.905	<.0001
Group = M-Ithaca,	B - M	-0.029	0.007	Inf	-4.230	<.0001
Group = B-Miami,	B - M	-0.016	0.007	Inf	-2.526	0.011
Group = M-Miami,	B - M	-0.013	0.007	Inf	-1.800	0.071
Stop = /k/:						
Group = B-Ithaca,	B - M	-0.029	0.007	Inf	-3.963	<.0001
Group = M-Ithaca,	B - M	-0.020	0.007	Inf	-2.815	0.004
Group = B-Miami,	B - M	-0.005	0.007	Inf	-0.767	0.443
Group = M-Miami,	B - M	-0.008	0.007	Inf	-1.107	0.268

Within-group comparison of VOT_{norm} when primed versus unprimed by model talkers

Overall VOT_{norm}

Table D.10: Post-hoc Tukey test results: Participants from the monolingual community (B-Ithaca, M-Ithaca) had shorter VOT_{norm} when primed by the bilingual model talker, compared to when unprimed.

contrast	estimate	SE	df	z.ratio	p.value
Model Talker = Bilingual:					
Group = B-Ithaca, primed - unprimed	-0.007	0.004	Inf	-1.867	0.061
Group = M-Ithaca, primed - unprimed	-0.009	0.004	Inf	-2.346	0.019

VOT_{norm} by Stop

Table D.11: Post-hoc Tukey test results: Priming influenced groups in both expected and unexpected ways.

contrast	estimate	SE	df	z.ratio	p.value
Model Talker = Bilingual:					
Stop = /t/:					
Group = B-Ithaca, primed - unprimed	-0.020	0.007	Inf	-2.828	0.004
Group = M-Ithaca, primed - unprimed	-0.019	0.007	Inf	-2.901	0.003
Model Talker = Monolingual:					
Stop = /t/:					
Group = B-Ithaca, primed - unprimed	-0.027	0.007	Inf	-4.044	0.0001
Group = B-Miami, primed - unprimed	-0.013	0.007	Inf	-2.145	0.032
Stop = /k/:					
Group = M-Miami, primed - unprimed	0.017	0.007	Inf	2.601	0.009

Between-group comparison of VOT_{norm} with each model talker primed and unprimed

Overall VOT_{norm}

Table D.12: Post-hoc Tukey test results: M-Miami had near-significantly shorter VOT_{norm} than B-Ithaca when interacting with the monolingual model talker and unprimed

contrast	estimate	SE	df	z.ratio	p.value
Model Talker = Bilingual, PrimeType = unprimed:					
B-Ithaca-M-Miami	0.052	0.021	Inf	2.444	0.069

VOT_{norm} by Stop

Table D.13: Post-hoc Tukey test results: B-Ithaca had longer VOT_{norm} than other participant groups, especially M-Miami, with both model talkers when primed and unprimed.

contrast	estimate	SE	df	z.ratio	p.value
Model Talker = Bilingual					
Stop = /k/, PrimeType = primed:					
B-Ithaca-M-Miami	0.054	0.022	Inf	2.442	0.069
Model Talker = Monolingual					
Stop = /p/, PrimeType = primed:					
B-Ithaca-M-Miami	0.052	0.022	Inf	2.366	0.083
Stop = /k/, PrimeType = primed:					
B-Ithaca-M-Ithaca	0.053	0.022	Inf	2.420	0.073
B-Ithaca-B-Miami	0.053	0.022	Inf	2.364	0.084
B-Ithaca-M-Miami	0.060	0.022	Inf	2.744	0.030
Stop = /k/, PrimeType = unprimed:					
B-Ithaca-M-Ithaca	0.055	0.022	Inf	2.476	0.057
B-Ithaca-B-Miami	0.056	0.022	Inf	2.513	0.057
B-Ithaca-M-Miami	0.071	0.022	Inf	3.177	0.008

D.2 Experiment 2: Time-course of accommodation

D.2.1 Accommodation changes within a short-term interaction

Within-group differences in mean VOT_{norm} with both model talkers for each block

Overall VOT_{norm}

Table D.14: VOT_{norm} mean and standard deviation for each participant group, model talker, and block

		Bilingual Model Talker		Monolingual Model Talker	
Group	Block	VOT_{norm} Mean	(SD)	VOT_{norm} Mean	(SD)
B-Ithaca	1	0.279	(0.114)	0.318	(0.102)
B-Ithaca	2	0.283	(0.104)	0.322	(0.105)
B-Ithaca	3	0.296	(0.118)	0.319	(0.104)
B-Ithaca	4	0.300	(0.117)	0.324	(0.117)
M-Ithaca	1	0.257	(0.072)	0.291	(0.078)
M-Ithaca	2	0.253	(0.073)	0.285	(0.082)
M-Ithaca	3	0.260	(0.067)	0.275	(0.073)
M-Ithaca	4	0.258	(0.072)	0.279	(0.072)
B-Miami	1	0.285	(0.096)	0.294	(0.093)
B-Miami	2	0.270	(0.089)	0.297	(0.092)
B-Miami	3	0.280	(0.095)	0.280	(0.084)
B-Miami	4	0.281	(0.093)	0.283	(0.090)
M-Miami	1	0.249	(0.073)	0.280	(0.072)
M-Miami	2	0.255	(0.074)	0.277	(0.081)
M-Miami	3	0.257	(0.078)	0.270	(0.082)
M-Miami	4	0.255	(0.073)	0.266	(0.078)

Table D.15: Post-hoc Tukey test results: All groups except B-Miami had longer VOT_{norm} with the monolingual model talker than with the bilingual model talker for all four blocks. B-Miami only had longer VOT_{norm} with the monolingual model talker in Block 2.

contrast	estimate	SE	df	z.ratio	p.value
Group=B-Ithaca:					
Block = 1, B - M	-0.038	0.005	Inf	-6.781	<.0001
Block = 2, B - M	-0.038	0.005	Inf	-6.758	<.0001
Block = 3, B - M	-0.022	0.005	Inf	-3.956	0.0001
Block = 4, B - M	-0.024	0.005	Inf	-4.283	<.0001
Group=M-Ithaca:					
Block = 1, B - M	-0.033	0.005	Inf	-5.919	<.0001
Block = 2, B - M	-0.031	0.005	Inf	-5.616	<.0001
Block = 3, B - M	-0.015	0.005	Inf	-2.688	0.007
Block = 4, B - M	-0.020	1 0.005	Inf	-3.672	0.0002
Group=B-Miami:					
Block = 1, B - M	-0.009	0.005	Inf	-1.601	0.109
Block = 2, B - M	-0.028	0.005	Inf	-4.919	<.0001
Block = 3, B - M	-0.0002	0.005	Inf	-0.040	0.968
Block = 4, B - M	-0.001	0.005	Inf	-0.232	0.816
Group=M-Miami:					
Block = 1, B - M	-0.030	0.005	Inf	-5.288	<.0001
Block = 2, B - M	-0.021	0.005	Inf	-3.714	0.0002
Block = 3, B - M	-0.012	0.005	Inf	-2.141	0.032
Block = 4, B - M	-0.010	0.005	Inf	-1.859	0.063

VOT_{norm} by Stop

Table D.16: VOT_{norm} mean and standard deviation for each participant group, model talker, and block (Groups = B-Ithaca and M-Ithaca)

Group	Stop	Block	Bilingual Model Talker VOT_{norm} Mean	(SD)	Monolingual Model Talker VOT_{norm} Mean	(SD)
B-Ithaca	/p/	1	0.249	(0.114)	0.289	(0.116)
B-Ithaca	/p/	2	0.250	(0.101)	0.288	(0.107)
B-Ithaca	/p/	3	0.257	(0.113)	0.293	(0.109)
B-Ithaca	/p/	4	0.268	(0.122)	0.287	(0.125)
B-Ithaca	/t/	1	0.281	(0.112)	0.317	(0.091)
B-Ithaca	/t/	2	0.281	(0.098)	0.319	(0.096)
B-Ithaca	/t/	3	0.293	(0.119)	0.314	(0.095)
B-Ithaca	/t/	4	0.296	(0.102)	0.323	(0.114)
B-Ithaca	/k/	1	0.308	(0.110)	0.350	(0.089)
B-Ithaca	/k/	2	0.317	(0.103)	0.359	(0.100)
B-Ithaca	/k/	3	0.338	(0.109)	0.351	(0.100)
B-Ithaca	/k/	4	0.338	(0.118)	0.362	(0.099)
M-Ithaca	/p/	1	0.232	(0.068)	0.260	(0.071)
M-Ithaca	/p/	2	0.231	(0.080)	0.255	(0.083)
M-Ithaca	/p/	3	0.240	(0.070)	0.244	(0.073)
M-Ithaca	/p/	4	0.228	(0.060)	0.247	(0.067)
M-Ithaca	/t/	1	0.262	(0.068)	0.301	(0.071)
M-Ithaca	/t/	2	0.260	(0.064)	0.299	(0.073)
M-Ithaca	/t/	3	0.262	(0.050)	0.291	(0.068)
M-Ithaca	/t/	4	0.256	(0.067)	0.290	(0.066)
M-Ithaca	/k/	1	0.277	(0.072)	0.313	(0.082)
M-Ithaca	/k/	2	0.268	(0.069)	0.300	(0.081)
M-Ithaca	/k/	3	0.276	(0.075)	0.291	(0.070)
M-Ithaca	/k/	4	0.291	(0.076)	0.301	(0.071)

Table D.17: VOT_{norm} mean and standard deviation for each participant group, model talker, and block (Groups = B-Miami and M-Miami)

			Bilingual Model Talker		Monolingual Model Talker	
Group	Stop	Block	VOT_{norm} Mean	(SD)	VOT_{norm} Mean	(SD)
B-Miami	/p/	1	0.257	(0.087)	0.262	(0.095)
B-Miami	/p/	2	0.249	(0.089)	0.268	(0.097)
B-Miami	/p/	3	0.251	(0.098)	0.256	(0.082)
B-Miami	/p/	4	0.253	(0.091)	0.260	(0.096)
B-Miami	/t/	1	0.290	(0.088)	0.306	(0.093)
B-Miami	/t/	2	0.281	(0.088)	0.319	(0.091)
B-Miami	/t/	3	0.292	(0.092)	0.295	(0.083)
B-Miami	/t/	4	0.291	(0.087)	0.290	(0.080)
B-Miami	/k/	1	0.308	(0.107)	0.313	(0.082)
B-Miami	/k/	2	0.280	(0.087)	0.303	(0.080)
B-Miami	/k/	3	0.295	(0.089)	0.289	(0.084)
B-Miami	/k/	4	0.300	(0.094)	0.299	(0.089)
M-Miami	/p/	1	0.211	(0.065)	0.245	(0.070)
M-Miami	/p/	2	0.215	(0.065)	0.248	(0.087)
M-Miami	/p/	3	0.218	(0.066)	0.237	(0.074)
M-Miami	/p/	4	0.217	(0.068)	0.232	(0.074)
M-Miami	/t/	1	0.265	(0.068)	0.294	(0.061)
M-Miami	/t/	2	0.281	(0.069)	0.294	(0.079)
M-Miami	/t/	3	0.279	(0.079)	0.286	(0.075)
M-Miami	/t/	4	0.271	(0.072)	0.281	(0.078)
M-Miami	/k/	1	0.272	(0.071)	0.302	(0.071)
M-Miami	/k/	2	0.270	(0.072)	0.290	(0.070)
M-Miami	/k/	3	0.273	(0.074)	0.286	(0.086)
M-Miami	/k/	4	0.278	(0.065)	0.283	(0.071)

Table D.18: Post-hoc Tukey test results: Participant groups were less likely in later blocks to produce longer VOT_{norm} with the monolingual model talker and shorter VOT_{norm} with the bilingual model talker. (Groups = B-Ithaca and M-Ithaca)

contrast	estimate	SE	df	z.ratio	p.value
Group=B-Ithaca					
Stop=/p/:					
Block = 1, B - M	-0.039	0.009	Inf	-3.995	0.0001
Block = 2, B - M	-0.038	0.009	Inf	-3.891	0.0001
Block = 3, B - M	-0.034	0.009	Inf	-3.516	0.0004
Block = 4, B - M	-0.021	0.009	Inf	-2.165	0.030
Stop=/t/:					
Block = 1, B - M	-0.035	0.009	Inf	-3.587	0.0003
Block = 2, B - M	-0.036	0.009	Inf	-3.693	0.0002
Block = 3, B - M	-0.020	0.009	Inf	-2.060	0.039
Block = 4, B - M	-0.028	0.009	Inf	-2.833	0.004
Stop=/k/:					
Block = 1, B - M	-0.041	0.009	Inf	-4.160	<.0001
Block = 2, B - M	-0.040	0.009	Inf	-4.122	<.0001
Block = 3, B - M	-0.012	0.009	Inf	-1.285	0.198
Block = 4, B - M	-0.024	0.009	Inf	-2.420	0.015
Group=M-Ithaca					
Stop=/p/:					
Block = 1, B - M	-0.026	0.009	Inf	-2.691	0.007
Block = 2, B - M	-0.026	0.009	Inf	-2.664	0.008
Block = 3, B - M	-0.002	0.009	Inf	-0.286	0.774
Block = 4, B - M	-0.019	0.009	Inf	-2.027	0.042
Stop=/t/:					
Block = 1, B - M	-0.039	0.009	Inf	-4.068	<.0001
Block = 2, B - M	-0.038	0.009	Inf	-3.864	0.0001
Block = 3, B - M	-0.029	0.009	Inf	-2.994	0.002
Block = 4, B - M	-0.032	0.009	Inf	-3.246	0.001
Stop=/k/:					
Block = 1, B - M	-0.035	0.010	Inf	-3.499	0.0005
Block = 2, B - M	-0.031	0.009	Inf	-3.200	0.001
Block = 3, B - M	-0.013	0.009	Inf	-1.380	0.167
Block = 4, B - M	-0.010	0.009	Inf	-1.081	0.279

Table D.19: Post-hoc Tukey test results: Participant groups were less likely in later blocks to produce longer VOT_{norm} with the monolingual model talker and shorter VOT_{norm} with the bilingual model talker. (Groups = B-Miami and M-Miami)

contrast	estimate	SE	df	z.ratio	p.value
Group=B-Miami					
Stop=/p/:					
Block = 1, B - M	-0.006	0.009	Inf	-0.660	0.509
Block = 2, B - M	-0.020	0.009	Inf	-2.112	0.034
Block = 3, B - M	-0.001	0.010	Inf	-0.181	0.856
Block = 4, B - M	-0.006	0.009	Inf	-0.640	0.521
Stop=/t/:					
Block = 1, B - M	-0.016	0.009	Inf	-1.663	0.096
Block = 2, B - M	-0.039	0.009	Inf	-3.965	0.0001
Block = 3, B - M	-0.001	0.009	Inf	-0.200	0.841
Block = 4, B - M	-0.0008	0.009	Inf	-0.088	0.930
Stop=/k/:					
Block = 1, B - M	-0.004	0.009	Inf	-0.446	0.655
Block = 2, B - M	-0.024	0.009	Inf	-2.448	0.014
Block = 3, B - M	0.003	0.009	Inf	0.314	0.753
Block = 4, B - M	0.003	0.009	Inf	0.324	0.745
Group=M-Miami					
Stop=/p/:					
Block = 1, B - M	-0.034	0.009	Inf	-3.487	0.0005
Block = 2, B - M	-0.032	0.009	Inf	-3.306	0.0009
Block = 3, B - M	-0.018	0.009	Inf	-1.881	0.060
Block = 4, B - M	-0.016	0.009	Inf	-1.697	0.089
Stop=/t/:					
Block = 1, B - M	-0.028	0.009	Inf	-2.870	0.004
Block = 2, B - M	-0.010	0.009	Inf	-1.035	0.300
Block = 3, B - M	-0.005	0.009	Inf	-0.585	0.558
Block = 4, B - M	-0.010	0.009	Inf	-1.057	0.2903
Stop=/k/:					
Block = 1, B - M	-0.0276	0.009	Inf	-2.802	0.005
Block = 2, B - M	-0.020	0.009	Inf	-2.089	0.036
Block = 3, B - M	-0.012	0.009	Inf	-1.241	0.214
Block = 4, B - M	-0.004	0.009	Inf	-0.462	0.644

Within-group comparison of VOT_{norm} between blocks for each model talker

Overall VOT_{norm}

Table D.20: Post-hoc Tukey test results: For both bilingual groups, there were significant changes in VOT_{norm} between blocks.

contrast	estimate	SE	df	z.ratio	p.value
Model Talker = Bilingual:					
Group=B-Ithaca, Block 1 - 3	-0.015	0.006	Inf	-2.411	0.074
Group=B-Ithaca, Block 1 - 4	-0.0203	0.007	Inf	-2.691	0.035
Group=B-Miami, Block 1 - 2	0.015	0.006	Inf	2.389	0.079
Model Talker = Monolingual:					
Group = B-Miami, Block 2 - 3	0.017	0.006	Inf	2.591	0.047

VOT_{norm} by Stop

Table D.21: Post-hoc Tukey test results: For both bilingual groups, there were significant changes in VOT_{norm} between blocks.

contrast	estimate	SE	df	z.ratio	p.value
Model Talker = Bilingual:					
Stop = /k/:					
Group=B-Ithaca, Block 1 - 3	-0.028	0.010	Inf	-2.683	0.036
Group=B-Ithaca, Block 1 - 4	-0.030	0.011	Inf	-2.768	0.028
Model Talker = Monolingual:					
Stop = /t/:					
Group=B-Miami, Block 2 - 3	0.0250	010	Inf	2.404	0.076
Group=B-Miami, Block 2 - 4	0.029	0.012	Inf	2.401	0.076

Between-group differences in VOT_{norm} by model talker and block

Overall VOT_{norm}

Table D.22: Post-hoc Tukey test results: B-Ithaca's VOT_{norm} is significantly longer than M-Miami's VOT_{norm}, when interacting with the monolingual model talker.

contrast	estimate	SE	df	z.ratio	p.value
Model Talker = Monolingual:					
Block = 4, B-Ithaca - M-Miami	0.057	0.023	Inf	2.518	0.0571

VOT_{norm} by Stop

Table D.23: Post-hoc Tukey test results: B-Ithaca's VOT_{norm} is significantly longer than other groups' VOT_{norm}, especially M-Miami.

contrast	estimate	SE	df	z.ratio	p.value
Model Talker = Bilingual:					
Stop = /k/:					
Block = 3, B-Ithaca - M-Miami	0.064	0.024	Inf	2.651	0.040
Block = 4, B-Ithaca - M-Miami	0.060	0.024	Inf	2.485	0.062
Model Talker = Monolingual:					
Stop = /k/:					
Block = 1, B-Ithaca - M-Miami	0.052	0.022	Inf	2.334	0.090
Block = 2, B-Ithaca - M-Miami	0.065	0.023	Inf	2.817	0.025
Block = 2, B-Ithaca - M-Ithaca	0.058	0.023	Inf	2.504	0.059
Block = 3, B-Ithaca - M-Miami	0.065	0.024	Inf	2.679	0.037
Block = 3, B-Ithaca - B-Miami	0.059	0.024	Inf	2.456	0.067
Block = 4, B-Ithaca - M-Miami	0.080	0.024	Inf	3.285	0.005
Block = 4, B-Ithaca - M-Ithaca	0.063	0.024	Inf	2.606	0.045
Block = 4, B-Ithaca - B-Miami	0.064	0.024	Inf	2.639	0.041

D.2.2 Influence of most-recent, previous interaction on accommodation

Within-group comparisons of VOT_{norm} with the monolingual model talker versus the bilingual model talker for each Model Talker Order

Overall VOT_{norm}

Table D.24: VOT_{norm} mean and standard deviation for each participant group, model talker, and model talker order

Group	Bilingual Model Talker VOT_{norm} Mean	(SD)	Monolingual Model Talker VOT_{norm} Mean	(SD)
Bilingual-1st:				
B-Ithaca	0.270	(0.099)	0.322	(0.108)
M-Ithaca	0.275	(0.075)	0.297	(0.079)
B-Miami	0.252	(0.085)	0.275	(0.087)
M-Miami	0.249	(0.067)	0.271	(0.082)
Monolingual-1st:				
B-Ithaca	0.309	(0.124)	0.320	(0.106)
M-Ithaca	0.240	(0.063)	0.268	(0.072)
B-Miami	0.305	(0.094)	0.302	(0.091)
M-Miami	0.259	(0.082)	0.276	(0.074)

Table D.25: Post-hoc Tukey test results: B-Miami who interacted with the monolingual model talker first (Monolingual-1st) did not produce shorter VOT_{norm} with the bilingual model talker.

