Overview

The goal of this study is to explore if the effects of prosocial priming extend to speech adaptation. To achieve this, we will implement a set of two experiments. **Experiment 1** participants will be split into two conditions. One condition will hear a simulated accent paired with prosocial primes. The second condition will hear the same accent paired with neutral cues. The rate of adaptation will be compared between conditions to determine if prosocial cues effect speech perception adaptation.

If there is a difference between conditions across participants, then we will run **Experiment 2**. In this design, each participant will be exposed to two distinct talkers, each with their own novel accent. One talker’s speech will be paired with prosocial cues, while the second talker’s speech is paired with neutral speech. If the adaptation to the talkers differs within subjects, then prosocial cues have a local effect on listener receptiveness to novel speech: the listener perceives that talker as more prosocial, facilitating adaptation to that talker. If there is no difference in listener adaptation between talkers, then prosocial cues have a global effect on listener receptiveness to novel speech: the listener is primed to a more prosocial state, facilitating adaptation to all novel talkers they encounter.

If there is no difference in listener adaptation found between conditions in Experiment 1, then we will run **Experiment 3**, which will introduce two talkers speaking simultaneously. Our goal would be to tax listener attentional systems, increasing the difficulty of listeners adapting their speech perception to a talker, under the assumption that listeners otherwise maximally adapt to both talkers. **Experiment 3a** will determine if the cocktail party effect impacts lexically guided perceptual learning when a listener is asked to attend to one of two talker’s speaking simultaneously. **Experiment 3b** will then introduce each listener to a simulated prosocial talker and a simulated neutral talker simultaneously. Listener’s speech perception adaptation will be compared across the talkers to determine if prosocial primes influence this adaptation, and if these effects are talker specific.

Experiment 1:

The listener population will be divided into two conditions at random. Half the participants will be exposed to Condition 1, which includes a prosocial prime. The other half will be exposed to Condition 2, which includes neutral primes instead.

|  |  |
| --- | --- |
| Conditions | |
| Condition 1 | Condition 2 |
| Prosocial Prime | Neutral Prime |

Table 1: The two possible conditions for Experiment 1.

The primes will take the form of prosocial and neutral words. These words will be presented both verbally and orthographically, matched with the appropriate accent. Listeners will encounter primes as a response choice on labeled trials, and during catch trials as both the audio and the correct response choice. Utilizing these trials which typically incorporate words unrelated to the experiment will allow us to efficiently implement the primes without substantially changing earlier paradigms.

A picture containing shape

Description automatically generatedA picture containing shape

Description automatically generatedProsocial Prime vs Neutral Prime

Figure 1b: Neutral prime response choice example

Sip

Shade

Share

Sip

Figure 1a: Prosocial prime response choice example

The rate of speech perception adaptation will be compared across conditions. If there is a significant a difference between conditions, **then the presence of prosocial primes effect speech perception adaptation.**

Experiment 2:

Every participant will be exposed to two distinct talkers, each with their own novel accent. An accent here will be defined as having the same shifted /s/-/sh/ distributions, where the ambiguous tokens will be labeled either /s/ (Accent s) or /sh/ (Accent sh). /s/-/sh/ stimuli will be used to simulate the accents because adaptation to this continuum is known to be talker-specific (Cummings & Theodore, *in press.)* The accents will be paired with either a Prosocial Prime (PP), presented as a word with a prosocial connotation, or a Neutral Prime (NP), presented as a word with a neutral connotation. Primes will be consistently assigned to the same accent throughout the experiment for each participant. This will create 4 possible combinations and a total of two potential conditions (see *Table 2*, below).

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Accent | |
| Accent s | Accent ʃ |
| Prime | PP | Accent s + PP | Accent ʃ + PP |
| NP | Accent s + NP | Accent ʃ + NP |

|  |  |
| --- | --- |
|  | Condition A |
|  | Condition B |

Table 2: Possible accent/prime combinations. Neither the accent nor the prime may repeat within a version of the experiment, resulting in the two potential combinations that create conditions A and B, shown in green and blue respectively.

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Condition | |
| A | B |
| Voice Gender | M, F | Accent s + PP; Accent ʃ + NP | Accent s + NP; Accent ʃ + PP |
| F, M | Accent s + PP; Accent ʃ + NP | Accent s + NP; Accent ʃ + PP |

To further the distinctive quality of the voices, one voice will be female (Voice F) while the other will be male (Voice M). To create the male voice, the audio stimuli will be manipulated using Praat (using a formant shift ratio of 0.08 and a new pitch median of 100 Hz; Luthra et al., 2021). By doing so, we can limit other acoustic cues beyond this manipulation from becoming confounding variables. Previous research does suggest that making these changes to the stimuli will cause listeners to regard the audio as voices from separate talker’s (Cummings & Theodore, *in press;* Tride & Brown-Schmidt, 2012), allowing us to track talker-specific speech perception adaptation when the voices are played across interleaved trials.

|  |  |
| --- | --- |
|  | Condition A |
|  | Condition B |

Table 3: Participants will be split in half within each condition. One half of each condition will experience the Accent + PP in a male voice, and the other Accent + PP in a female voice.

