

I was being sarcastic!: The effect of foreign accent and political ideology on irony (mis)understanding

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ABSTRACT

Misunderstood ironic intents may injure the conversation and impede connecting with others. Prior research suggests that ironic compliments, a rarer type of irony, are considered less ironic when spoken with a foreign accent. Using more ecologically-valid stimuli with natural prosodic cues, we found that this effect also applied to ironic criticisms, not just to ironic compliments. English native speakers ($N = 96$) listened to dialogs between Canadian English speakers and their foreign-accented peers, rating targets on multiple scales (irony, certainty in the speaker's intent, appropriateness, and offensiveness). Generalized additive mixed modelling showed that 1) ironic comments were rated lower for irony when foreign-accented, whereas literal comments were unaffected by accent; 2) the listener's political orientation, but not empathy or need for cognitive closure, modulated irony detection accuracy. The results are discussed in terms of linguistic expectations, social distance, cultural stereotypes, and personality differences.

1. Introduction

A foreign accent is an integral and mostly permanent part of a person's social identity, along with such markers as race, ethnicity, or age. Unfortunately, it is these permanent markers that often trigger implicit and explicit biases. Mounting evidence suggests that non-native speakers consistently face negative perception, being judged as less reliable, less credible, less intelligent, and less successful than native speakers (Foucart et al., 2019; Fraser & Kelly, 2012; Fuertes et al., 2012; Lev-Ari & Keysar, 2010). This bias starts in early childhood, with children preferring native over non-native speakers as their friends, and continues into adulthood (Imuta & Spence, 2020; Kinzler et al., 2009). A recent study provided evidence that any foreign-accented speech immediately and automatically triggers negativity biases simply by virtue of belonging to a non-native accent category (Roessel et al., 2018). From a linguistic point of view, a foreign accent alters multiple levels of language processing, including lexical access, semantic integration, reanalysis, and processing depth (Lev-Ari, 2015; Porretta et al., 2016; Romero-Rivas et al., 2015).

Since psycholinguistic investigations into foreign accents are recent, virtually all existing research is based on literal language. However, making inferences from non-literal language is also hard, if not harder than from literal speech. Irony, for instance, requires complex pragmatic

inferencing, metarepresentations, as well as first- and second-order mental state attributions to be properly understood (Colston & Gibbs, 2002; Dennis et al., 2001). Considering what is already known about the processing of foreign accents (e.g., Grey & van Hell, 2017; Hanulíková et al., 2012; Romero-Rivas et al., 2015) and the error-prone nature of foreign-accented speech, we can hypothesize that pragmatic inferencing from ironic utterances may be carried out quantitatively and/or qualitatively differently for non-native speech. As but one example, listeners have lower expectations regarding non-native speakers' linguistic competence (Lev-Ari, 2015), consequently treating their speech as less reliable. When encountering an utterance that is counterfactual to the preceding context (as is the case with most ironies), the listeners may thus have more reason to consider alternative explanations for this discrepancy, for instance that a wrong lexical item was chosen or that a non-native speaker simply misunderstood what happened.

In addition, because of the complexity of mental operations needed to understand irony, there is stable meaningful variance in irony performance among healthy adults, with some detecting ironic comments with almost perfect accuracy and some barely above the chance level (Bruntsch et al., 2016; Winner et al., 1988). Only very few predictors have been identified so far, including schizotypal and borderline traits (Kieckhäuser et al., 2019), trait anxiety (Gucman, 2016), trait bad mood and benevolent humor (Bruntsch & Ruch, 2017). Moreover, the

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perception of foreign-accented speech is also notoriously affected by individual differences, both at the level of speech recognition (McLaughlin et al., 2018) and affective response (Bresnahan et al., 2002). It thus seems likely that not only will pragmatic inferencing from foreign-accented irony be more difficult than from native irony, but also that it will be subject to significant interpersonal variation in both cognitive and affective traits.

To the best of our knowledge, the only two studies examining the perception of foreign-accented irony were conducted on native and English-accented Spanish (Caffarra et al., 2018, 2019). In the rating study (Caffarra et al., 2018), ironic praise—but not criticism—was considered less ironic when spoken with a foreign accent. The authors speculated that foreign-accented ironic praise was more often taken at face value since it is an infrequent trope that non-native speakers are not expected to master. The ERP study (Caffarra et al., 2019) found a larger N400 effect for native ironic praise only and a longer-lasting P600 effect for ironic utterances, which interacted with the type of irony and marginally with the accent. The researchers attributed the lack of an N400 effect for foreign-accented irony to the lack of anticipatory processes (cf. Porretta et al., 2020; Romero-Rivas et al., 2016). These findings are intriguing and in line with the mounting literature showing that listeners actively use information about the speaker to interpret their speech (Kamide, 2012; Kroczek & Gunter, 2021; Lev-Ari, 2015; Romero-Rivas et al., 2015; Tesink et al., 2009; van den Brink et al., 2012). It will, however, be useful to also consider potential sources of this effect in experimental design choices. For instance, the speakers in those experiments were instructed to maintain a flat intonation and slow speech rate for both literal and ironic stories. Native speakers were first asked to listen to the stories produced by non-native speakers to mimic their speech rate. This is understandable from a standpoint of experimental control but makes speech in general and ironic comments in particular less natural. As languages, including Spanish, commonly use tone of voice and intonation to convey irony (Escandell-Vidal & Prieto, 2020), unnatural use of prosody might make the results less informative of and less generalizable to everyday language use. In addition, the participants were tasked with rating every story first for accent strength and intelligibility, and only then for irony. Such procedure is likely to draw attention to the foreign accents, making them very salient. Rating foreign accents for their strength may also prompt the use of metalinguistic judgements in subsequent irony ratings, blurring the initial gut response.

Assuming that the effect persists regardless of experimental design, one may then ask what the possible reasons for non-native ironic compliments to be rated as less ironic than native ones are. Ironic praise does not require any linguistic skills over and above what is required for ironic criticism, and in most cases the two types are structurally identical (consider: “*It is known that he cooks very well/badly*”, Caffarra et al., 2018, p. 4). To date, we are not aware of any studies examining whether ironic compliments employ different prosody than ironic criticisms, although such research would certainly be warranted. In light of the above, it becomes unlikely that foreign-accented speakers cannot, or would not be expected to, master ironic praise. This is very different from, say, idioms or grammatical agreement, which indeed require special knowledge and are language-specific (Cieślicka, 2015; Hanulíková et al., 2012). Further, irony seems to be a universal phenomenon, and it is its prosodic marking that differs cross-linguistically (González Fuente, 2017). If this is indeed the case, one would expect this pragmatic knowledge to be transferable to a new language.

That said, it is nevertheless possible that non-native speakers are less likely to use ironic praise for at least two reasons, one having to do with “the asymmetry of affect” (Clark & Gerrig, 1984) and the other with the social circumstances in which it is most commonly used. “The asymmetry of affect” refers to the fact that ironic compliments, even though used in the face of positive circumstances, evoke more negative feelings than ironic criticisms. The reason for that asymmetry stems from the surface form of ironic compliments, which violates conversation

etiquette and politeness expectations (“*You are such a rotten friend!*” said to someone who has been nothing but loyal to you). In Dews, Kaplan, et al. (1995), participants rated ironic praise as more insulting than its literal counterpart, whereas ironic criticisms were rated as less insulting than literal ones. Since foreign-accented speakers are usually aware of and expect stigmatization by others due to their accent (Derwing, 2003; Gluszek & Dovidio, 2010), they might avoid language that can be perceived as rude and exacerbate this negative perception. The risk is much higher than in the case of ironic criticisms, since the latter could just be taken as literal compliments if misunderstood. Second, several studies demonstrated that common ground and closeness of the speaker-addressee relationship is much more important for the proper interpretation of ironic compliments than they are for ironic criticisms (Bruntsch & Ruch, 2017; Pexman & Zvaigzne, 2004). In addition, Kreuz and Link (2002) showed that ironic praise is much easier to interpret with an explicit antecedent event, whereas ironic criticism can be based on purely implicit antecedents (such as unstated societal/cultural norms or expectations). What that means is that one can use ironic criticism (“*You are indeed a great chef!*”) without explicit reminders of what was expected (a good meal). In contrast, ironic praise (“*You are indeed a terrible chef!*”) without an explicit antecedent (for example, someone previously complaining that they cook terribly and then preparing a delicious meal) is harder to interpret. All this suggests that the speaker and the addressee need to be close enough and have enough shared background to be “entitled” to use ironic compliments without the risk of injuring the conversation. Non-native speakers may simply not feel close enough with native speakers to use it and/or have fewer antecedents to refer to. According to the “heuristic of inferability” proposed by Kreuz (2018), an individual’s likelihood of using irony depends on how certain they are that their irony will be correctly understood. If non-native speakers are not really certain that their ironic compliments will not be taken at face value because their relationship with the addressee is not close enough, they may be less motivated to use them. Listeners, in their turn, may automatically assume less common ground and thus more social distance between native and non-native speakers (unless explicitly stated or demonstrated otherwise). This assumption of a larger social distance may, consciously or subconsciously, make native listeners consider foreign-accented ironic compliments less appropriate. Summarizing, it seems crucial for ironic praise to be grounded in sufficient context and be used between people who are close enough in order to be understood.

