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Verbal irony in the wild*

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Verbal irony constitutes a rough class of indirect intentional communication involving a complex interaction of language-specific and communication-general phenomena. Conversationalists use verbal irony in conjunction with paralinguistic signals such as speech prosody. Researchers examining acoustic features of speech communication usually focus on how prosodic information relates to the surface structure of utterances, and often ignore prosodic phenomena associated with implied meaning. In the case of verbal irony, there exists some debate concerning how these prosodic features manifest themselves in conversation. A form-function approach can provide a valuable tool for understanding speakers' varied vocal strategies in this domain. Here I describe several ways conversationalists employ prosodic contrasts, laughter, and other speech characteristics in their attempts to communicate effectively and efficiently. The presented examples, culled from spontaneous conversation recordings, reveal just a small sample of the enormous variation in delivery styles speakers adopt when communicating with ironic language.

Keywords: indirect language, laughter, prosody, spontaneous speech, verbal irony

1. Introduction

In spoken conversations, people convey many complex implied messages through their expressions, both verbally and non-verbally. These intentional indirect speech acts exploit users' common knowledge for an incredible range of pragmatic functions, and are ubiquitous both within and between cultures (Levinson 1983). Indirect language is verbal communication in which the linguistic surface constituents do not explicitly encode implied information that a speaker wishes to convey; that is, ultimate intentional meaning is not contained in the propositional form. Much of our everyday talk incorporates indirect speech — it is both heavily conventionalized, and used on command with ease in novel contexts. Psycholinguists and philosophers of language have proposed various theoretical accounts

of implied language understanding, many within more general theoretical frameworks addressing language and communication (e.g., Austin 1962; Clark and Gerrig 1984; Clark 1996; Grice 1975; Searle 1969; Sperber and Wilson 1986/1995). All of these explanations share an appreciation for an inherent duality — the dissociation between the actual words used and the meanings conveyed provides a special platform for conversationalists to express intentional information

1.1 Verbal irony as implied language

While many forms of implied language exist, here I will focus on ironic communication — specifically verbal irony. Verbal irony is a type of expressive, intentional irony that manifests itself linguistically. Similar by design, nonverbal intentional irony can be found in songs, fashion, pictures, and other art, where intentional representations afford implied meaning that refers to specific, alternative interpretations not explicit in the representation itself, and conceptually in opposition to the surface features. Likewise, multiple simultaneously-presented conflicting representations can communicate ironic intentions. Contemporary culture is replete with examples, such as the current trend of fake news media that often incorporates irony (e.g., The Onion and The Colbert Report) or the use of irony in rock music (e.g., Ween) (Ellis 2008). An audience must employ similar inferential processes when recognizing and understanding ironic meaning whether through the use of propositional language or other media. For example, Scott (2003) argued that echoic mention theory (Sperber and Wilson 1986/1995) provides an explanatory framework for understanding how irony is conveyed through photographs. Viewers must recognize conceptual allusions and contrasting representations, often with only subtle visible disambiguation. Verbal irony is a case of intentional irony that specifically uses linguistic propositions to imply alternative meanings. Paralinguistic information can help disambiguate intentions in verbal irony, including quite notably, vocal signals. Here I will demonstrate how speakers use a variety of prosodic signals to communicate ironic intentions — and I aim to show how these prosodic forms relate in non-arbitrary ways to the communicative goals of the speakers.

Verbal irony can be roughly categorized into instances and exchanges. Ironic instances are simply one-sentence autonomous ironic utterances that do not require any language use by others. Ironic exchanges involve two or more interlocutors exchanging ironic comments based on some constructed scenario. They can last for many conversational turns and the thematic play can spontaneously reappear during subsequent conversations, even years later among familiar speakers. Many communicative mechanisms can be incorporated into these ironic interactions, as we will see below — acts of pretense, double entendres, metaphors, and

clichés can function as signals of ironic intent and humor devices at the same time. The exchanges often focus on some absurdity in the reality of a situation under discussion.

Clark (1996) called these interactions staged communicative acts, and argued that through pretense plays, conversationalists coordinate their intentions and collaborate on joint communicative projects. Gibbs (2000a) argued that people participate in staged communicative acts by relying on layers of metarepresented meaning. Because verbal irony involves attributed attitudes and beliefs of real or imagined persons, interlocutors must decouple these second-order representations, and infer the actual intentions of one another by interpreting the relevant characteristics in the pretended discourse. Ironic exchanges are initiated by ironic instances, but the exchanges are more than just a set of instances. When conversationalists engage in a thematic exchange revolving around a pretended scenario, the communicated irony takes on an explicitly collaborative nature. In an ironic instance, one could argue that the interpretation of the utterance may be implicitly collaborative (Clark 1996), but the intentions of the speaker, while affected by the conversational context, are still her own. This, of course, applies to nonironic utterances as well.

There appears to be some variability in whether speakers engage in any substantial exchange when using irony. Kotthoff (2003) found that ironic teasing often elicited interactive responses, revealing what could be a humor related function of extended ironical exchanges. But Eisterhold et al. (2006) described almost 400 instances of spontaneous verbal irony and found that most cases involved a single instance with no ironic reply — less than 7% of the instances of verbal irony were followed by an ironic response. When a person did reply ironically to an ironic utterance, it was almost always limited to one remark. The authors presented these data as evidence for the least disruption principle — the effort speakers make to minimize cooperative disruption. Thus, violations of the Gricean Cooperative principle and its maxims should be as spare as necessary. According to this view, verbal irony represents a classic violation of the cooperative principle, and as such, should manifest generally only as a single, first-turn utterance. Eisterhold et al. (2006) described ironic exchanges as mode adoption, and reported that this phenomenon is rarer than has been previously described (e.g., Gibbs 2000b; Kotthoff 2003). One reason for this could be due to differences in populations from which utterances were culled. For example, Eisterhold et al. (2006) did not have as many young men in their 20s as did Gibbs in his collection and this age group could have been more inclined to adopt an ironic mode and enter into an ironic exchange.