Presenting the two talkers simultaneously across trials (oppose to blocking the trials based on the talker) will allow us to compare talker-specific perceptual adaptations without there being a biasing effect from whichever accent is presented first. Which voice gender speaks with which accent should be counterbalanced across participants to accommodate potential gender biases (See *Table 3*, above).

This design would allow us to investigate sociability as a moderator for speech perception adaptation, removing potential effects from ingroup biases, such as similarity in prior experiences that would lead to beliefs about that talker potentially matching well with the novel talker’s production. Additionally, we will be able to run within-subject analyses comparing the two voices without confounding effects from the participants desire to participate in the task, as well as the participant’s social network size and prior experiences. If there is a significant difference between the adaptation of the talker-specific model when comparing the accent/voice paired with the prosocial prime and the accent/voice paired with the neutral prime, **then this would suggest that associating the prime with a talker changes the listener’s receptiveness towards that specific talker.**

Experiment 3a

Each participant will be exposed to two distinct talkers who produce their own novel accent. An accent here will be defined as having the same shifted /s/-/ʃ/ distributions, where the ambiguous tokens will be labeled either /s/ (Accent s) or /ʃ/ (Accent ʃ). Alveolar (s) vs. post-alveolar (ʃ) fricatives will be used because their production is recognized as talker-specific by listeners (Cummings & Theodore, *in press*).

To further the distinctive quality of the voices, one voice will be Male (M) while the other will be female (F). To create the male voice, the audio stimuli will be manipulated using Praat (using a formant shift ratio of 1.2 and a new pitch median of 220 Hz). By doing so, we can limit other acoustic cues beyond this manipulation from becoming confounding variables. Previous research does suggest that making these changes to the stimuli will cause listeners to regard the audio as voices from separate talker’s (Cummings & Theodore, *in press;* Tride & Brown-Schmidt, 2012), allowing us to track talker-specific speech perception adaptation using test trials presented in either talker’s voice.

Though it is not anticipated that the simulated talker’s gender will influence speech perception adaptation, the accent assignment will be counterbalanced across genders to control for any unintended effects. Accents will be consistently assigned to the same gender within a listener’s exposure. This will create four possible talkers, and a total of two potential conditions for this experiment, as shown in the table below (see *Table 4)*.

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Accent | |
| Accent s | Accent ʃ |
| Gender | M | Accent s + M | Accent ʃ + M |
| F | Accent s + F | Accent ʃ + F |

|  |  |
| --- | --- |
|  | Condition A |
|  | Condition B |

Table 4: Possible gender/accent combinations. Each combination of an accent and a gender represents a possible talker. Neither the gender nor the accent may repeat within a version of the experiment, resulting in the two potential combinations that create Conditions A and B, shown in green and blue, respectively.

Listeners will be asked to attend to either the male-sounding voice or the female-sounding voice. This also should be counterbalanced within conditions (see *Table 5)*.

|  |  |
| --- | --- |
|  | Condition A |
|  | Condition B |

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Condition | |
| A | B |
| Attend To | M | Accent s + M; Accent ʃ + F | Accent s + F; Accent ʃ + M |
| F | Accent s + M; Accent ʃ + F | Accent s + F; Accent ʃ + M |

Table 5: Participants will be split within each condition. Half will be asked to attend to the male-sounding voice (top) while the other half will be asked to attend to the female-sounding voice (bottom), as noted by underlining.

In each exposure trial, listeners will hear one of the simulated talkers produce a range of fricatives. To simulate the accent, the talker’s ambiguous fricatives will be labeled as either /s/ or /ʃ/ by the offered orthographic response choices. During test trials, listeners will hear both talkers produce a word that begins with a fricative simultaneously. In theory, this will force the listener to choose one of the two talkers to attend to, similar to speech processing in the cocktail party effect (Bee & Micheyl, 2008). Listeners will be instructed which voice they should attend to at the beginning of the experiment. Participants will then select either a response choice beginning with “s” (e.g., sign) or “sh” (e.g., shine). At the end of the experiment, listeners’ perception of each talker’s range of fricative production will be tested using unlabeled trials where the trials are presented in each talker’s voice. If there is a significant difference in adaptation between the two talkers, then we can conclude that **attending to one talker when multiple talkers are speaking inhibits speech perception adaptation to the talkers that the listener is not attending to.**

