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Reading (between) the lines: Individual differences in emotion processing of native- and foreign-accented speech

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ABSTRACT

Previous literature on foreign-accented speech processing indicates the presence of an accent can influence perception and comprehension across multiple levels of language processing, but emotion inferencing appears to remain as one unexplored area in this context. To our knowledge, this research is the first of its kind to investigate whether differences exist in emotion processing of native- and foreign-accented speech, and if so, whether these differences are modulated by listener personality traits. This study utilized short constructed narratives that implied the emotional state of a character who was described as either a native or non-native speaker. Participants read the narratives then rated the emotional valence of the speaker using a Likert-type scale. Personality traits were recorded using the HEXACO Personality Inventory and the Wilson-Patterson Conservatism Scale (W-P). The results suggested that certain participant personality traits influenced emotion perceptions rather than the speaker's accent. In the context of negative stories, lower Openness to Experience led to less negative emotion interpretations, while higher Conscientiousness led to more negative emotion interpretations. These findings highlight the relevance of individual differences in emotion processing and, while an accent effect was not found, future exploration into this area of study with foreign accents is still encouraged.

ACKNOWLEDGEMENTS

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CHAPTER 1. BACKGROUND

Travel, immigration, and social media have made the world more interconnected than ever before. A natural result of constant interaction and exposure is a growing prevalence of non-native speech and accents in everyday life, which in turn highlights the value of research into foreign-accented speech processing. To maintain clear communication and strengthen social bonds, a listener must be able to take in information from speech and interpret its meaning. Despite the speed at which this process can be done, it is no small feat; there is a considerable amount of linguistic and extra-linguistic information that can be gleaned from conversational speech, and depending on what exactly a listener is trying to understand, the specific information required to comprehend meaning changes. One way to look at this is as a kind of spectrum: surface-level processing of an utterance can be used to understand its direct or denotative meaning (i.e., that which is derived from the culmination of information taken from the string of words). With the addition of certain extra-linguistic information, such as pragmatic and contextual background, a person can discern indirectly conveyed meaning, such as verbal irony, stereotypes, or implicatures. Relying on extra-linguistic information can also enable meanings that may be entirely implied, like emotion, to be inferred. Indeed, this requires considerable processing by the listener, but what they are able to accurately comprehend is modulated by both the speaker's language skills as well as the familiar (or unfamiliar) characteristics of their speech. Previous literature has largely focused on how accents influence comprehension of meaning from segmental or word level processing, while research into pragmatics or contextual meaning is comparatively new and in some areas, scarce. One such example is emotion. Accurately interpreting a person's emotional state is a critical part of a conversation. Depending on the context, an inaccurate perception can lead to a critical breakdown in understanding and

social bond maintenance. As such, it is important to understand what factors go into its perception and comprehension, particularly when accents are involved. Interestingly, this area appears to have only been studied in a native speaker context; to our knowledge, emotion perception with foreign accents has yet to be approached.

This review will go through some of the literature on foreign-accented speech processing to highlight the developments and gaps in this linguistic field to date. Research into foreign-accented speech processing at the syntactic level will first be explored, then the literature on pragmatic information processing via irony detection will be considered. Finally, research into emotion processing in native speech will be discussed.

1.1 Syntactic Processing

A portion of the literature examining the influence of foreign accent on language processing has focused particularly on the syntactic level. One such example comes from Hanulíková et al. (2012), who conducted an ERP study to examine whether syntactic processing is modulated by speaker identity, as represented by foreign accent. The researchers used Dutch sentence utterances that were manipulated for grammatical violation in either gender agreement or adjectival inflection, then recorded by native and foreign-accented speakers. As a control, they also included sentence utterances manipulated for semantic violations and accent type. Participants listened to the utterances while their ERP responses were recorded. Hanulíková et al. (2012) predicted that listeners would anticipate and be more accepting of errors from foreign-accented speakers (as reflected by an insignificant P600 response) given that syntactic violations are more common in non-native speech. The semantic violations used were equally unlikely across speech types, so they anticipated no significant change in N400 values. They found a significant P600 response for violations spoken in a native accent, but not a foreign accent

(Hanulíková et al., 2012). Significant N400 responses were also found for semantic violations in both accent conditions. While the size of these effects did not depend on accent, there were differences in their distribution; the N400 effect was more broadly distributed in the foreign-accent condition compared to the native-accent condition. These results suggest that listeners process certain grammatical errors differently when a foreign accent is involved, and this difference may be at least in part explained by listener expectations of the speaker's language ability (Hanulíková et al., 2012).

Zhou et al. (2019) also examined listener expectations using auditory perceptual simulation (APS): the imagining of a speaker's voice while silently reading (Alexander & Nygaard, 2008; Hubbard, 2010; Stites, Luke, & Christianson, 2013; Zhou, 2017, as cited in Zhou et al., 2019). Using two ERP studies, the researchers examined whether and how grammatical violations are processed differently between silent reading, reading with APS of a native speaker, and APS of a non-native speaker. Experiment 1 accumulated baseline data on silent reading using constructed sentences with three variations: a control (i.e. grammatically correct), subject-verb disagreement, and pronoun case mismatch. Participants read the sentences as they appeared word by word, then completed a paraphrase verification task, all while their ERP responses were recorded. Experiment 2 followed a similar design with the addition of APS information. Prior to the task, participants viewed photos and audio clips depicting a native and foreign-accented speaker. Then, a photo and audio clip of one speaker was shown before each trial with participants being instructed to imagine the speaker reading aloud the sentence they were about to see. The researchers found that grammatical violations in the silent reading and native speaker APS conditions caused significant P600 and N400 responses, with marginally stronger P600 responses for pronoun errors compared to subject-verb errors. Most interestingly, pronoun errors

in the non-native speaker APS conditions resulted in P600 and N400 responses similar to the other conditions, but subject-verb agreement errors resulted in a strengthened N400 response and no P600 response. Zhou et al.'s (2019) results align with the notion that certain grammatical errors are processed differently in the context of a foreign accent, but here, we see these changes in processing can occur by simply imagining the accent rather than hearing it.

Grey and van Hell (2017) considered the listener perspective more closely by examining the effect of accent experience (Porretta et al., 2016) and language ability (i.e., monolingual status) on processing. They constructed English sentences that were manipulated for semantic congruence and grammaticality (using pronoun errors), which were recorded by one native and one non-native English speaker. Monolingual participants listened to the sentences while their ERP responses were recorded. Language attitude and debrief surveys collected information on their language attitudes and accent perceptions. The results showed an accent effect for both grammatical and semantic violations; specifically, native speech elicited Nref and N400 responses for pronoun and semantic errors respectively, but no such results were found for non-native speech (Grey & van Hell, 2017). Instead, semantic violations led to a late negativity response in the non-native speaker condition. Interestingly, participants who could identify the non-native accent showed a marginal N400-like effect for grammatical errors and a late negativity for semantic errors; those who could not identify the accent only showed the late negativity for semantic errors.

The combined results of these studies indicate that listeners process certain syntactic violations differently when a foreign accent is involved. Not only that, but an accent does not need to be heard; simply imagining a non-native speaker is sufficient to affect processing in certain contexts (Zhou et al., 2019). It should still be noted, however, that there is a discrepancy

between the results: certain grammatical violations triggered an N400 response for Zhou et al. (2019) and Grey and van Hell (2017), while Hanulíková et al. (2012) saw no such effect. Grey and van Hell's (2017) N400-like effect was also limited to participants who could recognize the non-native accent, thereby showcasing an added influence of accent familiarity on the result. This type of individual difference arises in multiple areas of the literature on foreign-accented speech. Accent familiarity has been linked to facilitated performance on word recognition tasks (Porretta et al. 2016) and predictive processing during visual world paradigm eye-tracking (Porretta et al. 2020). The above findings further indicate the merit of further investigation into individual differences in foreign-accented speech processing. They also suggest that surface-level processing of this type of speech may involve a capacity to move in atypical directions, at least in the context of grammatical errors (Grey & van Hell, 2017; Zhou et al., 2019).