contrast	estimate	SE	df	z.ratio	p.value
Model Talker Order = Bilingual-1st:					
Group = B-Ithaca, B - M	-0.051	0.004	Inf	-12.773	<.0001
Group = M-Ithaca, B - M	-0.022	0.004	Inf	-5.648	<.0001
Group = B-Miami, B - M	-0.022	0.004	Inf	-5.480	<.0001
Group = M-Miami, B - M	-0.021	0.004	Inf	-5.384	<.0001
Model Talker Order = Monolingual-1st:					
Group = B-Ithaca, B - M	-0.010	0.004	Inf	-2.620	0.008
Group = M-Ithaca, B - M	-0.028	0.004	Inf	-7.180	<.0001
Group = B-Miami, B - M	0.003	0.004	Inf	0.859	0.390
Group = M-Miami, B - M	-0.015	0.004	Inf	-3.807	0.0001

VOT_{norm} by Stop

Table D.26: VOT_{norm} mean and standard deviation for each participant group, model talker, stop, and model talker order

Group	Stop	Bilingual Model Talker VOT_{norm} Mean	(SD)	Monolingual Model Talker VOT_{norm} Mean	(SD)
Bilingual-1st:					
B-Ithaca	/p/	0.243	(0.106)	0.291	(0.114)
M-Ithaca	/p/	0.252	(0.076)	0.259	(0.074)
B-Miami	/p/	0.230	(0.086)	0.247	(0.086)
M-Miami	/p/	0.212	(0.064)	0.240	(0.083)
B-Ithaca	/t/	0.258	(0.089)	0.308	(0.100)
M-Ithaca	/t/	0.276	(0.066)	0.313	(0.071)
B-Miami	/t/	0.265	(0.084)	0.291	(0.085)
M-Miami	/t/	0.268	(0.061)	0.282	(0.076)
B-Ithaca	/k/	0.308	(0.091)	0.367	(0.094)
M-Ithaca	/k/	0.296	(0.075)	0.319	(0.077)
B-Miami	/k/	0.260	(0.080)	0.285	(0.083)
M-Miami	/k/	0.267	(0.060)	0.290	(0.079)
Monolingual-1st:					
B-Ithaca	/p/	0.268	(0.117)	0.287	(0.114)
M-Ithaca	/p/	0.213	(0.056)	0.244	(0.073)
B-Miami	/p/	0.275	(0.091)	0.276	(0.096)
M-Miami	/p/	0.218	(0.067)	0.241	(0.069)
B-Ithaca	/t/	0.317	(0.117)	0.329	(0.097)
M-Ithaca	/t/	0.245	(0.055)	0.278	(0.064)
B-Miami	/t/	0.311	(0.087)	0.314	(0.088)
M-Miami	/t/	0.281	(0.082)	0.295	(0.070)
B-Ithaca	/k/	0.343	(0.125)	0.345	(0.099)
M-Ithaca	/k/	0.261	(0.067)	0.283	(0.072)
B-Miami	/k/	0.331	(0.095)	0.317	(0.082)
M-Miami	/k/	0.280	(0.079)	0.290	(0.071)

Table D.27: Post-hoc Tukey test results: B-Miami and B-Ithaca, when interacting with the monolingual model talker first (M-First), were less likely to produce shorter VOT_{norm} with the bilingual model talker (B-First).

contrast	estimate	SE	df	z.ratio	p.value
Model Talker Order = B-First					
Stop = /p/:					
Group = B-Ithaca, B - M	-0.047	0.007	Inf	-6.786	<.0001
Group = M-Ithaca, B - M	-0.006	0.007	Inf	-0.868	0.385
Group = B-Miami, B - M	-0.016	0.007	Inf	-2.427	0.015
Group = M-Miami, B - M	-0.0289	0.007	Inf	-4.146	<.0001
Stop = /t/:					
Group = B-Ithaca, B - M	-0.049	0.007	Inf	-7.148	<.0001
Group = M-Ithaca, B - M	-0.037	0.007	Inf	-5.372	<.0001
Group = B-Miami, B - M	-0.026	0.007	Inf	-3.831	0.0001
Group = M-Miami, B - M	-0.013	0.007	Inf	-1.978	0.047
Stop = /k/:					
Group = B-Ithaca, B - M	-0.057	0.007	Inf	-8.184	<.0001
Group = M-Ithaca, B - M	-0.022	0.007	Inf	-3.249	0.001
Group = B-Miami, B - M	-0.024	0.007	Inf	-3.523	0.0004
Group = M-Miami, B - M	-0.022	0.007	Inf	-3.200	0.0014
Model Talker Order = M-First					
Stop = /p/:					
Group = B-Ithaca, B - M	-0.019	0.007	Inf	-2.799	0.005
Group = M-Ithaca, B - M	-0.031	0.007	Inf	-4.560	<.0001
Group = B-Miami, B - M	-0.0007	0.007	Inf	-0.110	0.912
Group = M-Miami, B - M	-0.022	0.007	Inf	-3.183	0.001
Stop = /t/:					
Group = B-Ithaca, B - M	-0.010	0.007	Inf	-1.479	0.139
Group = M-Ithaca, B - M	-0.032	0.007	Inf	-4.642	<.0001
Group = B-Miami, B - M	-0.002	0.007	Inf	-0.332	0.739
Group = M-Miami, B - M	-0.013	0.007	Inf	-1.942	0.052
Stop = /k/:					
Group = B-Ithaca, B - M	-0.001	0.007	Inf	-0.270	0.787
Group = M-Ithaca, B - M	-0.022	0.007	Inf	-3.238	0.001
Group = B-Miami, B - M	0.013	0.007	Inf	1.926	0.054
Group = M-Miami, B - M	-0.010	0.007	Inf	-1.468	0.142

Within-group comparisons of VOT$_{norm}$ for participants with Monolingual-First versus Bilingual-First Model Talker Orders

Overall VOT$_{norm}$

Table D.28: Post-hoc Tukey test results: When talking to the bilingual model talker, B-Miami who interacted with the bilingual model talker first had shorter VOT$_{norm}$ than B-Miami who interacted with the monolingual model talker first.

contrast	estimate	SE	df	z.ratio	p.value
Model Talker = Bilingual:					
Group = B-Miami:					
Bilingual-1st - Monolingual-1st	-0.053	0.030	Inf	-1.774	0.076

VOT$_{norm}$ by Stop

Table D.29: Post-hoc Tukey test results: When talking to the bilingual model talker, B-Ithaca who heard the bilingual model talker first had shorter VOT$_{norm}$ for /t/ than B-Ithaca who heard the monolingual model talker first. Also, B-Miami who heard the bilingual model talker first had shorter VOT$_{norm}$ for /k/ than B-Miami who heard the monolingual model talker first.

contrast	estimate	SE	df	z.ratio	p.value
Model Talker = Bilingual:					
Group = B-Ithaca, Stop = /t/:					
Bilingual-1st - Monolingual-1st	-0.058	0.030	Inf	-1.923	0.054
Group = B-Miami, Stop = /k/:					
Bilingual-1st - Monolingual-1st	-0.070	0.030	Inf	-2.304	0.021

Between-group comparison of VOT_{norm} for each model talker and Model Talker Order

Overall VOT_{norm}

There were no significant differences.

VOT_{norm} by Stop

Table D.30: Post-hoc Tukey test results: After interacting with the bilingual model talker first (B-First), both Miami groups (M-Miami, B-Miami) had significantly shorter VOT_{norm} than B-Ithaca when interacting with the monolingual model talker. Also, after interacting with the monolingual model talker first (M-First), B-Ithaca had significantly longer VOT_{norm} than M-Ithaca when interacting with the bilingual model talker.

contrast	estimate	SE	df	z.ratio	p.value
Model Talker Order = B-First, Model Talker = Monolingual:					
Stop /k/, B-Ithaca - B-Miami	0.081	0.030	Inf	2.645	0.040
Stop /k/, B-Ithaca - M-Miami	0.076	0.030	Inf	2.501	0.059
Model Talker Order = M-First, Model Talker = Bilingual:					
Stop /k/, B-Ithaca - M-Ithaca	0.081	0.030	Inf	2.672	0.037

APPENDIX E

EXPERIMENTS 1 AND 2: VIOLIN-AND-BOX PLOTS

E.1 Experiment 1: Accommodation in short-term interactions

E.1.1 Accommodation to model talker

Within-group differences in mean VOT_{norm} with both model talkers

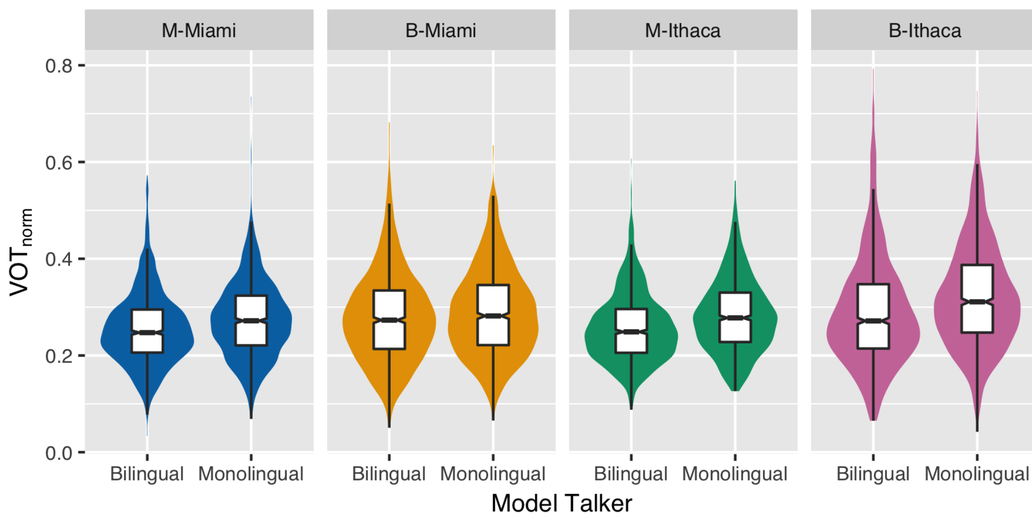


Figure E.1: VOT_{norm} by Participant Group and Model Talker

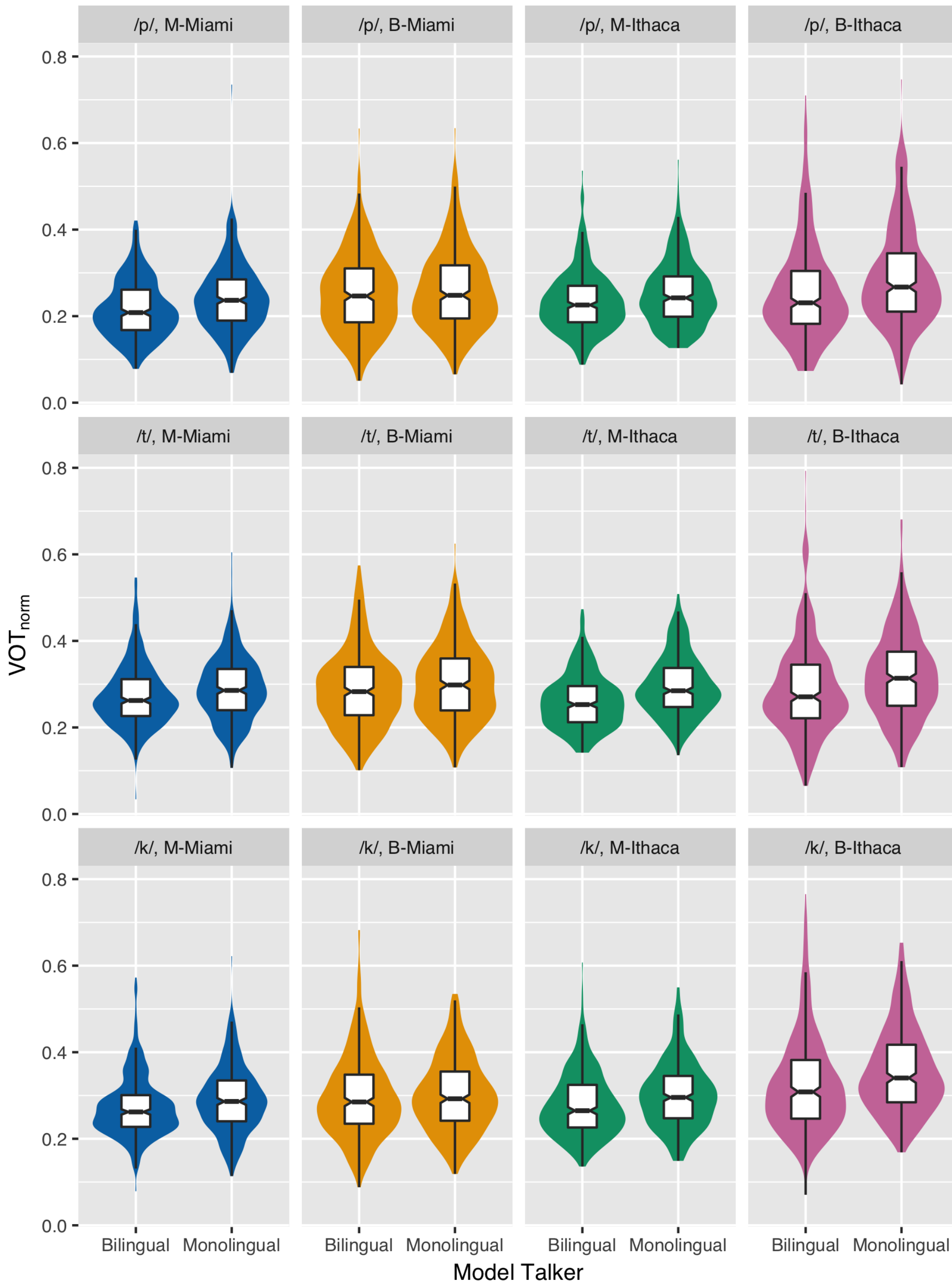


Figure E.2: VOT$_{norm}$ by Participant Group, Model Talker, and Stop

Between-group differences in mean VOT_{norm} by model talker

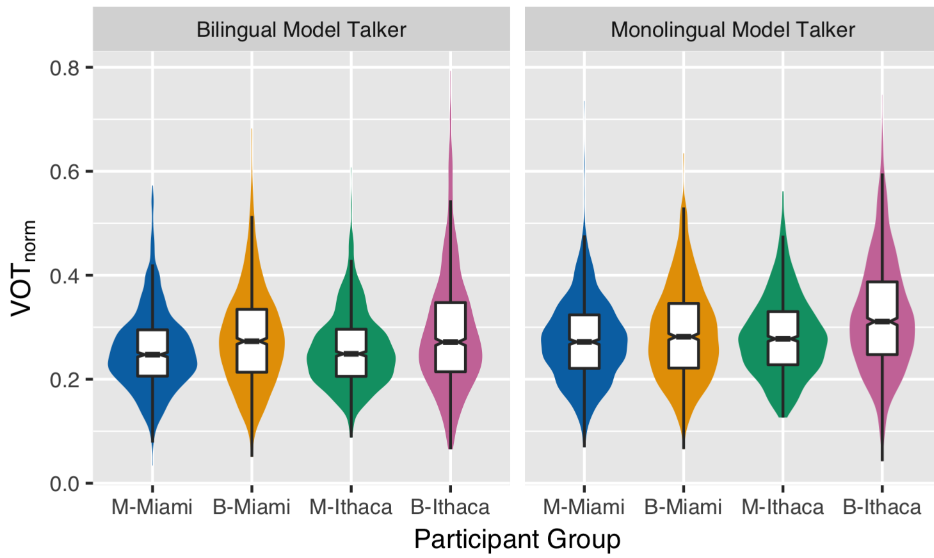


Figure E.3: VOT_{norm} by Participant Group and Model Talker

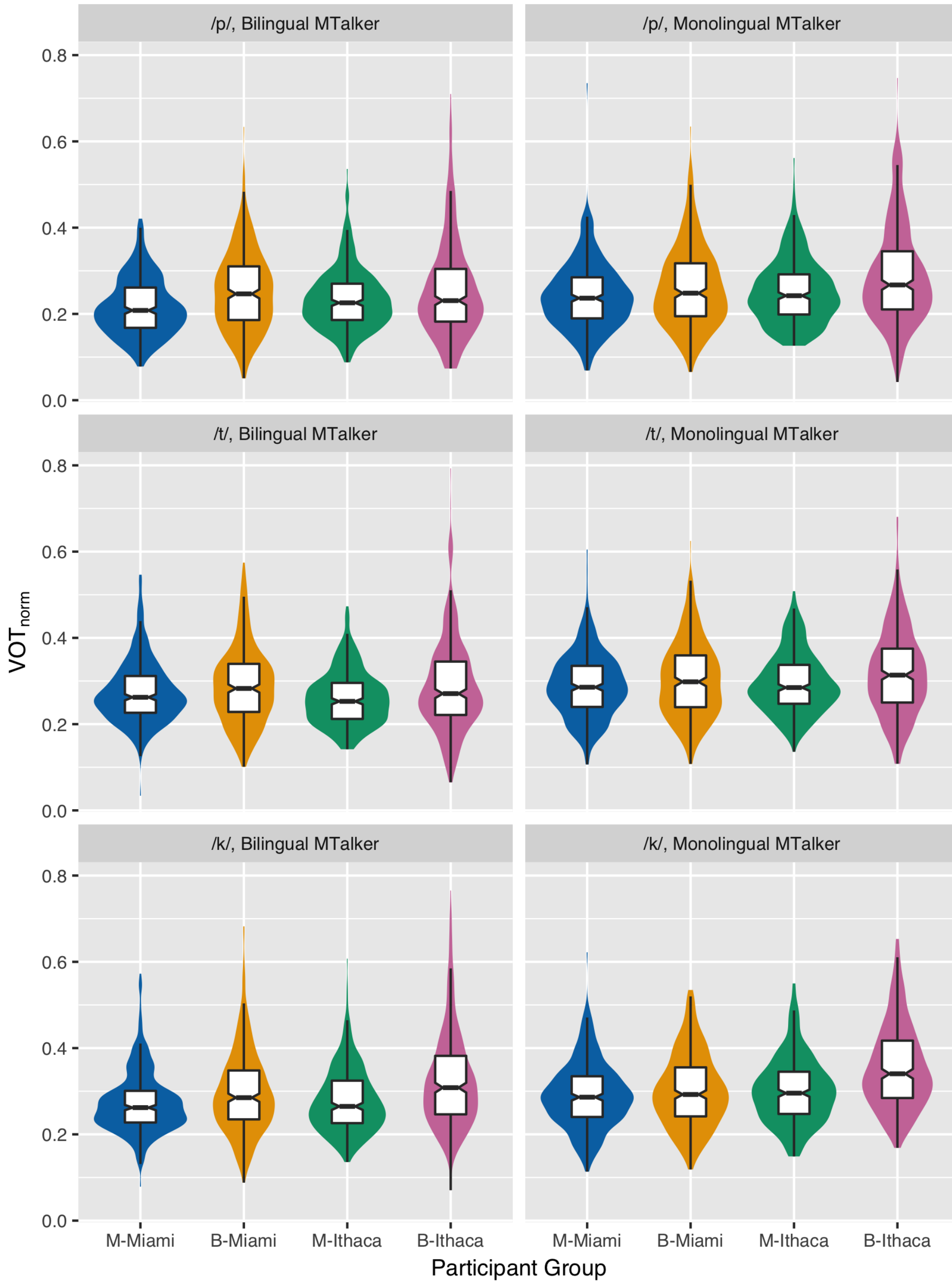


Figure E.4: $\mathrm{VOT}_{\mathrm{norm}}$ by Participant Group, Model Talker, and Stop

E.1.2 Influence of priming on accommodation

Within-group comparison of VOT$_{norm}$ with both model talkers when primed and unprimed

