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Prosodic markers of satirical imitation

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Abstract: Satirical imitation is a popular format of late-night comedy shows and can provide political entertainment and education. However, little research has been conducted on how satirists mark their satirical intent to clue audiences in on their intended messaging. This study investigates the prosodic marking of satirical imitation and contrasts it with prosodic marking of irony. We conducted a detailed case study of the prosodic marking in Alec Baldwin's satirical imitation of Donald Trump in his audiobook *You Can't Spell America Without Me* contrasted with both Baldwin's and Trump's regular voices. The analyzed corpus contained six hours of audio material across the three sources. Through a combination of automatic and manual coding, we measured average pitch, pitch variation, and speech rate. Our analysis did not reveal marking of satirical imitation by pitch or pitch variation. The satirical imitation was only marked by a faster speech rate than both baseline voices. These findings contrast with previous studies that identified a lower pitch, less pitch variation, and a slower speech rate as markers of verbal irony. Our study provides first evidence that satirical imitation is prosodically marked differently from verbal irony, with a faster speech rate as one potential marker.

Keywords: irony; political satire; prosody; satirical imitation; satire markers

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1 Introduction

Satirical imitation often occurs in popular late-night comedy shows (Peifer 2018), such as *Saturday Night Live* (SNL) and *The Late Show with Stephen Colbert*. Such shows can have multifaceted communicative effects. Beyond their role as entertainment, satirical formats can also function as a source of information about and evaluation of political actors and situations (Becker 2018; Droog et al. 2020). In this way, satire can – intentionally or not – educate the audience and, in some cases, affect their political opinions (Becker 2018; Burgers and Brugman 2021).

Regardless of how recipients interpret a satirical message, they may find a satirical program entertaining (LaMarre et al. 2009). However, interpretations of satire can vary. LaMarre et al. (2009) found that recipients holding conservative views were likelier to interpret a performance satirizing conservative views as a humorous statement of sincerely held beliefs rather than satirical criticism. Hence, satire can be misunderstood depending, for example, on prior viewer attitudes. To avoid such misunderstandings, satirists may use markers that signal their satirical intent to their audience.

Understanding how satirists mark their speech to enable addressees to pick up on the satirical message can shed light on how satire is expressed. Following Attardo (2000), we define a satire marker as a textual or contextual feature that may co-occur with a satirical text and serves as a cue for a recipient to interpret the text as satirical. Satire markers are not essential for a text to be satirical but may help the reader come to a satirical interpretation. A satirical text may be accompanied by any number of markers or be entirely unmarked. While there has been some research on lexical markers of written satire both at the phrasal level (Ravi and Ravi 2017; Skalicky 2018) and at the text level (Brugman et al. 2020; Burgers and Brugman 2021), prosodic markers of satire are, to the best of our knowledge, under-researched. However, we can look to research on related concepts, such as verbal irony, which is considered an essential ingredient of satire by some scholars (Baym 2005; Skalicky and Crossley 2019).

Satire encompasses a variety of expressions across media, such as literature, visual art, and comedy. While it is difficult to give a singular definition of satire due to its diversity in conceptual elements and communicative purposes (for more detail, see Condren 2012), we can identify the particular elements that define the type of satire we focus on in this article: Satirical imitation. In satirical imitation, a satirist takes on the persona of a public figure (e.g., a politician) in a recognizable but exaggerated way (D’Errico and Poggi 2016). In this, it shares similarities with pretense irony in which a speaker adopts a persona to criticize or ridicule attitudes that this person would express (Currie 2006). However, while pretense irony is a

linguistic characteristic primarily associated with individual utterances, satirical imitation is a type of text which has an overall satirical quality and may or may not contain individual ironic utterances (Kreuz and Roberts 1993).

Given the similarities between verbal irony and satirical imitation, satirical imitation may be marked by variations on the same prosodic variables that have been identified as markers for verbal irony: Pitch, pitch variation, and speech rate (e.g., Cheang and Pell 2011; Mauchand et al. 2020). We question whether satirical imitation is marked by prosodic cues that differentiate it from a sincere text, and if so, how. To answer these questions, we conducted an empirical case study comparing the prosodic characteristics of a satirist reading an audiobook in a satirical imitation of their satire target with two baselines: The same satirist reading their autobiography in their regular voice, and the satire target reading speeches in their regular voice.

2 Satirical imitation and discourse-level irony

Political satire juxtaposes events and entities within the political realm with the expectations of common sense or morality, creating a self-contained dialog of perspectives, often with the intent to criticize and ridicule a specific target (Baym 2005). It can provide entertainment and education and persuade its audience to engage with politics (Becker 2018). In the US, satirical television shows such as *SNL* and *The Late Show with Stephen Colbert* often use satirical imitations directed at specific politicians and broader political topics (Peifer 2018). A meta-analysis by Burgers and Brugman (2021) revealed that consuming these formats could, to some extent, educate viewers on satirized figures and events. This effect occurs even though the creators do not always intend it (Baumgartner and Lockerbie 2018; Baym 2005).

