MEMORY OF ACCENTED SPEECH AND IMPLICATIONS FOR LEGAL SETTINGS

by

AMY SLOAN

A THESIS

Presented to the Department of Psychology
and the Robert D. Clark Honors College
in partial fulfillment of the requirements for the degree of
Bachelor of Arts

June 2023

An Abstract of the Thesis of

Amy Sloan for the degree of Bachelor of Arts
in the Department of Psychology to be taken June 2023

Title: Memory of Accented Speech and Implications for Legal Settings

Approved: *Nicole Dudukovic, Ph.D.*
Primary Thesis Advisor

U.S. criminal justice settings disproportionately involve minority defendants and white judges/juries, often involving cross-accent communication. Although it is known that racial and linguistic profiling can lead to negative social outcomes, there is little literature specifically exploring the effect of a speaker's accent on a listener's memory. The present study investigates how a listener's recognition memory (have I heard this before?) and source memory (who said it?) are affected by the accent of the speaker, being either a native English speaker or native Spanish speaker speaking English. Forty-four participants, the majority of whom were native English speakers, completed a 3-phase experimental design involving familiarization, exposure, and a surprise memory test. Results demonstrated a significantly better performance for the recognition memory of content presented by native speakers. On the other hand, performance for partial source memory (remembering whether the speaker had an accent) was significantly better for the content presented by non-native speakers. Performance for specific source memory (remembering the specific speaker who produced the speech) was also better for the content presented by non-native speakers, but this difference was not statistically significant. These findings indicate that aspects of witness testimony regarding what was said may be more accurate if the witness is testifying about content presented by someone without an accent. They also suggest that native English-speaking witnesses may more accurately identify a perpetrator as

having an accent, but they may not necessarily be able to determine the specific accented speaker. Future research directions are proposed to expand upon these findings, and suggestions are made for improving cross-accent communication practices in courtroom settings.

Acknowledgements

I would like to thank Dr. Nicole Dudukovic, my amazing primary thesis advisor and CHC representative, for allowing me to join her in this research, meeting regularly with me, and giving me consistent and thoughtful feedback on my work. As my CHC advisor throughout my time at UO, she has given me meaningful guidance and support to navigate my studies and beyond. I would also like to thank Dr. Robert Mauro, my second reader, for his role on my committee. Having previously taken a psychology and law class with him, he provided me with enriching foundational knowledge about the crossover of these topics and challenged me to learn more. I am also thankful to Dr. Charlotte Vaughn, research partner of Dr. Dudukovic, for welcoming my involvement in this project and providing me with valuable background literature from which I could learn and build.

Finally, I would like to express my gratitude to the Clark Honors College for making my time at UO a uniquely valuable experience. It has enabled me to use my thesis to integrate my major area of study with other areas of interest such as sociolinguistics and legal studies, and I have had the opportunity to learn and grow within the liberal arts alongside driven students and encouraging instructors. Although not on my committee, Professor Michael Moffitt has inspired me through his passion, grace, and integrity, and I am grateful for the experience of working with him as well as my many other wonderful instructors.

Table of Contents

List of Figures

List of Tables

Introduction

There are a vast variety of accents in the United States, including among native English speakers. However, minority dialects are unfamiliar to many majority dialect speakers, who are in turn more likely to linguistically profile those with speech patterns that are different than their own. Linguistic profiling refers to a form of discrimination involving making inferences and judgments based on an individual's speech. In particular, when a voice sounds African American or Mexican American, negative perceptions, racism, and mistreatment are more likely to follow (Baugh, 2002). Linguistic profiling, like racial profiling, is associated with negative social outcomes, such as employment discrimination (Hosoda & Stone-Romero, 2010) and denial of housing (Purnell et al., 1999). This bias is not helped by the fact that language is not included as a legally protected class, even though linguistic bias is generally connected to negative attitudes against groups of lower social status, such as racial minorities or socioeconomically disadvantaged people. Although we know some information about language and bias, there is little research regarding how accent affects a listener's memory. The ability to remember speech across accents has direct implications for criminal justice settings.

Cross-accent communication, or communication between people with different accents, is common in criminal justice settings in the United States. This accent mismatch may occur between defendants and witnesses as well as judges and juries. Memory is crucial to criminal justice procedures, such as prosecution and sentencing, as these procedures and their outcomes often hinge on oral testimony. Witnesses must remember details about perpetrators, and judges and juries must remember details about witnesses and defendants and their testimonies. It is therefore imperative to understand how memory may be affected by different factors in legal proceedings.

The primary actors in the criminal justice system in the United States are overwhelmingly white. For example, 90% of state and federal judges in the U.S. are white (Chew & Kelley, 2008), and 98% of district attorneys in states with the death penalty are white (Lyon, 2008). Although white Americans are overrepresented in judicial and prosecutor positions, minority Americans are overrepresented in the defendant population. Black Americans represented 12% of the adult American population but comprised 26.6% of individuals arrested in 2019 (Federal Bureau of Investigation [FBI], n.d.), and they accounted for 33% of incarcerated people in 2018 (Gramlich, 2020). In 2018, Latinos made up 16% of the population but 23% of inmates. In contrast, white adults accounted for only 30% of those incarcerated, despite representing 63% of the total American population.