1.2 Irony Detection

Irony detection research offers an avenue into exploring how foreign accent influence extends into pragmatic processing. One such study by Caffarra, Michell, and Martin (2018) used Spanish stories containing target sentences that were manipulated to convey one of literal criticism, literal praise, ironic criticism, or ironic praise. The stories were recorded in a neutral intonation by three native and three non-native Spanish speakers of Spanish. Participants listened to the stories then rated each one for irony, intelligibility, and accent strength on Likert-type scales. Caffarra, Michell, and Martin (2018) predicted that ironic statements in the native speaker condition would be easier to identify and therefore be rated more ironic compared to equivalent statements in the non-native speaker condition. The results showed that while ironic stories were rated significantly more ironic than literal stories, ironic praise was rated significantly less ironic than ironic criticism across the accent conditions and this difference was significantly wider in

the foreign-accent condition. In other words, the ironic criticism ratings were similar between the accent conditions, but the ironic praise ratings in the foreign-accented condition were significantly less ironic than those in the native-accented condition.

Puhacheuskaya and Järvikivi (2022) examined verbal irony detection in native and foreign-accented speech through the lens of individual differences. They investigated whether political ideology, empathy, and need for cognitive closure would influence sarcasm detection accuracy. They recorded auditory dialogues of native and non-native English speakers that contained an end statement depicting one of literal praise, literal criticism, ironic praise, or ironic criticism. Participants listened to the dialogues and rated the final target sentence for level of irony, appropriateness, and offensiveness along with the participant's confidence in their judgements using a Likert-type scale. Puhacheuskaya and Järvikivi (2022) predicted that foreign-accented irony would be rated less ironic compared to native-accented irony. They also anticipated that political orientation, empathy, and need for cognitive closure would modulate the results; specifically, participants who self-rated as more conservative or less empathetic would be less accurate at detecting foreign-accented sarcasm. As anticipated, foreign-accented irony statements were rated significantly less ironic than those in a native accent for both criticism and praise. Empathy and need for cognitive closure showed no significant effect on the ratings. There was no interaction between political ideology and accent either; instead, right-leaning participants consistently misinterpreted literal praise as more ironic and ironic statements as less ironic, indicating a greater challenge with sarcasm detection overall (Puhacheuskaya & Järvikivi, 2022).

Considering the above results, accuracy is not the only aspect of detection worth interest; whether irony misinterpretations come with consequential effects on perceived social interaction

is another question worth exploring. Foucart et al. (2022) sought to answer it using written dialogues between a protagonist framed as either a native or foreign-accented speaker, and a native speaker interlocutor. Speakers were identified using photos and short bios, and the dialogues were manipulated such that the protagonist's statement would be either literal or ironic praise. The interlocutor provided a response that would match or mismatch the protagonist's statement (e.g. a literal/ironic response to a literal praise statement). Participants read the protagonist's statement first, then rated it for level of irony and friendliness on a Likert-type scale. Afterward, they read the interlocutor's statement and rated its level of appropriateness. The results showed that literal praise was rated more friendly and less ironic than ironic praise. Native speaker protagonist statements were also rated more ironic than non-native speaker protagonists. Most interestingly, interlocutor responses were rated less appropriate when directed to foreign protagonists compared to native protagonists, indicating that speaker identity influences language processing, which can consequently impact perceptions of social interactions (Foucart et al., 2022).

Despite using different modalities, the studies found that foreign accents do influence irony perceptions. Similar to the literature on syntactic processing, the research here points to listener expectations as a potential explanation. Irony is a skill requiring knowledge and ability that non-native speakers may take more time to learn and therefore find difficult to attempt in conversation (Caffarra, Michell, & Martin, 2018; Puhacheuskaya & Järvikivi, 2022; Foucart et al., 2022). As a result, participants may not expect ironic statements and be less inclined to perceive them as such. With that said, irony processing also involves an array of extra-linguistic information that can open the door to a number of potential influential factors that could affect interpretations and detection accuracy. As highlighted by Puhacheuskaya and Järvikivi's (2022)

study, individual differences represent one umbrella that these factors could fall under, making further exploration into them a valuable pursuit.

1.3 Emotion Processing

Like irony perception, emotion processing utilizes extra-linguistic information for meaning comprehension. Currently, foreign accent literature related to this subject is scarce. To get a sense of where the research stands on the topic so far, we will turn to native speech. One highly cited work comes from Gernsbacher et al. (1992), who investigated readers' situational models to see if they included representations of the emotional states of fictional characters. They designed three experiments utilizing constructed narratives describing the settings, actions, relationships, and (occasionally) goals of a primary character in a way that implied their emotional state. The first two experiments utilized a self-paced reading paradigm. The stories were paired based on their degree of difference in implied emotion and each narrative received a target sentence that contained an emotion word either matching or mismatching the implied emotional state of the story. Gernsbacher et al. (1992) hypothesized that if emotional states are included in situational models, participants would process target sentences faster when they matched the implied emotional state. In experiment 1, stories with opposite implied emotional states (e.g. bored vs. curious) were paired, and each story was given a target sentence with identical (i.e. matching) and opposite (i.e. mismatching) valence emotion word variations. Experiment 2 paired stories with implied emotional states that had the same valence (e.g. bored vs. angry) and each story was given a target sentence with identical (i.e. matching) and same-valence (mismatching) emotion word variations. In both experiments, participants read the target sentences significantly more slowly when the target emotion word mismatched the implied emotional state of the narrative. To verify these results, experiment 3 combined the narrative

pairings from experiment 1 with a laboratory task. Participants read the stories as they appeared sentence by sentence, during which two test words would randomly appear: a filler and an emotion target word either matching or mismatching the implied emotional state. Participants read the test words aloud as they appeared and their reading times were recorded with the expectation that, if emotional states are mentally represented, reading times for matching emotion words would be faster. Indeed, the results showed that participants read mismatching words slower than matching words, indicating that emotional states are a part of our mental representations.

Gillioz, Gygax, and Tapiero (2012) took a step further by exploring how simulation and individual differences in empathy and processing limitations (i.e., general working memory and visuospatial ability) influence the elaboration of emotional inferences. They utilized short French narratives that implied the emotional state of a main character. The stories were paired with their opposite valence counterparts and each one was presented with a target sentence defining the emotion of the story in one of four ways: a matching emotion word, a mismatching emotion word, a matching behaviour description, and a mismatching behavior description. Through a self-paced reading paradigm, participants read the stories sentence by sentence at a natural pace for the first half of the experiment; during the second half, they were instructed to simulate being in the main character's shoes while they read. For each story, they self-rated their level of simulation using a Likert-type scale. Afterward, they completed assessments on their general working memory, visuospatial ability, and empathy. The researchers found that congruent sentences were read significantly faster than incongruent ones, and the difference in reading times was largest with target sentences that contained behaviour descriptions. No significant effects of empathy or general working memory were found. Interestingly, the experimenters'

simulation manipulation resulted in different effects based on participants' visuospatial ability. Individuals with low visuospatial spans were only sensitive to the congruence manipulation of the target sentences, but those with high visuospatial spans were more sensitive to target sentences that contained behaviour information when they were instructed to simulate. The results indicate that emotional inferences are more likely to include behaviour information over emotion information, and this holds especially for those with high visuospatial spans (Gillioz, Gygax, & Tapiero, 2012).