Satire's influence on viewers' perceptions and attitudes can also manifest in other ways. Weinhold and Bodkin (2017) found that *SNL*'s sketches focused viewers' attention more on the personal characteristics of politicians than their political attitudes or actions. LaMarre et al. (2009) noted that viewers of a satirical imitation were likelier to interpret satirical messages in line with their pre-existing attitudes when their literal interpretation aligned with these attitudes. Hence, viewers sometimes understood the satirical imitation as not satirical but as a humorous expression of sincerely held beliefs. To ensure that the satirical character of their message is understood, a satirist may clue their audience in on it by using satire markers.

Since, to our knowledge, few studies have focused on the marking of political satire in speech, we look to the marking of irony in speech as a starting point for our investigation. Kreuz and Roberts (1993) point out that particularly pretense irony

often plays a role in satire. Pretense irony is defined as a speaker adopting the persona of a hypothetical person expressing an attitude they do not share and expressing this persona in such a way that their negative judgment of this attitude is communicated (Clark and Gerrig 1984). Currie (2006) emphasizes the importance of a person as the target for this type of irony.

Satirical imitation is also characterized by the satirist taking on a persona, namely of the satire target. The imitation must be clear enough that the target is recognizable. Exaggeration is employed to point out those features and attitudes of the target that are intended to be criticized or ridiculed (D’Errico and Poggi 2016). This overlap in definition, form, and function indicates that satirical imitation shares many characteristics with pretense irony. However, in satirical imitation, an actual person is imitated rather than a hypothetical persona.

Ironic pretense can be limited to single utterances or stretch across an entire text. Gibbs (2012: 109) defines discourse-level irony as “the linking or chaining together of various ironic statements in one stretch of discourse [that] create a sense of ‘ironic coherence’.” When a satirist performs a satirical imitation, not every aspect or statement that is part of the performance is an individual instance of irony. D’Errico and Poggi (2016) note the importance of a satirist re-creating characteristics of the satire target faithfully so that the target remains recognizable. Nonetheless, the performance itself has an overall satirical character that differentiates it from sincere imitation.

Satirical imitation, therefore, exemplifies an overlap between political satire and verbal irony, being a form of satire and sharing many of the characteristics of discourse-level pretense irony. Sketches on SNL, in which actors satirically imitate politicians and other public figures, have previously been directly connected to irony. Sienkiewicz (2013: 106) notes that the format’s sketches as a whole are inherently ironic because they address current political affairs in such a way that they “say one thing to prove its opposite.”

Studies comparing other forms of satire and irony indicate that they also have similar lexical marking, such as using a smaller, simpler vocabulary and more words associated with negative emotion (Ravi and Ravi 2017; Skalicky and Crossley 2015). Given these similarities, the marking of verbal irony in speech may correspond to how satirical imitation is marked in speech as well.

3 Prosodic markers of irony

In addition to morphological, facial, and co-textual markers, Attardo (2000) lists several prosodic features such as intonation patterns and stress. Speakers also use prosodic features to convey other linguistic information, such as affect (Rao et al.

2013) and pragmatic status (Vallduví and Engdahl 1996). In addition, research suggests that listeners rely partly on prosodic information to comprehend ironic statements (Peters and Almor 2017). Thus, if satirists want to ensure their audience picks up their satirical messages, utilizing prosodic cues may be helpful.

Three things should be considered when reviewing the literature on the prosodic marking of verbal irony. Firstly, studies on irony in different languages have found that irony is prosodically marked differently across languages (Attardo 2000; Cheang and Pell 2011). We will restrict our overview to English-language material. Secondly, for both irony and humor, prosodic markers have been identified for individual utterances recorded by trained speakers instructed to speak ironically (e.g., Deliens et al. 2018; Mauchand et al. 2020). However, research on whether prosodic marking occurs in spontaneous or conversational irony yielded inconsistent results (Attardo et al. 2011a, 2011b; Bryant and Fox Tree 2005). Thus, the type of material must be taken into account. Thirdly, studies differ in the ways they measure specific prosodic variables. We focus on identifying which prosodic features have been included repeatedly in previous research.

Many studies investigate pitch – the listener’s perception of the fundamental frequency of a speaker’s vocal fold vibrations (F_0) – as a carrier of prosodic marking of irony. Most studies include measurements of average pitch and pitch variation. Both can be analyzed at different intervals. Average pitch – the average of fundamental frequency values in Hertz produced by a speaker within a specific time interval – is tied to an individual speaker’s voice when averaged over an interval of several sentences (van Dommelen 1990), but can also be tied to the pragmatic status of a phrase when averaged over an interval of single words (Vallduví and Engdahl 1996). In irony research, average pitch is most often measured at the timescale of word groups and sentences, but, in some studies (Attardo et al. 2003; Rockwell 2000), average pitch is manually coded on a Likert scale according to raters’ auditory perception.