We attempted to address the limitations of prior research by using more ecologically-valid stimuli—dialogs between native and foreign speakers conversing as peers equal in social status. Since the primary function of ironic compliments is to be playful and to tease, and since the speaker-addressee relationship appears to be very important in this case, we constructed the dialogs in such a way that their style suggested that our speakers were either close acquaintances or friends. This should facilitate metarepresentational inferences for the listeners, as they can assume that the speakers have enough common ground to actually use irony without injuring the conversation. Additionally, our speakers used natural prosody to further facilitate irony interpretation. Native speakers of English have been shown to rely on prosodic cues to identify sarcasm, of which the primary ones are slower speech rate, greater intensity, and lower pitch level (Rockwell, 2000). It has also been shown that adult listeners are able to correctly identify irony based on prosody alone (with no context provided), further testifying to its importance (Mauchand et al., 2019; Rockwell, 2000). To examine whether the type of irony has a bearing on listeners’ ratings, we also used criticism (sarcasm) and praise (teasing).

We had two hypotheses for this study. First, based on the reasons discussed above, we predicted that foreign-accented irony of any type will be rated less ironic when spoken with a foreign accent even when sufficient contextual and prosodic cues are available for disambiguation. Since ironic compliments are harder to interpret even for native speech, they should be proportionally more difficult when delivered in a foreign

accent. Second, we expected individual differences in the need for cognitive closure, empathy, and political ideology to modulate irony detection aptitude. Motivation and more specific predictions for each character trait are outlined below.

Since irony comprehension requires both cognitive and affective processes, it should be modulated by traits with cognitive and affective components. Additionally, given that foreign-accented irony is produced by non-native speakers, traits that correlate with anti-immigrant biases may shape its detection and processing. Political attitudes have been shown to be a robust predictor of anti-immigrant prejudices (Banton et al., 2020; Hodson & Dhont, 2015). Aligning with political conservatism is predictive of anti-immigrant attitudes even despite sufficient exposure and immigrant friends (Kiehne & Ayón, 2016). We thus hypothesized that more conservative listeners may invest less effort in understanding foreign-accented speakers and thus miss their irony more often than less conservative listeners. We measured participants' political ideology along the left-right dimension using the 20-item Wilson-Patterson Conservatism Scale (W-P) (Wilson & Patterson, 1968). The need for cognitive closure, which clinical psychology defines as a person's desire to get straightforward, unambiguous answers (Frenkel-Brunswik, 1949), may also modulate irony detection aptitude. Verbal irony is inherently ambiguous since the true meaning of an ironic utterance is often the opposite of its surface meaning, but the listener needs to decide which meaning was actually intended. There is accumulating evidence that resolution of ironic ambiguity might be akin to other types of ambiguities, for instance in visual imagery, word recognition, or syntactic parsing (Pexman, 2008), when multiple cues seem to be assessed and weighted in parallel. Naturally, the listener needs to first recognize that the intended meaning of an utterance *might be* different from its literal meaning, and the clash between the preceding context and the speaker's comment ("You are really a terrible driver!" said after you passed your driving exam with flying colors) usually provides an initial indication. Given this ambiguity, greater need for cognitive closure may be correlated with more taxing processing of ironic statements, especially foreign-accented. Individuals with a greater need for cognitive closure also tend to attain it as quickly as possible and maintain it for as long as possible, which may manifest in them being more confident in their interpretation. This trait was measured using the 47-item Need for Cognitive Closure scale (NFCS) (Webster & Kruglanski, 1994). Lastly, irony requires the ability to mentalize other people's states of mind. A lesion study by Shamay-Tsoory et al. (2005) has shown that patients with impaired empathy are also impaired in verbal irony comprehension, but it is not clear whether empathy effects extend to non-clinical populations. We predicted that participants with lower empathy might take ironic statements as literal more often than those with higher empathy, and even more so for foreign-accented speech. There is also evidence that empathy correlates with the "pragmatic N400" indexing the participant's sensitivity to violations of social stereotypes (van den Brink et al., 2012). Importantly, this study also showed that participants with higher empathy adapt faster to pragmatic stimuli and adjust their expectations for particular content once they have sufficient evidence that social stereotypes are no longer a reliable cue. Thus, participants with higher empathy may show stronger learning effects for foreign-accented irony during the experiment, resulting in an even more accurate performance as the study progresses. As a proxy for this trait, we used the Interpersonal Reactivity Index (IRI) developed by Davis (1980). Overall, since ironic praise violates politeness expectations in its surface form and is more cognitively demanding (Bruntzsch et al., 2016; Hancock et al., 2000; Harris & Pexman, 2003), we expected its comprehension to be more shaped by the listeners' individual differences.

2. Materials and methods

2.1. Participants

Ninety-six self-identified native English speakers participated in the experiment. All participants were students and received partial course credit for their participation. Data from 3 participants were excluded due to failed attention checks ($N = 2$) or an unacceptable lie score in the NFCS survey ($N = 1$). The final sample included 93 participants (11M [12%], mean age: 20.4, range: 17–48, SD: 4.7). The mean self-reported English proficiency was 4.7 out of 5.

2.2. Materials

Thirty sets of dialogs were constructed as experimental items and fifteen more as fillers. Since all experimental targets directly commented on the speaker's actions and had similar structure, with an evaluative item being in the middle ("You are indeed wasteful with your finances" or "You always were incredibly mature in your behavior"), filler items contained neutral remarks with random sentence structure ("I'm glad environmental issues attract so much attention", "You can get a new one at Home Depot at a bargain price", or "Money is tight at the moment so I appreciate the suggestion") to hide the purpose of the experiment. Each set of experimental dialogs consisted of eight conditions, which yielded a crossed $2 \times 2 \times 2$ design (Table 1). Since irony perception is notoriously affected by how strong the contrast between the preceding context and the ironic remark is, all our dialogs built strong expectations for a particular reaction that was subsequently violated (for example, someone describing that they were literally kicked out of their cello class for being "the worst cello player ever" rather than saying that they just accidentally played out of key). No conventionalized ironic remarks were used ("Very funny"), and in this respect all our ironic utterances were "novel" (see Giora, 1999 for the idea that the salient, lexicalized meaning of conventionalized ironies is the ironic one, which affects their processing). Most dialogs contained intensifying lexical markers such as superlative adjectives and exaggeration adverbs (for example, "the most", "really", "indeed", "surely") that are commonly used in ironic remarks and bias listeners for non-literal interpretation (Ackerman, 1983). Eight experimental lists were created by simple item rotation to ensure that the participants only heard each item in one condition. Due to technical issues with Pavlovia at pavlovia.org, lists had to be pseudorandomized, and every participant assigned to the same list heard items in the same order. All lists started with two fillers.

The dialogs were recorded directly onto a computer hard disk, with the speakers sitting in adjacent sound-treated WhisperRoom booths using Countryman Earset microphones. The audio was saved in the WAV

Table 1

The list of experimental conditions with examples. Every dialog in this table was recorded twice, with the native and foreign-accented speakers swapping roles. The order in which the speakers started reading the dialogs was counterbalanced. Target words are in bold.

Ironical criticism	—How was your Saturday dinner with your wife? —I decided to try a new fish recipe. I probably messed up because she couldn't finish it and the next day got really bad food poisoning. —You surely are the most talented cook in this part of town
Literal criticism	—How was your Saturday dinner with your wife? —I decided to try a new fish recipe. I probably messed up because she couldn't finish it and the next day got really bad food poisoning. —You surely are the most terrible cook in this part of town
Ironical praise	—How did the dinner with your wife's parents go? —I spent the whole day cooking salmon and making drinks. They finished everything, down to the last crumb, and asked for seconds. —You surely are the most terrible cook in this part of town
Literal praise	—How did the dinner with your wife's parents go? —I spent the whole day cooking salmon and making drinks. They finished everything, down to the last crumb, and asked for seconds. —You surely are the most talented cook in this part of town

format with a 44.1 kHz sampling rate and a 16-bit precision. Two native speakers of Canadian English, from Ontario and Alberta, and two native speakers of Mandarin Chinese from Mainland China read the dialogs out loud. All speakers were male and in their mid-twenties. All were students at the University of Alberta. Each native speaker was paired with both foreign-accented speakers so that each pair of speakers read a quarter of the stimuli. Unlike Caffarra et al. (2018), we opted for natural prosody and let the speakers read ironic utterances with intonation they would normally use for conveying irony. The percentage of Canadians who identify themselves as being of Chinese origin is high in Edmonton (estimated at around 7% according to Statistics Canada, 2017), which means that our participants are likely to have had sufficient exposure to Chinese-accented English and should be relatively familiar with its prosody. The order in which the participants started reading the dialogs was counterbalanced to avoid the speakers mimicking each other.