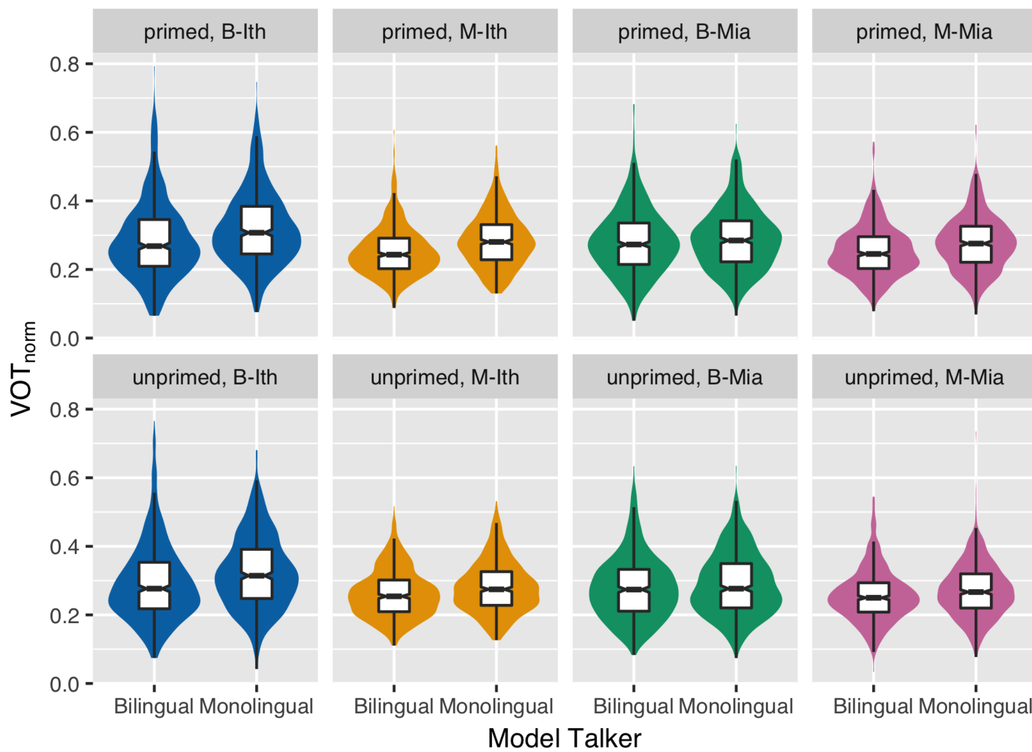


Figure E.5: VOT$_{norm}$ by Participant Group, Model Talker, and Prime Type

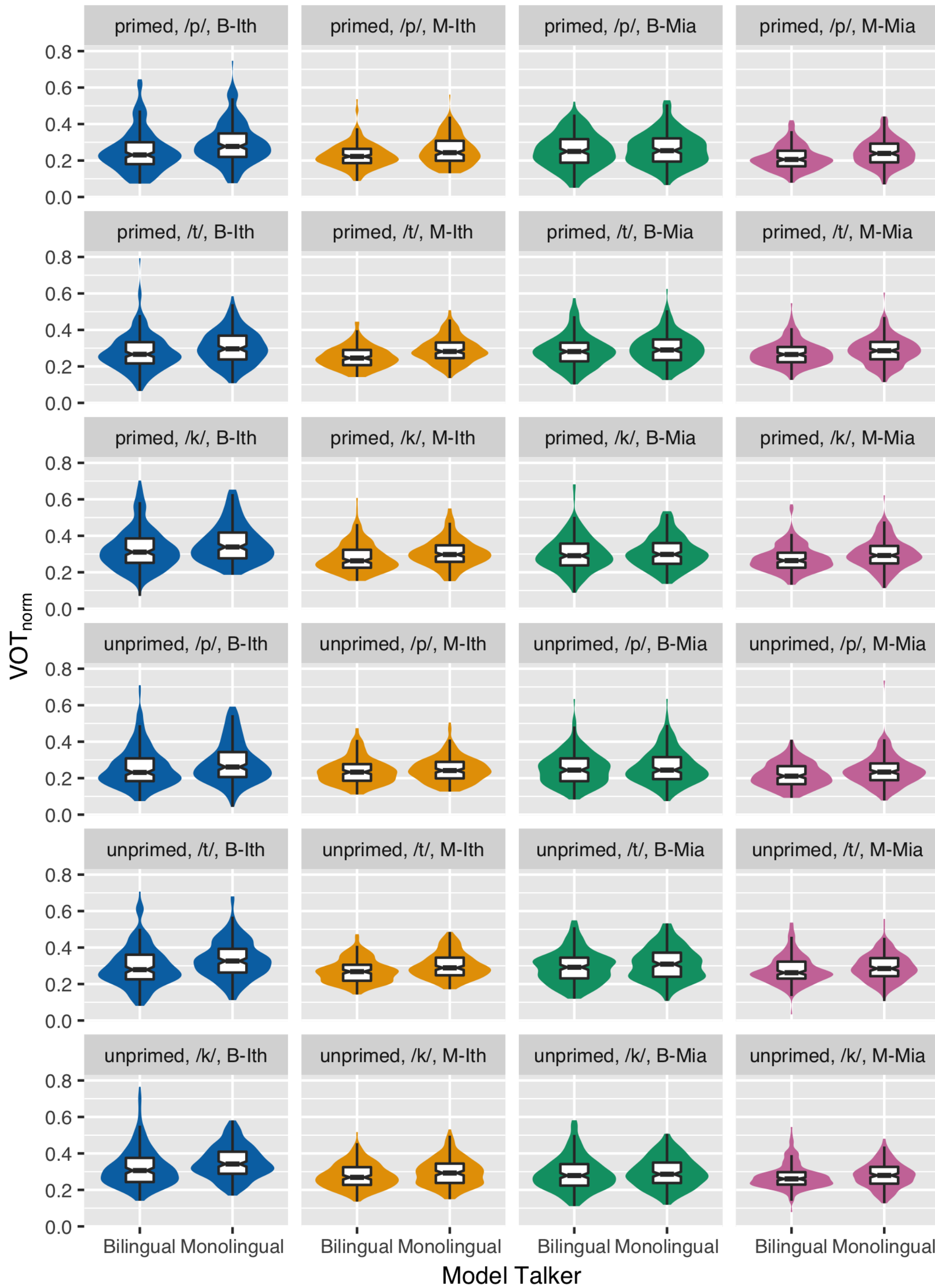


Figure E.6: VOT_{norm} by Participant Group, Model Talker, Prime Type, and Stop

Within-group comparison of VOT$_{norm}$ when primed versus unprimed by model talkers

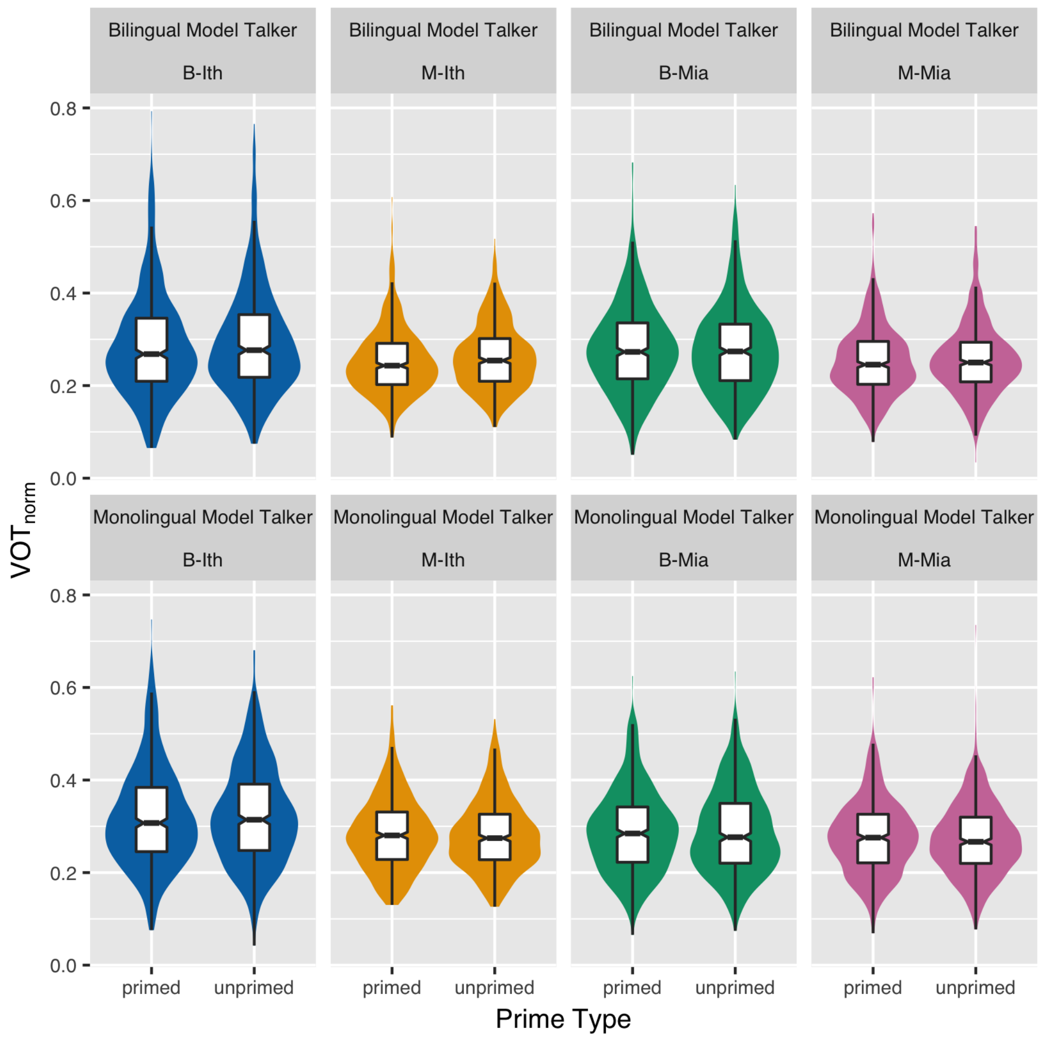


Figure E.7: VOT$_{norm}$ by Participant Group, Model Talker, and Prime Type

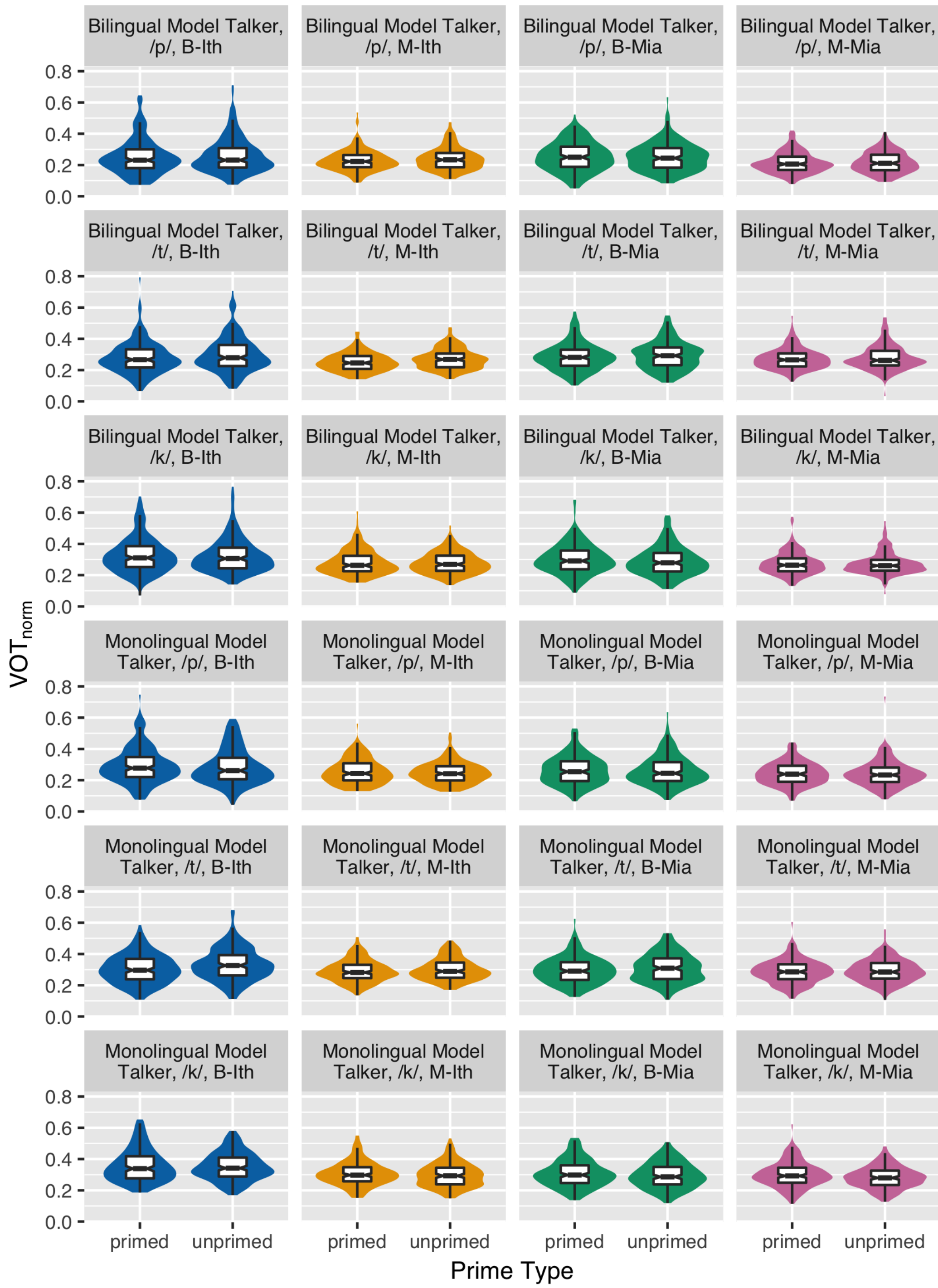


Figure E.8: $\mathrm{VOT}_{\mathrm{norm}}$ by Participant Group, Model Talker, Prime Type, and Stop

Between-group comparison of VOT_{norm} with each model talker primed and unprimed

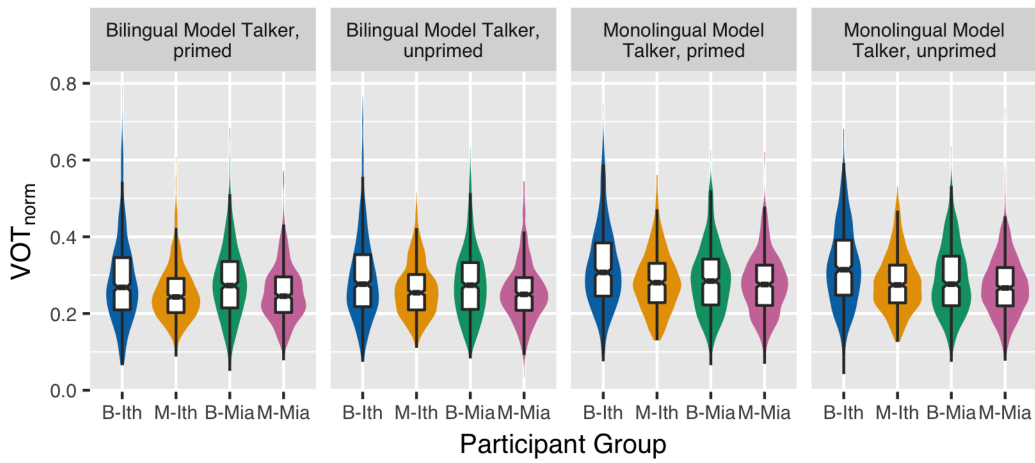


Figure E.9: VOT_{norm} by Participant Group, Model Talker, and Prime Type

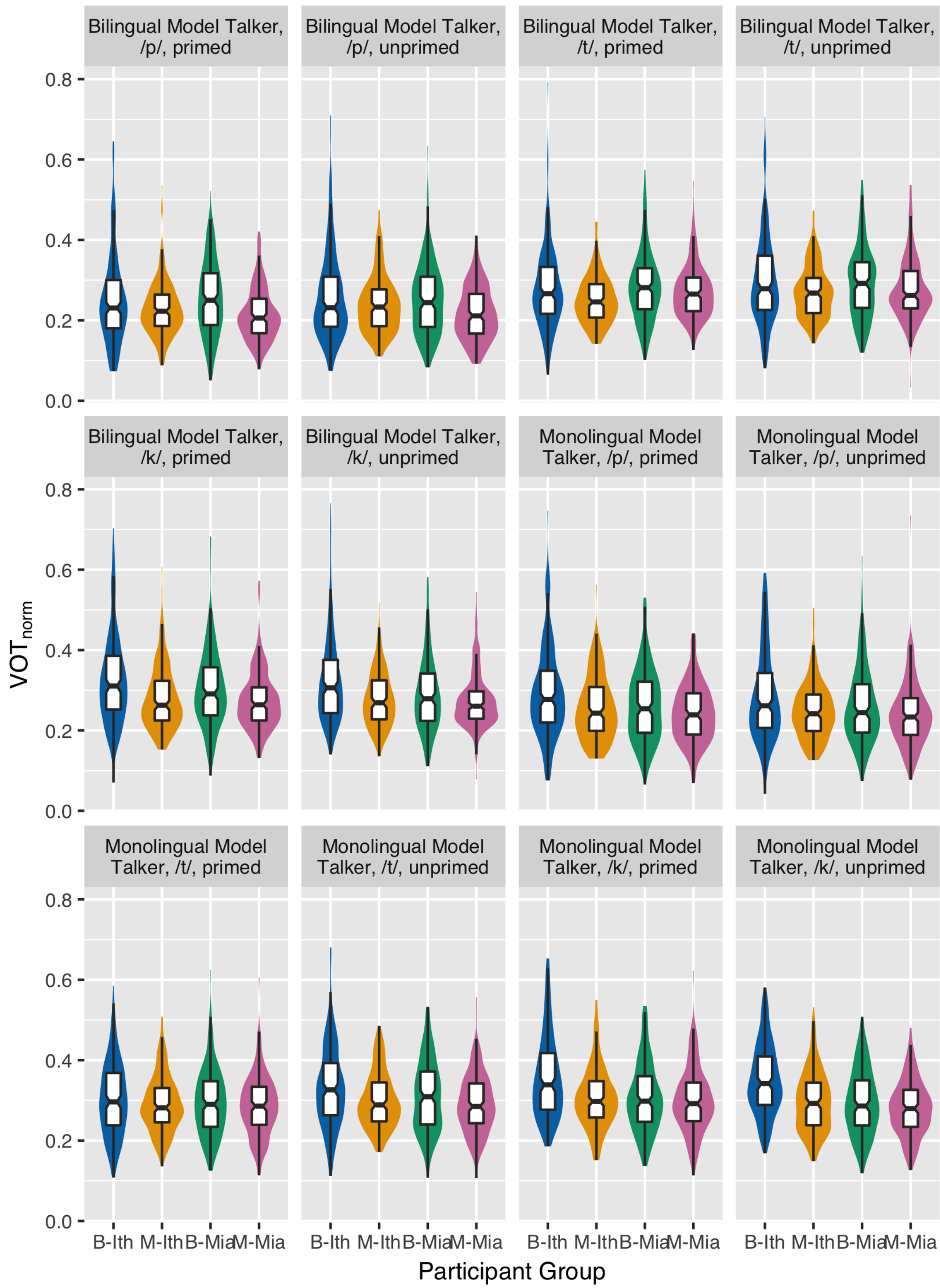


Figure E.10: VOT_{norm} by Participant Group, Model Talker, Prime Type, and Stop

E.2 Experiment 2: Time-course of accommodation

E.2.1 Influence of most-recent, previous interaction on accommodation

Within-group comparisons of VOT_{norm} with the monolingual model talker versus the bilingual model talker for each Model Talker Order