These differences are not necessarily due to the minority groups committing crimes at a higher rate, but rather may result from marginalized communities facing disparate treatment in policing, prosecution, and adjudication. For example, Black and white Americans use drugs at similar rates, but while only 5% of illicit drug users are Black, Black people represent 29% of those arrested and 33% of those incarcerated for drug offenses – 6 times the imprisonment rate of white people (National Association for the Advancement of Colored People [NAACP], 2022). Wooldredge et al. (2015) provide evidence that Black people have greater cumulative disadvantages throughout criminal processing, such as higher bond amounts and rates of pretrial detention. Hispanic people experience this cumulative disadvantage in a similar way, as do unemployed people (Spohn & Holleran, 2000). While this doesn't rule out the possibility that legitimate factors associated with race can explain these disparities, a review by Piquero and Brame (2008) did not find significant evidence of racial and ethnic differences in either official arrests leading to court referrals or self-reported offending of frequency and variety of crime.

Accent differences and linguistic profiling can affect anyone regardless of race, but racial minorities may be affected more often. In 2018, Mexico, China, India, the Philippines, and El Salvador were the most common countries of origin for immigrants to the United States (Pew Research Center, 2020). These countries have majority non-white populations and their official languages do not include English, except for India and the Philippines (accounting for 10% of immigrants' countries of origin). Therefore, although most people are required to demonstrate some English language proficiency in reading, writing, speaking, and understanding in order to become naturalized citizens (U.S. Citizenship and Immigration Services [USCIS], 2020), they are more likely to speak with an accent. Even for natural-born U.S. citizens, the dialects of some racial minorities may be considered accented in spaces dominated by Standard American English (SAE). African American English and Chicano English, or Mexican English, are considered non-standard varieties of the English language, despite both dialects having fully formed and established vocabulary, syntax, and grammar (Blundon, 2016). Because accent is a common characteristic of non-standard speech (Acheme, 2018), some English-fluent African American and Mexican American speakers may be considered to have non-standard English accents as well. While racial minorities are more likely to be speakers of these marginalized speech varieties, white judges, juries, and prosecutors likely speak varieties of mainstream white American English such as SAE. The communication between those prosecuting and those being prosecuted, therefore, often reveals linguistic trends in a similar way that it does racial and ethnic trends.

Listeners use linguistic profiling to infer characteristics of the speaker such as socioeconomic class, cultural background, and race. In several U.S. murder trials, the dialects of defendants overheard with no visual race cues were central to witness testimony and to

inferences about the race of the defendant (Baugh, 2000). In addition to inferring simple demographic information, listeners tend to use this information to make judgments about internal characteristics. According to Quinn and Petrick (1993), listeners are more likely to interpret accents associated with lower social status (namely Hispanic, African, Asian, and Eastern European accents) as unintelligible and indicative of incompetence, whereas high-status accents (like Western European accents) are more often interpreted as connoting high intelligence. Many cases rely largely on witness and defendant testimony. The consequent legal decisions, such as conviction and sentencing, may be influenced by judgments that result from linguistic profiling. A witness' perception of a defendant may influence their testimony of the defendant, and judges and juries may perceive the oral testimony of a defendant with non-accented English speech differently, potentially leading to differing legal outcomes.

There are documented issues related to cross-accent communication in courtroom settings. For example, prosecutors in New York cited being able to speak Spanish as a valid reason for bilingual Latino jurors to be excluded. Despite the fact that these jurors spoke English proficiently, there were concerns that they wouldn't be able to accept the translated testimony as final and authoritative (Hernandez v. New York, 1991). With these kinds of decisions that determine who can be a trier of fact being upheld by the United States Supreme Court, it is evident that defendants may be limited to facing juries who do not share their language characteristics and are not familiar with their accents. One might suppose that judges and juries can lean on court documents like transcriptions if their memory of court events suffers from an accent mismatch. However, Jones et al. (2019) found that court reporters regularly produce transcripts of African American English speech that are not only inaccurate but also alter the record of who performed which actions and under which circumstances. Jones et al. explained

that court reporters, depending on the organization that certifies them, are certified at either 95% or 98% accuracy. However, the measure used to determine their accuracy does not test or evaluate the ability to transcribe "non-standard" dialects.

With witnesses, jurors, prosecutors, and transcriptionists demonstrating disparate perceptions of non-native English speakers, it is important to parse out what the effects of these differences may be. Although there has been research about how we perceive speech when it is produced by people who have accents that are different than our own, we do not yet know specifically how memory may be impacted by these processes, and if accented speech is remembered differently than non-accented speech. It is therefore unclear whether this is a factor that should be examined in order to inform best communication practices in the courtroom. Memory is vitally important in courtroom proceedings, specifically in terms of eyewitness identification, eyewitness testimony, jury deliberation, and court transcription. Because of this, there is a need for literature exploring the effect of a speaker's accent on a listener's memory.