Pitch variation is the degree to which F_0 values produced by a speaker deviate from the average pitch within a specific time interval. A low degree of pitch variation is generally perceived as a flat or monotonous voice, while a high degree of pitch variation is often perceived as a lively voice. In irony research, pitch variation is generally measured at the timescale of short word-groups or sentences. How pitch variation is measured differs between studies and includes standard deviation of F_0 values (Cheang and Pell 2008) or perceptual coding (Attardo et al. 2003; Rockwell 2000).

Speech rate – the speed at which a speaker produces linguistic material – is a third prosodic feature often measured by studies on the prosodic marking of irony (Deliens et al. 2018; Mauchand et al. 2020). It refers to the speed at which a speaker produces linguistic material. In irony research, speech rate is generally measured in words at the timescale of sentences (Mauchand et al. 2020) or in syllables

produced per millisecond at the timescale of single words or word groups (Cheang and Pell 2008; Deliens et al. 2018). In some studies, speech rate is coded by raters' perception (Rockwell 2000).

When analyzing prepared speech read by trained speakers aggregated at the timescale of word groups, Cheang and Pell (2008) found irony to be marked by a lower average pitch, lower pitch variation, and a lower speech rate than matched literal utterances. Deliens et al. (2018) found that in ironic sentences, the first syllable was spoken slower than in literal sentences.

At the timescale of sentences, several studies found verbal irony to be marked by lower average pitch (Cheang and Pell 2008; Deliens et al. 2017; Mauchand et al. 2020; Rockwell 2000) and lower pitch variation (Cheang and Pell 2008; Mauchand et al. 2020; Rockwell 2000) compared to matched literal sentences. However, Deliens et al. (2018) did not find ironic sentences to be marked by a lower average pitch. While Cheang and Pell (2008) and Deliens et al. (2018) did not find speech rate to be a marker at the sentence level, other studies did find ironic sentences to be marked by a lower speech rate compared to literal sentences (Deliens et al. 2017; Mauchand et al. 2020; Rockwell 2000).

Notably, no single prosodic marker was identified consistently across these studies. This may be due to irony not being marked the same way in all cases, as the content and structure of study materials differed considerably between studies. Studies on verbal irony and humor in spontaneous or conversational materials further challenge the idea of a universal prosodic marking of irony. Bryant and Fox Tree (2005) analyzed ironic sentences produced in the context of a radio show and found irony to be marked by a higher average pitch than non-irony only in 'dripping sarcasm', i.e., in sentences rated as highly ironic when read (instead of heard). No prosodic marking through pitch was found in sentences rated to be ambiguous when read, nor were there consistent effects regarding pitch variation. However, Bryant and Fox Tree (2005) noted that irony appeared connected to specific pitch contours, meaning the shape in which pitch varies within a specific window of time, such as a high pitch followed by a low pitch followed by another high pitch. They did not find ironic sentences to be spoken at a different speech rate than sincere sentences.

Similarly, studies investigating the prosodic marking of conversational humorous narratives could not identify any reliable prosodic markers that signal that a particular utterance is humorous (Attardo et al. 2011a, 2011b). In a review of the literature, Gironzetti (2017) concludes that there is no reliable prosodic marking of humor. This lack of clear marking of both irony and humor in conversational contexts further suggests that the type of speech plays a significant role in whether prosodic marking occurs, with prosodic marking being more apparent in prepared and highly ironic speech.

In summary, while the literature is not unanimous regarding the exact character of the prosodic marking of irony and humor, those studies that did find prosodic marking identified changes of pitch and speech rate measurements at the timescales of word groups and sentences. Given the similarities between irony and satirical imitation, we will investigate prosodic marking of satirical imitation at the same timescales and on the same variables. However, the unique character of satirical imitation must first be considered.

4 The case of satirical imitation

Satirical imitation, as seen in popular television formats, is generally performed by professional comedians performing a pre-written script with a clear intent on communicating the satirical character of their performance (Koivukoski and Ödmark 2020). This intent to communicate the satirical character makes satirical imitation similar to materials used in studies in which speakers read out ironic statements with instructions to use an ironic tone of voice (Deliens et al. 2017). These speakers also aim to communicate the ironic character of their statements. However, while this kind of satirical imitation is trained at length and performed according to a script, it may also carry the illusion of natural, conversational speech, similar to humorous narratives analyzed by Pickering et al. (2009) or radio shows analyzed by Bryant and Fox Tree (2005). The question remains whether, within that category of materials, satirical imitation is closer to the prosodically marked ‘dripping sarcasm’ or to inconsistently prosodically marked ‘ambiguous sarcasm’ (Bryant and Fox Tree 2005). One way in which satirical imitation differs from verbal irony is in its relation between satirist, satire target, and satirical message.

Satirical imitation inherits from the larger satirical genre a triadic structure comprised of a satirist, a satire target, and the satirical character of the message. While specific forms of verbal irony, such as ironic compliments, are prosodically exclusively characterized by the ironist’s voice and their ironic intent, a satirical imitation must by definition contain characteristics derived from the satire target. Thus, three elements inform the prosodic characteristics of a satirical imitation.