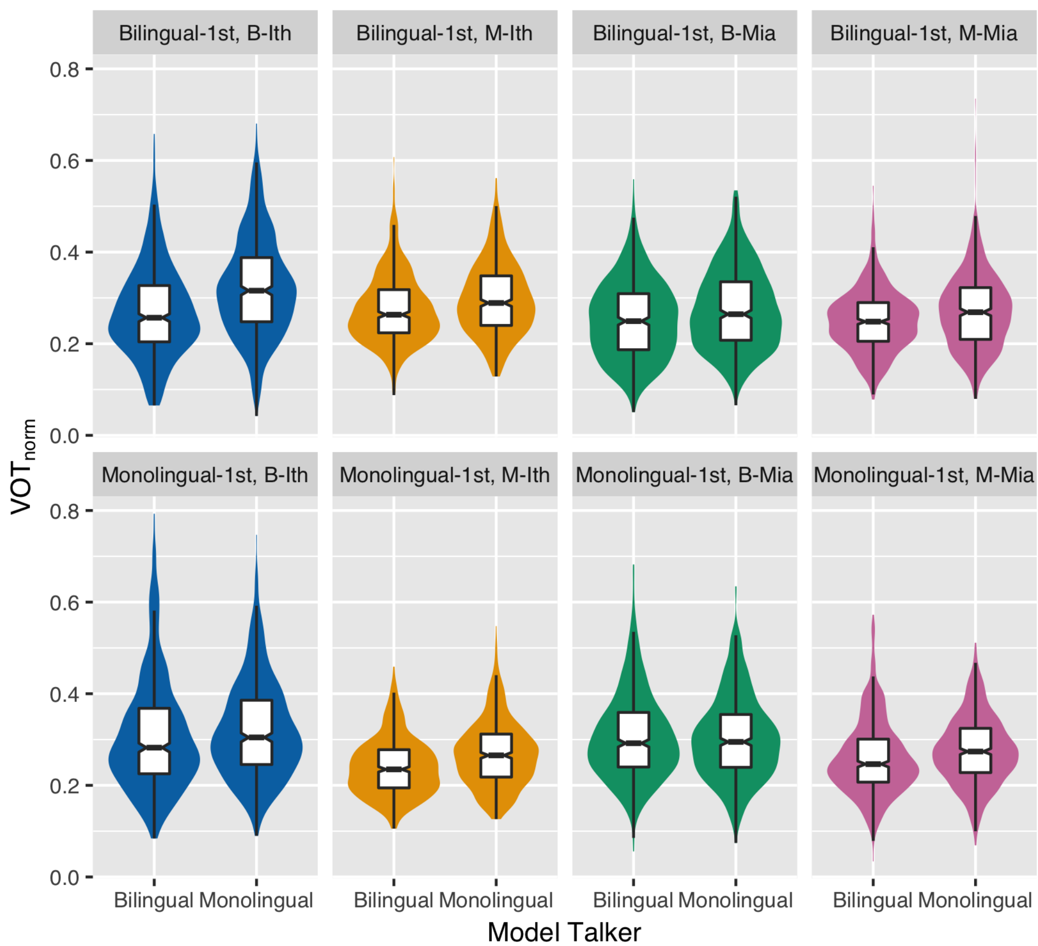


Figure E.11: VOT_{norm} by Participant Group, Model Talker, and Model Talker Order

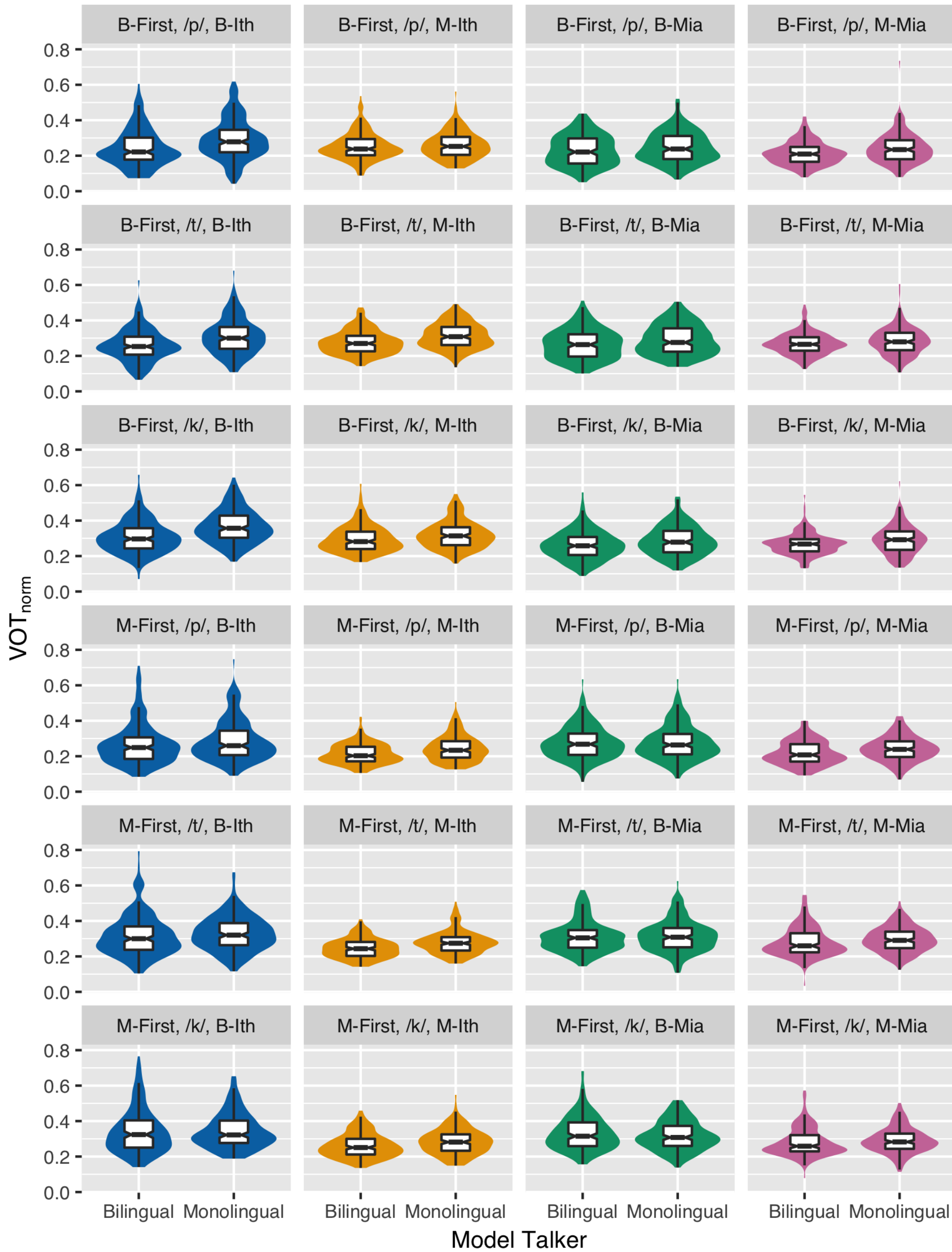


Figure E.12: VOT_{norm} by Participant Group, Model Talker, Model Talker Order, and Stop

Within-group comparisons of VOT_{norm} for participants with Monolingual-First versus Bilingual-First Model Talker Order

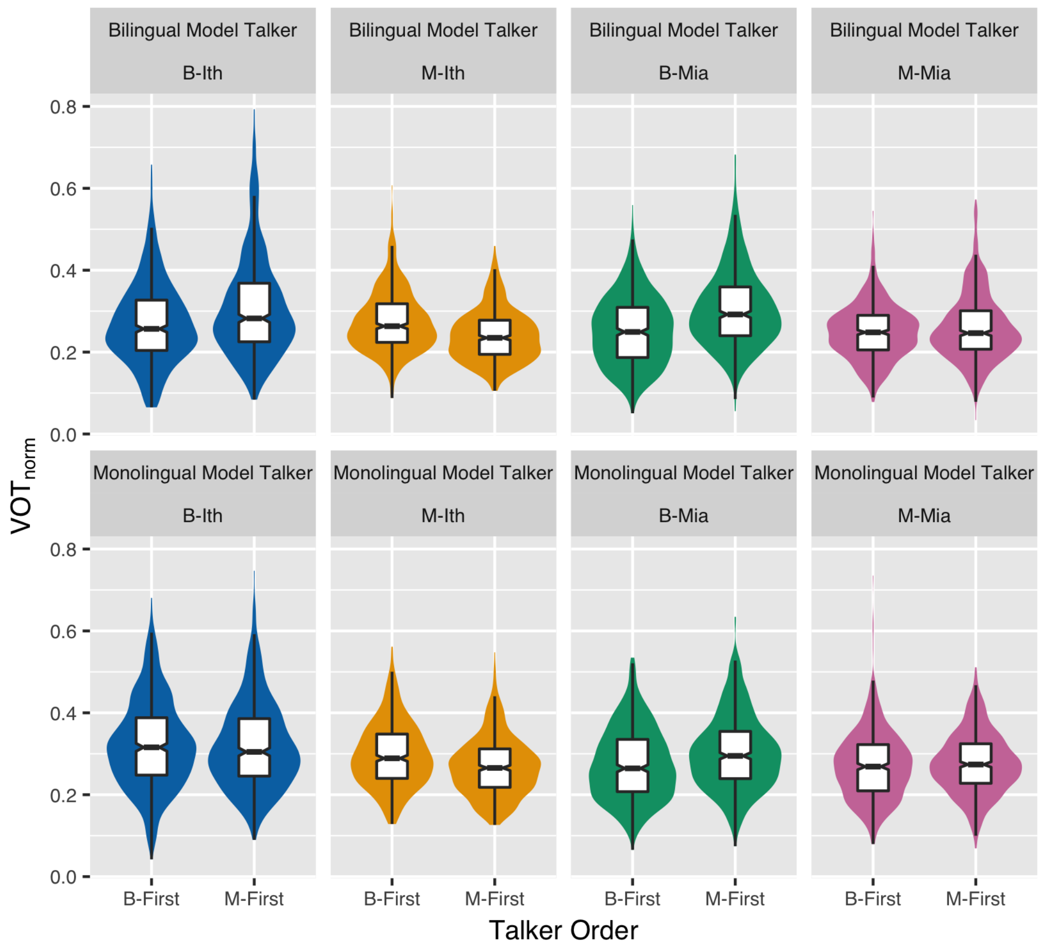


Figure E.13: VOT_{norm} by Participant Group, Model Talker, and Model Talker Order

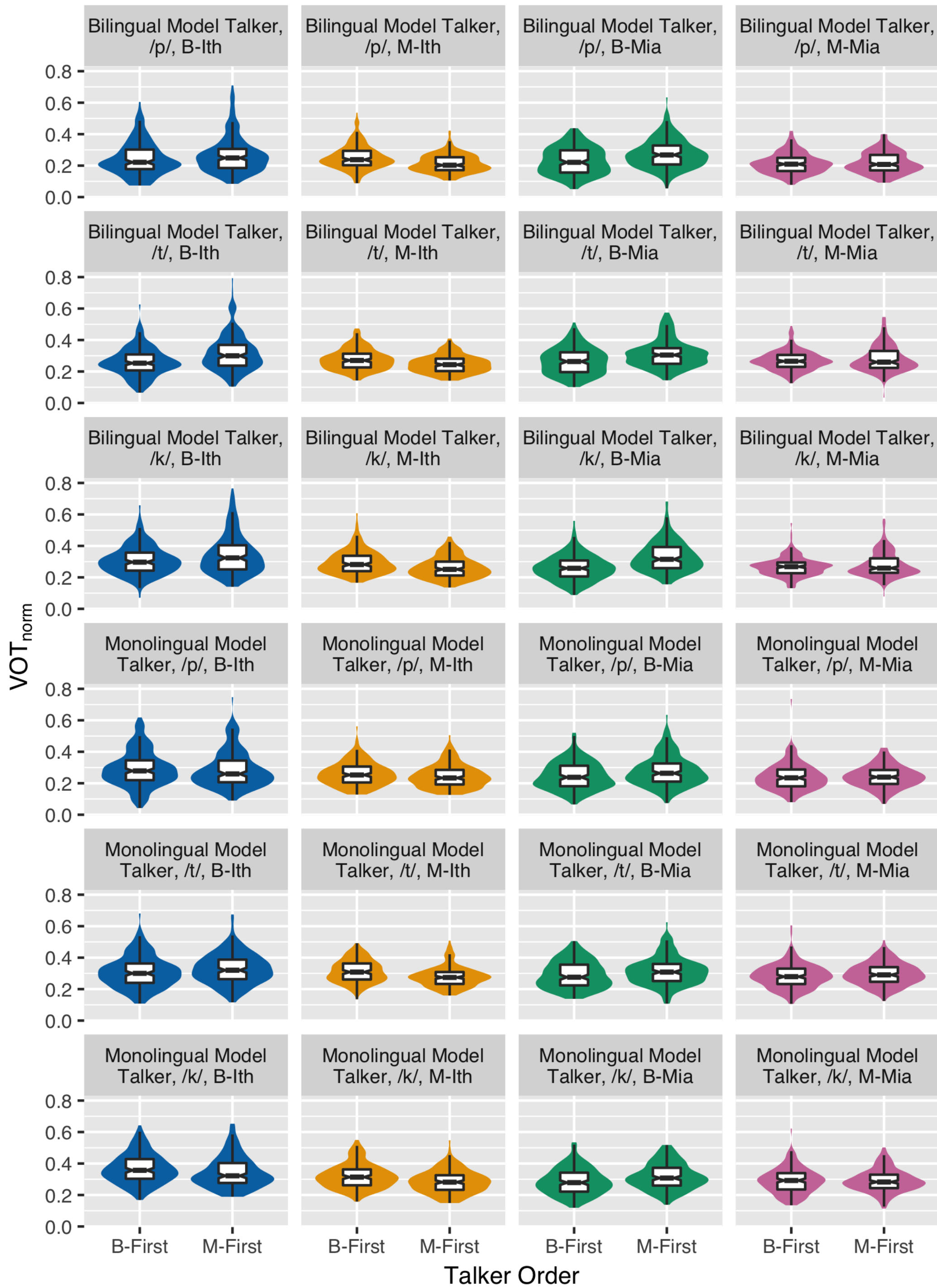


Figure E.14: VOT_{norm} by Participant Group, Model Talker, Model Talker Order, and Stop

Between-group comparison of VOT_{norm} for each model talker and Model Talker Order

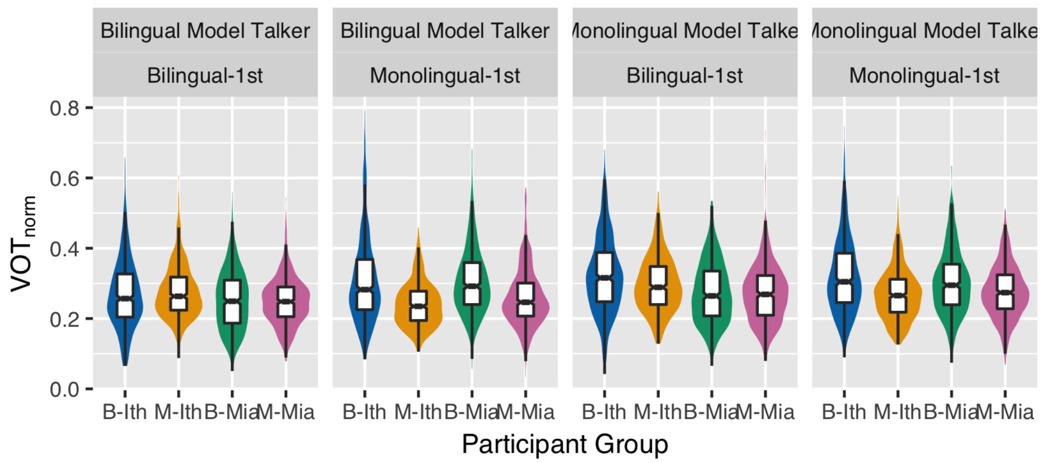


Figure E.15: VOT_{norm} by Participant Group, Model Talker, and Model Talker Order

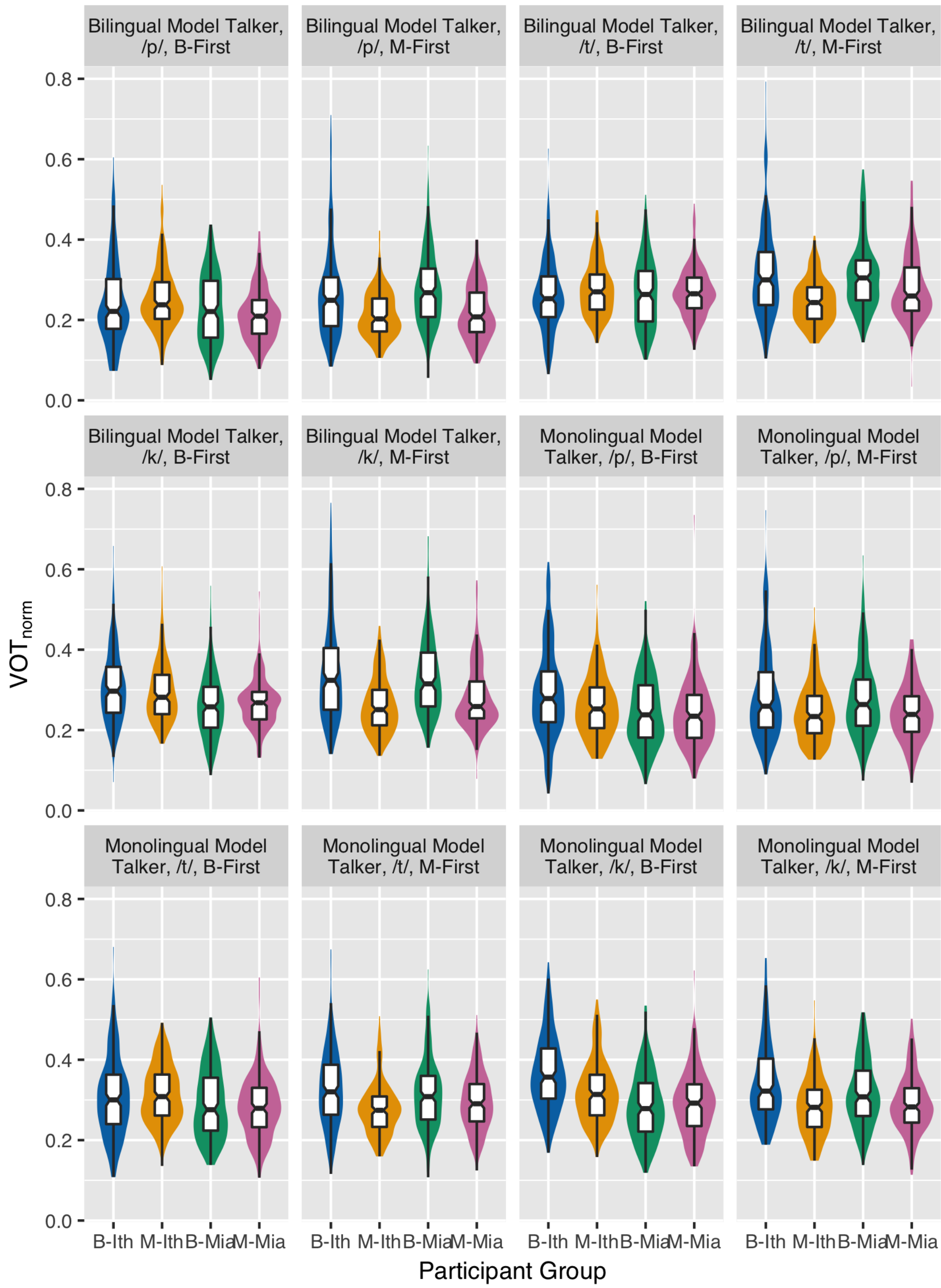


Figure E.16: $\mathrm{VOT}_{\mathrm{norm}}$ by Participant Group, Model Talker, Model Talker Order, and Stop

APPENDIX F

EXPERIMENTS 1 AND 2: NON-NORMALIZED VOT RESULTS

F.1 Mixed-Effects Model

F.1.1 Variables

All variables included in the linear mixed-effects model are provided in Table F.1 below. The variables included to examine social accommodation are linguistic background (LingBackground), speech community (Community), and model talker (Model Talker).

Table F.1: Description of variables

Variable Name	**Description**	**Continuous/ Categorical?**	**Variable/Effect Type**
VOT	Voice Onset Time (in seconds)	Continuous	Dependent
Participant	Participant ID#	Categorical	Random effect
Word	Target word: Each repeated 4 times per participant	Categorical	Random effect
Stop	/p/, /t/, /k/	Categorical	Fixed effect
LingBackground	monolingual, bilingual	Categorical	Fixed effect
Community	Ithaca, Miami	Categorical	Fixed effect
Model Talker	monolingual, bilingual	Categorical	Fixed effect
PrimeType	primed, unprimed	Categorical	Fixed effect
Block	Boards are divided into 4 blocks per model talker	Categorical	Fixed effect & random slope
Model Talker Order	Order that participants heard model talker voices in (monolingual-bilingual or bilingual-monolingual)	Categorical	Fixed effect

F.1.2 Model

Table F.2: Likelihood Ratio Tests for fixed effects (main effects and interactions) with VOT (sec.) as dependent variable.

Predictor	ChiSq	df	Pr(<ChiSq)	
Stop	–	–	–	
Stop + LingBackground	0.2001	1	0.6546	
Stop * LingBackground	20.32	2	3.869e-05	***
Stop * LingBackground + Community	1.4047	1	0.2359	
Stop * LingBackground * Community	66.29	5	6.051e-13	***
Stop * LingBackground * Community + ModelTalker	140.05	1	<2.2e-16	***
Stop * LingBackground * Community * ModelTalker	24.759	11	0.009885	**
Stop * LingBackground * Community * ModelTalker + PrimeType	11.658	1	0.0006393	***
Stop * LingBackground * Community * ModelTalker * PrimeType	25.462	23	0.3269	
Stop * LingBackground * Community * ModelTalker * PrimeType + Block	94.822	12	5.717e-15	***
Stop * LingBackground * Community * ModelTalker * PrimeType * Block	98.876	141	0.9972	
Stop * LingBackground * Community * ModelTalker * PrimeType * Block + ModelTalkerOrder	0.0125	1	0.911	
Stop * LingBackground * Community * ModelTalker * PrimeType * Block * ModelTalkerOrder	238.93	191	0.01055	*

As mentioned in Section 2.3.4, a random slope was added for each Block. This slope was added once Block was added to the model.