Mouw et al. (2019) considered this topic from a developmental perspective. Focusing on negative emotions, they examined how emotion processing differs between children and adults. They theorized that a reader's knowledge of their own emotional states would aid their emotion processing of fictional protagonists. Thus, it was predicted that adults would show more accurate emotion perceptions due to their greater socio-cognitive development. Taking ten emotion states from Gernsbacher et al.'s (1992) study, the researchers constructed two age-appropriate narratives for each one. The second-last sentence of each narrative contained the emotional target: it either implied the intended emotional state or did not imply any emotion at all. Participants read the narratives using a self-paced reading paradigm, then rated their emotional state in terms of valence and arousal on Likert-type scales. Afterward, they rated the emotional state of the protagonist on the same scales. The results showed that both adults and children were faster at reading the prime sentences than the final (i.e. spillover) sentences. Adults read the target and final sentences faster with negative narratives compared to neutral narratives, but this was not the case with children. Instead, final sentences were read more slowly with negative narratives compared to neutral ones. In terms of valence and arousal, the protagonists were

consistently rated as having a more negative and aroused emotional state compared to both the child and adult participants.

1.4 Current Study

While emotion processing is a complex process that utilizes and can be influenced by extra-linguistic information, the literature shows that we can discern emotional states to a considerable degree, and this is a skill we refine throughout the lifespan (Gernsbacher et al., 1992; Mouw et al., 2019). The social value of this ability is clear; recognizing others' emotions can greatly assist in navigating conversations across contexts, and yet the literature on this topic appears to be limited to native speech. The combined results of the literature highlight the influence of foreign accent on language processing. Listener perceptions can be made more lenient (Hanulíková et al., 2012; Grey & van Hell, 2017; Zhou et al., 2019) or even inaccurate (Caffarra, Michell, & Martin, 2018; Puhacheuskaya & Järvikivi, 2022; Focuart et al., 2022) depending on their expectations and preconceptions around a foreign-accented speaker's abilities. For emotion processing, these findings highlight the importance of further investigation into whether perceptions are affected here too and, if so, what sort of individual factors (if any) modulate this change in language processing.

This study will consider emotion processing in the context of foreign-accented speech. Building on previous experimental designs (Gernsbacher et al., 1992; Mouw et al., 2019), we will use short constructed stories to determine whether there is any difference in processing between native-accented speech and foreign-accented speech. In addition, we will examine whether any identified differences are modulated by individual difference factors using the HEXACO Personality Inventory and Wilson-Patterson (W-P) Conservatism Scale. If foreign accent indeed influences emotion processing, we predict an effect of accent on emotion

processing such that, for narratives implying negative emotions, participants will rate emotional states more negatively in the native speaker condition compared to the non-native speaker condition. If individual differences modulate foreign accent effects, we anticipate that certain listener traits will influence emotion ratings. More specifically, individuals who are less open will show a larger difference in ratings between the accent conditions such that their ratings of native speakers' emotional states will be stronger (i.e., more negative for narratives implying negative emotions and more positive for narratives implying positive emotions) compared to their ratings of non-native speakers' emotional states. Finally, right-leaning participants will be less accurate in their emotion ratings overall.

CHAPTER 2. MATERIALS AND METHODS

2.1 Participants

One hundred sixty-one undergraduate students enrolled in Linguistics 101 or 102 at the University of Alberta participated in this study for research credits by signing up via the online system SONA. Data from 26 participants were removed as they identified as non-native speakers of English. An additional nine participants' data were not included as they failed the attention check presented after the speaker bios (i.e., scored less than 75% on the comprehension questions). This left a final pool of 127 participants comprising of 93 females, 30 males, 2 nonbinary, and 2 who preferred not to answer ($mean_{age}$ = 19.4, range: 17 – 48 years).

2.2 Materials

2.2.1   Speaker profiles

We used two portrait images from the Chicago Face Database (Ma et al., 2015) to create a native speaker (Caucasian female) and non-native speaker (Asian female) profile. Profile images were chosen based on similar age and attractiveness ratings (native speaker: age = 24.04 and attractiveness = 4.129; non-native speaker: age = 22.34 and attractiveness = 4.206). Speaker bios were loosely adapted from Fairchild and Papafragou (2018) and consisted of information on education, employment, residence, hobbies, and accentedness. Minor details were varied to prevent identical bios from being shown across the conditions.

Table 1

Speaker bios used for the experiment.

Native Speaker Bio	Non-native speaker Bio

My name is Katie and I'm a student at the University of Arizona. I'm studying Anthropology and I also work part time at a bookstore near campus. I was born and raised in Alberta, and I moved to Arizona to get my degree. Many of my friends here have said that I have a distinct Canadian accent. In my spare time, I like to listen to podcasts and go running.	My name is Mei and I'm a student at the University of Arizona. I'm studying Sociology and I also work part time at a coffee shop near campus. I was born and raised in China, and I moved to Arizona to get my degree. Many of my friends here have said that I have a distinct Chinese accent. In my spare time, I like to watch movies and go hiking.

2.2.2 Experimental stimuli

We constructed 16 base narratives in the first person perspective of a speaker retelling an event or situation they experienced in a manner that implies their emotional state without explicitly stating it. Each narrative is six sentences long and follows the structure adopted by Mouw et al. (2019) and Gernsbacher et al. (1992): sentences 1-4 provide background information and details surrounding the event. Sentence 5 is the target sentence that implies the emotional state of the character. Sentence 6 is the concluding sentence.

Each narrative was created with two variations: one where the implied emotional state is positive and one where the implied emotional state is negative. The positive and negative emotions chosen for each narrative were of opposite valence to each other (e.g., *guilty-proud*). Twelve of our emotion pairs were taken from Gernsbacher et. al's (1992) study (*guilty-proud, bored-curious, sad-joyful, shy-confident, restless-content, afraid-bold, depressed-happy, disgusted-admiring, envious-sympathetic, callous-caring, desperate-hopeful, angry-grateful*) and we created 4 additional emotion pairs using adjectives taken from Warriner and Kuperman's (2013) normed valence measures of words (*disappointed-delighted, skeptical-certain, annoyed-*

pleased, rejected-welcomed). We also used this inventory to confirm that the Gernsbacher et. al (1992) emotion pairs were of the correct valence (i.e., negative words were negative in valence and vice versa) and the pairs had generally equal valence strength. Only the *shy-confident* pair was modified given that *shy* was found to have a positive valence. We chose *embarrassed* as its replacement as it had a negative valence of roughly the same strength as *confident*. Additionally, the *angry-grateful* narratives were adapted from the narrative stimuli used in Mouw et al.'s (2019) study. In total, 32 narratives were made.

Table 2

Experimental narrative examples for each valence condition (negative and positive).

Sentence	Guilty Prompt	Proud Prompt
1-4: Background Information	A group of friends and I planned to celebrate Thanksgiving by having a potluck dinner together. I volunteered to cook the turkey since I've done it before. My week ended up being very busy so I ran out of time to make it. I showed up with two rotisserie chickens from the grocery store instead.	A group of friends and I planned to celebrate Thanksgiving by having a potluck dinner together. I volunteered to cook the turkey since I've done it before. My week ended up being very busy but I managed to find time to make it. I showed up with the finished dish still warm inside my largest roasting pan.
5: Target	When we sat down to eat, a couple people mentioned it was a shame that there wasn't any turkey on Thanksgiving.	When we sat down to eat, a couple people mentioned it was awesome to have turkey on Thanksgiving.
6: Concluding Sentence	We decided to watch a movie after that.	We decided to watch a movie after that.