Existing Literature

Previous research has explored some of the ways that a speaker's unfamiliar accent may be associated with a listener's altered perception of the speaker. In a simulated legal context, listeners' ability to describe the physical appearance of a perpetrator declined when the information given by the perpetrator was spoken with an accent rather than no accent. These listeners, the majority of whom were white native English speakers, were also less able to identify the perpetrator's voice accurately (Pickel & Staller, 2012). Moreover, Kutlu et al. (2022) found that visual cues for race enhanced the impact of judgments of accentedness for a Florida sample, but not a Quebec one. Florida listeners' ability to transcribe speech decreased for all accent varieties when listening to content paired with South Asian faces, and their judgments of speech being accented increased for both American English and Indian English varieties when visual cues changed from a white face to a South Asian one. Quebec listeners' accentedness judgments and measures of intelligibility were not influenced to this degree, which was attributed to their context of higher language entropy. This means that they are more exposed to different languages, a process that requires them to adapt their cognitive processes to handle linguistic uncertainties, so they are more attuned to linguistic differences and are less impeded by visual race cues. Because these judgments of accentedness and intelligibility appear to be more profound in American settings, this contributes to our understanding of how linguistic differences may manifest uniquely in U.S. legal settings.

As demonstrated by Pickel and Staller (2012) and Kutlu et al. (2022), the perception of accented speech is evidently driven largely by familiarity and similarity to a listener's linguistic and racial characteristics. Familiarity is also the factor that underpins in-group bias, where individuals tend to favor members of their own group above those of other groups. Similarity and

familiarity are likewise the basis for the same race effect, the phenomenon that people are generally better at recognizing and remembering the faces of people from their own racial group (Brown et al., 2017; Feingold, 1914). The same race effect is viewed as an "in-group advantage" resulting from in-group bias (Beaupre & Hess, 2006). With the overlapping nature of race and accents previously discussed, it is understandable that linguistic similarity could function as an in-group determinant in a similar way that race does. Paladino and Mazzurega (2019) found that Italian participants used accent as a primary indicator of in-group categorization, with native European accents being construed as "one of us" over non-native European accents, even with the factor of race being controlled. This suggests that accent may be used to infer group membership, and this inferred group membership could affect the way people perceive members of their out-group differently beyond their linguistic characteristics.

In white-majority spaces like many U.S. courtroom settings, it is evident how this may put racial minorities and speakers of marginalized speech varieties at a unique disadvantage. In addition to facing potential bias from belonging to a linguistic and/or racial out-group, defendants who speak with non-standard accents are subject to differing perceptions of their speech. When an eyewitness describes a subject, not only are they prone to impaired memory and misidentification when the alleged perpetrator speaks with an unfamiliar accent (Pickel & Staller, 2012), but they are also more likely to view the speech as accented when it accompanies a non-white speaker's face (Kutlu et al., 2022). Race can therefore amplify the perceptual effects of accented speech, which could be especially problematic in witness identification of a suspect with an accent involving cross-racial recognition.

False identification is responsible for 69% of the wrongful convictions in the United States that have been overturned by DNA evidence, and of those exonerated through DNA

evidence, 42% result from mistaken cross-racial identification (Innocence Project, 2022). While it is unknown how many of these also involve cross-accent communication, the literature exploring familiarity with race and accents tells us that the nature of processing unfamiliar stimuli may interfere with our ability to make accurate identifications. This aids in our understanding of some of the factors that potentially make racial minorities, especially those with accented speech, subject to disproportionate imprisonment rates. This project aims to elaborate on these issues by isolating accent as a factor so it can be applied in broader contexts exploring linguistic bias.

The present study seeks to investigate memory as a consequence of accented speech perception by looking at two types of memory: recognition and source memory. Recognition memory refers to the ability to identify previously encountered events as having been encountered. For speech memory, this would be represented by whether a listener remembers hearing a word previously, and can be assessed by answering questions such as "Have I heard this before?" Source memory refers to the ability to retrieve contextual details acquired during exposure to the event. For speech memory, this would be seen in whether listeners retain information about the voice and accent in which the speech was produced, and can be assessed by answering questions such as "Who said it?" and "What accent did they speak with?"

Previous literature relating to the memory of spoken material has explored source memory for gendered voices. Dodson et al. (1998) presented listeners with test items spoken by two male voices and two female voices and found that participants could often remember the gender of the speaker (partial-source information) even when they couldn't remember the specific person or voice that had spoken (specific-source information). If this same effect is observed with accented speech, participants may remember that the speech was accented or not

accented but not whose specific voice it came from. While this study is largely modeled after that of Dodson et al., it will also test for measures of recognition memory. Recognition and source memory are both types of declarative memory, the type of memory that deals with facts and events that can be consciously recalled.