Firstly, the satirist’s voice is characterized by an individual combination of prosodic features. Pitch, pitch variation, and speech rate are salient characteristics that differ between speakers (Sheffert et al. 2002). Secondly, the satire target also has their characteristic prosody. Since satirical imitation necessitates a recognizable depiction of the satire target (D’Errico and Poggi 2016), a satirist may change their voice to imitate the voice of their target. Thirdly, much like other types of irony can be marked by variations in prosodic features (Cheang and Pell 2008; Rockwell

2000), satirical imitation may have its own prosodic expression beyond the addition of the prosodic qualities of the satirist and the satire target.

Studies on prosodic markers of verbal irony compared a speaker's ironic utterances with the same speaker's sincere utterances (e.g., Bryant and Fox Tree 2005; Cheang and Pell 2008; Rockwell 2000). However, in the case of satirical imitation, a difference between a satirist's satirical voice and their regular voice could indicate either the satirical character of the utterance or an effort to produce a recognizable imitation of the satire target. Hence, we need to include the voice of the satire target as a second baseline. If a satirical imitation's prosodic characteristics lie between the satirist's regular voice and the satire target's voice, it can indicate either satirical intent or an imitation. However, if the prosodic characteristics of a satirical imitation lie outside of that space, it would indicate that, in this case, the prosodic features are used to mark the satirical character of the message.

Rather than following a universal pattern, the prosodic marking of a specific case of satirical imitation may depend on the prosodic differences between the satirist and the satire target. Clark and Gerrig (1984) assumed that, in pretense irony, a speaker would push their voice beyond the prosodic characteristics associated with the sentiment corresponding to the literal interpretation of their utterance. For example, ironic criticism would take on the prosodic characteristics of negative emotion, while ironic praise would typically take on the prosodic characteristics of positive emotion. In the case of satirical imitation, a satirist might mark their satirical intent by pushing the prosodic expression of the satire target to an extreme. From this consideration of exaggerating the imitated target, we derive the following hypothesis:

***H1:** When performing a satirical imitation, a satirist changes their a) average pitch, b) pitch variation, and c) speech rate in the direction of the prosodic expression of the satire target and pushes this prosodic expression to an extreme.*

An excellent and well-researched (e.g., in Becker 2018) example of satirical imitation is US actor Alec Baldwin's recurring satirical imitation of former US President Donald Trump on SNL. In 2017, Baldwin won an Emmy Award as Best Supporting Actor in a comedy series for this portrayal, indicating a high-quality satirical performance. We investigate the potential marking used by Baldwin to clue his viewers in on his satirical message.

5 Method

We conducted an empirical case study of the prosodic markers of satirical imitation based on a satirical audiobook and two matching literal baselines. Our analysis compares speech produced as part of a satirical imitation with the satirist's regular

speech and the satire target's regular speech. The prosodic features that we investigate are average pitch, pitch variation, and speech rate.

5.1 Materials

We chose to use audiobooks as our source material because they offer large amounts of audio data at good quality with little to no background noise. As our satirical source, we used the audiobook “You Can’t Spell America Without Me” (Baldwin and Andersen 2017), of which Alec Baldwin narrates 105 min (1,250 sentences) in a satirical imitation of Donald Trump. The book is explicitly labeled as satirical in its subtitle “A So-Called Parody” and narrates a fictional autobiographical take on Trump’s bid for the US Presidency in 2016 as well as his eventual election. The audiobook is similar to Baldwin’s portrayal of Trump on SNL in style and tone. However, it includes a continuous satirical narrative rather than short sketches. This is particularly suitable for our intent of analyzing satirical imitation at a larger text level. In addition, the audiobook does not contain interruptions and background noise which are common in *SNL* TV sketches and might skew an acoustic analysis. Our analysis included the full amount of audio material narrated by Baldwin.

As baselines, we used (a) Baldwin’s reading of his autobiography “Nevertheless” (Baldwin 2017) and (b) several public addresses given by Donald Trump in his function as President of the United States of America (for a list of references, see online appendix A at <https://osf.io/qem4b/>). These were weekly messages in which Trump was recorded reading a speech from a prepared transcript from his office. These public addresses also satisfy our requirement of being recordings of pre-written speech with little to no background noise. From the Baldwin autobiography, we analyzed 165 min of speech (1,744 sentences), while the total length of Trump’s speeches included in the present study is 110 min (800 sentences). To the best of our knowledge, this makes it one of the most extensive single corpus analyses of humor markers so far.

5.2 Procedure

For the analysis of prosodic markers, we collected and aggregated data from the audio sources (The full protocol for data collection is detailed in online appendix B at <https://osf.io/qem4b/>). We used *Praat 6.1* for phonetic analysis (Boersma and Weenink 2019). The first and second authors independently checked 10 min of audio material from each source for pitch artifacts, i.e., implausible pitch measurements. Measurements were judged to be artifacts (e.g., stemming from sounds that cannot

have a pitch value, such as voiceless sounds or static noise, or from background noise, or algorithmic error) using the raters' best judgment.