After the recording, two sets of dialogs were excluded because the target word was pronounced incorrectly. Seven English speakers were then asked to transcribe the foreign-accented target utterances taken out of context. Since all our items were spoken twice, with a literal and an ironic intonation, listeners were divided in two groups so that none of them would hear the same word twice. Four more sets were excluded because the mean agreement for the same target word was 50% or less. This left us with 24 dialog sets (192 dialogs; all the stimuli are available in Supplementary Materials).

2.3. Acoustic analysis

We first scaled the intensity of the dialogs to 70 dB. We then calculated mean duration, mean pitch, mean speech rate (the number of syllables per time in seconds; de Jong & Wempe, 2009) and pitch range of the target utterances (Table 2) using PRAAT (6.11.16) (Boersma & Van Heuven, 2001).

For each dependent variable (duration, pitch, and speech rate) we fitted three increasingly complex mixed-effect models using the *nlme* package (3.1.149) (Pinheiro et al., 2021) in R (4.0.3) (R Core Team, 2020). The data with all the scripts are available on OSF. The first model included one random effect of item. The next model added irony, type, and accent as predictors. A three-way interaction was added last. For both duration and pitch, the three predictors significantly improved the model's fit, whereas the interaction decreased it. The results of the final models are summarized in Table 3. We omit the speech rate model because no predictor was significant. Consistent with previous studies (e.g., Caillies et al., 2019; Regel et al., 2011), ironic utterances were longer in duration than literal utterances. Importantly, foreign-accented ironic comments were longer in duration than their respective literal comments (2639 ms vs 2435 ms for criticism and 2871 ms vs 2506 ms for praise). Further, foreign-accented utterances were longer and lower-pitched than native ones. Pitch between ironic and literal utterances did not differ. There were no significant interactions between irony and accent.

Table 2

The comparison of acoustic features between the conditions. SDs are reported in parentheses.

Condition			Prosodic parameters			
Irony	Type	Accent	Mean duration, ms	Mean pitch, Hz	Mean speech rate, nsyll/s	Pitch range, Hz
Ironic	Criticism	Native	2459 (305)	129 (8)	4.20 (0.54)	112–144
		Foreign	2639 (378)	113 (12)	4.17 (0.67)	91–131
	Praise	Native	2523 (323)	126 (6)	4.32 (0.59)	112–143
		Foreign	2871 (460)	116 (17)	4.15 (0.69)	92–145
Literal	Criticism	Native	2247 (282)	133 (16)	4.41 (0.83)	113–183
		Foreign	2435 (363)	110 (14)	4.32 (0.71)	91–135
	Praise	Native	2194 (282)	130 (7)	4.49 (0.78)	114–145
		Foreign	2506 (393)	111 (15)	4.28 (0.59)	90–137

Table 3

Results summary of the best-fitting linear mixed-effects regression models with duration (in ms) and pitch (in Hz) as dependent variables. Asterisks indicate statistical significance (* $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$).

	Value	Std. Error	dF	t-value	p-value	
Duration						
(Intercept)	2712.24	50.96	188	53.22	<0.001	***
Irony literal	-277.44	50.96	188	-5.44	<0.001	***
Type praise	78.34	50.96	188	1.54	0.126	
Accent native	-256.87	50.96	188	-5.04	<0.001	***
Pitch						
(Intercept)	112.79	1.83	188	61.61	<0.001	***
Irony literal	-0.01	1.83	188	-0.00	0.997	
Type praise	-0.39	1.83	188	-0.21	0.833	
Accent native	16.69	1.83	188	9.12	<0.001	***

2.4. Procedure

The experiment was programmed in PsychoPy3 and run on Pavlovia. The participants were asked to listen to the dialogs one by one and then rate the last utterance of each dialog. The rating questions were as follows:

1. How appropriate is the speaker's utterance?
2. Is the speaker being ironic?
3. Is the speaker being offensive?
4. How certain are you that you correctly interpreted the speaker's intent?

The scale ranged from 1 “not at all” to 7 “extremely”. The participants were explicitly asked to provide “snap” judgements using their gut feelings. After the participant had rated the dialog, the next one started playing automatically. Each participant rated 39 dialogs, of which 15 were fillers. There were two opportunities for taking a break. The individual difference questionnaires were presented after the main experiment. All questionnaires together with their scoring systems and response scales are available in Supplementary Materials.

2.5. Data analysis

The dataset for this study can be found in [dataset] (Puhacheuskaya & Järvikivi, 2021). All analyses were done in R (4.0.3) (R Core Team, 2020) and are available on OSF. We used generalized additive mixed modelling for ordinal data (GAMM; Wood, 2017), a non-parametric equivalent of a regression analysis which allows one to analyze random effects and individual differences without assuming linearity (Divjak & Baayen, 2017). The only way to examine the effects of individual differences (continuous predictors) together with factorial predictors in a GAMM model is to represent the interaction between factorial predictors as a grouping predictor with n levels (see van Rij et al., 2020). Since accent, irony and type were all discrete predictors, the interaction was modelled as an eight-level grouping predictor Condition (ironic/literal criticism/praise foreign/native accent). All models

included random smooths for participant and dialog and factor smooths for participant by trial. For each rating type, we did stepwise forward model elimination using the *mgcv* package (1.8.33) (Wood, 2017) and the *compareML()* function from the *itsadug* package (2.4) (van Rij et al., 2020). The *compareML()* function outputs a chi-square test of REML scores and an AIC difference between two models. If the chi-square test had a *p*-value of $>.05$, suggesting a non-significant difference in REML scores between a less and a more complex model, then the simpler model was preferred, and the predictor was removed. If the predictor was significant in the model's output but the *compareML()* function showed no significant difference in REML scores, we took a conservative approach and removed the predictor. All final models included in the paper showed a significant improvement ($p \leq .01$) over the models with $n-1$ predictors. There were no "borderline cases" with *p*-values in-between .05 and .09. The main reference level for the intercept was *ironic criticism native*. Since the difference between the literal and ironic conditions was large, we additionally tested whether the difference between accents was significant for each condition (ironic/literal praise/criticism) by choosing different native conditions to estimate the intercept. The results were plotted using the *mgcviz* (0.1.6) (Fasiolo et al., 2018) and *itsadug* (2.4) packages. The scores in the individual difference questionnaires were standardized. The correlations (obtained using the *rcorr()* function from the *Hmisc* package) were as follows: $r = -0.25$ between W-P and IRI scores ($p = .015$), $r = 0.32$ between W-P and NFCS scores ($p = .002$), and $r = -0.19$ between IRI and NFCS scores ($p = .075$). Cronbach's alphas (obtained using the *ltm* package) were as follows: 0.83 for NFCS, 0.85 for IRI, and 0.79 for W-P. Please note that none of the final models contained more than one individual difference, thus a problem of multicollinearity did not arise.

2.6. Results

We started with checking the correlations between the four rating scales. Irony and Certainty were the least correlated ($r = -0.05$, $p = .017$). The rest of the scales were correlated with $p < .001$, with the strongest correlation found between Offensiveness and Appropriateness ($r = -0.58$). Table 4 provides the mean ratings for every condition.

2.6.1. Irony rating

Every condition was significantly different from the chosen baseline in the final model (Table 5). As noted above, we additionally tested the difference between all foreign-accented conditions in relation to native ones by re-leveling the model. As predicted, foreign-accented irony was considered significantly less ironic than native one, and that held for both criticism ($p = .008$) and praise ($p = .044$). Crucially, accent had no effect on literal conditions (all $ps > .7$). This indicates that making pragmatic inferences from foreign-accented speech is heavily context-dependent: statements that do not clash with the preceding context are easily classified as literal regardless of accent, while counterfactual

Table 5

Summary of the best-fitting GAMM with Irony Rating as a dependent variable. The model's formula: IronyRating ~cond + s(W-P, by = cond, k = 3, bs = "tp") + s(participant, bs = "re") + s(dialog, bs = "re") + s(trial, participant, bs = "fs", m = 1), family = ocat($R = 7$). Deviance explained = 28.1%. Asterisks indicate statistical significance (* $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$).