The present study tests item recognition and source memory for a list of words read by two native English speakers and two non-native English speakers. Potential hypotheses are informed by previous literature concerning memory of spoken material and perceptual disfluency. Perceptual disfluency refers to a subjective, metacognitive sense of difficulty when performing cognitive tasks. Diemand-Yauman et al. (2011) found that participants had increased retention of materials presented in harder-to-read fonts, demonstrating that perceptual disfluency can create a desirable difficulty because more effortful encoding can engage deeper perceptual processes. This might suggest that an unfamiliar accent, which could cause this disfluency in encoding, might aid in the memory of spoken material. Contrarily, however, Yue et al. (2012) found that visually distorted words were less likely to be remembered than regular words when processing time was short, and they were remembered at similar rates when participants had more time to process the words. This suggests that perceptual disfluency may not always create a desirable difficulty and may sometimes instead impede encoding, where more difficult information may impair cognitive ability and interfere with the encoding process.

Because there is conflicting literature about the effects of perceptual disfluency, there are two alternative hypotheses extending these ideas to speech. There is some evidence to suggest that unusual or distinctive stimuli are remembered better than those that are more common. Balota and Neely (1980) found that high-frequency words, which are more familiar, are recalled better, but low-frequency words, which are more unusual, are recognized better. Recall refers to

the ability to independently generate a list of previously heard words, while recognition refers to the ability to identify previously heard words from a provided list. Accented speech would presumably be less familiar to non-accented native English speakers, making it low frequency. Based on these findings, we can hypothesize that accented speech would be recognized better, potentially due to desirable difficulty. However, these findings also indicate that people would be less likely to be able to recall specific details about the speech, and they would better recall the material presented in non-accented speech. These findings are more consistent with the alternative concept of impeded encoding. Indeed, research has shown that new information is easier to process and encode when it is composed of familiar, rather than unfamiliar, stimulus elements (Reder et al., 2016). Applying this pattern to speech, we would expect native English speakers to remember the material presented in non-accented speech better than that presented in accented speech due to the nature of non-accented speech having more familiar elements. The present study aims to test which of these hypotheses will be supported in the context of recognition and source memory for spoken material.

Methods

Participants

The participants in this study (n = 44) were University of Oregon undergraduate students recruited from the human subjects pool for course credit. Most of the participants were native English speakers (n = 42), one participant was a native Spanish speaker who also spoke English fluently, and one participant did not report their native language.

Materials

Ninety-six English words were selected from Dudukovic and Wagner (2007) to use as stimuli. Half of the words were concrete, or things that can be perceived through the five physical senses of sight, sound, touch, taste, and smell, such as "cloud" or "pen." The other half of the words were abstract, or intangible things that cannot be perceived through the five senses, such as "joy" or "honor." The words were divided into six lists that were equated for factors like frequency (how frequently the word occurs in the English language) and duration (how long it takes to pronounce the word).

Recordings were made of four male voices, two native English speakers and two native Spanish speakers, saying each of the 96 words. Each of the voices was assigned a face photo and a name (see Figure 1). This served to make participants familiar with the speakers' voices and accents so they could recall their identities in later tasks. The face photos and name pairings were randomly assigned across participants. The face photos and names (Felix, Gabriel, Isaac, and Julian) were designed to present as ethnically ambiguous, allowing us to isolate accent as a variable so that participants' memory was not influenced by other factors.

Procedure

The study was conducted online using PsychoPy3 software, with participants completing the experiment on their personal devices. The experiment took roughly 30 minutes for participants to complete. The study tested if listeners' recognition memory and source memory for English words were affected by the accent of the speaker, either a native English speaker or a native Spanish speaker. It used a 3-phase experimental design modeled after that used in Dodson et al. (1998) with the phases being familiarization, an exposure task, and a surprise memory test.

In the first, familiarization, phase, participants saw the four different photos of the speakers with their accompanying names one at a time. While each speaker's photo and name were on the screen, participants heard the speaker read (in English) the same four-sentence passage about the sun, which was taken from Roediger and Karpicke (2006).

Participants then heard sections of the passage repeated by each of the different speakers and were asked to respond to each sentence by indicating which of the speakers they believed was speaking. Participants heard four sentences, one from each speaker, presented in random order. If the participant selected the wrong speaker, the correct answer would appear on the screen. They then heard the speakers' voices read sentences they hadn't heard before from a separate passage about the sun and were again asked to indicate who they believed was speaking, again receiving feedback about their correctness. This time, participants heard sixteen sentences, four from each speaker, presented in random order.

In the second, exposure, phase of the experiment, participants heard a 72-word series and were asked to decide whether each word was "concrete" or "abstract." Each of the four speakers produced 18 of the words, and each word was accompanied by a picture of the speaker's face and their name on the screen. Sixteen words from each group of 18 words were target stimuli,

and the remaining two words were buffer stimuli that were presented at the beginning and end of the exposure phase (4 buffer words at the beginning and 4 at the end). The words spoken by each person were counterbalanced across participants in a Latin square design. This is a type of within-subjects design in which treatments (in this case, words spoken by each person) are administered in systematically varied sequences so that each treatment occurs equally often in each position of the sequence in order to control for order effects.

The third experimental phase was a surprise memory test in which participants saw a series of 96 test words (64 target words from the exposure phase and 32 new words) presented in random order on their screen with no audio accompaniment. They were asked to report if they remembered hearing the word before in the exposure task – if they did, they answered the word was "old," and if they did not, they answered "new." If the participants identified a word as "old," they were asked which speaker said the word before. When they made this decision, the four names and face photos appeared on the screen. The task of reporting if they remembered hearing the word before served as a test of recognition memory, while the task of reporting which speaker said the word served as a test of source memory.