In addition, we created 16 neutral narrative fillers. These fillers followed the same narrative structure as the experimental stimuli but consisted of the speaker retelling an event (and implying the emotional state) experienced by a separate character.

2.2.3 Materials Pretest

Prior to the main experiment, we conducted a separate norming study on the stimuli to ensure they evoked the intended emotional state. The narratives were divided into two counterbalanced and randomized lists such that each consisted of an equal amount of positive and negative stories and each base narrative was only shown in one list (e.g., the base narrative for *guilty* and *proud* was the same, so each list could only contain one variation of the story).

Using the undergraduate experiment sign-up system SONA, we recruited 59 English speaking students from the University of Alberta who participated for course credit. Participants were tasked with reading the narratives and stating what they perceived the speaker's implied emotional state to be using a short written response answer. There were some instances of variability in responses away from instructions (e.g., emotion lists, "Emotion 1 AND Emotion 2" responses, "Emotion 1 OR Emotion 2" responses, sentence-length responses), so the data was first analyzed for interpretability. If more than 50% of a participant's responses followed an "Emotion 1 AND Emotion 2" format or were sentence-length written responses, their data was discarded. Six participants' data were excluded from analysis for failing to meet this criterion. Data from seven non-native speakers of English was also discarded. This narrowed the response pool to 49 participants. From here, any remaining individual responses that were uninterpretable were discarded. Lists of emotions or "Emotion 1 OR Emotion 2" responses were interpreted based on the first stated emotion.

Next, the interpretable responses were translated into their associated valence values using Warriner and Kuperman's (2013) normed valence measures. We prioritized using the valence measures for the adjectival form of emotion words. If there was no adjectival form, we used the valence measure for the noun form. If there was no valence rating available for an individual response (in either adjective or noun form) then it was discarded. Additionally, responses that were not emotions were removed. These additional criteria led to 27 individual responses being removed from data analysis. Finally, the average valence rating and standard deviation of each narrative were calculated and compared with the valence of the true implied emotional state. If the difference in valences was greater than 1 and/or if the SD was greater than 2, the narrative was not accepted. This resulted in 16 narratives being removed from the main experiment, leaving 16 narratives and associated emotions to be examined: *guilty, proud, bored, curious, afraid, bold, disgusted, admiring, angry, grateful, disappointed, delighted, annoyed, pleased, rejected*, and *welcomed*.

Each accent condition was paired with each variation of the narrative stimuli, making 32 experimental items in total. These were randomized into a 2x2 experimental design, leading to four experimental lists, each consisting of eight fillers and eight narrative stimuli such that each experimental base narrative was only seen once. The lists were organized into two counterbalanced blocks based on speaker accent, such that half the lists started with foreign-accented speaker stories and half started with native-accented speaker stories.

2.2.4 Individual Difference Measures

Personality and political ideology measures were recorded using the 60-question version of the HEXACO Personality Inventory – Revised (Ashton & Lee, 2009) and the 20-question

version of the Wilson-Patterson (W-P) Conservatism Scale (Wilson & Patterson, 1968). See the appendix for the assessment items.

2.2.5   Background Questionnaire

Participants completed a language background questionnaire that collected information on language proficiency, experience, and exposure as well as basic demographic information (i.e., gender and age).

2.3 Procedure

Participants completed the study in one session using their own electronic device (i.e., laptop or desktop). Participants first completed the background questionnaire, then viewed and read the speaker profiles. They also completed an attention check consisting of four comprehension questions about the bios to ensure the information was sufficiently retained. Afterward, they moved on to the main experiment. Participants were tasked with reading the narratives one at a time, then rating how the speaker felt emotionally using a 9-point Likert-type scale, with 1 being very negative and 9 being very positive. Following the main experiment, individual differences were recorded using the HEXACO Personality Inventory and the Wilson-Patterson (W-P) Conservatism Scale questionnaires. The entire experiment took about 45-60 minutes to complete.

CHAPTER 3. RESULTS

3.1 Analysis

We used the statistical program R to analyze the data (version 4.3.2, R Core Team, 2023). General Additive Mixed Modeling was chosen as it allowed for the analysis of both interactions and individual effects of numerical and factorial predictors without the assumption of linearity (Baayen and Linke, 2020). The *mgcv* (Wood, 2017), *itsadug* (version 2.4.1, van Rij et al., 2017), and *psych* (version 2.4.1, Revelle, 2024) packages were used to run and fit the models as well as plot the smooths. In the output of the models, we looked at the effective degree of freedom (edf) and p-values. The edf is a numerical value that indicates the degree of nonlinearity between a predictor and response variable (i.e., the wiggliness of the smooth plot) while the p-value indicates the probability of a smooth plot to be a horizontal line (Baayen and Linke, 2020). These values were used to determine whether the results of the model were significant.

Predictors examined in the analysis included an interaction between Speaker (native or nonnative) and Valence (positive or negative), Gender (male, female, and other), Age, and Narrative List. These models and all the ones proceeding included random smooths for subject and narrative. The interaction between Speaker and Valence was not significant ($z = 0.685$), indicating that accent did not affect participants' emotion ratings. We then relaxed the interaction and used a stepwise backward procedure to identify significant variables. The final model is reported in Table 3 and includes the predictors of Valence, Speaker, and Gender (see Table 3). There was a significant effect of Valence, which confirmed the effectiveness of the experimental stimuli at eliciting the intended emotion valence. In other words, participants rated speakers' emotional states significantly more positively after reading a narrative that implied a positive emotion compared to a narrative that implied a negative emotion. There was no effect of Speaker

found on emotion ratings. Given this lack of an effect and no interaction between Speaker and

Valence, we did not move forward with tests for interactions between accent and individual

differences, nor interactions between accent, individual differences, and valence.

Table 3

Summary of the final GAMM: *gam(Rating ~ Speaker + valence + Gender + s(Subject.ID, by =*

valence, bs = "re") + s(Narrative.ID, bs = "re"), family = ocat(R=9), data = dat_all).

Significance indicated by asterisks (0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1)

Parametric coefficients	Estimate	Std. Error	z-value	Pr(>| z |)	
(Intercept)	2.28565	0.45289	5.047	4.49e-07	***
Speakernonnative	-0.06913	0.49999	-0.138	0.8900	
valencepos	7.00189	0.52958	13.222	< 2e-16	***
GenderMale	0.09359	0.25199	0.371	0.7103	
GenderOther	1.01219	0.60588	1.671	0.0948	.

Smooth terms	edf	Ref.df	Chi.sq	p-value	
s(Subject.ID):valenceneg	80.67	124	245.7	<2e-16	***
s(Subject.ID):valencepos	85.96	124	318.3	<2e-16	***
s(Narrative.ID)	26.83	29	686.2	< 2e-16	***

The next step involved centering the HEXACO traits and Conservatism score, then

testing each one separately. Each model included the predictors Valence, Speaker, Gender, and a

random smooth for the particular trait being tested. The models for Honesty, Emotionality,

Extroversion, and Agreeableness as well as the Conservatism score did not show significant

effects on emotion rating (see appendix A for the model tables and smooth plots). The results for Openness to Experience and Conscientiousness are reported below.