Parametric coefficients	Estimate	Std. Error	z-value	Pr(> z)
(Intercept)	3.31	0.21	16.13	<0.001
(Ironic criticism native)				***
Ironic criticism foreign	-0.71	0.27	-2.63	0.008
Ironic praise native	-1.14	0.27	-4.20	<0.001
Ironic praise foreign	-1.67	0.27	-6.18	<0.001
Literal criticism native	-3.56	0.27	-13.25	<0.001
Literal criticism foreign	-3.55	0.27	-13.20	<0.001
Literal praise native	-4.46	0.27	-16.25	<0.001
Literal praise foreign	-4.37	0.27	-16.05	<0.001
Smooth terms	edf	Ref.df	Chi.sq	p-value
s(W-P): ironic criticism native	1.59	1.81	10.64	0.015 *
s(W-P): ironic criticism foreign	1.25	1.42	10.65	0.006 **
s(W-P): ironic praise native	1.00	1.00	7.70	0.006 **
s(W-P): ironic praise foreign	1.87	1.97	13.73	<0.001 ***
s(W-P): literal criticism native	1.00	1.00	5.01	0.025 *
s(W-P): literal criticism foreign	1.57	1.79	2.03	0.422
s(W-P): literal praise native	1.80	1.95	17.70	<0.001 ***
s(W-P): literal praise foreign	1.00	1.00	13.25	<0.001 ***
s(participant)	28.98	91.00	41.56	<0.001 ***
s(dialog)	114.33	184.00	300.68	<0.001 ***
s(trial, participant)	63.31	835.00	153.97	0.006 **

statements evoke more uncertainty as to their proper interpretation when delivered in a non-native accent (Fig. 1A). Also, consistent with the previous research, ironic praise in general was deemed significantly less ironic than criticism. As discussed in the Introduction, this may be explained by its surface form that violates social norms.

Of the individual difference measures, only political ideology significantly improved the model's fit. Smooth plots in Fig. 2 show that right-leaning participants (higher W-P scores) were worse at detecting irony compared to their left-leaning peers: they consistently rated ironic comments as less ironic and literal comments as more ironic. Further, difference plots in Fig. 3 show that the results discussed above were significant across the entire spectrum of W-P scores. Importantly, however, our prediction that right-leaning individuals would miss ironic intent in foreign-accented speech more often than left-leaning ones did not prove true. There was also no interaction between the type of irony (praise or criticism) and political orientation.

To make sure the difference in irony rating was not due to intelligibility we also added the results of the intelligibility pre-test as a predictor to the model with Condition (for native speech, we took it to be 100% for

Table 4

The comparison of mean ratings between conditions. SDs are reported in parentheses.

Condition	Irony	Type	Accent	Rating type			
				Irony	Appropriateness	Offensiveness	Certainty
Ionic	Criticism	Native	Native	6.14 (1.47)	4.56 (1.68)	4.01 (1.73)	5.71 (1.21)
		Foreign	Native	5.64 (1.79)	4.62 (1.57)	3.84 (1.63)	5.35 (1.44)
	Praise	Native	Native	5.25 (2.05)	3.52 (1.95)	4.06 (1.99)	5.34 (1.47)
		Foreign	Native	4.75 (2.12)	3.76 (1.99)	3.73 (1.99)	5.02 (1.72)
Literal	Criticism	Native	Native	2.84 (1.92)	4.22 (1.79)	4.73 (1.68)	5.45 (1.31)
		Foreign	Native	2.87 (1.94)	4.44 (1.73)	4.28 (1.75)	5.27 (1.51)
	Praise	Native	Native	2.20 (1.68)	5.99 (1.25)	1.89 (1.27)	5.74 (1.35)
		Foreign	Native	2.17 (1.58)	5.81 (1.37)	1.91 (1.30)	5.69 (1.47)

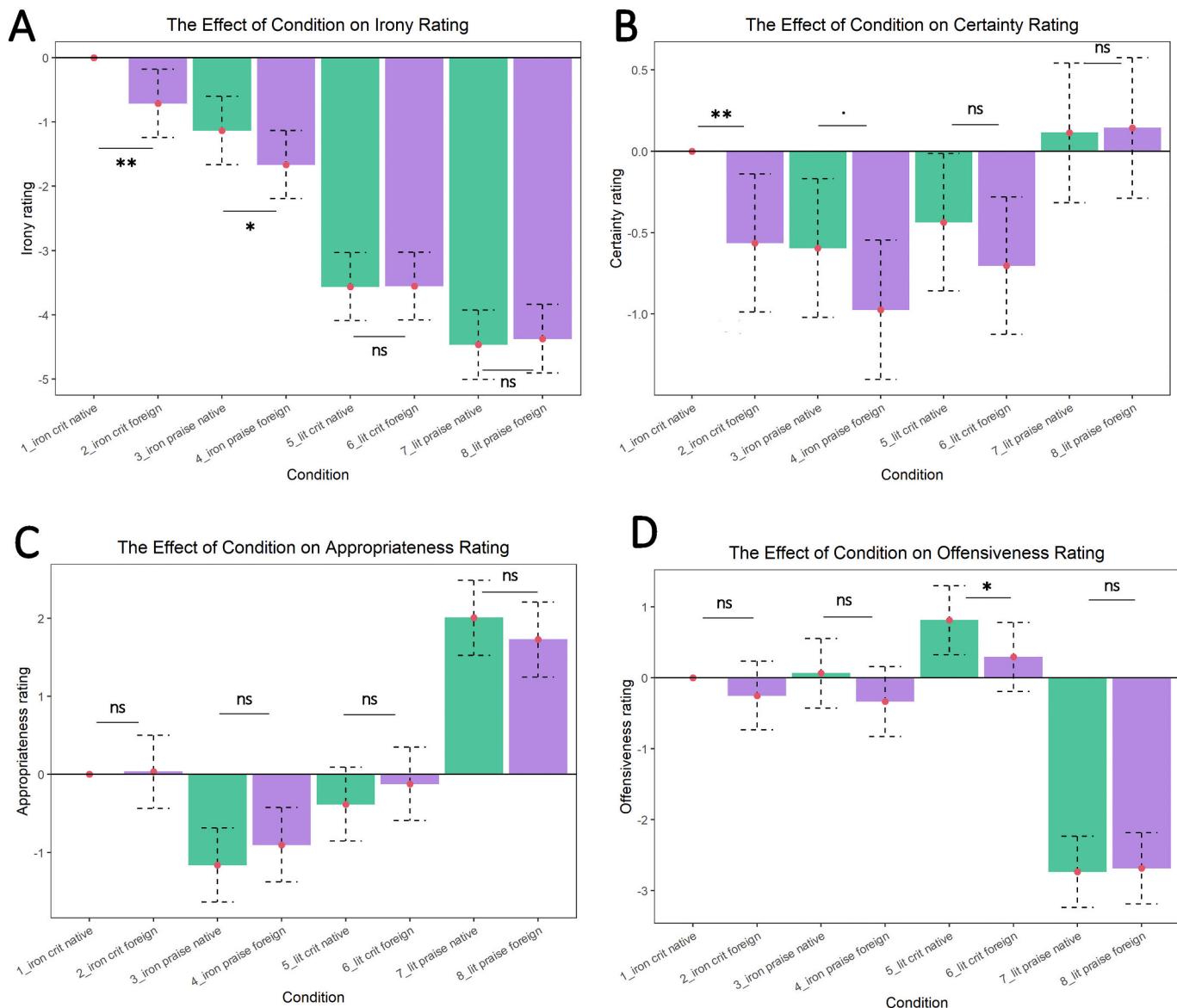


Fig. 1. The parametric effects plots for all rating types (irony, certainty in the speaker's intent, appropriateness, and offensiveness). Stars indicate significant differences against the intercept (<0.001 “***”, <0.01 “**”, <0.05 “*”, <0.09 “.”, >0.09 “ns”) after the model was re-levelled four times to test the difference between accents for each level of Irony and Type. The dotted lines indicate the 95% confidence intervals.

all items). The predictor turned out to be insignificant, both by itself ($\text{Chi. sq} = 1.70, p = .192$) and in interaction with Condition (all $p > .4$).

2.6.2. Certainty rating

Every condition was significantly different from the baseline save literal praise (Table 6). This indicates that the difference between the accents was significant for the ironic criticism, with the participants being less certain in their interpretation of foreign-accented utterances. Same as before, we varied the intercept to test for significant differences between the rest of the conditions. No effect of accent was found for either literal criticism or praise (all $p > .2$). The participants' certainty in the correct interpretation of foreign-accented ironic praise was marginally lower than for native ironic praise ($p = .085$) (Fig. 1B). None of the individual differences improved the model's fit.