Finally, participants completed one more test using the sentences from the sun passage to demonstrate retention of the speakers' voices. They heard four sentences, one from each speaker, presenting sections from the original sun passage in random order. They were again asked to respond to each sentence by indicating which of the speakers they believed was speaking, this time not receiving feedback about their correctness.

The experiment concluded with participants completing a short demographic survey asking their gender, race and ethnicity, language background, and language attitudes, with no personally identifiable information. Participants were debriefed upon completion.

Results

The overall percentage of correct speaker judgments in the familiarization phase was 80.9 (*SD* = 17.3). In the final sun test, the overall percentage of correct speaker judgments was 75 (*SD* = 28.5).

Paired-samples t-tests were used to analyze differences in accuracy for abstract and concrete decisions using a significance level of $\alpha = .05$. The effect for accents was significant, $t(43) = 5.8$, $p < .001$ with the percentage of correct abstract and concrete judgments ($M = 77.9$, $SD = 19.7$) being higher for the native speakers ($M = 80.9$, $SD = 19.6$) than for the non-native speakers ($M = 74.9$, $SD = 20.1$).

Differences in item recognition, partial source, and specific source memory for native and nonnative speakers were also analyzed using paired-samples t-tests. See Table 1 for descriptive statistics of memory performance. The effect of accents on item recognition was significant, $t(43) = 2.65$, $p = .011$ with the percent of correct responses ($M = 66.9$, $SD = 16.4$) being higher for the native speakers ($M = 63.1$, $SD = 16.4$) than for the non-native speakers ($M = 58.6$, $SD = 24.8$). The effect of accents on partial source memory, or remembering the language background of the speaker (native vs. non-native), was also significant, $t(43) = -2.65$, $p = .011$, but this time the percentage of correct responses was higher for the non-native speakers ($M = 61.2$, $SD = 15.6$) than for the native speakers ($M = 52.7$, $SD = 16.4$). Similarly, the percentage of correct responses for specific source memory, or the specific speaker, was higher for the non-native speakers ($M = 35.1$, $SD = 17.7$) than the native speakers ($M = 28.4$, $SD = 15.0$), but this trend did not reach statistical significance, $t(43) = -1.96$, $p = .057$.

One-proportion t-tests were used to compare the observed percent of correct responses for the partial and specific source memory tasks to the hypothesized proportion that would occur

by chance in the population, using a significance level of $\alpha = .05$. The percentage of correct responses for partial source memory for non-native speakers differed significantly from chance, $t(44) = 4.77$, $p < .001$, but the percentage for partial source memory for native speakers did not, $t(44) = 1.10$, $p = .28$. The percentage of correct responses for specific source memory for non-native speakers also differed significantly from chance, $t(44) = 3.77$, $p < .001$, but the percentage for specific source memory for native speakers did not $t(44) = 1.51$, $p = .07$.

Discussion

The results of this study demonstrated that abstract and concrete judgments were significantly more accurate for words presented by native than non-native speakers. It was also observed that item recognition memory was significantly better for native speech than non-native speech. Finally, participants demonstrated better source memory for non-native than native speech, but this difference was significant only for partial source memory (referring to participants' ability to remember if content was spoken by a native or non-native voice) and not for specific source memory (referring to the ability to remember the exact person who produced the speech). Although the p-value for the specific source memory performance narrowly failed to reach significance, its close value of .057 does not necessarily justify accepting the null hypothesis and may be due to inadequate statistical power.

The finding that abstract and concrete judgments were more accurate for the native speakers is likely due to intelligibility. This exposure task demonstrated that initial comprehension was lower for the target words spoken by the non-native speakers. This is consistent with the idea that new information is easier to process when it is composed of familiar stimulus elements (Reder et al., 2016), as the less familiar stimuli, the accented words, were more often misunderstood.

This experiment only used English and Spanish speakers, so we are unable to determine whether Hispanic accents would be less intelligible compared to other non-English accents or if the diminished comprehension is because the accent is unfamiliar in the first place. Quinn and Petrick (1993) found that listeners are more likely to interpret accents associated with lower social status, such as Hispanic accents, to be unintelligible. A hypothesis that would require future research could be that the present findings may also apply to Asian, African, and Eastern

European accents as well as non-standard English dialects such as African American English, Chicano English, and Southern American English. Future research could measure perceptions of social status and look at the similarities in the way people process these accents. Based on the findings from Quinn and Petrick, the present results are less likely to apply to accents such as Western European ones as they are more often perceived as intelligible. The present findings should also not be generalized beyond settings in, or similar to, the U.S., as higher language entropy, which is more common in non-U.S. countries, may be a mediating factor for judgments of accentedness (Kutlu et al., 2022).