F.2 Experiment 1 post-hoc Tukey test results: Accommodation in short-term interactions

In this section, post-hoc Tukey test results from Experiments 1 and 2 are presented. Post-hoc results are only presented if significant, unless otherwise noted. Also, it should be noted that "Group" is not a variable in the mixed model. Rather, Linguistic Background (monolingual or bilingual) and Community (Miami or Ithaca) are variables in the model, and the interaction between Linguistic Background and Community (LingBackground * Community) is examined in the post-hoc tests. However, "Group" is listed below in the tables, instead of both Linguistic Background and Community separately, for clarity and brevity.

F.2.1 Accommodation to model talker

Within-group differences in mean VOT with both model talkers

Overall VOT

Table F.3: Post-hoc Tukey test results: All participant groups had significantly greater VOT (sec.) when interacting with the monolingual model talker (M) than when interacting with the bilingual model talker (B).

	contrast	estimate	SE	df	z.ratio	p.value
Group = B-Ithaca,	B - M	-0.0043	0.0006	Inf	-6.375	<.0001
Group = M-Ithaca,	B - M	-0.0053	0.0006	Inf	-7.894	<.0001
Group = B-Miami,	B - M	-0.0019	0.0006	Inf	-2.898	0.003
Group = M-Miami,	B - M	-0.0047	0.0006	Inf	-6.924	<.0001

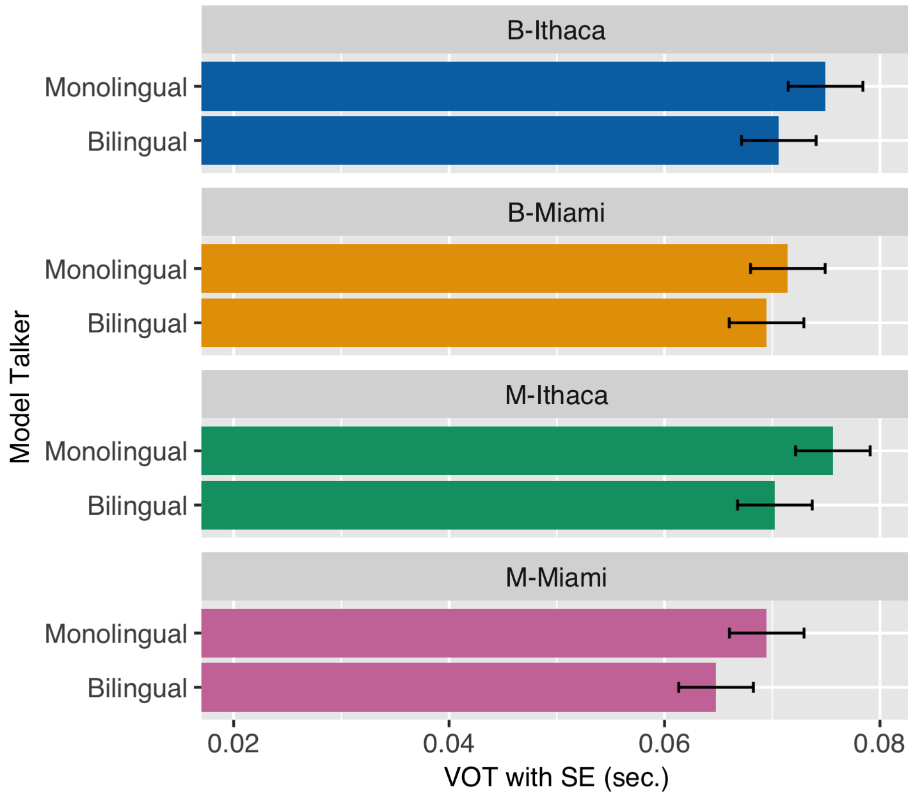


Figure F.1: VOT by Participant Group and Model Talker

VOT by Stop

Table F.4: Post-hoc Tukey test results: All participant groups except B-Miami had significantly greater VOT (sec.) for all stops when interacting with the monolingual model talker (M) than when interacting with the bilingual model talker (B).

	contrast	estimate	SE	df	z.ratio	p.value
Stop = /p/:						
Group = B-Ithaca,	B - M	-0.0050	0.0011	Inf	-4.275	<.0001
Group = M-Ithaca,	B - M	-0.0035	0.0011	Inf	-3.027	0.002
Group = B-Miami,	B - M	-0.0016	0.0011	Inf	-1.382	0.167
Group = M-Miami,	B - M	-0.0064	0.0011	Inf	-5.436	<.0001
Stop = /t/:						
Group = B-Ithaca,	B - M	-0.0043	0.0011	Inf	-3.688	0.0002
Group = M-Ithaca,	B - M	-0.0078	0.0011	Inf	-6.649	<.0001
Group = B-Miami,	B - M	-0.0031	0.0011	Inf	-2.632	0.008
Group = M-Miami,	B - M	-0.0035	0.0011	Inf	-3.043	0.002
Stop = /k/:						
Group = B-Ithaca,	B - M	-0.0036	0.0011	Inf	-3.083	0.002
Group = M-Ithaca,	B - M	-0.0047	0.0011	Inf	-4.003	0.0001
Group = B-Miami,	B - M	-0.0011	0.0011	Inf	-1.008	0.313
Group = M-Miami,	B - M	-0.0041	0.0011	Inf	-3.511	0.0004

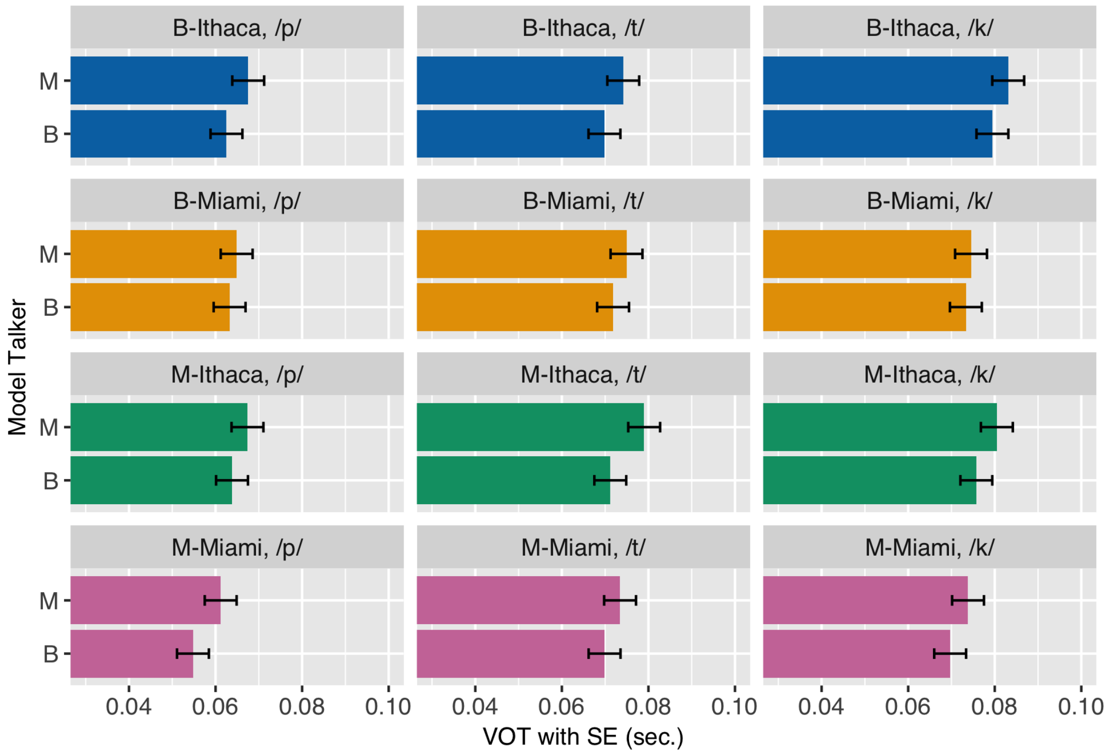


Figure F.2: VOT by Participant Group, Model Talker, and Stop

Between-group differences in mean VOT by model talker

Overall VOT

There were no significant differences.

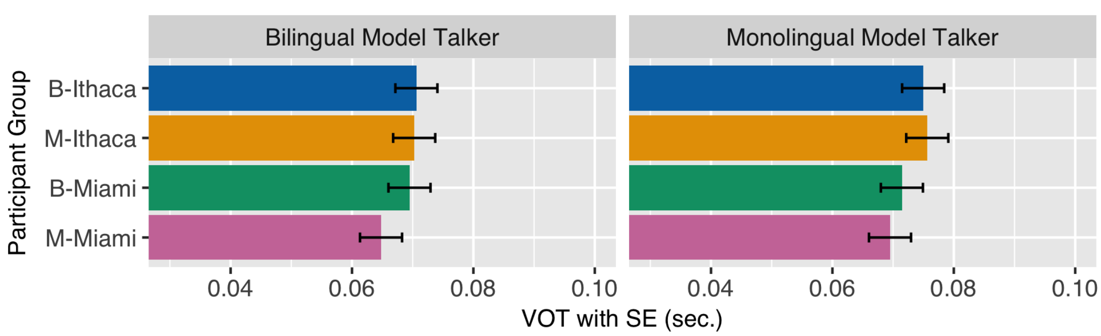


Figure F.3: VOT by Participant Group, and Model Talker

VOT by Stop

There were no significant differences.

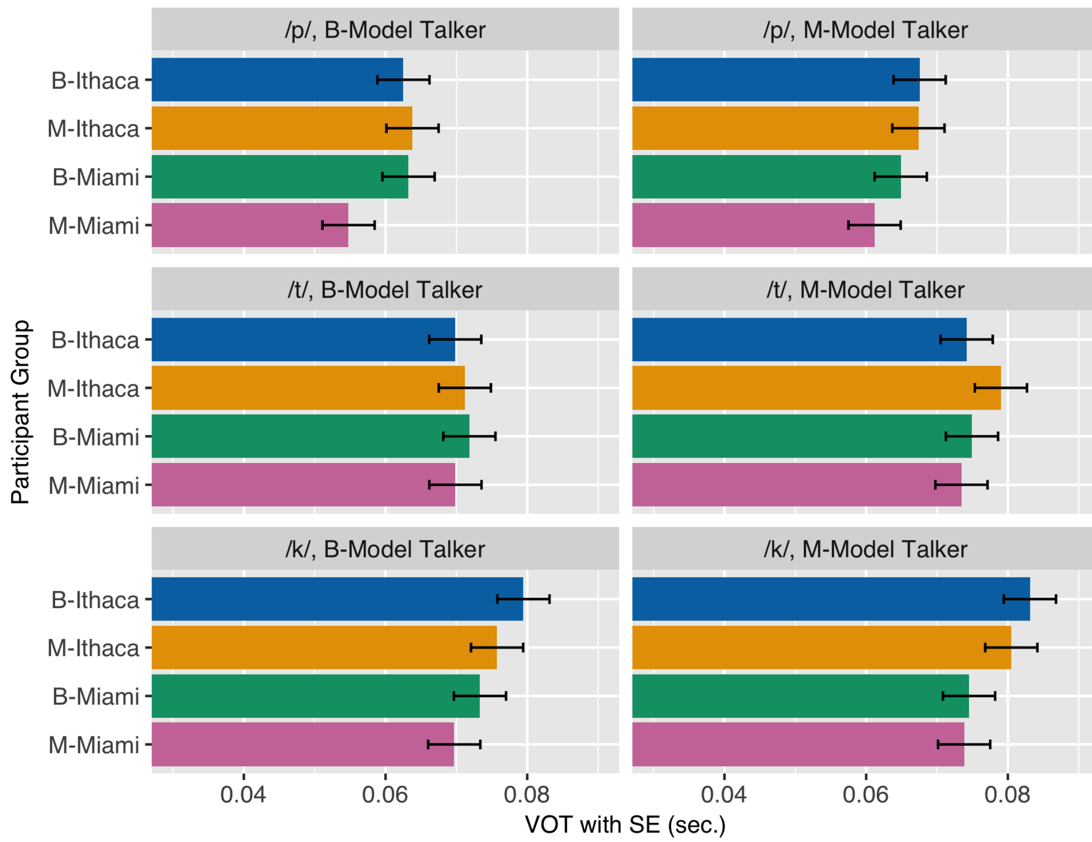


Figure F.4: VOT by Participant Group, Model Talker, and Stop

F.2.2 Influence of priming on accommodation

Within-group comparison of VOT with both model talkers when primed and unprimed

Overall VOT

Table F.5: Post-hoc Tukey test results: In both priming and non-priming conditions, all participant groups had significantly greater VOT when interacting with the monolingual model talker than when interacting with the bilingual model talker.

	contrast	estimate	SE	df	z.ratio	p.value
PrimeType = primed:						
Group = B-Ithaca,	B - M	0.0051	0.0009	Inf	-5.322	<.0001
Group = M-Ithaca,	B - M	-0.0070	0.0009	Inf	-7.314	<.0001
Group = B-Miami,	B - M	-0.0018	0.0009	Inf	-1.942	0.052
Group = M-Miami,	B - M	-0.0057	0.0009	Inf	-5.952	<.0001
PrimeType = unprimed:						
Group = B-Ithaca,	B - M	-0.0035	0.0009	Inf	-3.696	0.0002
Group = M-Ithaca,	B - M	-0.0037	0.0009	Inf	-3.855	0.0001
Group = B-Miami,	B - M	-0.0020	0.0009	Inf	-2.157	0.031
Group = M-Miami,	B - M	-0.0036	0.0009	Inf	-3.841	0.0001

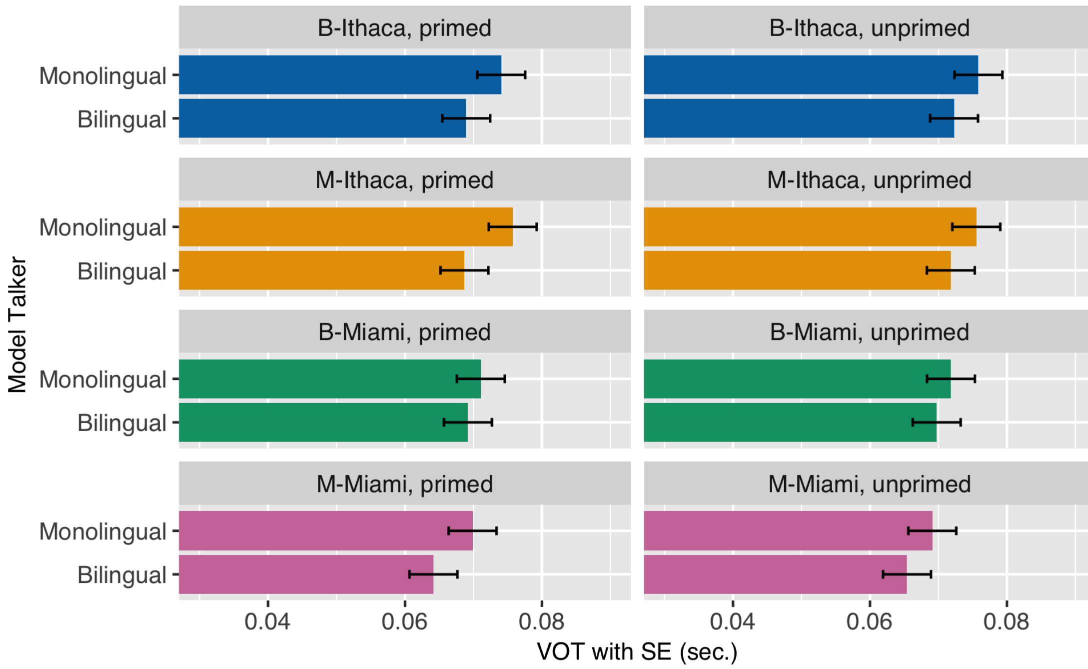


Figure F.5: VOT by Participant Group, Model Talker, and Prime Type

VOT by Stop

Table F.6: Post-hoc Tukey test results: All participant groups except B-Miami had significantly greater VOT when interacting with the monolingual model talker, compared to when interacting with the bilingual model talker, for some—if not all—stops. This difference was more common in priming conditions.

	contrast	estimate	SE	df	z.ratio	p.value
PrimeType = primed:						
Stop = /p/:						
Group = B-Ithaca,	B - M	-0.0072	0.0016	Inf	-4.376	<.0001
Group = M-Ithaca,	B - M	-0.0063	0.0016	Inf	-3.792	0.0001
Group = B-Miami,	B - M	-0.0019	0.0016	Inf	-1.143	0.252
Group = M-Miami,	B - M	-0.0071	0.0016	Inf	-4.315	<.0001
Stop = /t/:						
Group = B-Ithaca,	B - M	-0.0035	0.0016	Inf	-2.122	0.033
Group = M-Ithaca,	B - M	-0.0094	0.0016	Inf	-5.672	<.0001
Group = B-Miami,	B - M	0.0023	0.0016	Inf	-1.398	0.162
Group = M-Miami,	B - M	-0.0037	0.0016	Inf	-2.241	0.0250
Stop = /k/:						
Group = B-Ithaca,	B - M	-0.0045	0.0016	Inf	-2.721	0.006
Group = M-Ithaca,	B - M	-0.0053	0.0016	Inf	-3.205	0.001
Group = B-Miami,	B - M	-0.0013	0.0016	Inf	-0.823	0.410
Group = M-Miami,	B - M	-0.0062	0.0016	Inf	-3.750	0.0002
PrimeType = unprimed:						
Stop = /p/:						
Group = B-Ithaca,	B - M	-0.0027	0.0016	Inf	-1.670	0.094
Group = M-Ithaca,	B - M	-0.0008	0.0016	Inf	-0.497	0.619
Group = B-Miami,	B - M	-0.0013	0.0016	Inf	-0.813	0.416
Group = M-Miami,	B - M	-0.0056	0.0016	Inf	-3.374	0.0007
Stop = /t/:						
Group = B-Ithaca,	B - M	-0.0051	0.0016	Inf	-3.093	0.002
Group = M-Ithaca,	B - M	-0.0061	0.0016	Inf	-3.728	0.0002
Group = B-Miami,	B - M	-0.0038	0.0016	Inf	-2.325	0.020
Group = M-Miami,	B - M	-0.0034	0.0016	Inf	-2.062	0.039
Stop = /k/:						
Group = B-Ithaca,	B - M	-0.0027	0.0016	Inf	-1.641	0.101
Group = M-Ithaca,	B - M	-0.0041	0.0016	Inf	-2.459	0.013
Group = B-Miami,	B - M	-0.0010	0.0016	Inf	-0.602	0.547
Group = M-Miami,	B - M	-0.0020	0.0016	Inf	-1.213	0.225