Interrater agreement of a pitch value being an artifact or not was evaluated using Krippendorff's Alpha set for nominal variables (Hayes and Krippendorff 2007), calculated with the R package *irr* (Gamer et al. 2019). The first round of ratings revealed only minor differences in what the raters identified as pitch artifacts ($\alpha_K = 0.93$). Differences in initial annotation could be attributed to oversights, and a discussion of the results between the raters brought inter-rater agreement to 100% ($\alpha_K = 1.00$). Following a protocol based on this discussion, the first author performed a second pass on all material. All pitch artifacts detected in this second pass were deleted from the dataset. We segmented the audio material into intervals of 500 ms, a time window representing the timescale of word groups at which some studies on the prosody of irony observed prosodic effects (Cheang and Pell 2008).

For the analysis, a Praat script developed by the first author (script available in Online Appendix C at <https://osf.io/qem4b/>) was used to record the mean pitch value and the standard deviation of pitch values for each interval of 500 ms in the audio sources for further analysis. Intervals containing only silence or a single pitch value were discarded, bringing the total number of intervals to 41,869. Data from intervals was also aggregated into sections covering 1 min of audio data each (total number of sections: 414, average number of intervals included in a section: 101). This time window is representative of the timescale of sentences.

5.3 Measurement variables

Data is aggregated at the levels of Section and Chapter. Average pitch is the average of mean F_0 values of each 500 ms-long interval in a section.

As we have no a priori expectation of how exactly pitch marking will occur, and because measurements differ between studies, we take a broad approach to measuring pitch variation. Going forward, we use pitch variation as the umbrella term for three specific measurements: pitch spread, pitch fluctuation, and pitch movement. In this way, we obtain a more fine-grained view of where a marking of pitch variation might occur. We define pitch spread as a measurement of how much pitch varies on average within a 1-min section. It was calculated as the standard deviation of average pitch measurements within a section. Pitch spread is robust to extreme results but may give overly smoothed results as it provides a measurement only at the timescale of sections. To address this, we included the measurement of pitch fluctuation, which we define as a measurement of how much pitch varies within an interval. It was calculated as the average standard deviation of interval-level F_0 measurements. Pitch fluctuation is more vulnerable to extreme

values but also provides a more fine-grained measurement of pitch variation at the timescale of word groups. Finally, pitch movement measures how extreme and frequent a speaker's pitch variation is. It is calculated as the absolute sum value of the differences in the average pitch between neighboring intervals within a section divided by the number of intervals within the section.

Speech rate was operationalized as the number of words per second. Since section boundaries could cut through words, this variable was only calculated at the chapter level.

6 Analysis

Sections could contain different amounts of intervals due to empty intervals within a section being discarded from analysis. Sections deviating from the average number of intervals per section by more than one standard deviation in either direction were excluded to ensure a roughly equal amount of information contained in each section. In this way, 9% of sections containing 3% of the total intervals were removed, corresponding to about 18 min of audio material. The final dataset included 40,591 intervals grouped into 376 sections and 50 chapters (see Table D1 in Online Appendix D at <https://osf.io/qem4b/>). Initial inspection of the descriptive data (see Table 1) indicates prosodic differences between the satirist's regular voice and the satire target's regular voices, as expected when comparing different speakers.

For each prosodic measurement variable at the section level, we fitted a mixed-effects regression model in *R* 4.0.2 (R Core Team 2020) with the *lme* package, version 4.1.1-23 (Bates et al. 2015) using Source (Satire, Satirist, Satire Target) as the predictor. Effects were calculated with treatment coding with satire as the reference level.

Table 1: Means and standard deviations of average pitch, pitch spread, pitch fluctuation, pitch movement, and speech Rate.

	Average pitch (SD)	Pitch variation measurements			Speech rate (SD)
		Pitch spread (SD)	Pitch fluctuation (SD)	Pitch movement (SD)	
Satire	116.01 Hz (6.77)	22.36 Hz (5.22)	9.56 Hz (1.15)	15.61 Hz (2.67)	2.84 w/s (0.14)
Satirist regular voice	112.86 Hz (5.98)	19.93 Hz (6.57)	11.32 Hz (1.41)	16.01 Hz (3.01)	2.66 w/s (0.05)
Satire target	162.84 Hz (13.05)	30.00 Hz (7.34)	17.71 Hz (4.50)	28.43 Hz (6.44)	2.31 w/s (0.17)

Descriptive averages. Hz = Hertz; w/s = words per second. For model results, see Table 2.