The finding that participants recognized items said by native speakers better adds an interesting perspective to research around desirable difficulties in recognition memory. It challenges the idea that perceptual disfluency can create a desirable difficulty that improves memory due to more effortful processing, as seen in Diemand-Yauman et al. (2011). It also contradicts Balota and Neely's (1980) findings that less familiar stimuli are recognized better than familiar stimuli. Instead, it supports the idea that perceptual disfluency can impede encoding (Yue et al., 2012). Because recognition memory relates to what content is spoken, impeded encoding due to perceptual disfluency may have implications in courtroom dynamics. Native SAE-speaking witnesses may not accurately remember what was said by a perpetrator with an accent or what was said in an interaction between accented speakers, and native SAE-speaking judges and jurors may not as effectively perceive, comprehend, and remember information from witnesses and defendants who speak with accents or non-standard dialects.

One limitation of these conclusions about recognition memory is that we do not know if the difference in accuracy is due to intelligibility discrepancies during initial comprehension or issues in further processing such as encoding, consolidation, or retrieval. One can't remember

something they never perceived clearly to begin with, and it is possible that much of the observed difference came from initial comprehension problems. Future research should consider teasing this out further by investigating if stimuli we know are initially comprehended are remembered differently if they are produced by native versus non-native speakers. This could be done by specifically tracking the words that were responded to with correct abstract and concrete judgments and analyzing the memory performance of those words to see if items said by native speakers are still remembered better.

Another potential limitation is that recognition is only one type of memory relating to the content of spoken material. Balota and Neely (1980) demonstrated that recognition memory can differ from recall memory based on the familiarity of the stimuli. This study only tested recognition memory and not recall, so it cannot fully inform us about the way we remember spoken content. It is possible that our findings about recognition memory, which would be relevant to asking witnesses questions such as "Do you remember the perpetrator saying this?" could also apply in a similar way to recall, which is more common in witness testimony through questions such as "What did the perpetrator say?" To see if this is true, future research in this format might incorporate a task that asks participants to freely recall words they remember from the abstract/concrete decision task.

Additionally, Yue et al.'s (2012) findings indicate that perceptual disfluency impeded encoding compared to perceptually fluent materials when processing times were shorter, but this effect was diminished when participants had more time to process the stimuli. The non-native voices in the current study presented the sun passage slightly slower than the native voices did, which is common for non-native English speakers (Baese-Berk & Morrill, 2015). This could mean that encoding was impeded even with a slightly longer processing time, but participants

were not given time between tasks. Because they did not have any additional time to process after the content was spoken, we are unable to observe if the effect of accents would be diminished with longer overall processing times. Future research could test if perceptual disfluency impedes encoding in the context of native and non-native spoken content when people have short or long periods of time to process after hearing the material. This could help to determine if non-native speech would be recognized at a more comparable rate to native speech with more time for encoding. This could also help to inform our understanding of these memory discrepancies in courtroom interactions, such as witness testimony about a perpetrator, and determine if longer processing time could be a mediating factor for witnesses remembering this content.

While perceptual disfluency impeded encoding for recognition memory in this study, the same was not true for source memory. Partial source memory was better for non-native speakers, meaning that participants were better able to remember if a word was spoken by a non-native voice than a native one, even if they couldn't remember who said it specifically. This implies that, if one is able to comprehend and remember spoken material, they may be able to remember more about the context in which it was spoken if the context creates perceptual disfluency. This supports the previous findings from Diemand-Yauman et al. (2011) and Balota and Neely (1980) in favor of perceptual disfluency creating desirable difficulty and improving retention.

The improved partial source memory for non-native speech challenges Pickel and Staller's (2012) findings that listeners were more prone to misidentification of a simulated perpetrator when that perpetrator spoke with an unfamiliar accent. Specific source memory was also better for non-native than native speakers, as we observed that participants were better able to identify the exact speaker who presented a word when the speaker had an accent, although this

difference failed to reach statistical significance. Because of this, it is possible that listeners might be able to remember that a voice was accented but not who the specific speaker was (though the trend that specific accented speakers were identified better than specific non-accented ones may have reached significance with more participants, so it is difficult to conclude this confidently). In the context of witness identification, this could be problematic as native English-speaking witnesses might remember that a perpetrator spoke with an accent but still be prone to misidentifying them as someone else with the same accent.

The observation that source memory was better for non-native speech is counter to the observation that recognition memory was better for native speech. This suggests that perceptual disfluency may uniquely create the benefit of desirable difficulties in the context of source memory. Future research in this topic should investigate the role of desirable difficulties for source memory in particular. Past research has primarily looked at it in the context of recognition memory (Diemand-Yauman et al., 2011; Yue et al., 2012), so it would be beneficial to understand how source information might be processed and remembered differently.

A limitation of the source memory findings is that some participants did not learn the speakers and their voices well in the familiarization phase, in which the lowest observed score was 50% accuracy, and some did not retain the familiarization information by the final sun test, in which the lowest observed score was 0% accuracy. This makes these participants' source memory data more difficult to interpret as we cannot distinguish whether source memory performance differences came from not learning the voices in the first place or not being able to retrieve them later. Similarly, we did not analyze familiarization accuracy separately between native and non-native speakers, so we cannot distinguish whether source memory deficits are due to problems with initial familiarization or further processing. To resolve this, a future iteration of

this project could specifically analyze the source memory performance results of those participants who scored 100% in the familiarization phase in order to see if further processing challenges arise for people who correctly learned which voice belonged to each person initially.