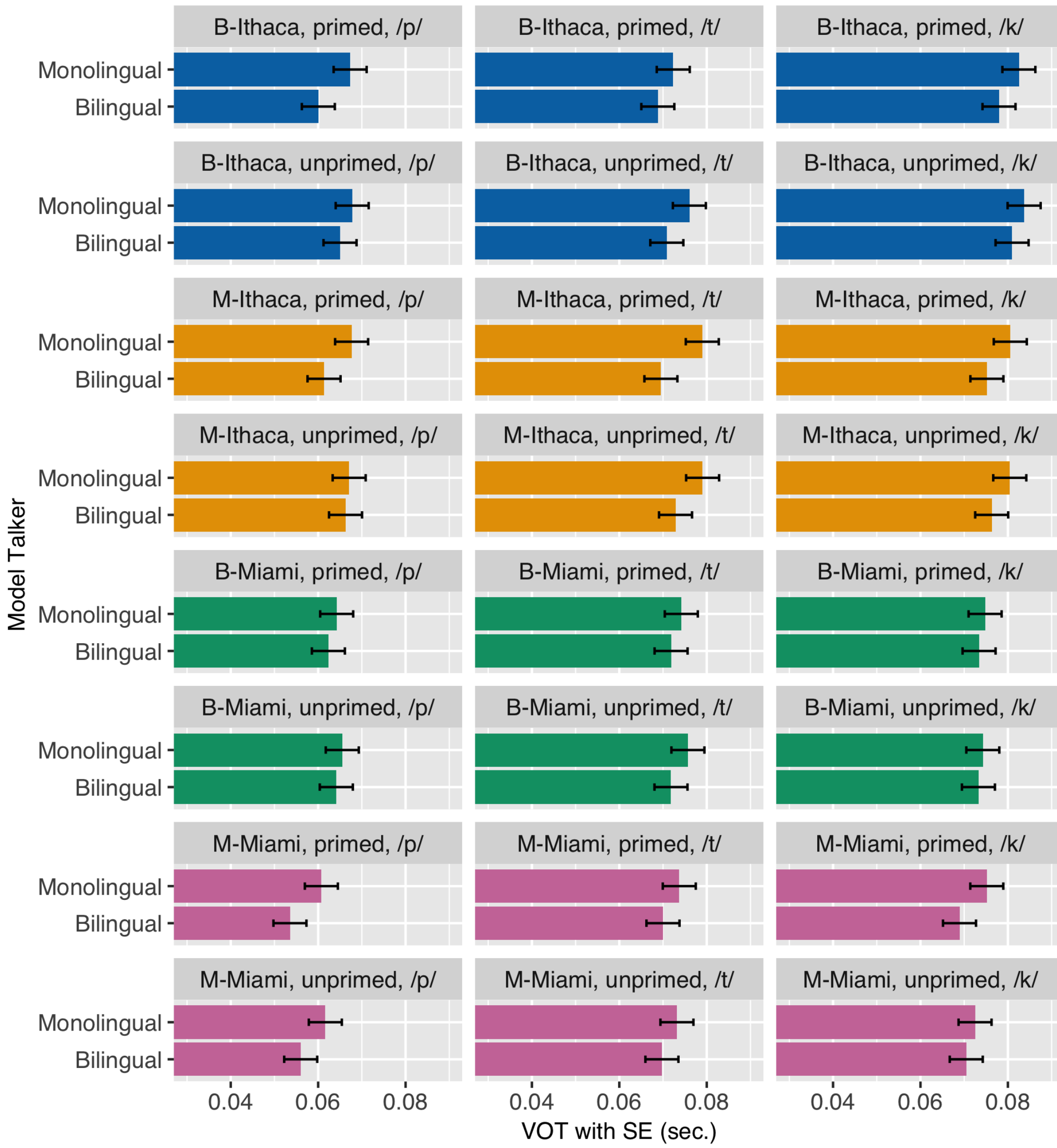


Figure F.6: VOT by Participant Group, Model Talker, PrimeType, and Stop

Within-group comparison of VOT when primed versus unprimed by model talkers

Overall VOT

Table F.7: Post-hoc Tukey test results: Participants from the monolingual community (B-Ithaca, M-Ithaca) had shorter VOT when primed by the bilingual model talker, compared to when unprimed.

contrast	estimate	SE	df	z.ratio	p.value
Model Talker = Bilingual:					
Group = B-Ithaca, primed - unprimed	-0.0033	0.0009	Inf	-3.467	0.0005
Group = M-Ithaca, primed - unprimed	-0.0031	0.0009	Inf	-3.240	0.0012
Model Talker = Monolingual:					
Group = B-Ithaca, primed - unprimed	-0.0017	0.0009	Inf	-1.857	0.063

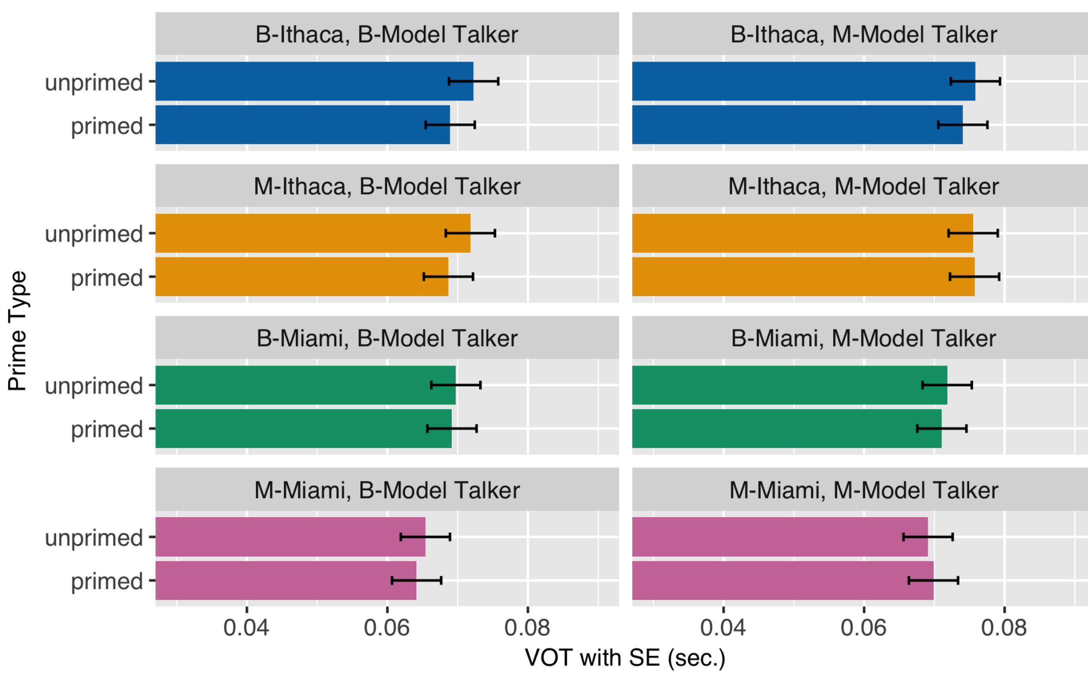


Figure F.7: VOT by Participant Group, Model Talker, and Prime Type

VOT by Stop

Table F.8: Post-hoc Tukey test results: Priming influenced Ithaca groups, particularly when interacting with the bilingual model talker.

contrast	estimate	SE	df	z.ratio	p.value
Model Talker = Bilingual:					
Stop = /p/:					
Group = B-Ithaca, primed - unprimed	-0.0049	0.0016	Inf	-2.984	0.002
Group = M-Ithaca, primed - unprimed	-0.0049	0.0016	Inf	-2.952	0.003
Stop = /t/:					
Group = M-Ithaca, primed - unprimed	-0.0033	0.0016	Inf	-2.006	0.045
Stop = /k/:					
Group = B-Ithaca, primed - unprimed	-0.0029	0.0016	Inf	-1.788	0.073
Model Talker = Monolingual:					
Stop = /t/:					
Group = B-Ithaca, primed - unprimed	-0.0036	0.0016	Inf	-2.215	0.026

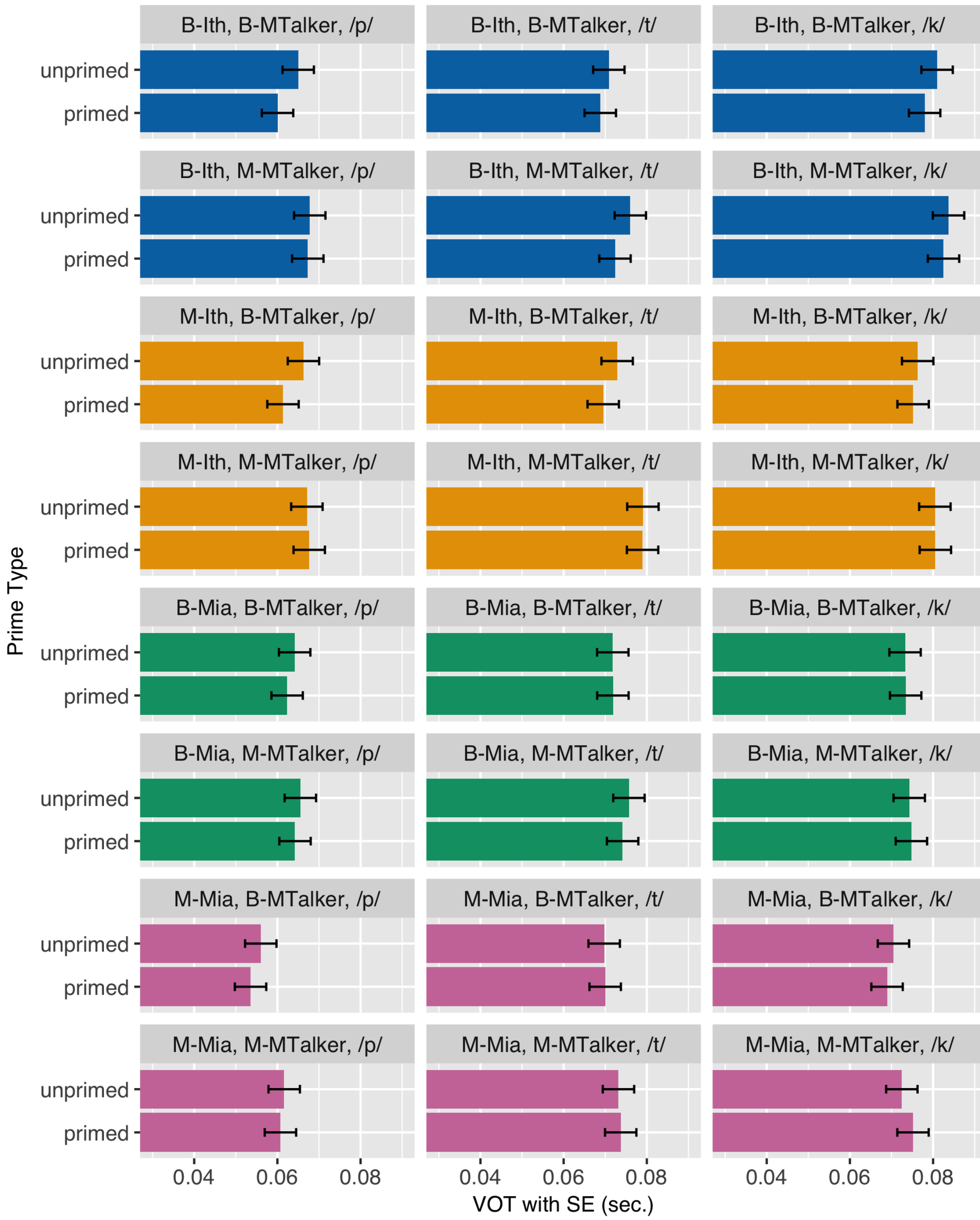


Figure F.8: VOT by Participant Group, Model Talker, Prime Type, and Stop

Between-group comparison of VOT with each model talker primed and unprimed

Overall VOT

There were no significant differences.

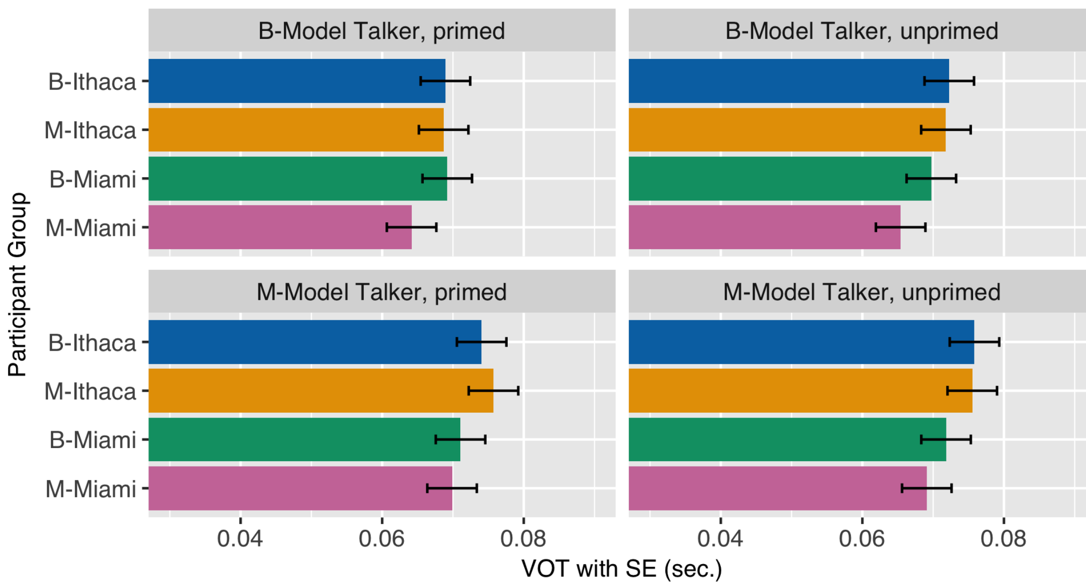


Figure F.9: VOT by Participant Group, Model Talker, and Prime Type

VOT by Stop

There were no significant differences.

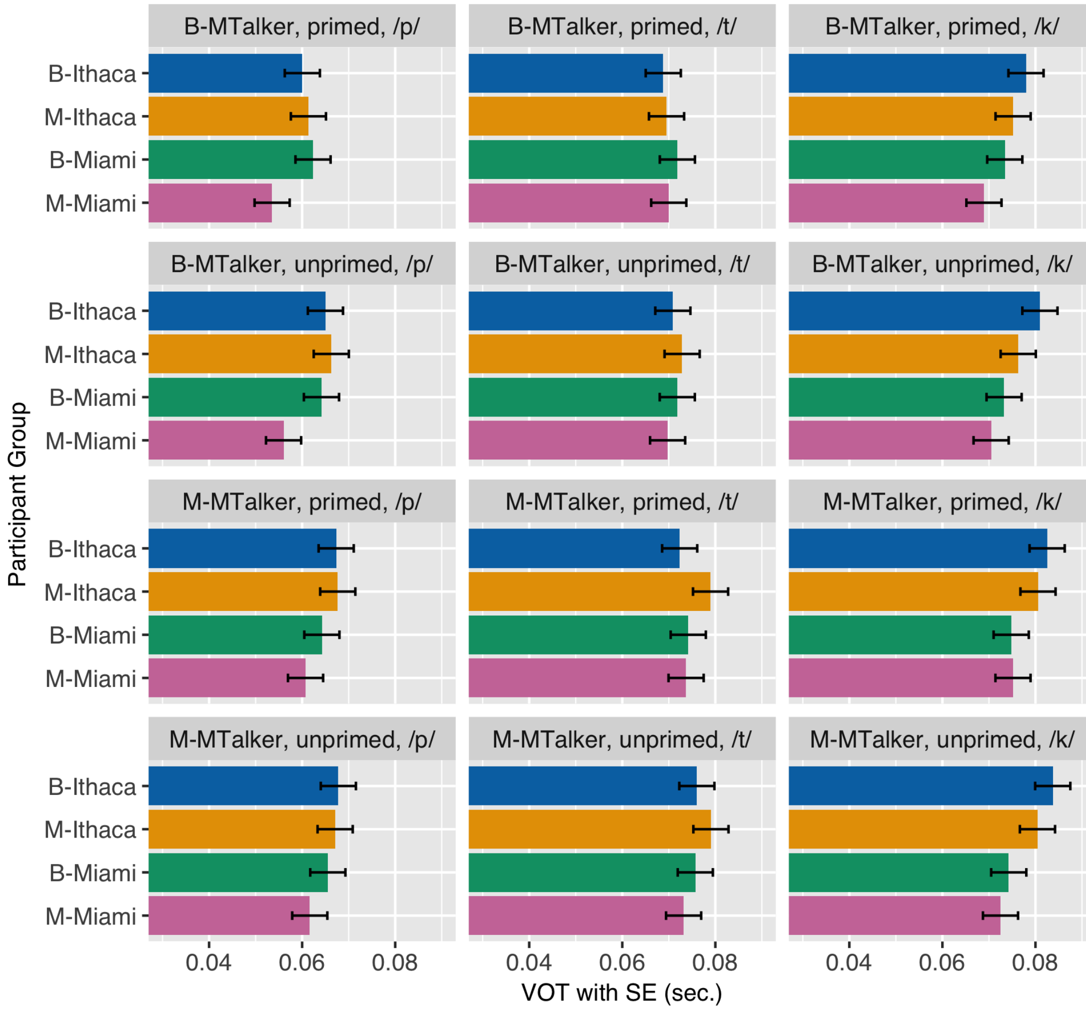


Figure F.10: VOT by Participant Group, Model Talker, Prime Type, and Stop

F.3 Experiment 2: Time-course of accommodation

F.3.1 Accommodation changes within a short-term interaction

Within-group differences in mean VOT with both model talkers for each block

Overall VOT

Table F.9: Post-hoc Tukey test results: All groups except B-Miami had longer VOT with the monolingual model talker than with the bilingual model talker for all four blocks. B-Miami only had longer VOT with the monolingual model talker in Blocks 2 and 4.

contrast	estimate	SE	df	z.ratio	p.value
Group=B-Ithaca:					
Block = 1, B - M	-0.0044	0.0013	Inf	-3.279	0.001
Block = 2, B - M	-0.0043	0.0013	Inf	-3.182	0.001
Block = 3, B - M	-0.0037	0.0013	Inf	-2.752	0.006
Block = 4, B - M	-0.0048	0.0013	Inf	-3.536	0.0004
Group=M-Ithaca:					
Block = 1, B - M	-0.0032	0.0013	Inf	-2.413	0.015
Block = 2, B - M	-0.0070	0.0013	Inf	-5.205	<.0001
Block = 3, B - M	-0.0048	0.0013	Inf	-3.533	0.0004
Block = 4, B - M	-0.0063	0.0013	Inf	-4.647	<.0001
Group=B-Miami:					
Block = 1, B - M	0.0003	0.0013	Inf	0.279	0.780
Block = 2, B - M	-0.0045	0.0013	Inf	-3.329	0.0009
Block = 3, B - M	0.0011	0.0013	Inf	-0.815	0.414
Block = 4, B - M	-0.0026	0.0013	Inf	-1.941	0.052
Group=M-Miami:					
Block = 1, B - M	-0.0040	0.0013	Inf	-2.978	0.003
Block = 2, B - M	-0.0052	0.0013	Inf	-3.858	0.0001
Block = 3, B - M	-0.0043	0.0013	Inf	-3.229	0.001
Block = 4, B - M	-0.0051	0.0013	Inf	-3.781	0.0002

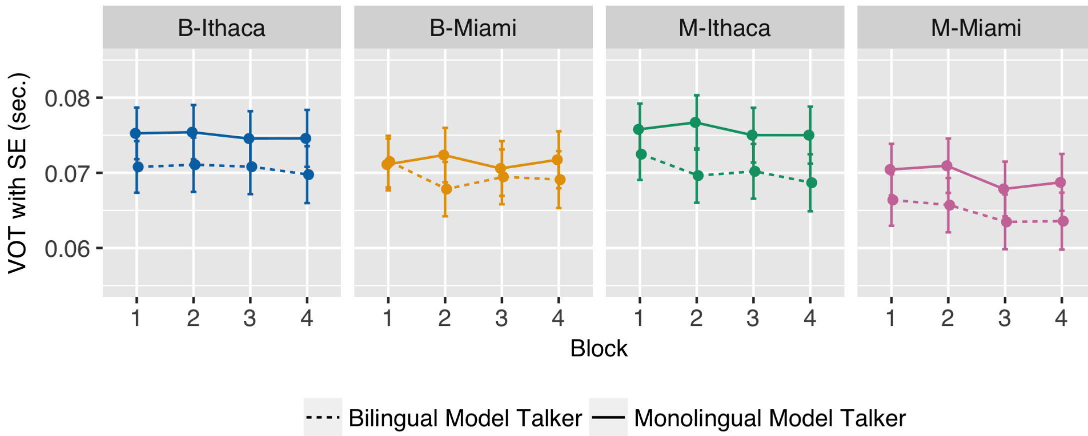


Figure F.11: VOT by Participant Group, Model Talker, and Block

VOT by Stop

Table F.10: Post-hoc Tukey test results: Ithaca participant groups produced longer VOTs with the monolingual model talker and shorter VOT with the bilingual model talker in most blocks. (Groups = B-Ithaca and M-Ithaca)

contrast	estimate	SE	df	z.ratio	p.value
Group=B-Ithaca					
Stop=/p/:					
Block = 1, B - M	-0.0045	0.0023	Inf	-1.930	0.053
Block = 2, B - M	-0.0048	0.0023	Inf	-2.052	0.040
Block = 3, B - M	-0.0066	0.0023	Inf	-2.816	0.005
Block = 4, B - M	-0.0041	0.0023	Inf	-1.752	0.079
Stop=/t/:					
Block = 1, B - M	-0.0043	0.0023	Inf	-1.868	0.061
Block = 2, B - M	-0.0041	0.0023	Inf	-1.763	0.078
Block = 3, B - M	-0.0036	0.0023	Inf	-1.533	0.125
Block = 4, B - M	-0.0052	0.0023	Inf	-2.212	0.027
Stop=/k/:					
Block = 1, B - M	-0.0044	0.0023	Inf	-1.881	0.059
Block = 2, B - M	-0.0039	0.0023	Inf	-1.698	0.089
Block = 3, B - M	-0.0010	0.0023	Inf	-0.430	0.667
Block = 4, B - M	-0.0051	0.0023	Inf	-2.158	0.030
Group=M-Ithaca					
Stop=/p/:					
Block = 1, B - M	-0.0018	0.0023	Inf	-0.777	0.437
Block = 2, B - M	-0.0055	0.0023	Inf	-2.369	0.017
Block = 3, B - M	-0.0011	0.0023	Inf	-0.466	0.641
Block = 4, B - M	-0.0057	0.0023	Inf	-2.454	0.014
Stop=/t/:					
Block = 1, B - M	-0.0049	0.0023	Inf	-2.110	0.034
Block = 2, B - M	-0.0086	0.0023	Inf	-3.673	0.0002
Block = 3, B - M	-0.0082	0.0023	Inf	-3.511	0.0004
Block = 4, B - M	-0.0094	0.0023	Inf	-3.993	0.0001
Stop=/k/:					
Block = 1, B - M	-0.0031	0.0023	Inf	-1.301	0.193
Block = 2, B - M	-0.0070	0.0023	Inf	-2.974	0.003
Block = 3, B - M	-0.0050	0.0023	Inf	-2.147	0.032
Block = 4, B - M	-0.0037	0.0023	Inf	-1.596	0.110