In all cases, model comparison using the likelihood ratio test showed that the models including source as a predictor and chapter as the random intercept performed better than null effect models including only chapter as the random intercept (all $p < 0.001$). Significance values for the levels of the predictor variables in the fitted models were obtained using Satterthwaite's method as implemented in the *lmerTest* package, version 3.1-2 (Kuznetsova et al. 2020). R^2 values were obtained using the *performance* package, version 0.5.0 (Lüdtke et al. 2021).

We fitted a linear regression model using Source as the predictor variable for speech rate, calculated at the chapter level. The data and analysis scripts are available at <https://osf.io/qem4b/>.

7 Results

Table 1 shows means and standard deviations, and Table 2 shows the results of the multilevel analyses. We observed no significant difference for average pitch between the Satirist's satirical voice and his regular voice ($B = -5.74$, $SE = 4.38$, $t(41.65) = -1.31$, $p = 0.197$). The Satirist's satirical voice had a significantly lower pitch than the Satire Target's voice ($B = 46.10$, $SE = 2.91$, $t(45.14) = 15.83$, $p < 0.001$). *H1a* was that when speaking satirically, the Satirist would change his pitch in the direction of the Satire Target's voice and exaggerate the Satire Target's pitch. While there was a marked difference between the Satirist's regular voice and the Satire Target's voice, we did not observe the Satirist adjusting his average pitch in the direction of the Satire Target when speaking satirically. Thus, *H1a* was not supported.

The results in the pitch variation measurements were similar to those in average pitch. The Satirist's satirical voice and his regular voice showed no significant differences in pitch spread ($B = -2.99$, $SE = 2.21$, $t(23.14) = -1.35$, $p = 0.189$), pitch fluctuation ($B = 1.51$, $SE = 1.60$, $t(42.62) = 0.94$, $p = 0.351$), or pitch movement ($B = -0.07$, $SE = 2.20$, $t(37.67) = -0.03$, $p = 0.973$). Compared to the Satire Target's voice, the Satirist's satirical voice showed significantly lower pitch spread ($B = 7.89$, $SE = 1.57$, $t(33.13) = 5.02$, $p < 0.001$), lower pitch fluctuation ($B = 8.44$, $SE = 1.05$, $t(44.63) = 8.02$, $p < 0.001$), and lower pitch movement ($B = 13.07$, $SE = 1.47$, $t(41.63) = 8.90$, $p < 0.001$). Overall, the Satirist's satirical voice was marked by significantly less pitch variation than the Satire Target's voice while not differing significantly from the Satirist's regular voice. *H1b* was that the Satirist would adjust his degree of pitch variation to the Satire Target's pitch variation and exaggerate it. We did not observe any of the predicted effects.

The analysis on speech rate showed that when speaking satirically, the Satirist spoke significantly faster than when speaking in his regular voice ($B = -0.19$, $SE = 0.07$, $t(47) = -2.57$, $p = 0.014$). When speaking satirically, the Satirist also spoke significantly

Table 2: Results of linear mixed-effects regression analysis for pitch features.

Predictors	Average pitch (Hz)			Pitch spread (Hz)			Pitch fluctuation (Hz)			Pitch movement (Hz)		
	Estimate	95% CI	p	Estimate	95% CI	p	Estimate	95% CI	p	Estimate	95% CI	p
Intercept	116.42	111.97–120.86	<0.001	22.39	20.05–24.72	<0.001	9.57	7.96–11.18	<0.001	15.61	13.37–17.85	<0.001
Satirist (reg.)	-5.74	-14.35–2.87	0.191	-2.99	-7.34–1.36	0.177	1.51	-1.63–4.64	0.346	-0.07	-4.40–4.25	0.973
Satire target	46.10	40.38–51.83	<0.001	7.89	4.80–10.98	<0.001	8.44	6.37–10.51	<0.001	13.07	10.19–15.96	<0.001
Random effects												
σ^2	26.62			31.36			2.00			8.28		
τ_{00}	82.86 _{chapter}			19.21 _{chapter}			11.13 _{chapter}			20.76 _{chapter}		
ICC	0.76			0.38			0.85			0.71		
N	50 _{chapter}			50 _{chapter}			50 _{chapter}			50 _{chapter}		
Observations	376			376			376			376		
Marginal R^2	0.810			0.275			0.459			0.527		
Cond. R^2	0.954			0.550			0.918			0.865		

Intercept. Satire. All comparisons are to the intercept. *p*-values obtained with Satterthwaite's Method. CIs are set for 95%.

faster than the Satire Target ($B = -0.54, SE = 0.05, t(47) = -11.09, p < 0.001$). However, from this model, we could not tell the relation between the speech rate of the Satirist's regular voice and that of the Satire Target. To identify if the Satirist indeed adjusted his speech rate in the direction of the Satire Target's speech rate and exaggerated this adjustment, we re-ran the analysis with the Satirist's regular voice as the reference level. We found that the Satirist's regular voice was significantly faster than the Satire Target's voice ($B = -0.35, SE = 0.07, t(47) = -4.91, p < 0.001$), indicating that the Satirist adjusted his speech rate in the opposite direction of the Satire Target's speech rate. *H1c* was that the Satirist would adjust his speech rate in the direction of the Satire Target's speech rate and exaggerate the Satire Target's speech rate when speaking satirically. Thus, our results do not confirm this hypothesis.