Experiment 3b

Experiment 2 will follow a similar structure to Experiment 1, with the exception that prosocial primes will be integrated into one of the talkers. Within the experiment, each talker will be paired with either a Prosocial Prime (PP), presented as a word with a prosocial connotation, or a Neutral Prime (NP), presented as a word with a neutral connotation. Primes will be consistently assigned to the same talker throughout the experiment for each participant. This will create 4 possible combinations and a total of two potential conditions (see*Table 6).*

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Accent | |
| Accent s | Accent ʃ |
| Prime | PP | Accent s + PP | Accent ʃ + PP |
| NP | Accent s + PP | Accent ʃ + NP |

|  |  |
| --- | --- |
|  | Condition A |
|  | Condition B |

Table 6: Possible accent/prime combinations. Neither the accent nor the prime may repeat within a version of the experiment, resulting in the two potential combinations that create conditions A and B, shown in green and blue respectively.

The prime will be presented both verbally and orthographically (*Figures 1a & 1b)*, matched with the appropriate accent. Participants will encounter primes as a response choice on labeled trials and during catch trials, as both the audio and the correct response choice. Utilizing these trials, which typically incorporate words unrelated to the experiment, will allow us to efficiently implement the primes without substantially changing earlier paradigms.

The talkers will also be presented as two different genders, like in Experiment 1, to further listener’s distinction between the two voices. As a result, gender should again be counterbalanced between conditions, although we do not anticipate any differences in speech perception adaptation (see *Table 7)*.

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Condition | |
| A | B |
| Prosocial Prime | M | Accent s + M; Accent ʃ + F | Accent s + F; Accent ʃ + M |
| F | Accent s + M; Accent ʃ + F | Accent s + F; Accent ʃ + M |

|  |  |
| --- | --- |
|  | Condition A |
|  | Condition B |

Table 7: Participants will be split within each condition. Half will experience the condition + the prosocial prime in a male (M) voice and the counterpart in a female (F) voice. The other half will be exposed to the inverse.

In each exposure trial, listeners will hear one of the simulated talkers produce a range of fricatives. To simulate the accent, the talker’s ambiguous fricatives will be labeled as either /s/ or / ʃ/ by the offered orthographic response choices. The labeled trials will include either the prosocial or neutral prime. During test trials, listeners will simultaneously hear both talkers produce a word that begins with a fricative. This will again, hopefully, result in the cocktail party effect, which ideally will have been proven to inhibit speech perception adaptation to the unattended talkers in Experiment 1. As a result, we would then be able to test the effect of prosocial primes on talker-specific speech perception adaptation. Additionally, this would allow us to examine the general effects of prosocial priming by comparing the outcomes of this experiment to those of Experiment 1.

Unlike in Experiment 1, listeners will *not* be instructed to attend to a specific talker. Participants will then select either a response choice beginning with “s” (e.g., sign) or “sh” (e.g., shine). At the end of the experiment, listeners’ perception of each talker’s range of fricative production will be tested using unlabeled trials, where the trials are presented in each talker’s voice. If there is a significant difference in adaptation between the two talkers, **then these results may imply that prosocial primes have a talker-specific effect on a listener’s speech perception adaptation.** If there is a significant difference between the results of Experiment 1 and Experiment 2, **then these results may imply that prosocial primes have a general effect on a listener’s speech perception adaptation.**

~ \* ~

Self-Report Measures

Text

Description automatically generatedFurthermore, I propose we include several self-report surveys at the end of the experiment. Including the Prosocial Behavioral Intentions Scale (PBIS) (Baumsteiger & Siegel, 2018) could serve as a gauge of participant’s receptiveness to the prosocial primes presented throughout the experiment. This survey consists of 4 items that require participant responses in the form of 7-point Likert scales:

Figure 2 PBIS instructions and questions. Copied from Appendix in Baumsteiger & Siegel, 2018.

I also think we could include the [Interpersonal Reactivity Index](https://docs.google.com/document/d/1YCKkyg-OVpT0Qz36qFdHM7yeSGj0DsUYgyyx9u7ubnc/edit) (IRI) (Davis, 1980), which may be useful in secondary analyses because it is designed to measure empathy, faceted into 4 distinct dimensions. This self-report includes 28 items rated on 5-point Likert scales, but scoring is admittedly more complex.

For similar reasons, I am also interested in adding the BIS/BAS measures from Carver and White, (1994). The Behavioural Inhibition System (BIS) and the Behavioural Activation System (BAS) were the basis of Gray’s dimensions of personality (Gray, 1981), which was a modification of Eysenck’s dimensions of personality (Eysenck, 1967). Gray’s dimensions of personality are categorized by anxiety proneness and impulsivity, which may correlate to the modern-day measures of emotional reactivity and mood inertia. Both factors would also likely play a role on social acceptance and the development of interpersonal relationships.