Once again, we added the intelligibility predictor as a smooth to the final model. It was not significant by itself ($\text{Chi. sq} = 2.23, p = .135$) or in interaction with Condition (all $p > .6$ except for the interaction with literal praise foreign with $p = .014$). As to the latter model, even though

one interaction was significant, the model itself did not have a better fit than the one with Condition only (the difference in REML scores was negligible).

2.6.3. Appropriateness rating

All praise conditions, literal and ironic, came out significant with respect to native ironic criticism (Table 7). Ironic praise was deemed less appropriate than ironic criticism in both accents (Fig. 1C). This corroborates the “asymmetry of affect” observed in previous studies (Clark & Gerrig, 1984). Even the fact that our speakers conversed as peers equal in social status apparently did not make ironic praise sound more appropriate. Since we did not specifically test for the effect of social ranks and speakers' relationships, we can only speculate that ironic praise might be judged more appropriate if the speakers are explicitly introduced as close friends. Literal praise, regardless of the accent, was rated more appropriate than the baseline. This suggests that it was successfully conveyed prosodically, without being too similar to sarcastic praise. There was no effect of accent in any condition (all $p > .3$).

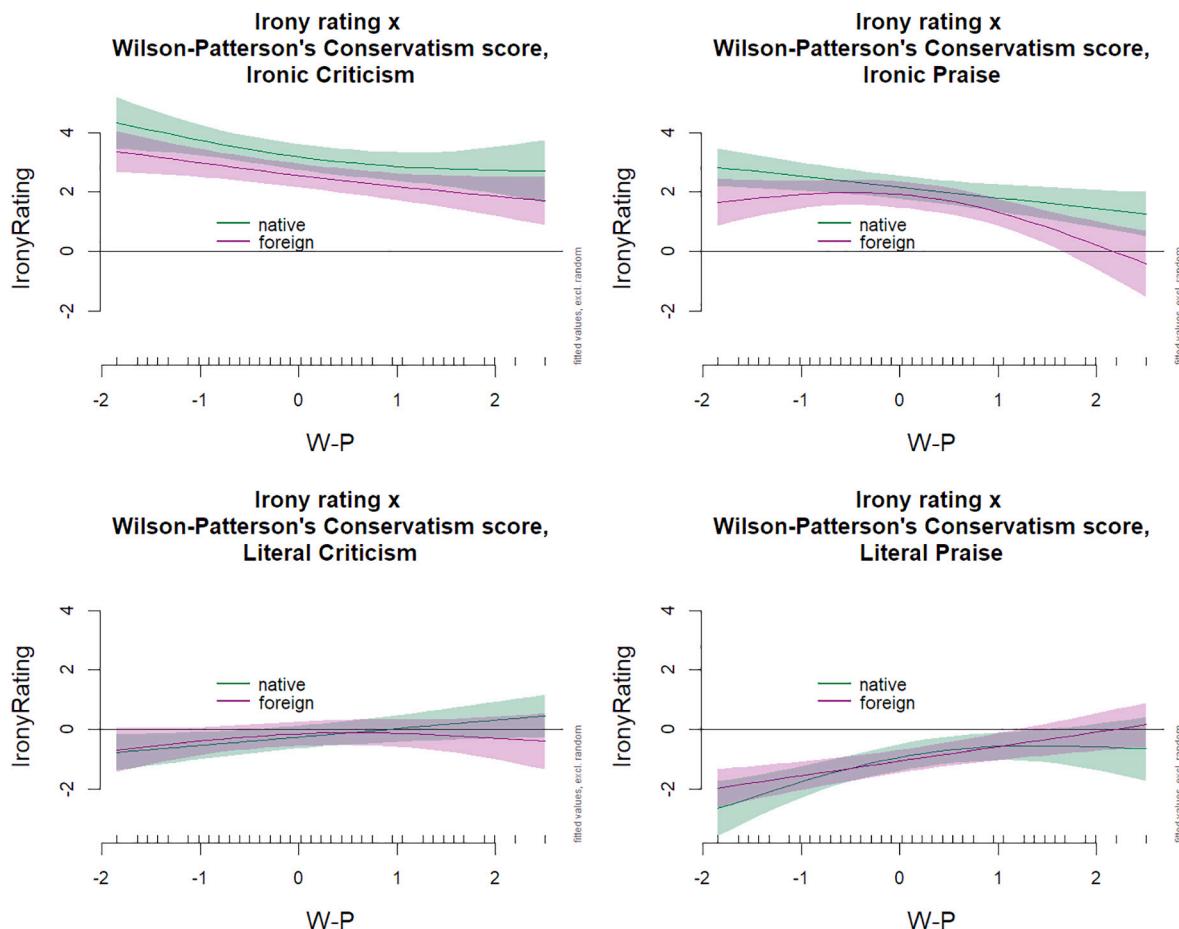


Fig. 2. Interaction of irony ratings with Wilson-Patterson's Conservatism scores. The scores are standardized. Lower scores indicate more liberal orientation.

Again, only political orientation improved the model's fit. The clearest effect was found for literal praise, which was consistently rated as less appropriate by right-leaning participants compared to left-leaning ones (Fig. 4). One explanation could be weaker irony detection aptitude. As discussed above, those who scored higher on the W-P scale were worse at differentiating between ironic and literal comments, which may have led them to believe that literal praise was actually sarcastic. Ratings for ironic praise had the same downward trend in the right end of the scale. The results for criticism were less conclusive. There was a weak trend for left-leaning participants to rate foreign-accented criticism as more appropriate than native, whereas the opposite was true for right-leaning people. This finding requires additional testing. Difference plots produced unclear results (Fig. 5). Even though the ironic and literal criticism showed an expected trend, the window of significant differences was very narrow. The praise conditions showed significant differences across the entire spectrum of W-P scores, but the trend was non-linear (similar to a downward parabola): larger differences at the extreme ends of the W-P spectrum and lower differences in the middle of the scale. Foreign minus native conditions did not show any significant results.

2.6.4. Offensiveness rating

Both native and foreign-accented literal praise, as well as native literal criticism were significant in the final model (Table 8). There was no effect of accent on either ironic criticism or praise ($p > .1$). Foreign-accented literal criticism was rated less offensive than native criticism ($p = .038$), with no difference for literal praise ($p = .853$). Overall, literal criticism was considered more offensive than ironic criticism in both accents (Fig. 1D), which agrees with and extends the findings of Dews, Kaplan, et al. (1995). Finally, native and foreign-accented literal praise

was considered less offensive, once again proving that it was successfully delivered prosodically.

2.7. Post-tests of the stimuli

To further explore whether some properties of our stimuli could have contributed to the results, we conducted a post-test. We removed the target word (an evaluative adjective) from each dialog frame and asked native speakers of English to fill in the gap with the first word that came to mind. Twenty-three participants completed the task (mean age = 20.2, SD = 4.7) for partial course credit. Since each dialog frame had a positive and a negative version, two lists were created. Additionally, we asked the participants to rate the degree of friendship between the speakers on a 5-point scale (1 = the speakers are total strangers, 5 = the speakers are very close friends).

Since we were not interested in the exact word the participants filled in but rather the valence of the evaluation, no cloze-probability score was computed. Instead, we calculated an "irony score" by dividing the number of ironic completions by all completions. This allowed us to assess whether some contexts were more predictive of ironic continuations than the other. One dialog frame (out of 48) was removed as an outlier because it got 100% of ironic continuations, whereas the next closest score was 36%. We then re-ran the final GAMM model for irony rating with these additional predictors (irony score and friendship score), once again adding them one by one. Both of them came out significant; however, when added together, only the irony score was significant ($p = .025$). The model was thus re-fitted with the irony score only and it had a significant improvement over the model without it (REML score -70, $p < .001$). Fig. 6 shows that higher percentage of ironic continuations correlate with higher irony ratings, even though the effect