Overall, we found no support for our hypotheses H1a–c, but we observed that the Satirist significantly sped up his speech rate when speaking satirically. Figure 1 shows the structure of the data plotted on three prosodic dimensions (an interactive version of the 3D Plot is available at <https://osf.io/qem4b/> as “Interactive3DPlot_prosodicfeatures.html”). While the Satirist's regular speech and his satirical speech aligned on the dimensions of average pitch and pitch spread, there was a marked difference in speech rate between the two, creating three distinct clusters of data points, analogous to the triadic structure of satire proposed earlier.

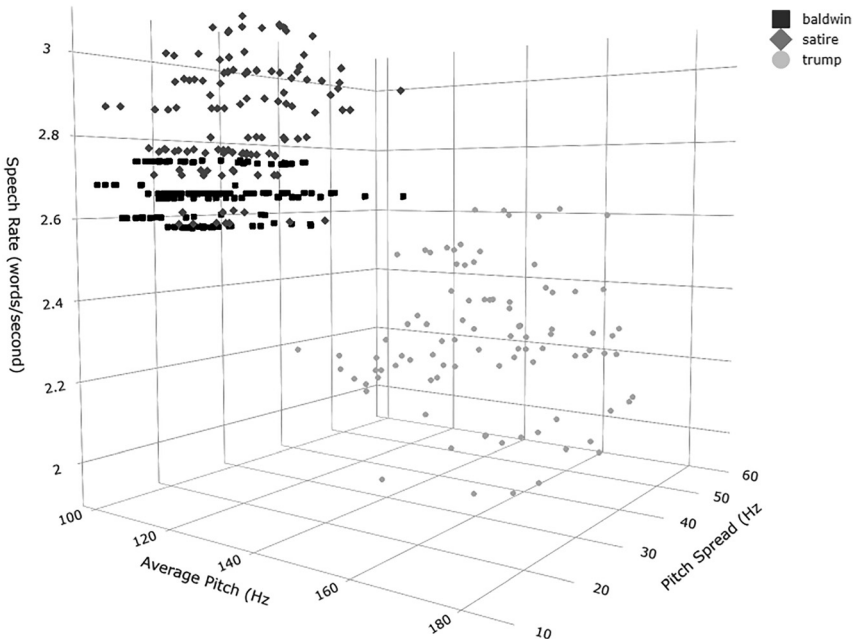


Figure 1: 3-dimensional scatterplot of average pitch, pitch spread, and speech rate values for the Baldwin, Satire, and Trump sources.

8 Discussion

We investigated whether and how satirical imitation is marked through prosodic features at a discourse level with an empirical case study. We hypothesized that, when satirically imitating another person, a satirist would change their (*H1a*) average pitch, (*H1b*) pitch variation, and (*H1c*) speech rate to perform an exaggeration of their satire target's voice. We expected to see the prosodic expression of the satirist when speaking satirically to be between the satirist's regular voice and their target's regular voice or to be beyond the target's regular voice.

H1a predicted that, since the satire target's average pitch was higher than that of the satirist's regular voice, the satirist would raise his pitch in the satirical performance to that of the satire target or even higher. Similarly, for *H1b*, we expected the satirist to increase his pitch variation in at least one of the three measurements pitch spread, pitch fluctuation, and pitch movement to match or exceed the pitch variation of the satire target. However, while the satirist's satirical voice differed significantly from the satire target's average pitch and pitch variation, it did not significantly differ from his regular voice. Our results did not support *H1a–b*.

These results suggest that contrary to the prosodic marking identified for sentence-level irony performed by trained speakers, pitch is not used as a marker in this case study of discourse-level irony. The differences in average pitch and pitch variation between the Satirist and Satire sources were not significant. Confidence intervals for the estimates of average pitch and pitch variation (see Table 2) were very small; for example, the average pitch of the satirist's satirical voice was calculated to be between 14 Hz lower and 3 Hz higher than his regular voice, an imperceptible difference. This suggests that even if we failed to detect a small but significant difference in pitch between these two sources, it is unlikely to be large enough to be identifiable by a listener. This supports the argument that there may be no consistent marking of humor as made by some scholars (Bryant and Fox Tree 2005; Pickering et al. 2009).

H1c predicted that the satirist's speech rate would be slower in the satirical imitation than his regular voice. While the satire target's speech rate was slower than the satirist's regular speech rate, the satirical imitation was marked by a significantly faster speech rate than both baselines. The satirist changed his speech rate in the opposite direction of the satire target's prosodic expression. Our results, therefore, did not support *H1c*. Instead, we see in this case study that the satirist adopted a speech rate that did not imitate the satire target's speech rate. This contrast between how a listener might expect an imitation of the target to sound and how the satirist's voice actually sounds may be a prosodic marker for satirical imitation. Alternatively, it may be that a faster speech rate is by itself a prosodic marker of satirical imitation. Future research may be able to shed more light on this.