General Courtroom Implications

White English-speakers are overrepresented in positions of prosecuting, such as judges, and minority groups are overrepresented in positions of being prosecuted, such as those arrested, tried, and incarcerated. Racial and ethnic minorities are more often considered to have "unfamiliar" language varieties, with African American English and Chicano English being considered "non-standard" English varieties, and most immigrants to the U.S. being from majority non-white populations without English as an official language. It is therefore important to understand how accents might affect memory in legal proceedings in order to parse out why some of these demographic trends exist.

The present study ultimately found that listeners comprehend and remember the content of spoken material better if it is spoken without an accent. When they successfully comprehend and remember this information, though, they are better able to remember that it was said by someone with an accent than someone without an accent, but it is unclear if they can identify who specifically said it significantly better when the speaker had an accent. These findings imply that aspects of witness testimony about what was said may be more accurate if the native English-speaking witness is testifying about content presented by someone without an accent. The findings also suggest that witnesses should more accurately identify a perpetrator as having an accent, but they may not necessarily be able to determine the specific accented speaker.

These findings can help to inform both future research in this area and communication practices in legal settings. As previously mentioned, future research should investigate whether

differences in recognition memory arise from deficits in initial comprehension or later processing, whether processing time influences the memory of native or non-native spoken content, the difference between recognition and recall accuracy in spoken content, and how perceptual disfluency may uniquely create desirable difficulties or impede encoding for source memory. In current courtroom proceedings, we can use this study's results to develop more equitable practices for cross-accent communication. At a basic level, juries, judges, and witnesses can have a better understanding of potential memory differences and be aware of the ways in which accented speech could influence their identification, their testimony, and their memory of a testimony. Knowing that initial comprehension of spoken content is important for the memory of that content and that this comprehension might be impaired for accented speech, it is important to ensure that initial content is documented accurately so listeners can effectively revisit the information if they face problems encoding it. An example of this could be hiring bilingual court reporters to transcribe court proceedings involving cross-accent communication. At a larger level, this could involve certification organizations evaluating court reporters' ability to transcribe non-standard dialects. This study supports and builds on past research, and it opens numerous paths to better understanding cross-accent communication dynamics in legal settings in the future.

Figures

Figure 1: Example Face and Name Pairings

Names and face stimuli paired with the four voices, randomized across participants.

Tables

	Item percent correct (native)	Item percent correct (non-native)	Partial source percent correct (native)	Partial source percent correct (non-native)	Specific source percent correct (native)	Specific source percent correct (non-native)
Mean	63.1 (25.8)	58.6 (24.8)	52.7 (16.4)	61.2 (15.6)	28.4 (15.0)	35.1 (17.7)
Minimum	9.4	6.3	0.0	26.7	0.0	0.0
Maximum	96.9	100	100	100	66.7	81.8

Table 1: Memory Performance

Means with standard deviations and minimum and maximum percentage values of item recognition, partial source memory, and specific source memory for content presented by native and non-native speakers.

Bibliography

Acheme, D. (2018, March). *Portrayal and perception: Non-standard accents.* [Paper presentation]. Eastern Communication Association 2018, Pittsburg, Pennsylvania, United States.

Baese-Berk, M. M., & Morrill, T. H. (2015). Speaking rate consistency in native and non-native speakers of English. *The Journal of the Acoustical Society of America, 138*(3), 223-228. doi: 10.1121/1.4929622

Balota, D. A., & Neely, J. H. (1980). Test-expectancy and word-frequency effects in recall and recognition. *Journal of Experimental Psychology: Human Learning and Memory, 6*(5), 576-587. doi: 10.1037/0278-7393.6.5.576

Baugh, J. G. (2000). Racial identification by speech. *American Speech, 75*(4), 362-364. doi: 10.1215/00031283-75-4-362

Baugh, J. G. (2002). Linguistic profiling. In Makoni, S., Smitherman, G., Ball, A. F., & Spears, A. K. (Eds.), *Black Linguistics: Language, Society, and Politics in Africa and the Americas* (pp. 155-168). Routledge.

Beaupre, M. G., & Hess, U. (2016). An ingroup advantage for confidence in emotion recognition judgments: The moderating effect of familiarity with the expressions of outgroup members. *Personality and Social Psychology Bulletin, 32*(1), 16-26. doi: 10.1177/0146167205277097

Blundon, P. H. (2016). Nonstandard dialect and educational achievement: Potential implications for First Nations students. *Canadian Journal of Speech-Language Pathology and Audiology, 40*(3), 218-231.