Table F.11: Post-hoc Tukey test results: Miami participant groups produced longer VOT with the monolingual model talker and shorter VOT with the bilingual model talker in some blocks. (Groups = B-Miami and M-Miami)

contrast	estimate	SE	df	z.ratio	p.value
Group=B-Miami					
Stop=/p/:					
Block = 1, B - M	0.0011	0.0023	Inf	0.471	0.637
Block = 2, B - M	-0.0028	0.0023	Inf	-1.205	0.228
Block = 3, B - M	-0.0015	0.0023	Inf	-0.628	0.529
Block = 4, B - M	-0.0032	0.0023	Inf	-1.402	0.161
Stop=/t/:					
Block = 1, B - M	-0.0014	0.0023	Inf	-0.596	0.551
Block = 2, B - M	-0.0069	0.0023	Inf	-2.962	0.003
Block = 3, B - M	-0.0012	0.0023	Inf	-0.526	0.598
Block = 4, B - M	-0.0028	0.0023	Inf	-1.190	0.233
Stop=/k/:					
Block = 1, B - M	0.0014	0.0023	Inf	0.612	0.540
Block = 2, B - M	-0.0037	0.0023	Inf	-1.605	0.108
Block = 3, B - M	-0.0006	0.0023	Inf	-0.256	0.797
Block = 4, B - M	-0.0018	0.0023	Inf	-0.771	0.440
Group=M-Miami					
Stop=/p/:					
Block = 1, B - M	-0.0057	0.0023	Inf	-2.435	0.015
Block = 2, B - M	-0.0084	0.0023	Inf	-3.570	0.0004
Block = 3, B - M	-0.0053	0.0023	Inf	-2.281	0.022
Block = 4, B - M	-0.0061	0.0023	Inf	-2.587	0.010
Stop=/t/:					
Block = 1, B - M	-0.0034	0.0023	Inf	-1.460	0.144
Block = 2, B - M	-0.0023	0.0023	Inf	-0.999	0.317
Block = 3, B - M	-0.0032	0.0023	Inf	-1.365	0.172
Block = 4, B - M	-0.0053	0.0023	Inf	-2.253	0.024
Stop=/k/:					
Block = 1, B - M	-0.0029	0.0023	Inf	-1.262	0.206
Block = 2, B - M	-0.0049	0.0023	Inf	-2.110	0.034
Block = 3, B - M	-0.0045	0.0023	Inf	-1.945	0.051
Block = 4, B - M	-0.0040	0.0023	Inf	-1.706	0.088

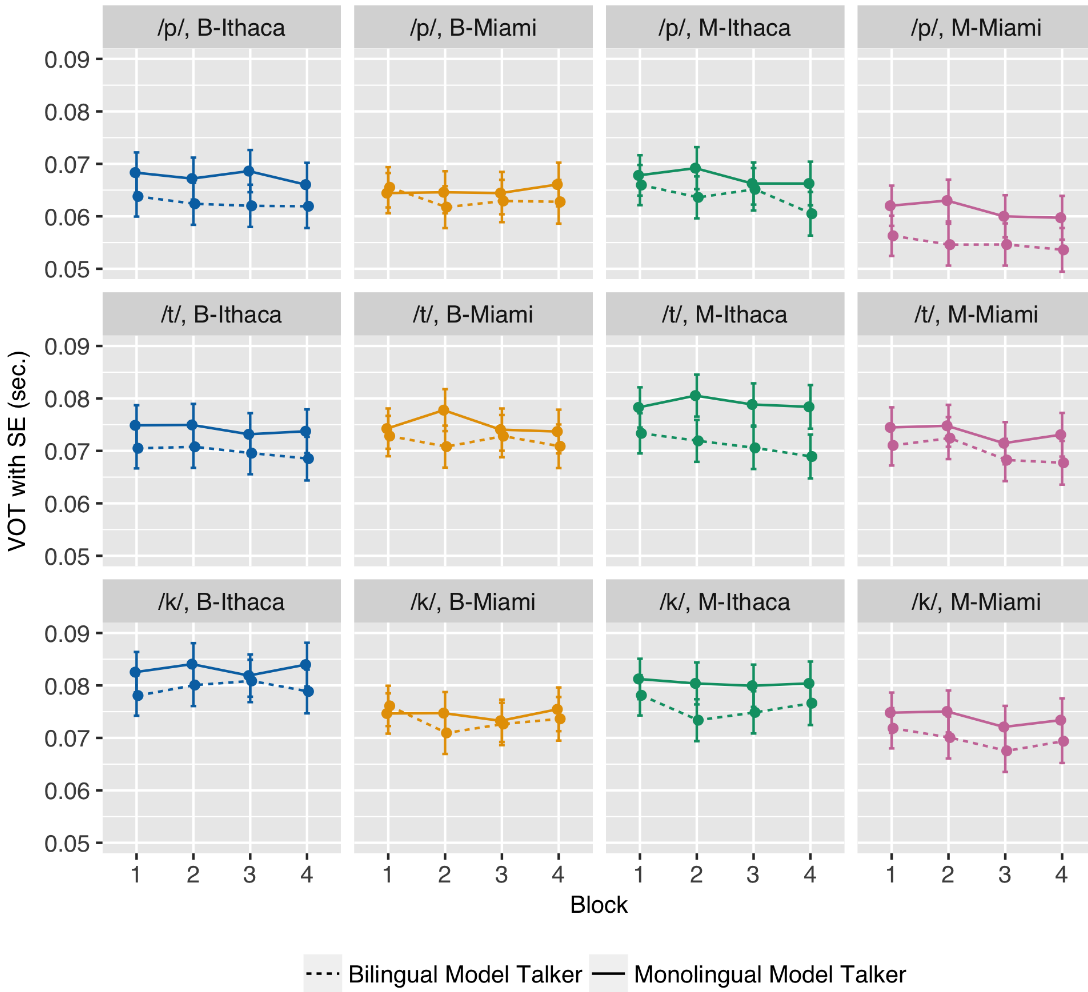


Figure F.12: VOT by Participant Group, Model Talker, Block, and Stop

Within-group comparison of VOT between blocks for each model talker

Overall VOT

Table F.12: Post-hoc Tukey test results: For B-Miami, there were significant changes in VOT between blocks 1 and 2, when interacting with the bilingual model talker.

contrast	estimate	SE	df	z.ratio	p.value
Model Talker = Bilingual:					
Group=B-Miami, Block 1 - 2	0.0036	0.0015	Inf	2.400	0.077

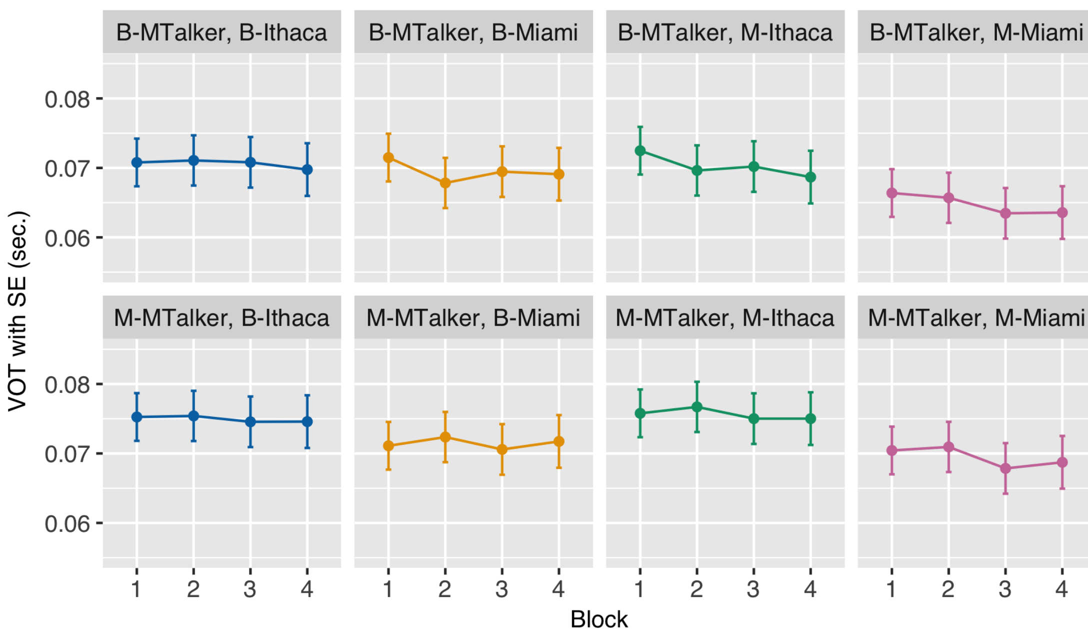


Figure F.13: VOT by Participant Group, Model Talker, and Block

VOT by Stop

There were no significant differences.

Between-group differences in VOT by model talker and block

Overall VOT

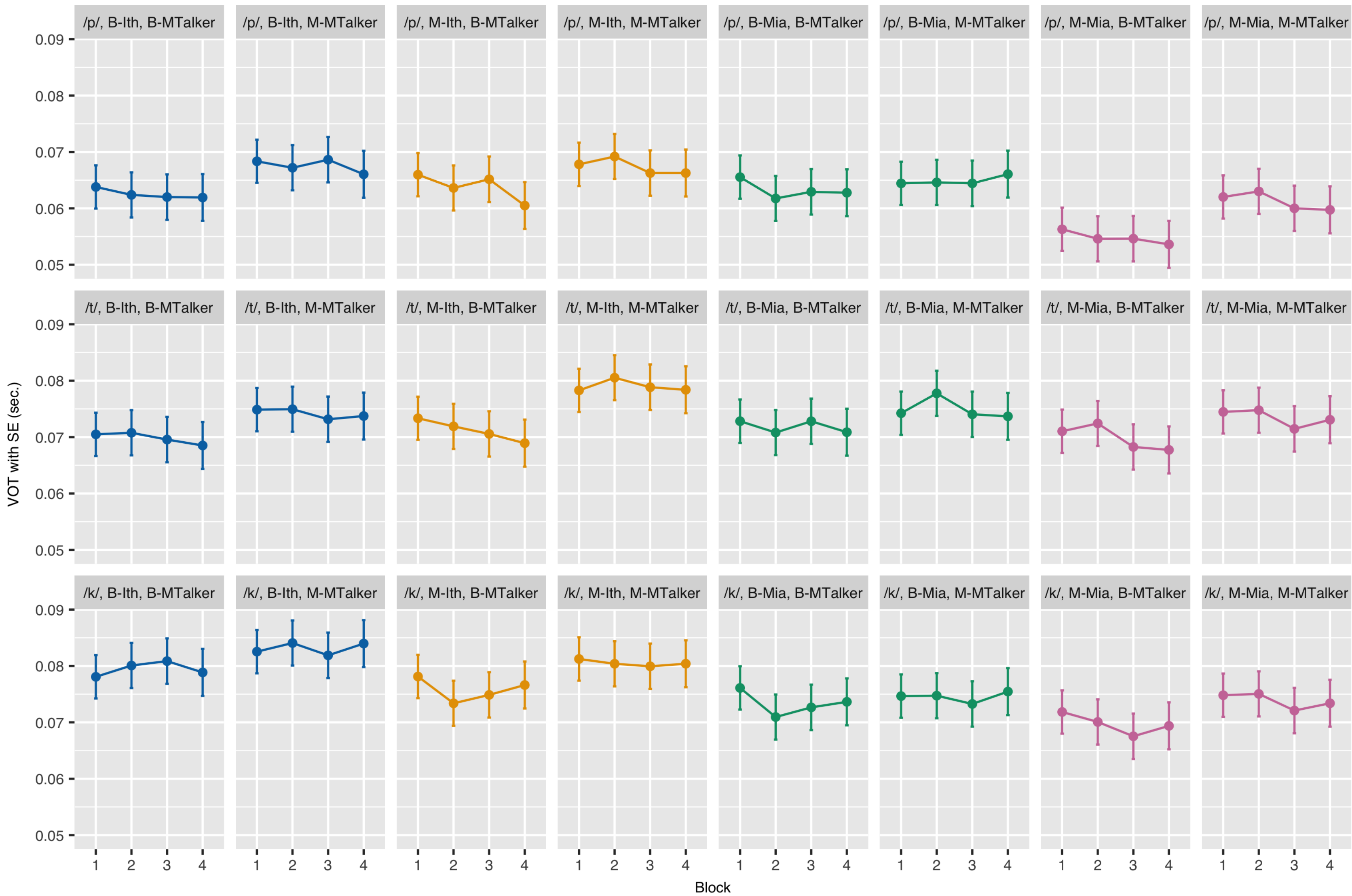


Figure F.14: VOT by Participant Group, Model Talker, Block, and Stop

There were no significant differences.

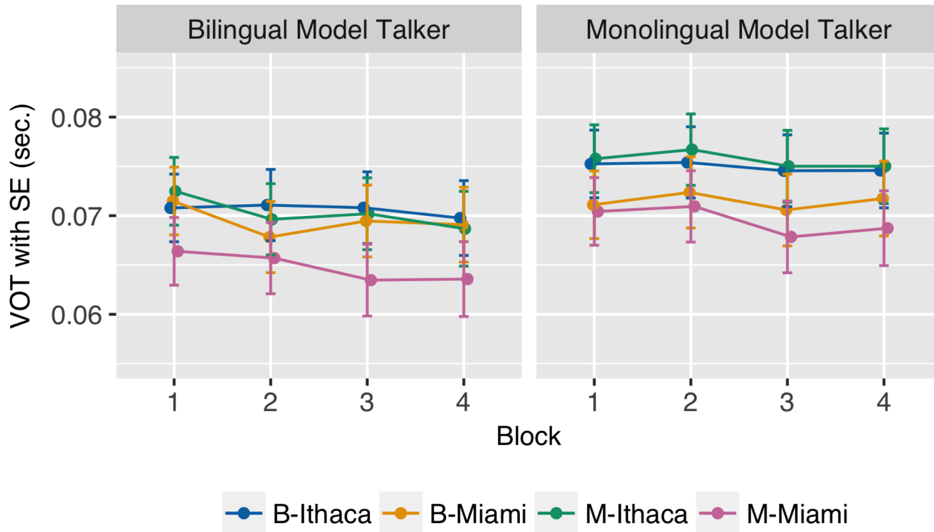


Figure F.15: VOT by Participant Group, Model Talker, and Block

VOT by Stop

Table F.13: Post-hoc Tukey test results: B-Ithaca's /k/ VOT is significantly longer than M-Miami's /k/ VOT.

contrast	estimate	SE	df	z.ratio	p.value
Model Talker = Bilingual:					
Stop = /k/:					
Block = 3, B-Ithaca - M-Miami	0.013	0.005	Inf	2.467	0.065

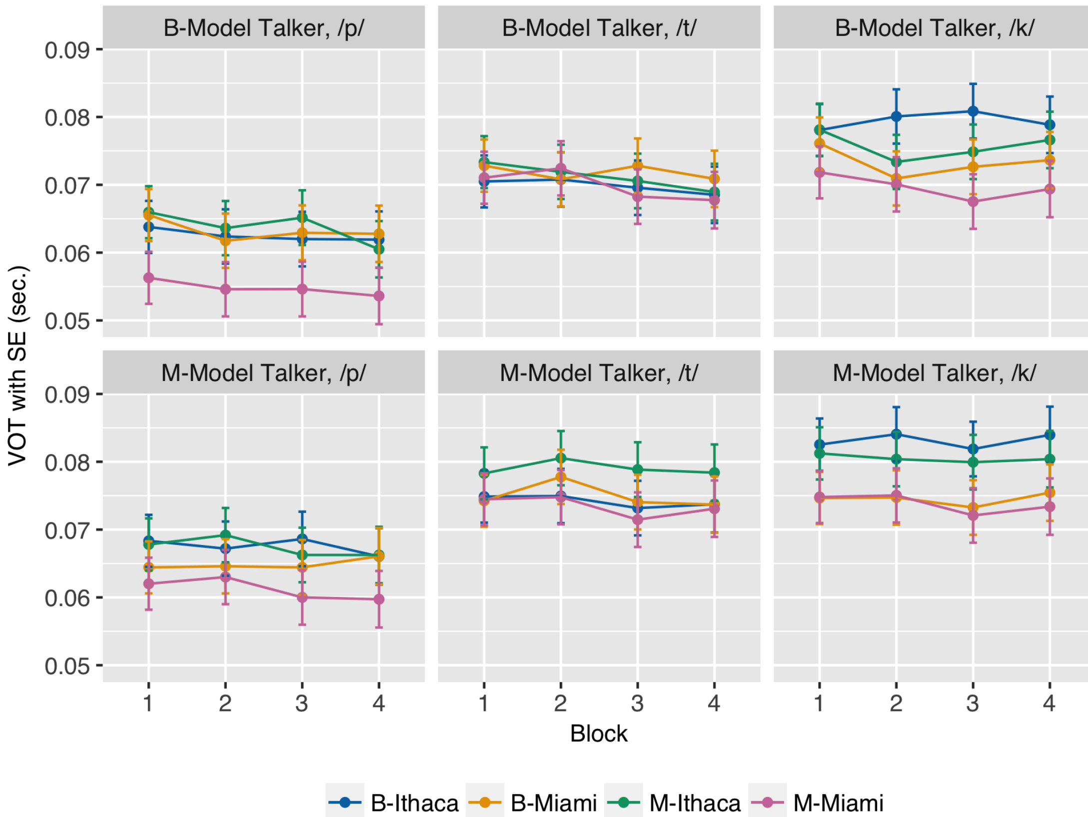


Figure F.16: VOT by Participant Group, Model Talker, Block, and Stop

F.3.2 Influence of most-recent, previous interaction on accommodation

Within-group comparisons of VOT with the monolingual model talker versus the bilingual model talker for each Model Talker Order

Overall VOT

Table F.14: Post-hoc Tukey test results: B-Miami who interacted with the bilingual model talker first (B-First) did not produce longer VOT with the monolingual model talker after.

contrast	estimate	SE	df	z.ratio	p.value
Model Talker Order = B-First					
Group = B-Ithaca, B - M	-0.0027	0.0009	Inf	-2.907	0.003
Group = M-Ithaca, B - M	-0.0021	0.0009	Inf	-2.179	0.029
Group = B-Miami, B - M	-0.0010	0.0009	Inf	-1.129	0.258
Group = M-Miami, B - M	-0.0022	0.0009	Inf	-2.296	0.021
Model Talker Order = M-First					
Group = B-Ithaca, B - M	-0.0058	0.0009	Inf	-6.109	<.0001
Group = M-Ithaca, B - M	-0.0086	0.0009	Inf	-9.017	<.0001
Group = B-Miami, B - M	-0.0028	0.0009	Inf	-2.971	0.003
Group = M-Miami, B - M	-0.0072	0.0009	Inf	-7.497	<.0001