Our findings for speech rate run counter to the assumption that a satirist will imitate and exaggerate their target's prosodic expression (Clark and Gerrig 1984; Currie 2006; D'Errico and Poggi 2016). If this assumption had been met, the satirist would have spoken slower in our case study because the satire target's speech rate was lower than the satirist's regular voice. Our results also do not match results of previous studies that investigated ironic speech produced by trained speakers and found irony to be marked by a slower speech rate at different time scales (e.g., Deliens et al. 2017; Mauchand et al. 2020). This indicates that satirical imitation, when marked prosodically, is indeed marked differently from ironic speech, namely by a faster speech rate instead of a slower one. The necessity to combine prosodic marking of satirical intent with a faithful imitation of the satire target may require more differentiated or simply different marking than verbal irony in other modalities.

Our data source was an audiobook, which has both conversational and prepared speech qualities by being a humorous narrative read aloud by a professional actor consciously performing satire. Our results mirror the discussion in the literature on prosodic marking of irony. We did not find pitch markers of satirical imitation, which is in line with previous studies that found no prosodic marking of irony and humor in conversational materials (Attardo et al. 2003; Bryant and Fox Tree 2005). However, satirical imitation is marked by speech rate, albeit differently from the irony investigated by previous studies (Deliens et al. 2017; Mauchand et al. 2020). Since satirical imitation shares many characteristics with irony, this opens the possibility that while there is no universal marking of verbal irony, there may be different prosodic markers associated with different types of verbal irony and humor, while some types, such as spontaneous conversational humor, may not be marked prosodically at all.

The context of the analyzed materials should also be considered. Results from a smaller sample in Bryant and Fox Tree (2005) suggested a connection between prosody and other features of a text. In their analysis of radio programs, utterances that were identifiable as ironic from text alone were associated with stronger prosodic marking than utterances that were ambiguous in text. As we could not identify prosodic marking on all observed variables, it may be that overall, our materials are similar to the ambiguous utterances mentioned above. Contrasting this interpretation, Burgers and van Mulken (2017) raised the point that in communicative situations, speakers may choose to generally mark ambiguous ironic utterances more strongly to aid recipient comprehension. If this is the case, a satirical audiobook being marketed as satirical may not require strong prosodic marking in the text as the labeling of the text may avoid such ambiguities that trigger strong prosodic marking. It may also be that broad measurements such as average pitch or pitch variation, which can also be used to identify individual speakers (van Dommelen 1990), are less influential in the overall prosodic expression of a longer text. A closer

analysis of individual sentences from various satirical texts may offer additional insights into these questions.

In the prosody of satirical imitation, we observe the triadic structure abstracted from the literature on satire and pretense irony (Clark and Gerrig 1984; Currie 2006; D'Errico and Poggi 2016). Our results on pitch and pitch variation show that the satirist's characteristic prosodic features remain partially intact within the satirical imitation. No adaptation of prosody in exaggeration or mere imitation of the satire target was found in the prosodic features analyzed in our study, but these may occur in other parts of the performance (Gilbert 2019). Finally, the faster speech rate appears to be something unique to satirical imitation, as it is not found in either the satirist's regular voice or the satire target's voice.

Our study focused on a single satirist and a single satire target to obtain the most thorough comparison possible with the power provided by a large amount of material. Thus, we could perform a very sensitive and robust analysis of prosodic features contained in satirical imitation. This approach is also in line with previous studies that included a limited number of speakers, such as Deliens et al. (2018), who used three speakers, Cheang and Pell (2008), who analyzed utterances from six speakers, and Mauchand et al. (2020) who included four speakers. Of course, one important next step is to investigate if these effects observed can also be replicated for other satirists and other satire targets. In addition, satirical imitation is one type of audiovisual news satire, with other sub-types including satirical monologues (e.g., *Late Night with Seth Meyers*, *Full Frontal with Samantha Bee*). Future research could also investigate prosodic marking on such other types of news satire.

9 Conclusion

In our case study, discourse-level irony was marked by a faster speech rate than both baselines, contrasting the prosodic marking of phrase-level irony. This faster speech rate may result from the satirist pointedly moving away from the satire target's prosodic expression to signal that the utterance is satirical. However, it may also be that an increased speech rate is a general marker of satirical imitation independent of the satire target's prosodic expression, analogous to how phrase-level irony is often marked by a slower speech rate.

Our study gives a first insight into how satirical imitation is marked prosodically. We found that, differently to irony, it may be marked by a faster instead of a slower speech rate. Considering the differences in prosodic marking between humorous narratives, verbal irony, and satirical imitation, our study suggests that there may not be a universal pattern of prosodic marking for different types of

humorous speech. Instead, when investigating the prosodic marking of humorous speech, it is crucial to consider both the type of humor and the materials studied.

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