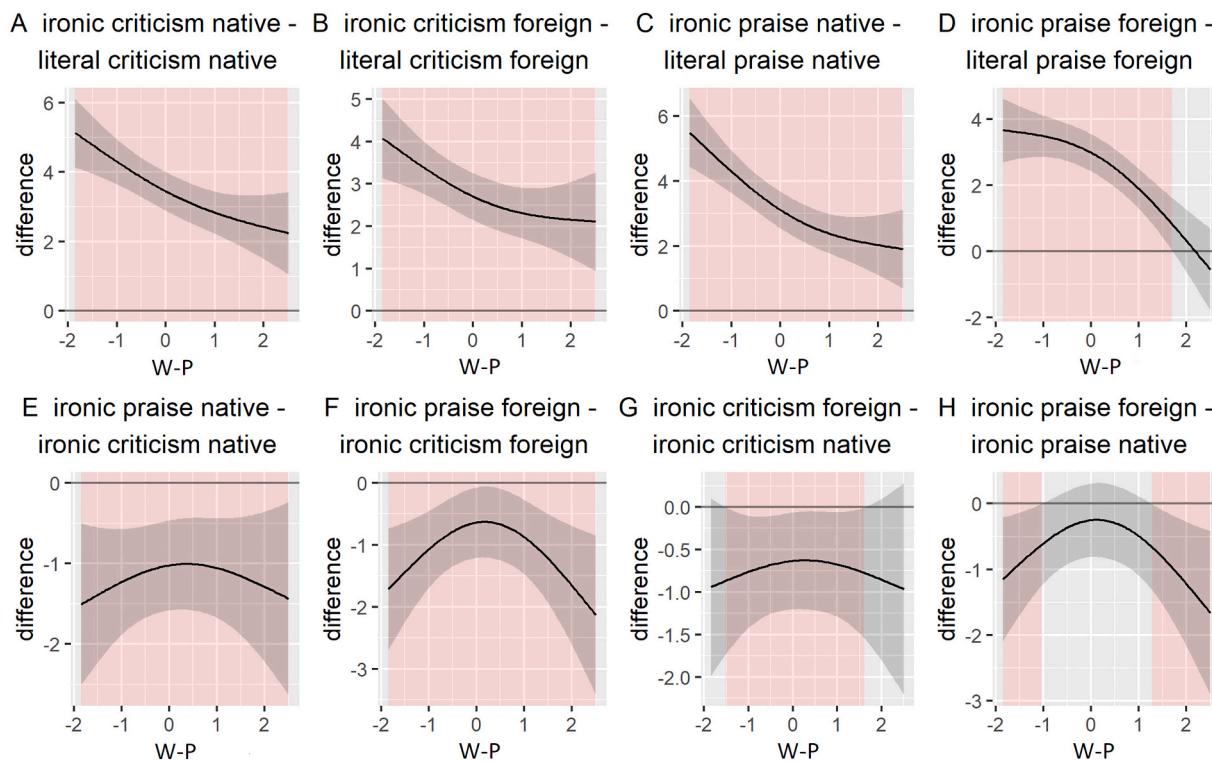


Fig. 3. Difference plots smoothed by Wilson-Patterson's Conservatism scores. Y-axis shows an estimated difference in irony ratings. Shaded areas indicate windows of significant differences.

Table 6

Summary of the best-fitting GAMM with Certainty Rating as a dependent variable. The model's formula: CertaintyRating ~ cond + s(participant, bs = "re") + s(dialog, bs = "re") + s(trial, participant, bs = "fs", m = 1), family = ocat(R = 7). Deviance explained = 22.4%. Asterisks indicate statistical significance (*p < 0.05, **p < 0.01 and ***p < 0.001).

Parametric coefficients	Estimate	Std. Error	z-value	Pr(> z)
(Intercept)	3.98	0.21	18.77	<0.001 ***
(Irony criticism native)				
Irony criticism foreign	-0.56	0.22	-2.61	0.009 **
Irony praise native	-0.60	0.22	-2.74	0.006 **
Irony praise foreign	-0.97	0.22	-4.47	<0.001 ***
Literal criticism native	-0.44	0.22	-2.02	0.043 *
Literal criticism foreign	-0.70	0.22	-3.27	0.001 **
Literal praise native	0.11	0.22	0.52	0.606
Literal praise foreign	0.14	0.22	0.65	0.514
Smooth terms	edf	Ref.df	Chi.sq	p-value
s(participant)	41.05	92.00	69.90	<0.001 ***
s(dialog)	82.96	184.00	155.30	<0.001 ***
s(trial, participant)	121.44	836.00	2068.60	0.023 **

is small. This provides initial motivation for further research to use such a task in a pre-test, since it may potentially explain some variance in the final dataset. Importantly, though, the effects of condition and political ideology remained significant despite the new predictor.

3. Discussion

A tool for social bonding, verbal irony is an essential aspect of social competence. If misunderstood, it may lead to communication breakdowns and injure the relationship. Due to the error-prone nature of foreign-accented speech, listeners might have different expectations when interacting with non-native speakers and exploit different repair strategies when input violates those expectations. Since irony in its

Table 7

Summary of the best-fitting GAMM with Appropriateness Rating as a dependent variable. The model's formula: AppropriatenessRating ~ cond + s(W-P, by = cond, k = 3, bs = "tp") + s(participant, bs = "re") + s(dialog, bs = "re") + s(trial, participant, bs = "fs", m = 1), family = ocat(R = 7). Deviance explained = 19.3%. Asterisks indicate statistical significance (*p < 0.05, **p < 0.01 and ***p < 0.001).

Parametric coefficients	Estimate	Std. Error	z-value	Pr(> z)
(Intercept)	2.06	0.19	11.00	<0.001 ***
(Irony criticism native)				
Irony criticism foreign	0.03	0.24	0.14	0.893
Irony praise native	-1.16	0.24	-4.80	<0.001 ***
Irony praise foreign	-0.90	0.24	-3.70	<0.001 ***
Literal criticism native	-0.38	0.24	-1.58	0.114
Literal criticism foreign	-0.12	0.24	-0.50	0.614
Literal praise native	2.01	0.25	8.14	<0.001 ***
Literal praise foreign	1.73	0.25	7.05	<0.001 ***
Smooth terms	edf	Ref.df	Chi.sq	p-value
s(W-P): irony criticism native	1.58	1.79	2.58	0.346
s(W-P): irony criticism foreign	1.00	1.00	5.11	0.023 *
s(W-P): irony praise native	1.90	1.98	9.10	0.008 **
s(W-P): irony praise foreign	1.90	1.98	9.24	0.008 **
s(W-P): literal criticism native	1.00	1.00	0.24	0.626
s(W-P): literal criticism foreign	1.79	1.94	4.66	0.062
s(W-P): literal praise native	1.58	1.80	17.85	0.001 **
s(W-P): literal praise foreign	1.73	1.91	19.88	<0.001 ***
s(participant)	33.77	91.00	53.95	<0.001 ***
s(dialog)	107.25	184.00	262.75	<0.001 ***
s(trial, participant)	83.26	835.00	343.89	<0.001 ***

surface form is often contradictory to the preceding context and thus requires complex pragmatic inferencing, the present study tested two hypotheses: 1) foreign-accented irony will be considered less ironic than native irony even when prosodic, contextual, and lexical cues are present, and 2) political ideology, empathy, and the need for cognitive