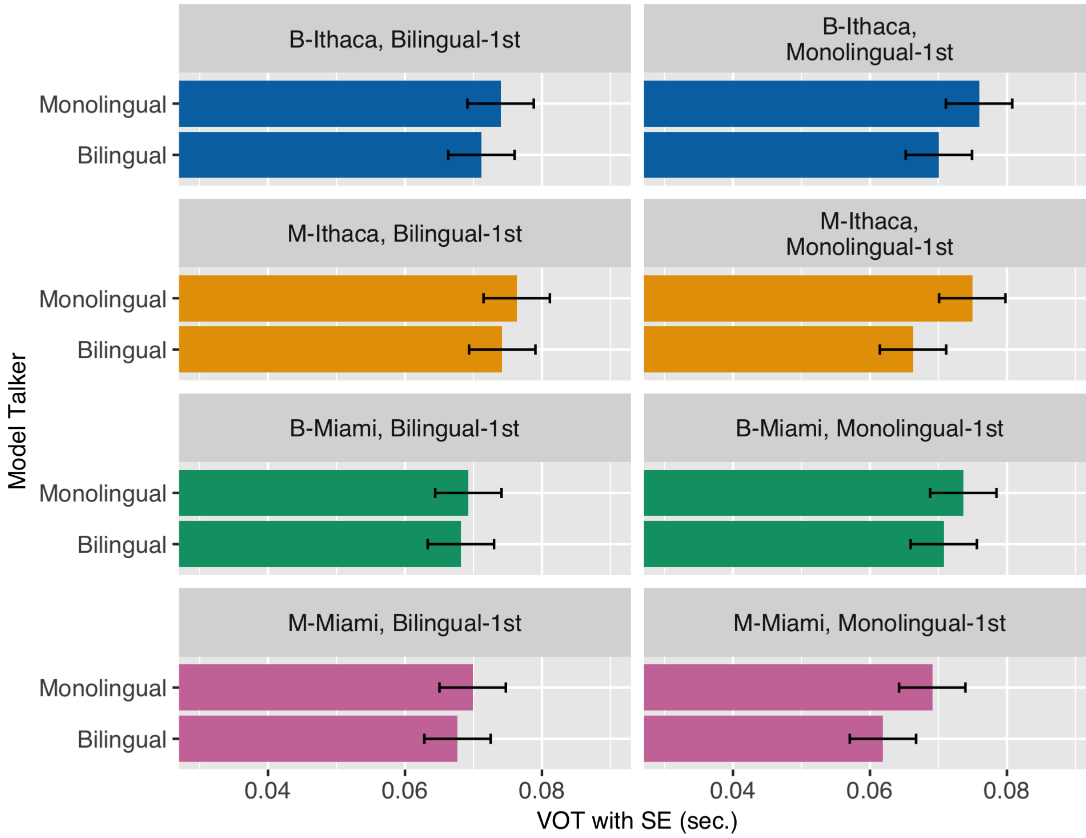


Figure F.17: VOT by Participant Group, Model Talker, and Model Talker Order

VOT by Stop

Table F.15: Post-hoc Tukey test results: Participants who interacted with the bilingual model talker first (B-First) were less likely to produce longer VOT with the monolingual model talker after.

contrast	estimate	SE	df	z.ratio	p.value
Model Talker Order = B-First					
Stop = /p/:					
Group = B-Ithaca, B - M	-0.0025	0.0016	Inf	-1.546	0.122
Group = M-Ithaca, B - M	0.0021	0.0016	Inf	1.257	0.208
Group = B-Miami, B - M	-0.0001	0.0016	Inf	-0.094	0.924
Group = M-Miami, B - M	-0.0046	0.0016	Inf	-2.797	0.005
Stop = /t/:					
Group = B-Ithaca, B - M	-0.0028	0.0016	Inf	-1.721	0.085
Group = M-Ithaca, B - M	-0.0060	0.0016	Inf	-3.632	0.0003
Group = B-Miami, B - M	-0.0018	0.0016	Inf	-1.132	0.257
Group = M-Miami, B - M	0.00008	0.0016	Inf	0.052	0.958
Stop = /k/:					
Group = B-Ithaca, B - M	-0.0029	0.0016	Inf	-1.768	0.077
Group = M-Ithaca, B - M	-0.0071	0.0016	Inf	-4.284	<.0001
Group = B-Miami, B - M	-0.0012	0.0016	Inf	-0.728	0.466
Group = M-Miami, B - M	-0.0020	0.0016	Inf	-1.228	0.219
Model Talker Order = M-First					
Stop = /p/:					
Group = B-Ithaca, B - M	-0.0074	0.0016	Inf	-4.506	<.0001
Group = M-Ithaca, B - M	-0.0092	0.0016	Inf	-5.556	<.0001
Group = B-Miami, B - M	-0.0031	0.0016	Inf	-1.858	0.063
Group = M-Miami, B - M	-0.0081	0.0016	Inf	-4.892	<.0001
Stop = /t/:					
Group = B-Ithaca, B - M	-0.0058	0.0016	Inf	-3.490	0.0005
Group = M-Ithaca, B - M	-0.0095	0.0016	Inf	-5.781	<.0001
Group = B-Miami, B - M	-0.0043	0.0016	Inf	-2.596	0.009
Group = M-Miami, B - M	-0.0072	0.0016	Inf	-4.355	<.0001
Stop = /k/:					
Group = B-Ithaca, B - M	-0.0043	0.0016	Inf	-2.593	0.009
Group = M-Ithaca, B - M	-0.0023	0.0016	Inf	-1.395	0.163
Group = B-Miami, B - M	-0.0011	0.0016	Inf	-0.697	0.485
Group = M-Miami, B - M	-0.0062	0.0016	Inf	-3.737	0.0002

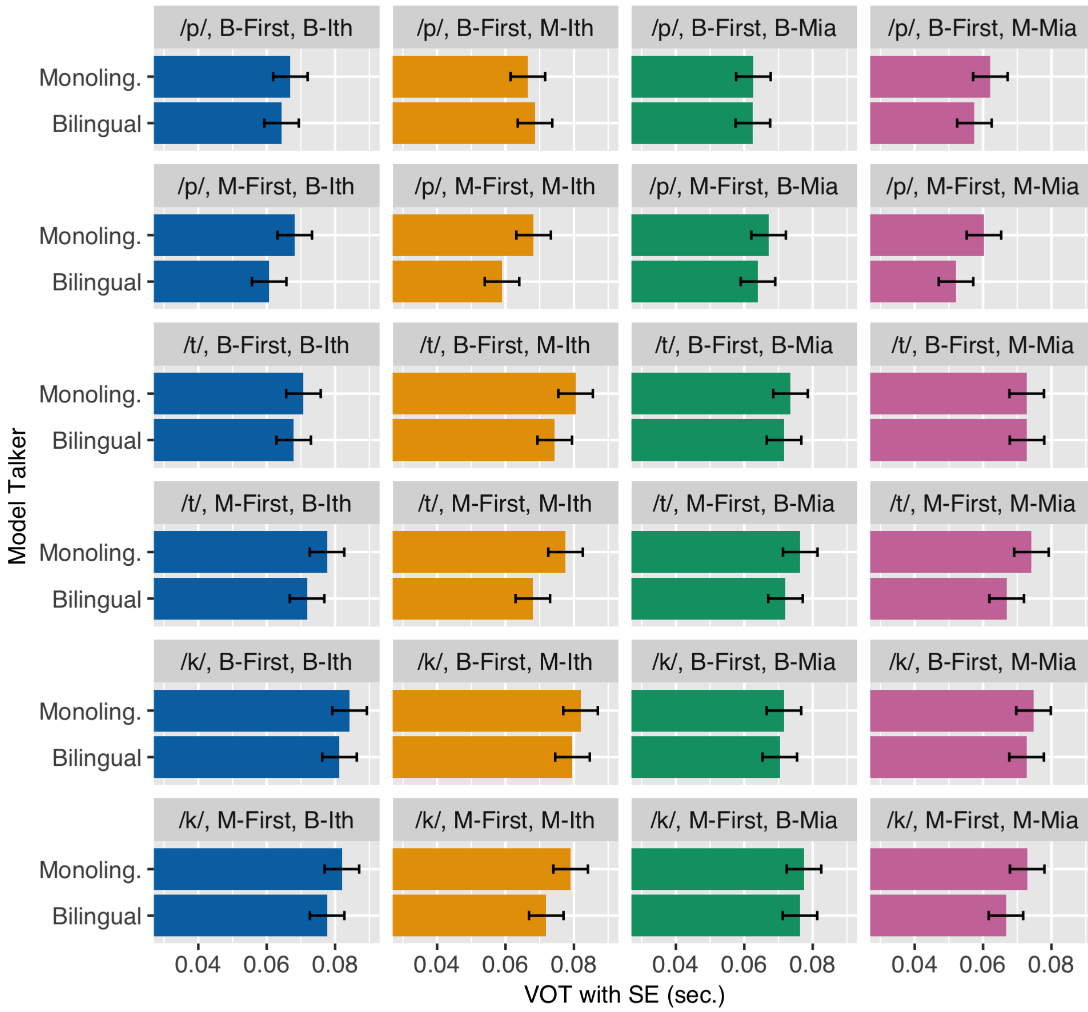


Figure F.18: VOT by Participant Group, Model Talker, Model Talker Order, and Stop

Within-group comparisons of VOT for participants with Monolingual-First versus Bilingual-First Model Talker Orders

Overall VOT

There were no significant differences.

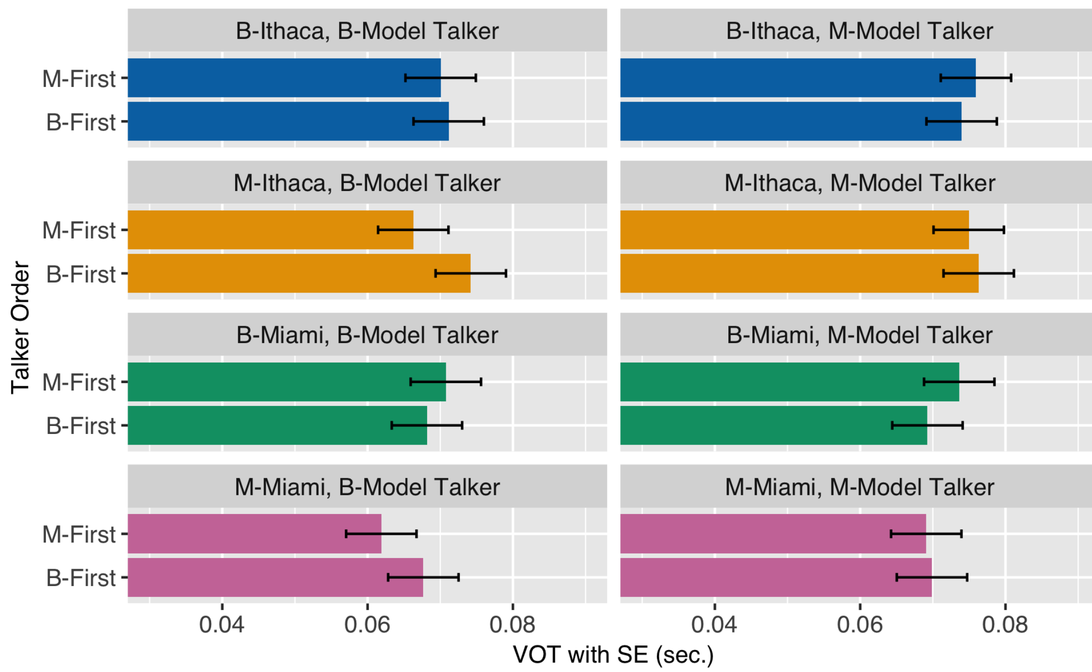


Figure F.19: VOT by Participant Group, Model Talker, and Model Talker Order

VOT by Stop

There were no significant differences.

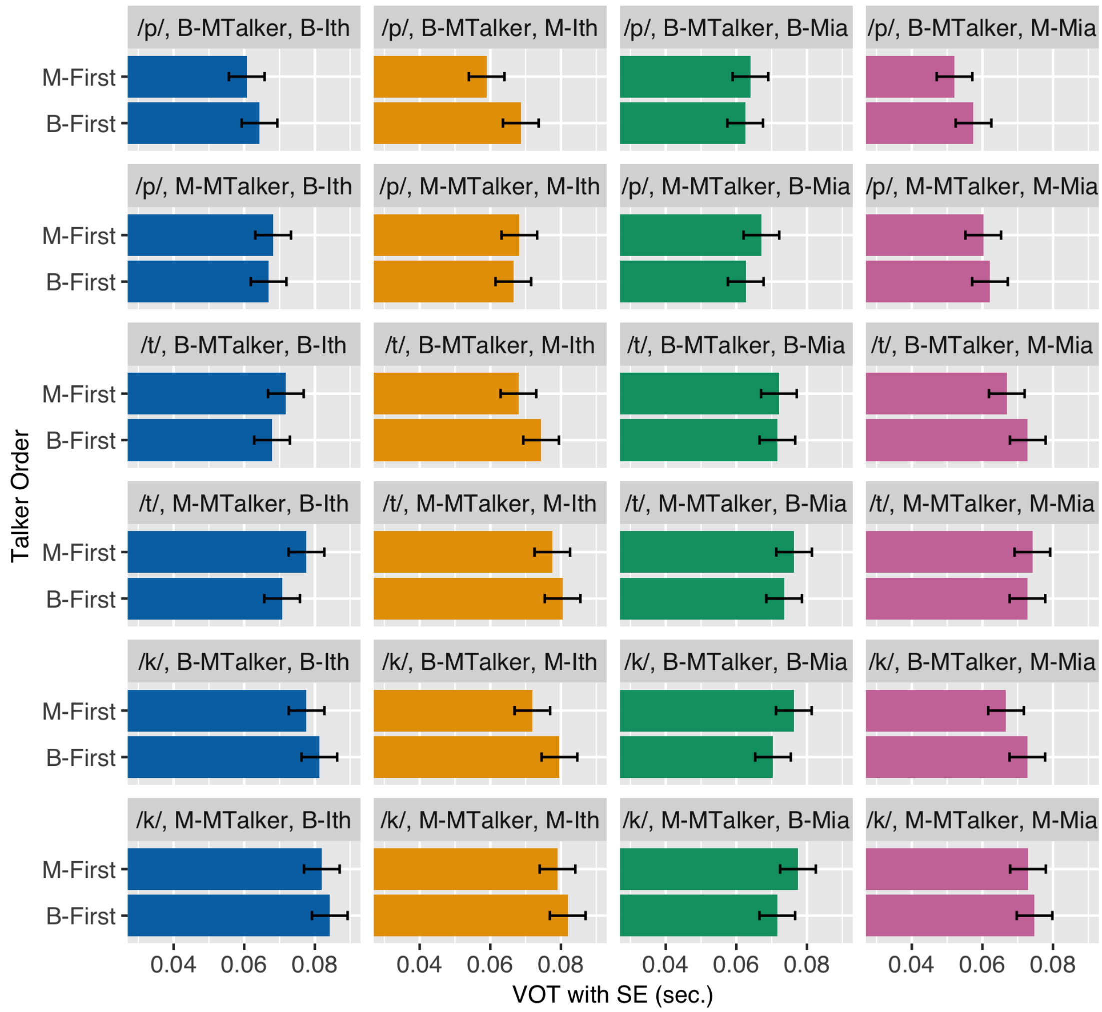


Figure F.20: VOT by Participant Group, Model Talker, Model Talker Order, and Stop

Between-group comparison of VOT for each model talker and Model Talker Order

Overall VOT

There were no significant differences.

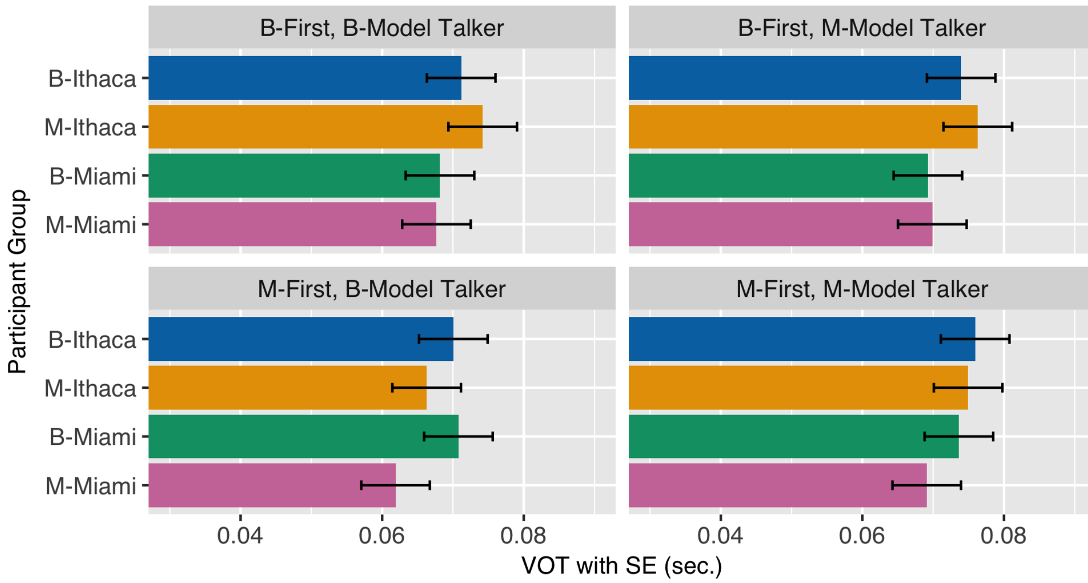


Figure F.21: VOT by Participant Group, Model Talker, and Model Talker Order

VOT by Stop

There were no significant differences.

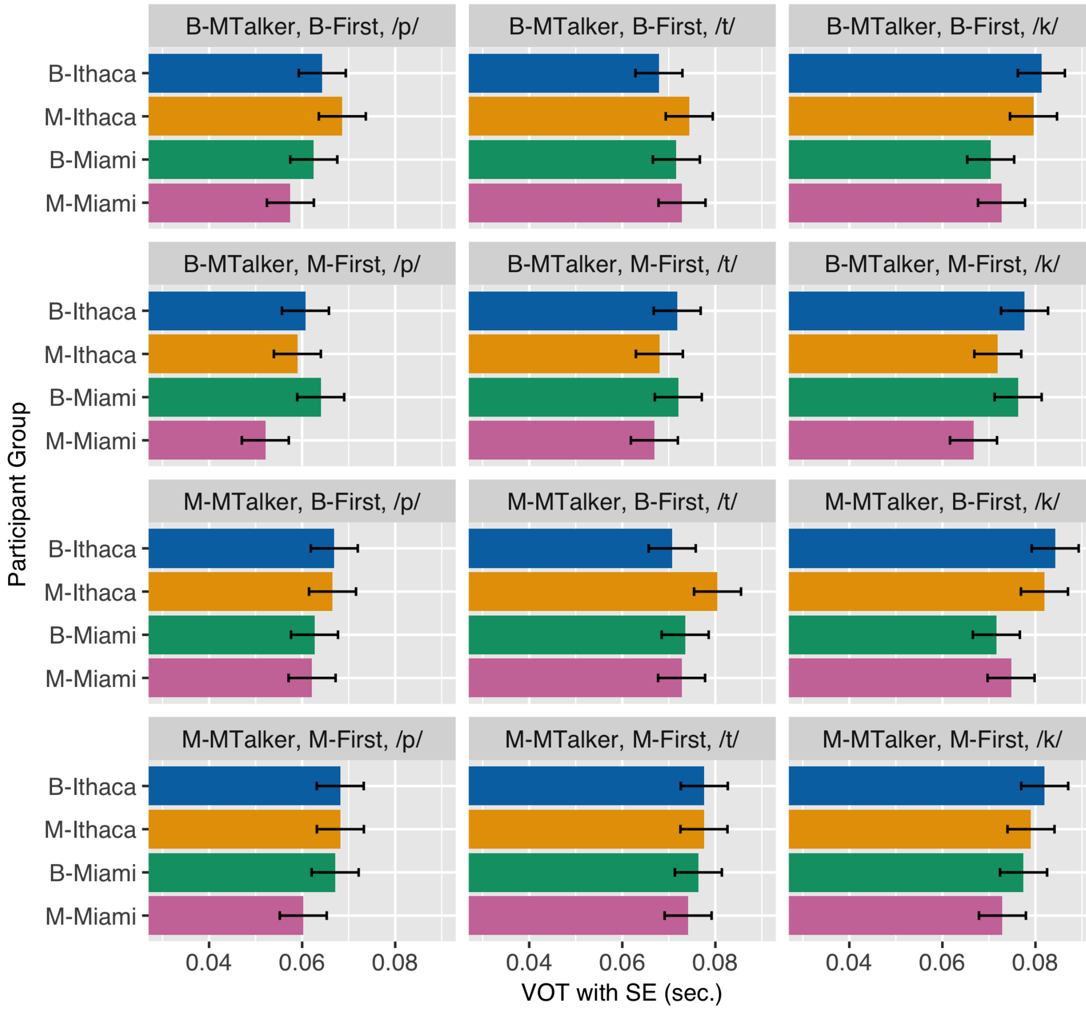


Figure F.22: VOT by Participant Group, Model Talker, Model Talker Order, and Stop

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