Brown, T. I., Uncapher, M. R., Chow, T. E., Eberhardt, J. L., & Wagner, A. D. (2017). Cognitive control, attention, and the other race effect in memory. *PLOS One, 12*(3). doi: 10.1371/journal.pone.0173579

Budiman, A. (2020). *Key findings about U.S. immigrants*. Pew Research Center. Retrieved from https://www.pewresearch.org/short-reads/2020/08/20/key-findings-about-u-s-immigrants/

Diemand-Yauman, C., Oppenheimer, D. M., & Vaughan, E. B. (2011) Fortune favors the bold (and the italicized): Effects of disfluency on educational outcomes. *Cognition, 118*(1), 111-115. doi: 10.1016/j/cognition.2010.09.012

Dodson, C. S., Holland, P. W., & Shimamura, A. P. (1998). On the recollection of specific- and partial-source information. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 24*(5), 1121-1136. doi: 10.1037/0278-7393.24.5.1121

Dudukovic, N. M., & Wagner, A. D. (2007). Goal-dependent modulation of declarative memory: Neural correlates of temporal recency decisions and novelty detection. *Neuropsychologia, 45*(11), 2608-2620. doi: 10.1016/j.neuropsychologia.2008.02.025

FBI. (n.d.). *Table 43 overview.* Federal Bureau of Investigation. Retrieved from https://ucr.fbi.gov/crime-in-the-u.s/2019/crime-in-the-u.s.-2019/tables/table-43/table-43-overview#:~:text=Arrests%2C%20by%20Race%20and%20Ethnicity,percent%20were%20Hispanic%20or%20Latino.

Feingold, G. A. (1914). The influence of environment on identification of persons and things. *Journal of the American Institute of Criminal Law and Criminology, 5*(1), 39-51. doi: 10.2307/1133283

Gramlich, J. (2020). *Black imprisonment rate in the U.S. has fallen by a third since 2006*. Pew Research Center. Retrieved from https://www.pewresearch.org/fact-tank/2020/05/06/share-of-black-white-hispanic-americans-in-prison-2018-vs-2006/

Hernandez v. New York, 500 U.S. 352 (1991).

Hosoda, M., & Stone-Romero, E. (2010). The effects of foreign accents on employment-related decisions. *Journal of Managerial Psychology, 25*(2), 113-132. doi: 10.1108/02683941011019339

Innocence Project. (2022). *DNA exonerations in the United States (1989-2020).* Innocence Project. Retrieved from https://innocenceproject.org/dna-exonerations-in-the-united-states/

Jones, T., Kalbfeld, J. R., Hancock, R., & Clark, R. (2019). Testifying while black: An experimental study of court reporter accuracy in transcription of African American English. *Language, 95*(2), 216-252. doi: 10.1353/lan/2019.0042

Kutlu, E., Tiv, M., Wulff, S., & Titone, D. (2022). Does race impact speech perception? An account of accented speech in two different multilingual locales. *Cognitive Research: Principles and Implications, 7*(1), 7. doi: 10.1186/s41235-022-00354-0

NAACP, an American organization. (2022). *Criminal justice fact sheet*. National Association for the Advancement of Colored People. Retrieved from https://naacp.org/resources/criminal-justice-fact-sheet

Paladino, M. P., & Mazzurega, M. (2019). One of us: On the role of accent and race in real-time in-group categorization. *Journal of Language and Social Psychology, 39*(1), 22-39. doi: 10.1177/0261927X19884090

Pickel, K. L., & Staller, J. B. (2012). A perpetrator's accent impairs witnesses' memory for physical appearance. *Law and Human Behavior, 36*(2), 140-150. doi: 10.1037/h0093968

Piquero, A. R., & Brame, R. W. (2008). Assessing the race-crime and ethnicity-crime relationship in a sample of serious adolescent delinquents. *Crime & Delinquency, 54*(3), 390-422.

Purnell, T., Idsardi, W., & Baugh, J. (1999). Perceptual and phonetic experiments on American English dialect identification. *Journal of Language and Social Psychology, 18*(1), 10-30. doi: 10.1177/0261927X99018001002

Quinn, J. F., & Petrick, J. A. (1993). Emerging strategic human resource challenges in managing accent discrimination and ethnic diversity. *Applied H.R.M. Research, 4*(2), 79-93.

Reder, L. M., Liu, X. L., Keinath, A., & Popov, V. (2016). Building knowledge requires bricks, not sand: The critical role of familiar constituents in learning. *Psychonomic Bulletin & Review, 23*, 271-277. doi: 10.3758/s13423-015-0889-1

Roediger III, H. L, & Karpicke, J. D. (2006b). Test-enhanced learning: Taking memory tests improves long-term retention. *Psychological Science, 17*, 249– 255. doi: 10.1111/j.1467-9280.2006.01693.x

USCIS (2020). *Chapter 2 – English and Civics Testing.* U.S. Citizenship and Immigration Services. Retrieved from https://www.uscis.gov/policy-manual/volume-12-part-e-chapter-2

Wooldredge, J., Frank, J., Goulette, N., & Travis III, Lawrence. (2015). *Criminology & Public Policy, 14*(2), 187-223. doi: 10.1111/1745-9133.12124

Yue, C. L., Castel, A. D., & Bjork, R. A. (2012). When disfluency is – and is not – a desirable difficulty: the influence of typeface clarity on metacognitive judgments and memory. *Memory & Cognition, 41*, 229-241. doi: 10.3758/s13421-012-0255-8