Perception is shaped by context and associations. When we encounter a stimulus in the environment, there is a staggering amount of peripheral information that is also taken into account to perceive that stimulus. In speech perception specifically, listeners use acoustic cues to make assumptions about a talker’s traits, like their cultural background, age, and gender. These assumptions may change the way that the listener interacts with the talker (MacFarlane, 2014). Over the past 40 years, psychology research has explored purposefully introducing associations that prime beliefs and manipulate subsequent intentions and behaviours (Srull & Wyer, 1979). In 2013, Abbate et al. performed an experiment in which participants were primed for prosocial intentions –the desire to engage in behavior that benefited others, including helping, cooperating, comforting, and sharing– and then placed in a scenario where they could act on that desire. The experiment was successful in that prosocial priming significantly increased participant engagement in prosocial behavior in multiple contexts.

Recently, there has been a shift in the field to address the reduction problem: How does the brain process potentially innumerous cues in the environment to produce nonconscious behavior in real time (Bargh, 2016)? This question steps away from the traditional interest in the effects a cue has on behaviour, instead asking *how* multiple cues interact to produce the resultant behaviour. For instance, priming tends to be most effective when the targeted behaviour aligns with the participant’s goals and/or values (Bargh, 2016). In the context of speech perception adaptation, this question can be presented as how listeners use a range of cues within an interaction to understand a talker.

Speech can communicate various cues about the talker’s identity at the pragmatic, syntactic, wrote, and even phonetic levels. This encourages social grouping and prosocial behaviour. Social groups have a tendency to adopt similar language and usage patterns, and even imitate the speech cues of those perceived as belonging to their social group (Babel, 2012). Prior research suggests that individuals retain more detailed memories during word learning when those words are taught to them by someone perceived as belonging to their social group (Iacozza et al., 2020). Additionally, Trude and Brown-Schmidt (2012) found that listener’s use knowledge of talker identity as a talker-specific guide during online speech perception. Though unfavored speech alone has not been found to inhibit speech perception adaptation in listeners (Babel et al., 2019), it is another question entirely if prosocial intentions would facilitate this adaptation. Furthermore, previous studies (to the best of my knowledge) have failed to isolate potential prosocial cues from ingroup-biased expectations.

Listeners can understand novel talkers by comparing their expectations about how the talker will speak –formulated from their prior experiences with cues produced by other talkers they’ve encountered– with the experienced productions from that talker (Kleinschmidt & Jaeger, 2015). Thus, expectations about acoustic cues are likely biased towards ingroup members. Listeners then develop expectations for that specific talker and update their general expectations for future novel talkers. As a listener acquires more experiences with a specific talker, the malleability of their expectations for that talker tend to decrease (Kraljic et al., 2008; Saltzman & Myers, 2021; Tzeng et al., 2021). This is due to each experience with a specific talker having less weight as the number of those experiences increases. In a similar fashion, when individuals with larger social networks encounter a novel talker, their general expectations are less malleable (Lev-Ari, 2017).

Though listeners with larger social networks possess less malleable general expectations, they still communicate with more people and experience a wider variation in speech productions. This could suggest that listeners with larger social networks process their talker-specific expectations differently in order to maintain their relationships. Similar to how primed prosocial intentions facilitate relationship development by inspiring prosocial behaviour, could prosocial primes moderate a listener’s receptiveness to novel talkers? Could this be a possible response to the reduction problem in speech perception adaptation?

*Design*

The goal of this study is to explore if the effects of prosocial priming extend to speech adaptation. To achieve this, each 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 /d/-/t/ distributions (likely between 20-30msec) along the VOT continuum, where the ambiguous tokens will be labeled either /d/ (Accent d) or /t/ (Accent t).

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:

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Accent | |
| Accent d | Accent t |
| Prime | PP | Accent d + PP | Accent t + PP |
| NP | Accent d + NP | Accent t + NP |

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

Table 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, 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

Figure 1a Prosocial prime response choice example

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 normed during BCS 206 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 when the voices are played across interleaved trials.

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Condition | |
| A | B |
| Voice | M, F | Accent d + PP + M; Accent t + NP + F | Accent d + NP + M; Accent t + PP + F |
| F, M | Accent d + PP + F; Accent t + NP + M | Accent d + NP + F; Accent t + PP+ M |

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

Table Participants will be split within each condition. Half will experience the Accent + Prime in a male (M, blue) voice and the counterpart in a female (F, red) voice. The other half will be exposed to the opposite.

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 2*, 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.** If there is no significant a difference between the talkers, but there is evidence that listener’s adaptation to the talker’s may be facilitated by the prime, then a second comparison experiment could be run where no prosocial primes are present during the exposure. If there is **a significant difference between the first experiment and the second, then it may be the case that the presence of prosocial primes cues receptiveness to talkers in general.**

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.

~ \* ~

Questions moving forward:

* What prosocial words should be used as primes?
  + What types of neutral words would balance these out well?
* When should test trials be added throughout the talker exposure?
  + Interspersed in addition to at the beginning + end?
* Which scales should be included? Should any scales be excluded?
  + Other measures/ideas?
* Exclusion criteria
  + Similar to what we have implemented in past experiences
  + Changes based on Cummings & Theodore (*in press*)?

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