3.2 Openness to Experience

The model for Openness to Experience showed a significant interaction between openness and valence (p = 0.0105). Figure 1 plots the difference in emotion ratings between narratives implying positive emotional states and narratives implying negative emotional states. Panel A depicts the difference in emotion ratings by openness. It shows that individuals who scored lower on openness showed a smaller difference in emotion ratings between positive and negative stories than individuals who scored higher on openness. This effect seems to be confined largely to the low-to-mid range of openness scores, with no difference visible in the mid-to-high range of openness scores. Visual analysis of the individual smooth plots for the valence conditions confirmed this effect occurred primarily with negative stories (see Figure 2, panels A and C). In other words: after reading a story that implied a negative emotion, participants who were less open interpreted the speaker's emotional state as less negative than individuals who were more open. The same thing occurred (though not to a significant degree) with positive stories: the less open participants were, the less positive they rated the emotional state of the speaker.

Table 4

Summary of the GAMM for Openness to Experience: *gam(Rating ~ Speaker + Valence + Gender + s(OPEN, by = valence) + s(Subject.ID, by = valence, bs = "re") + s(Narrative.ID, bs = "re"), family = ocat(R=9), data = dat_all)*. Significance indicated by asterisks (0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1)

Parametric coefficients	Estimate	Std. Error	z-value	Pr(>| z |)	
(Intercept)	2.2891	0.4510	5.076	3.85e-07	***
Speakernonnative	-0.0667	0.4986	-0.134	0.8936	
valencepos	7.0143	0.5272	13.306	< 2e-16	***
GenderMale	0.1075	0.2487	0.432	0.6655	
GenderOther	1.0563	0.6028	1.752	0.0797	.

Smooth terms	edf	Ref.df	Chi.sq	p-value	
s(OPEN):valenceneg	1.039	1.052	6.894	0.0105	*
s(OPEN):valencepos	2.288	2.456	2.395	0.2663	
s(Subject.ID):valenceneg	78.604	123.000	231.109	<2e-16	***
s(Subject.ID):valencepos	83.493	123.000	294.304	<2e-16	***
s(Narrative.ID)	26.828	29.000	661.331	< 2e-16	***

3.3 Conscientiousness

The model for Conscientiousness resulted in a significant effect on emotion rating in the context of negative stories ($p = 0.00897$). Figure 1 (panel B) plots the difference in emotion ratings by conscientiousness and shows that individuals who scored higher on conscientiousness had a greater difference in emotion ratings between positive and negative stories compared to individuals who scored lower on conscientiousness. Individual smooths based on Valence condition confirmed this effect is more contingent on negative stories (Figure 2, panels B and D). Put differently, more conscientious participants rated a speaker's emotional state as more

negative after reading a story that implied a negative emotion. There was a marginal increase in ratings of speaker emotional state with positive stories, but this was not significant.

Table 5

Summary of the GAMM for Conscientiousness: *gam(Rating ~ Speaker + Valence + Gender + s(CONSC, by = valence) + s(Subject.ID, by = valence, bs = "re") + s(Narrative.ID, bs = "re"), family = ocat(R=9), data = dat_all)*. Significance indicated by asterisks (0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1)

Parametric coefficients	Estimate	Std. Error	z-value	Pr(>| z |)	
(Intercept)	2.30713	0.45285	5.095	3.49e-07	***
Speakernonnative	-0.06948	0.50197	-0.138	0.8899	
valencepos	7.01245	0.53030	13.224	< 2e-16	***
GenderMale	0.02809	0.25087	0.112	0.9108	
GenderOther	1.05759	0.59634	1.773	0.0762	.

Smooth terms	edf	Ref.df	Chi.sq	p-value	
s(CONSC):valenceneg	2.083	2.28	9.855	0.00897	**
s(CONSC):valencepos	1.000	1.00	0.196	0.65864	
s(Subject.ID):valenceneg	75.998	123.000	208.335	<2e-16	***
s(Subject.ID):valencepos	85.639	123.000	319.218	<2e-16	***
s(Narrative.ID)	26.849	29.000	678.294	< 2e-16	***

Figure 1

Smooth plots of difference in emotion ratings by personality trait score (openness on left, conscientiousness on right). Difference in emotion ratings = narratives implying positive emotional states – narratives implying negative states. Personality scores are standardized.
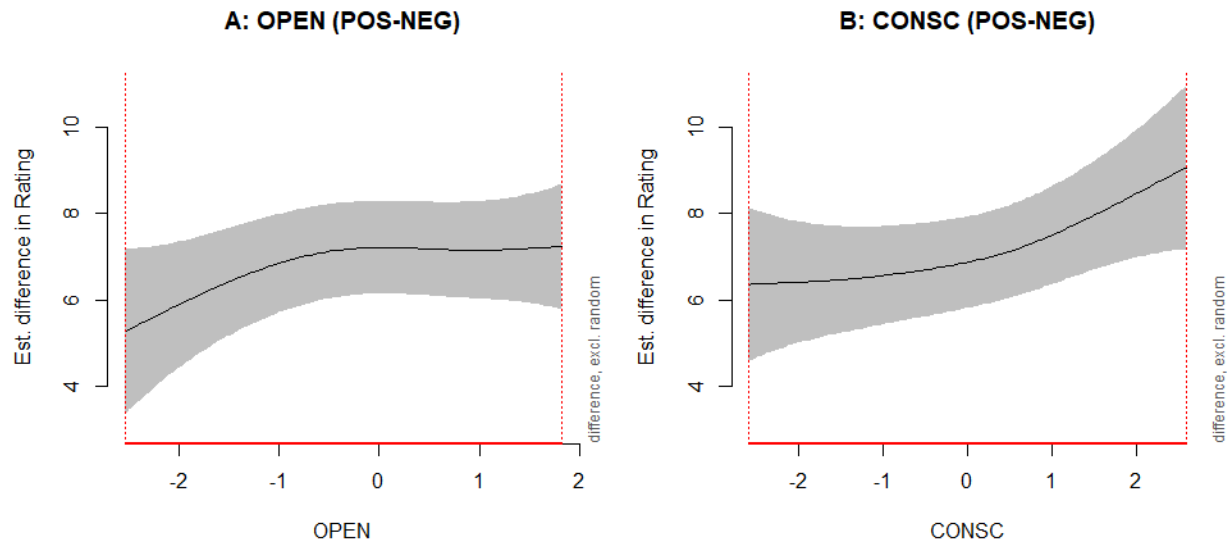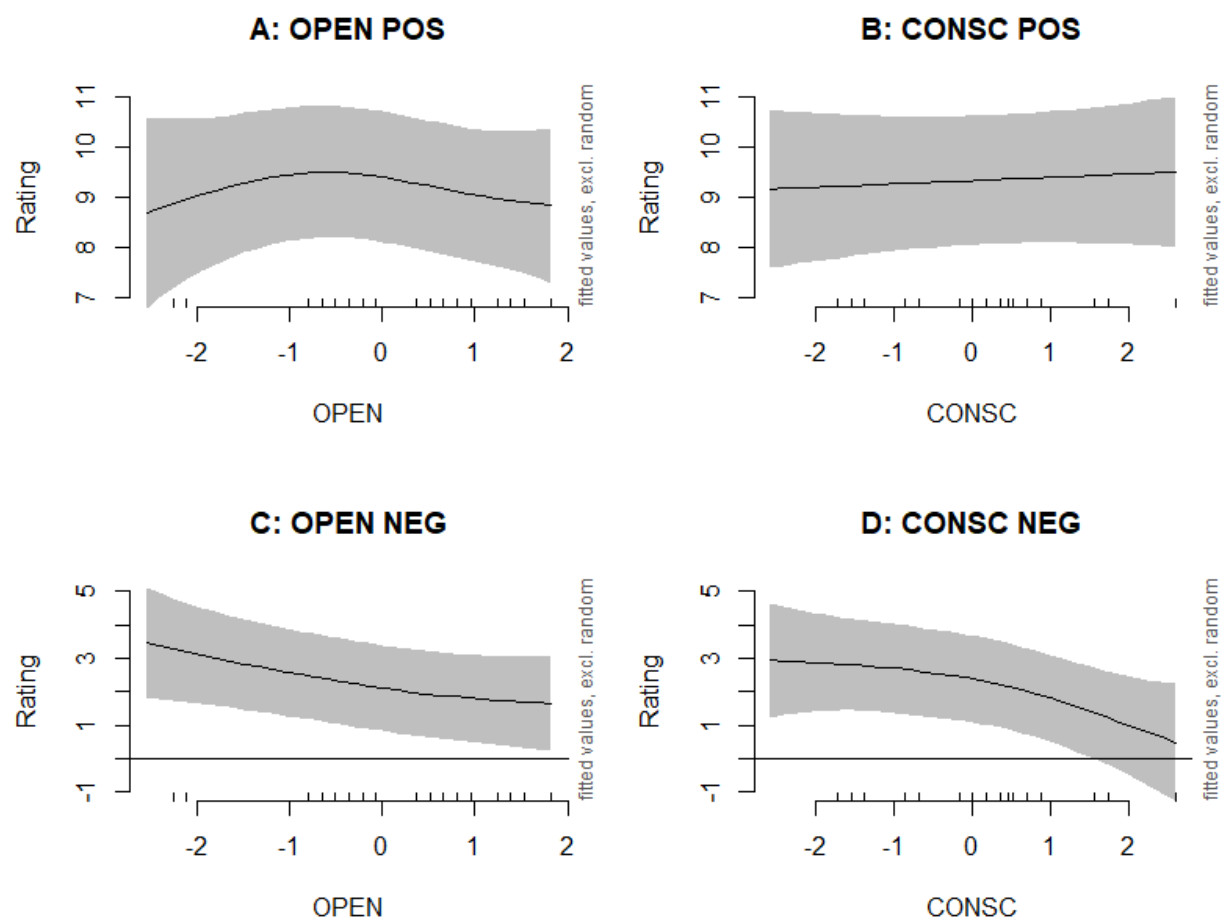