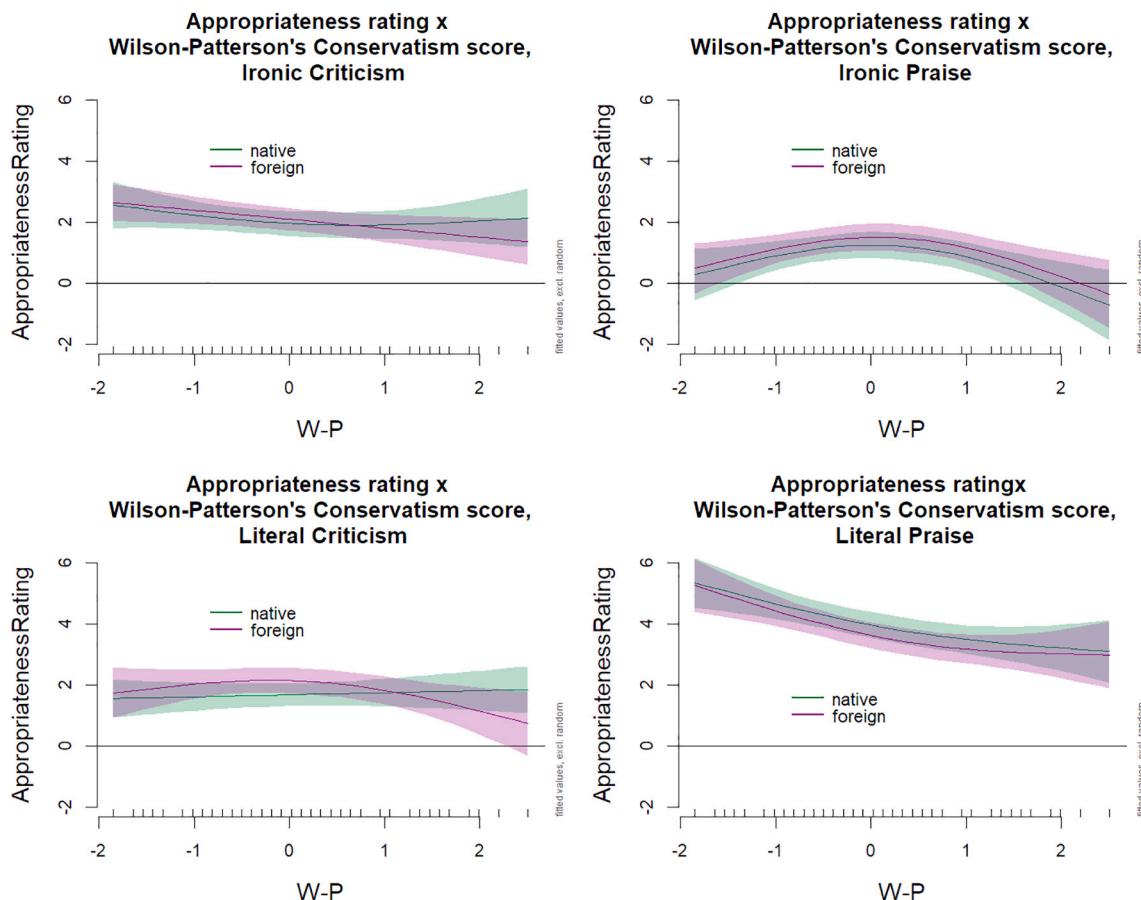


Fig. 4. Interaction of appropriateness ratings with Wilson-Patterson's Conservatism scores. The scores are standardized. Lower scores indicate more liberal orientation.

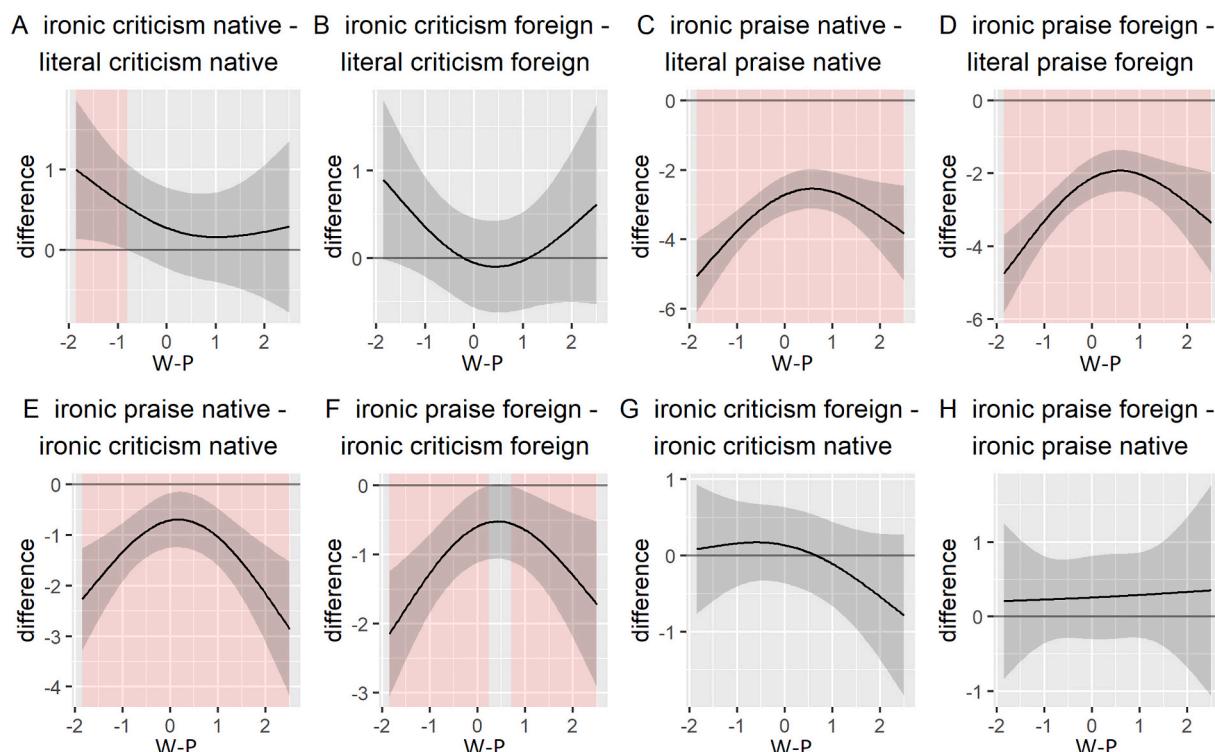


Fig. 5. Difference plots smoothed by Wilson-Patterson's Conservatism scores. Y-axis shows an estimated difference in appropriateness ratings. Shaded areas indicate windows of significant differences.

Table 8

Summary of the best-fitting GAMM with Offensiveness Rating as a dependent variable. OffensivenessRating ~cond + s(participant, bs = "re") + s(dialog, bs = "re") + s(trial, participant, bs = "fs", m = 1), family = ocat(R = 7). Deviance explained = 21.2%. Asterisks indicate statistical significance (* $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$).

Parametric coefficients	Estimate	Std. Error	z-value	Pr(> z)
(Intercept)	1.46	0.19	7.49	<0.001 ***
(Ironie criticism native)				
Ironie criticism foreign	-0.25	0.25	-1.02	0.308
Ironie praise native	0.06	0.25	0.25	0.804
Ironie praise foreign	-0.34	0.25	-1.34	0.181
Literal criticism native	0.81	0.25	3.25	0.001 **
Literal criticism foreign	0.29	0.25	1.18	0.240
Literal praise native	-2.73	0.26	-10.68	<0.001 ***
Literal praise foreign	-2.69	0.26	-10.50	<0.001 ***
Smooth terms	edf	Ref.df	Chi.sq	p-value
s(participant)	36.87	92	61.33	<0.001 ***
s(dialog)	112.04	184	298.54	<0.001 ***
s(trial, participant)	51.30	836	338.40	0.004 **

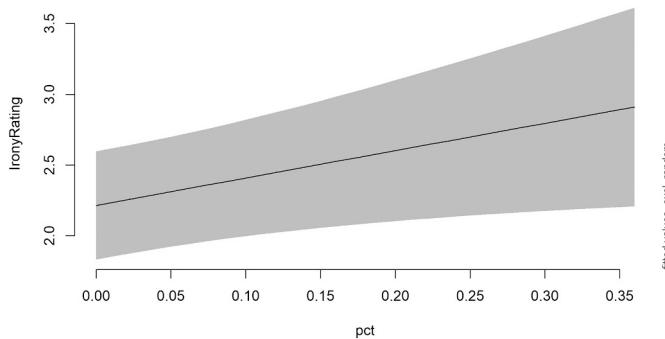


Fig. 6. A smooth for Irony Score with irony ratings as a dependent variable. X-axis shows the percentage of ironic continuations provided by the participants in the post-test. Y-axis shows an estimated difference in irony ratings.

closure will modulate the listeners' perception of foreign-accented irony. To increase the generalizability of our findings, we recorded dialogs with natural prosody and used several rating scales to get a multi-faceted insight into the phenomenon. In brief, we found substantial support for Hypothesis 1 and only partial support for Hypothesis 2. The key findings are as follows:

- Both types of irony, criticism and praise, were rated as less ironic when delivered in a foreign compared to a native accent despite multiple cues.
- "The asymmetry of affect" observed in prior research was supported by our data. Overall, the participants considered ironic praise less ironic and less appropriate than criticism. Foreign-accented ironic praise predictably evoked most doubts about the speaker's intent (although the effect was marginal) and was judged the least ironic.
- Political ideology significantly affected the participant's irony and appropriateness ratings but not certainty or offensiveness ratings. No effect of either empathy or the need for cognitive closure was found.

Perhaps the most salient finding of this study concerns the different perception of native and foreign-accented irony. These results are not likely to stem from comprehension difficulties for several reasons. First, our stimuli provided rich, supportive context sufficient for disambiguating ironic and literal comments based on semantics alone. Second, the speakers used natural prosody which resulted in longer duration of ironic compared to literal utterances in both accents—the only cross-linguistically consistent cue to irony found to date (González Fuente,

2017) and the one English native speakers use the most (Bryant, 2010). Third, the results of the intelligibility pre-test did not significantly correlate with either irony or certainty ratings. Fourth and most importantly in terms of possible phonetic difficulties, literal comments in both accents were rated equally low for irony, ruling out comprehension issues. As discussed in the Introduction, there may be multiple reasons beyond comprehension for the observed effect—linguistic, social, cultural, or a combination thereof. We will briefly go over each of them below.