Figure 2

Smooth plots of emotion ratings (top row: positive stories, bottom row: negative stories) by personality trait score (openness on left, conscientiousness on right). Personality scores are standardized.

CHAPTER 4. DISCUSSION

This study looked at emotion processing in the context of native- and foreign-accented speech to determine whether accent influences emotion perception and, if it does, examine whether the accent effect is modulated by individual differences in personality and/or political ideology. The results showed no difference in emotion ratings between the accent conditions. Instead, there was an effect of valence. Participants made more positive ratings of speakers' emotional states after reading stories that implied positive emotions compared to stories that implied negative emotions. Additionally, two personality traits revealed individual effects on emotion perceptions. Participants who scored low on Openness to Experience interpreted the emotional state of speakers as less negative after reading stories that implied a negative emotion. Those who scored closer to the midrange on openness also rated speakers' emotional states less negatively in the same valence context, but to a lesser extent; from the mid-to-high range of openness scores, the emotional state ratings gradually became more negative. Individuals who scored high on Conscientiousness rated the emotional state of speakers as more negative after reading stories implying a negative emotion. As participant conscientiousness scores decreased to the mid-to-low range, their ratings of speakers' emotions from these same stories became less negative. While our prediction of an accent effect was not confirmed, we did see significant effects of personality traits on emotion perceptions from negative stories. The lack of an accent effect on emotion ratings could suggest that, unlike in morphosyntactic or irony detection contexts, accent does not have a role to play in emotion perception. However, it is still premature to consider this vein of study completely explored. Our analysis into potential interactions involving accent concluded when neither an effect of accent nor an interaction between accent and valence was found. For a comprehensive understanding of the potential influence of accent,

further investigation should be conducted into interactions between accent and individual differences as well as accent, individual differences, and valence. Additionally, one potential factor we did not consider in this experiment is accent type. The non-native speaker profile and accent were chosen based on assumed familiarity to participants given the demographic makeup of the university and city at large. To get a clearer sense of this apparent lack of effect, replications of this study should be conducted with different non-native accents. In a similar vein, it would also be beneficial to examine the potential influence of accent familiarity on emotion perceptions.

The finding of an interaction between openness and valence aligns well with previous findings on openness in personality psychology. Several studies have linked openness with higher accuracy in emotion recognition across visual and auditory contexts (Mill et al., 2009; Realo et al., 2003; Matsumoto et al., 2000). One particular study by Fiori and Antonakis (2012) considered openness in the context of a lexical decision task involving pairs of facial primes depicting emotional expressions (one being a target and the other being a distractor). They found that individuals who were more open made correct responses more quickly when the word and the target were related (e.g., a happy face target and a letter string "happy"). Considering the present study in the context of this literature, our findings can be taken as more evidence for the notion that greater openness relates to greater mental flexibility (Fiori & Antonakis, 2012) and heightened attentiveness to one's social environment (Matsumoto et al., 2000).

The conscientiousness effect is a bit more ambiguous to interpret. Previous research has found a correlation between conscientiousness and greater accuracy in emotion recognition from faces (Matsumoto et al., 2000). The HEXACO personality inventory defines the trait as being characteristic of individuals who are, among other things, disciplined and motivated to perform

tasks accurately and to perfection (Ashton & Lee, n.d.). From this perspective, it could be plausible to assume this trait motivated conscientious participants to pay closer attention to the details of the narratives, which then reflected in their interpretations of the speakers' emotional states (at least in the case of negative narratives). It may also be possible that these individuals were more motivated to find less ambiguous answers. Rather than deciding on more neutral and potentially ambiguous interpretations of emotional state, they may have taken to a more dichotomous approach to interpreting emotions. Hence, if a speaker appears to be feeling negatively, then it could have reflected in a more (clearly) negative rating.

There are a few limitations to our study. The most poignant of these was the significant reduction in the final count of experimental stories. Of the original 32 narratives, half were removed based on the results of the norming study. This left a significantly reduced pool of experimental stimuli (and emotions) to examine. For future studies, it would be beneficial to re-expand the experimental stimuli list to the original count. This could be achieved by writing and testing new stories, or by using another documented approach (Gygax & Tapiero, 2003, as cited in Gillioz, Gygax, & Tapier, 2012) involving participants drafting short stories based on an emotion prompt, then using the material to develop new experimental stimuli. This method would allow for a variety of perspectives to be included in the narrative development and ensure that the story topics are relevant to the studied population. Our participant pool was also predominantly female in their late teens and early twenties. This was an anticipated limitation given our research recruitment being restricted to university students in Linguistics courses. To gain a broader range of gender, age, and individual difference characteristics, future studies would benefit from recruitment of participants from outside of the university community.

CHAPTER 5. CONCLUSION

This study examined whether emotion processing differs in the contexts of native- and foreign-accented speech, and if so, whether individual differences modulated any observed changes in processing. Using a combination of questionnaires and a rating task involving positive and negative valence narratives, we found that accent did not affect emotion interpretations. Instead, there were two interactions: one between openness and valence as well as one between conscientiousness and valence. In the context of negative stories, lower openness led to less negative emotion ratings of the speaker while higher conscientiousness resulted in more negative emotion ratings of the speaker. These findings highlight the influence of personality on emotion perceptions. While a lack of an accent effect was unexpected, this may be a result of our experimental design and narrowed focus. As discussed previously, there are other vantages from which this question can be considered. For a clearer picture of how processing is affected (or not) in this context, further exploration is necessary.

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APPENDIX A

A.1: Experimental Narratives

Negative Valence Narrative	Positive Valence Narrative
Guilty A group of friends and I planned to celebrate Thanksgiving by having a potluck dinner together. I volunteered to cook the turkey since I've done it before. My week ended up being very busy so I ran out of time to make it. I showed up with two rotisserie chickens from the grocery store instead. When we sat down to eat, a couple people mentioned it was a shame that there wasn't any turkey on Thanksgiving. We decided to watch a movie after that.	**Proud** A group of friends and I planned to celebrate Thanksgiving by having a potluck dinner together. I volunteered to cook the turkey since I've done it before. My week ended up being very busy but I managed to find time to make it. I showed up with the finished dish still warm inside my largest roasting pan. When we sat down to eat, a couple people mentioned it was awesome to have turkey on Thanksgiving. We decided to watch a movie after that.
Bored I started watching a new sci-fi mystery series. Only two episodes are out so far, but many of my friends have watched them already and recommend that I do too. The plot of the first one reminded me of some other shows I've seen before. By the end of the episode, I could already guess what was going to happen next. I decided not to watch the second one. I went to bed after that.	**Curious** I started watching a new sci-fi mystery series. Only two episodes are out so far, but many of my friends have watched them already and recommend that I do too. The plot of the first one was very different from other shows I've seen before. By the end of the episode, I couldn't guess what was going to happen next. I decided to watch the second one right afterward. I went to bed after that.
Afraid I went ziplining with my sister. I've never tried it before because I used to avoid heights as a kid. We had to wear a lot of protective gear and climb a really tall ladder to reach the starting platform. Standing on it, I could see the zipline ran straight over a dense forest down below. When the operator asked who wanted to go first, I said I couldn't go through with it. I watched my sister go after that	**Bold** I went ziplining with my sister. I've never tried it before because I didn't have any opportunities to go. We had to wear some protective gear and climb a really tall ladder to reach the starting platform. Standing on it, I could see the zipline ran straight over a dense forest down below. When the operator asked who wanted to go first, I said that I would. I watched my sister go after that

Disgusted

I visited a friend's house for the first time last week. Right when I walked in there was this pungent smell, like rotting fruit. The kitchen sink was filled with dirty dishes and the living room couch was covered in fast food wrappers and clothes. There was a cockroach crawling across the wall too. When my friend suggested we order dinner, I said that I couldn't stay because something came up. I drove myself home afterward.

Admiring

I visited a friend's house for the first time last week. Right when I walked in there was this sweet smell, like citrus. The kitchen was spotless and the living room couch was covered with a crochet blanket and matching cushions. There were a couple photos framed across the walls too. When my friend suggested we order dinner, I agreed and made myself comfortable in the living room. I drove myself home afterward.

Angry

I've been working with my classmate Evan in our Educational Psychology course. Every time we planned to meet to work on a paper, he didn't show up. I ended up writing the paper all by myself. Then during class, the teacher walked up to us and said we wrote a great paper together. Evan said we worked really hard together. Then the teacher walked away.

Grateful

I've been working with my classmate Evan in our Educational Psychology course. Every time we planned to meet to work on a paper, he showed up on time. We wrote the paper together. Then during class, the teacher walked up to us and said we wrote a great paper together. Evan said that I worked really hard. Then the teacher walked away.

Rejected

My roommate Mia introduced me to her best friends Jerome and Katlyn. She wanted us all to get to know each other, so we met at a restaurant for lunch. When we got there, they just nodded at me. Mia tried to get the conversation going between us, but all of their questions and stories were directed at her. I just listened to them talk to each other over the entire lunch. Mia and I went home after that.

Welcomed

My roommate Mia introduced me to her best friends Jerome and Katlyn. She wanted us all to get to know each other, so we met at a restaurant for lunch. When we got there, they got up to give us hugs. Mia started the conversation, and they asked me questions and shared a lot of funny stories. We all talked over the entire lunch. Mia and I went home after that.

Annoyed

A mystery book sale happened in the atrium of my lecture building. The books were wrapped in paper with vague descriptions of what each one was about. I found one that seemed to be a novel I've been trying to buy

Pleased

A mystery book sale happened in the atrium of my lecture building. The books were wrapped in paper with vague descriptions of what each one was about. I found one that seemed to be a novel I've been trying to buy

online, but it's been sold out for months. I bought the book and opened it right then and there. It turned out to be a random book I've never heard of before. I went to class after that.

online, but it's been sold out for months. I bought the book and opened it right then and there. It turned out to be the exact book that I'd been expecting. I went to class after that.

Disappointed

My manager is retiring and she told our team that she was looking for her replacement within our team. I've always wanted to move into a management role. I'm one of the most senior employees right now so I have a lot of experience. Many of my coworkers have told me that I'd be a great fit for the position too. Yesterday, I asked my manager about the job and she told me that she'd already offered it to someone else. It was hard to keep my expression in check after that.

Delighted

My manager is retiring and she told our team that she was looking for her replacement within our team. I've always wanted to move into a management role. I'm one of the most senior employees right now so I have a lot of experience. Many of my coworkers have told me that I'd be a great fit for the position. Yesterday, I asked my manager about the job and she told me that she'd like to offer it to me. It was hard to keep my expression in check after that.

A.2: Individual Difference Questionnaires

Items from the HEXACO Personality Inventory – Revised (Ashton & Lee, 2009)

I would be quite bored by a visit to an art gallery.

I plan ahead and organize things, to avoid scrambling at the last minute.

I rarely hold a grudge, even against people who have badly wronged me.

I feel reasonably satisfied with myself overall.

I would feel afraid if I had to travel in bad weather conditions.

I wouldn't use flattery to get a raise or promotion at work, even if I thought it would succeed.

I'm interested in learning about the history and politics of other countries.

I often push myself very hard when trying to achieve a goal.

People sometimes tell me that I am too critical of others.

I rarely express my opinions in group meetings.

I sometimes can't help worrying about little things.

If I knew that I could never get caught, I would be willing to steal a million dollars.

I would enjoy creating a work of art, such as a novel, a song, or a painting.

When working on something, I don't pay much attention to small details.

People sometimes tell me that I'm too stubborn.

I prefer jobs that involve active social interaction to those that involve working alone.

When I suffer from a painful experience, I need someone to make me feel comfortable.

Having a lot of money is not especially important to me.

I think that paying attention to radical ideas is a waste of time.

I make decisions based on the feeling of the moment rather than on careful thought.

People think of me as someone who has a quick temper.

On most days, I feel cheerful and optimistic.

I feel like crying when I see other people crying.

I think that I am entitled to more respect than the average person is.

If I had the opportunity, I would like to attend a classical music concert.

When working, I sometimes have difficulties due to being disorganized.

My attitude toward people who have treated me badly is "forgive and forget".

I feel that I am an unpopular person.

When it comes to physical danger, I am very fearful.

If I want something from someone, I will laugh at that person's worst jokes.

I've never really enjoyed looking through an encyclopedia.

I do only the minimum amount of work needed to get by.

I tend to be lenient in judging other people.

In social situations, I'm usually the one who makes the first move.

I worry a lot less than most people do.

I would never accept a bribe, even if it were very large.

People have often told me that I have a good imagination.

I always try to be accurate in my work, even at the expense of time.

I am usually quite flexible in my opinions when people disagree with me.

The first thing that I always do in a new place is to make friends.

I can handle difficult situations without needing emotional support from anyone else.

I would get a lot of pleasure from owning expensive luxury goods.

I like people who have unconventional views.

I make a lot of mistakes because I don't think before I act.

Most people tend to get angry more quickly than I do.

Most people are more upbeat and dynamic than I generally am.