From a general linguistic perspective, it has been shown that reanalysis following semantic or grammatical errors appears to be hampered during the processing of non-native speech. Romero-Rivas et al. (2015) found that semantic violations elicited no late positivity when spoken with a foreign accent. There is a sizeable literature attributing this ERP signature to domain-general mechanisms of reanalysis and repair (Kuperberg et al., 2011; Regel et al., 2014; Van Petten & Luka, 2012) or to the integration of multiple sources of information (Friederici, 2017). Importantly, irony has been shown to also systematically elicit late positivity (Regel et al., 2011). Synthesizing all of the above, it appears that the later stage of pragmatic inferencing from ironic comments, be it reintegration of meaning with the information in the long-term memory or repair of disparity between the literal and figurative meanings, proceeds differently for foreign-accented speech compared to native speech. It is not entirely clear whether pragmatic inferencing is just "blocked", reducing cognitive load for the listeners, or whether the attempt at a reanalysis is made but the listener reaches a different conclusion—for instance, that a wrong word was chosen or that a foreign-accented speaker misunderstood the situation. Since we also observed a clear "asymmetry of affect" phenomenon for both accents equally, this pragmatic inferencing appears to be sensitive to the typicality of a trope (ironic criticisms constitute 90% of all ironies according to Dews, Winner, et al., 1995, as cited in Dennis et al., 2001) and its appropriateness (Dews, Kaplan, et al., 1995).

Another potential reason for the results may be less frequent use of irony by non-native speakers, thus producing a surprisal effect and tilting the listeners towards alternative explanations. We are not aware of any research examining the issue of irony use by non-native speakers directly; however, there is converging evidence that non-native speakers are less accurate and slower in irony detection in their non-native language, including Chinese learners of English (Bromberk-Dyzman & Rataj, 2016; Ellis et al., 2021). It is thus possible to hypothesize that, since irony detection seems to be one of the later acquired aspects of L2 pragmatic competence, non-native speakers may use it less often. This needs to be verified by future research.

The perception of social distance and reduced common ground may be another contributing factor. It is possible that the friendly conversational style of our dialogs did not provide enough evidence that the speakers know each other well enough to be ironic. Even though the majority of our items were rated above 3 on a 5-point friendship scale in a post-test, this may not be enough when non-native speakers are concerned. Less friendly relationship between the speakers has been shown to make irony less prototypical and harder to interpret (Pexman & Zvaigzne, 2004). One may then wonder why this effect was unidirectional. Perhaps foreign-accented speakers are less expected to be comfortable enough to use irony, and this surprisal promotes searching for an alternative explanation.

Cultural stereotypes may also play a role. Regel et al. (2011) showed that extra-linguistic information about the speaker (e.g., the speaker's preferred communicative style, literal or ironic) interacts with pragmatic inferencing in both early and late processing stages. Naturally, it seems plausible that the listeners' stereotypical perception about the frequency and type of irony used by a particular nation can further affect its processing. Most participants in the study by Caffarra et al. (2018) estimated the use of irony as less frequent in Great Britain as compared to Spain. Since we did not ask our participants to provide such estimation about China and Canada, this explanation remains speculative and

needs further validation.

Contrary to what we expected, higher conservatism scores did not correlate with poorer detection of foreign-accented irony—but rather irony as a whole. Right-leaning participants consistently rated ironic comments as less ironic than their left-leaning peers. To our knowledge, no one has previously explored this relationship, so we will offer an explanation building on findings from personality psychology. A meta-analysis by Sibley et al. (2012) suggested that Openness to Experience is the best personality predictor of political ideology, with higher openness predicting higher liberalism. This trait may help left-leaning participants detect playful cues and reject the superficial evaluation uttered by the speaker in favor of a jocular interpretation. Additionally, right-leaning participants rated literal compliments higher for irony and lower for appropriateness than their left-leaning peers. This strongly suggests that they misinterpreted literal praise as sarcastic. Literal praise in our experiment followed explicit sharing of one's achievements (e.g., "I got a *thirty thousand dollar grant for my project!*") which may have been perceived as bragging. Since bragging tends to annoy, it is easy to see how literal praise that followed ("Oh, your supervisor must be so proud of you right now!") could be mistaken for sarcasm. Additionally, as shown by Slugoski and Turnbull (1988), literal compliments are likely to be misinterpreted as sarcastic if the speakers dislike each other, whereas literal criticisms are likely to be misinterpreted as ironic compliments if the speakers like each other. Since political ideology had an effect only on literal compliments and not on literal criticisms, this might suggest that right-leaning participants inferred the "relationship affect" between the speakers incorrectly, erring on the negative side. This idea certainly warrants further investigation.

We did not find any effect of the need for cognitive closure or empathy on any of the ratings. Even though the literature often emphasizes the importance of empathy and mentalizing skills for irony detection, our experiment did not provide any evidence to support this claim. This agrees with the findings of Kieckhäuser et al. (2019) who also failed to find an effect of IRI scores on irony detection beyond personality traits. One possible reason for our findings is the skewness of IRI scores in our sample consisting mostly of young females. This additionally raises the question whether the variance in empathy in healthy individuals is sufficient to lead to noticeable changes in irony detection. Alternatively, the Interpersonal Reactivity Index may not be the right tool for measuring it. It does not seem possible to choose between the above explanations now, and more research is warranted. The need for cognitive closure also did not interact with any of the rating types. Due to the absence of previous irony research using this measure, we can only speculate that irony with sufficient prosody may not be ambiguous enough to trigger affective discomfort, or this affective discomfort may not affect behavioral measures such as ratings.

The results of the current study extend our rather limited knowledge about the processing of foreign-accented speech, specifically as it pertains to pragmatically driven inferences. Our results clearly demonstrate that, when the utterance is counterfactual to the preceding context, the listeners consider the speaker's identity when making an inference about their intention. Further research can explore the timing of these effects using more time-sensitive methods (self-paced listening, EEG). Additionally, future work can try to remove the effects of adverse listening conditions accompanying any foreign-accented speech from the picture and use written stimuli cuing the speaker's identity.

Naturally, our study had limitations. First, the convenience sample resulted in somewhat skewed distributions of individual difference scores. Second, due to a prohibition on in-person testing as a result of the COVID-19 pandemic, we had to transfer our experiment online. Even though we emphasized the importance of completing it in one sitting and without external distractions, we cannot be certain that our recommendations were respected. Third, even though accent did not interact with any condition when acoustic features such as pitch, duration, and speech rate were analyzed, it remains possible that this interaction was present on some other level of phonological analysis (for

instance, intonation). And finally, as discussed in the **Data analysis** section, opting for generalized additive mixed modelling meant that we had to represent our three predictors with two levels each as one grouping predictor with eight levels. Even though we reran the model for irony ratings without individual differences as a $2 \times 2 \times 2$ and the results converged, this should still be noted as a potential limitation.

In conclusion, we showed that even an intelligible foreign accent affects irony comprehension, and that irony detection skills are in turn affected by political ideology. Our results are based on a novel statistical method for analyzing ordinal data (generalized additive mixed modelling) which does not require treating ordinal data as simple integer-valued. Most importantly, we used dialogs that contained multiple cues to irony (supportive context, prosody, and intensifying lexical markers biasing an ironic interpretation), which makes the data ecologically valid and more readily generalizable to language processing in the real world. The results of this study demonstrate the importance of taking interpersonal differences in language processing into account rather than averaging over them, in particular when it comes to irony detection. This study also adds to the growing body of evidence that non-native speakers face numerous challenges in day-to-day communication, which may eventually translate into negative consequences for many aspects of life. Even though a few studies showed unexpected social advantages for being a non-native speaker (Fairchild et al., 2020; Ip & Papafragou, 2021), most work still converges on negative social attitudes towards non-native speech (Bresnahan et al., 2002; Fraser & Kelly, 2012; Fuertes et al., 2012; Gluszek & Dovidio, 2010; Lev-Ari, 2015; Lev-Ari & Keysar, 2010). Last but not least, the results of this study extend the previous findings obtained in a more controlled lab setting to an online format, suggesting that in-lab and online data collection can deliver converging results.

4. Ethics

All participants gave consent to participating in the experiment after they were provided with a full description of the study and were at liberty to withdraw from the experiment at any point for any reason with no consequences. The plan for this study was reviewed for its adherence to ethical guidelines by a Research Ethics Board at the University of Alberta (reference number Pro00102750).

CRediT authorship contribution statement

Veranika Puhacheuskaya: Conceptualization, Methodology, Software, Formal analysis, Data curation, Writing - Original Draft, Writing - Review & Editing.

Juhani Järvikivi: Conceptualization, Methodology, Supervision, Writing - Review & Editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.actpsy.2021.103479>.

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