I feel strong emotions when someone close to me is going away for a long time.

I want people to know that I am an important person of high status.

I don't think of myself as the artistic or creative type.

People often call me a perfectionist.

Even when people make a lot of mistakes, I rarely say anything negative.

I sometimes feel that I am a worthless person.

Even in an emergency I wouldn't feel like panicking.

I wouldn't pretend to like someone just to get that person to do favors for me.

I find it boring to discuss philosophy.

I prefer to do whatever comes to mind, rather than stick to a plan.

When people tell me that I'm wrong, my first reaction is to argue with them.

When I'm in a group of people, I'm often the one who speaks on behalf of the group.

I remain unemotional even in situations where most people get very sentimental.

I'd be tempted to use counterfeit money, if I were sure I could get away with it.

Items from the Wilson-Patterson (W-P) Conservatism Scale (Wilson & Patterson, 1968)

prayer at school

universal healthcare

stop all immigration

death penalty ("capital punishment")

same-sex marriage

right to legal abortion ("pro-choice")

biblical truth

increase welfare spending

increase military spending

foreign aid for nations in crisis

lower taxes

allow torture of terrorism suspects

gender equality

action to combat climate change

obedience

compromise

patriotism

extra-marital sex ("sex before marriage")

gun control

free market

A.3: GAMMs of Emotion Ratings by Individual Difference Factors

Summary of the GAMM for Honesty: *gam(Rating ~ Speaker + Valence + Gender + s(HON, by = valence) + s(Subject.ID, by = valence, bs = "re") + s(Narrative.ID, bs = "re"), family = ocat(R=9), data = dat_all)*. Significance indicated by asterisks (0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1)

Parametric coefficients	Estimate	Std. Error	z-value	Pr(>| z |)	
(Intercept)	2.29965	0.45584	5.045	4.54e-07	***
Speakernonnative	-0.06883	0.50374	-0.137	0.891	
valencepos	7.01600	0.53318	13.159	< 2e-16	***
GenderMale	0.04187	0.25433	0.165	0.869	
GenderOther	1.11868	0.61296	1.825	0.068	.

Smooth terms	edf	Ref.df	Chi.sq	p-value	
s(HON):valenceneg	1.002	1.003	1.682	0.195	
s(HON):valencepos	1.368	1.448	0.745	0.680	
s(Subject.ID):valenceneg	79.589	123.000	239.658	<2e-16	***
s(Subject.ID):valencepos	85.303	123.000	316.634	<2e-16	***
s(Narrative.ID)	26.840	29.000	696.684	< 2e-16	***

Summary of the GAMM for Emotionality: *gam(Rating ~ Speaker + valence + Gender + s(EMO, by = valence) + s(Subject.ID, by = valence, bs = "re") + s(Narrative.ID, bs = "re"), family = ocat(R=9), data = dat_all)*. Significance indicated by asterisks (0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1)

Parametric coefficients	Estimate	Std. Error	z-value	Pr(>| z |)	
(Intercept)	2.32346	0.45516	5.105	3.31e-07	***
Speakernonnative	-0.06768	0.50176	-0.135	0.893	
valencepos	7.01351	0.53105	13.207	< 2e-16	***
GenderMale	0.03886	0.29074	0.134	0.894	
GenderOther	0.96614	0.60610	1.594	0.111	

Smooth terms	edf	Ref.df	Chi.sq	p-value	
s(EMO):valenceneg	1.190	1.245	2.432	0.117	
s(EMO):valencepos	1.001	1.001	0.250	0.617	
s(Subject.ID):valenceneg	78.839	123.000	225.917	<2e-16	***
s(Subject.ID):valencepos	85.639	123.000	317.381	<2e-16	***
s(Narrative.ID)	26.828	29.000	686.698	< 2e-16	***

Summary of the GAMM for Extraversion: *gam(Rating ~ Speaker + Valence + Gender + s(EXTR, by = valence) + s(Subject.ID, by = valence, bs = "re") + s(Narrative.ID, bs = "re"), family = ocat(R=9), data = dat_all)*. Significance indicated by asterisks (0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1)

Parametric coefficients	Estimate	Std. Error	z-value	Pr(>| z |)	
(Intercept)	2.29885	0.45391	5.065	4.09e-07	***
Speakernonnative	-0.06838	0.50196	-0.136	0.8916	
valencepos	7.01453	0.53085	13.214	< 2e-16	***
GenderMale	0.07204	0.25202	0.286	0.7750	

GenderOther	1.05617	0.61285	1.723	0.0848	.

Smooth terms	edf	Ref.df	Chi.sq	p-value	
s(EXTR):valenceneg	2.588	2.822	2.610	0.340	
s(EXTR):valencepos	1.235	1.293	1.414	0.233	
s(Subject.ID):valenceneg	77.833	123.000	229.746	<2e-16	***
s(Subject.ID):valencepos	84.842	123.000	310.901	<2e-16	***
s(Narrative.ID)	26.846	29.000	683.541	< 2e-16	***

Summary of the GAMM for Agreeableness: *gam(Rating ~ Speaker + Valence + Gender + s(AGR, by = valence) + s(Subject.ID, by = valence, bs = "re") + s(Narrative.ID, bs = "re"), family = ocat(R=9), data = dat_all)*. Significance indicated by asterisks (0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1)

Parametric coefficients	Estimate	Std. Error	z-value	Pr(>| z |)	
(Intercept)	2.28660	0.45320	5.045	4.53e-07	***
Speakernonnative	-0.06943	0.50037	-0.139	0.8896	
valencepos	7.01976	0.53010	13.242	< 2e-16	***
GenderMale	0.11278	0.25553	0.441	0.6589	
GenderOther	1.02241	0.60667	1.685	0.0919	.

Smooth terms	edf	Ref.df	Chi.sq	p-value	
s(AGR):valenceneg	1.001	1.001	2.049	0.152	

s(AGR):valencepos	1.000	1.001	0.741	0.390	
s(Subject.ID):valenceneg	79.738	123.000	239.601	<2e-16	***
s(Subject.ID):valencepos	85.584	123.000	319.223	<2e-16	***
s(Narrative.ID)	26.812	29.000	677.708	< 2e-16	***

Summary of the GAMM for Conservatism score: *gam(Rating ~ Speaker + Valence + Gender + s(wp, by = valence) + s(Subject.ID, by = valence, bs = "re") + s(Narrative.ID, bs = "re"), family = ocat(R=9), data = dat_all)*. Significance indicated by asterisks (0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1)

Parametric coefficients	Estimate	Std. Error	z-value	Pr(>| z |)	
(Intercept)	2.312002	0.455754	5.073	3.92e-07	***
Speakernonnative	-0.068690	0.503602	-0.136	0.8915	
valencepos	7.017892	0.532837	13.171	< 2e-16	***
GenderMale	0.004493	0.258000	0.017	0.9861	
GenderOther	1.058047	0.605864	1.746	0.0808	.

Smooth terms	edf	Ref.df	Chi.sq	p-value	
s(wp):valenceneg	1.789	1.944	2.115	0.277	
s(wp):valencepos	1.001	1.001	1.700	0.192	
s(Subject.ID):valenceneg	78.863	123.000	235.712	<2e-16	***
s(Subject.ID):valencepos	85.386	123.000	318.627	<2e-16	***
s(Narrative.ID)	26.852	29.000	699.222	< 2e-16	***

A.4: Smooth Plots of Emotion Ratings by Individual Difference Factors

Smooth plots of emotion ratings (left column: negative stories, right column: positive stories) by individual difference factor score (in order: Honesty, Emotionality, Extroversion, Agreeableness, Conservatism). Scores are standardized.