This empirical inconsistency is just one example of the notable variety in verbal irony manifestations during regular conversation — a theme underlying a crucial point in this article. Verbal irony constitutes a rough class of intentional

communicative behavior involving a complex interaction of language-specific (i.e., lexical and syntactic) and language related phenomena including higher-order conceptual structure, semantics, and social communication strategies (Pinker et al. 2008). Conversationalists use indirect language in an effort to achieve various communicative goals, both in cooperative and conflictual contexts. The evolved architecture of the human language faculty incorporates highly specialized inferential procedures and modes of encryption tailored to strategic manipulation characteristic of all animal signaling.

1.2 Verbal irony and the voice

Speakers need ways to make their intentions clear. Researchers examining the acoustic components of speech communication usually focus on how prosodic information relates to the surface structure of utterances, and often ignore prosodic phenomena associated with implied communicative intentions. But listeners use prosodic information when making judgments about implicatures in spontaneous speech as research on the recognition of verbal irony has shown (Bryant and Fox Tree 2002, 2005). Recent work in neuroimaging of brain damaged patients has confirmed the disambiguating role of vocal information in understanding, for example, sarcastic intent (e.g., Channon et al. 2007; Wang, Lee, et al. 2006). There has been a fair amount of research examining the vocal correlates of verbal irony in normal subjects, with most studies focusing on sarcasm, a particular type of verbal irony with a relatively narrowed set of associated attitudes and emotional intentions (e.g., Anolli et al. 2000; Cheang and Pell 2008; Rockwell 2000). No clear pattern across studies has emerged, though actors portraying sarcasm often lower their pitch and slow down their speech, the latter of these consistent with studies of spontaneous ironic speech (Bryant 2010a). But we should not expect consistent prosodic patterning across such a broad category of language use such as verbal irony. Instead we should focus on figures of speech that are more reliably connected with specific emotional intentions because particular prosodic forms used by speakers are driven by communicative functions.

Ethologists studying animal signaling first made note of the intimate connections between communicative signal structure (form) and adaptive function. Since then, the approach has led to important theoretical and empirical advances in primate signaling (Owren and Rendall 2001). Vocalizations often achieve their communicative function by virtue of their physical structure. For example, the rapid onset time, high amplitude, and frequency spectra of certain call types (e.g., fear shrieks, alarms calls, etc.,) exploit the perceptual acoustic-startle reflex in typical mammalian auditory systems. The specific physical characteristics increase the likelihood of these vocalizations being perceived rapidly by a target organism — a

crucial feature for them to function effectively. Evolutionary selection processes often shape structural features of communicative signals to predictably manipulate others' behavior in adaptive ways. Human speech is no exception — many aspects of our vocalizations are explicable with reference to functional influences on acoustic form. Research on infant-directed speech provides an excellent and relevant example (Bryant and Barrett 2007; Fernald 1992).

This form-function approach can be applied to many aspects of speech communication including how prosody might be associated with implied language such as verbal irony. Recent work with actors by Cheang and Pell (2008) illustrated this nicely. These researchers found that compared to sincere tokens, sarcastic speech had relatively greater noise as measured by harmonics-to-noise ratio, and differed in resonance properties that contributed to voice quality changes (one-third octave spectral values). Additionally, they found that sarcastic tokens were lower pitched and had reduced pitch variation. Sarcasm is a type of verbal irony associated with biting criticism, with often positive literal comments delivered in a sneering tone. Not surprisingly, the aggressive nature of this trope is correlated with vocal characteristics of dominance and aggression — low, broadband (i.e., noisy) sounds are commonly used by humans and nonhumans alike to communicate aggression (Morton 1977). There is a non-arbitrary relationship between the communicative function of such vocalizations and these vocal parameters: aggressive animals often attempt to sound dominant, confident, and large. The same applies to vocal parameters in human speech, even in the relatively harmless context of sarcastic criticism. But this is not how all ironic speech should manifest itself. For example, if a person intended to praise another by stating something literally critical, then one might expect a different pattern where the prosodic information conveyed less aggressive and more positive valence (e.g., Anolli et al. 2002). Examples of spontaneously produced ironic speech are provided below, further illustrating how prosodic forms are not stereotypically formed according to the category of verbal irony, but instead are tailored to specific emotional communicative functions.

Another important prosodic phenomenon is how people change vocal features during speech to indicate pragmatic meanings. Conversationalists often contrast prosodic features, and this strategy seems to be especially prevalent during the use of verbal irony (Attardo et al. 2003; Bryant 2010a). A contrast here is defined as a statistically significant and perceivable shift in some acoustic dimension across phrasal units that can signal speaker meaning and help guide listeners' inferential processes. In other words, these vocal signals can contribute to conceptual and procedural meaning (Blakemore 1987). Bryant (2010a) measured pitch, loudness, and speech rate contrasts in spontaneously produced verbal irony targets produced in 11 natural dyadic conversations between friends. Irony targets were

compared to baseline speech immediately preceding them, and these baseline utterances were compared to utterances immediately preceding them as an index of contrast rates not related to verbal irony. Speakers used contrasts significantly more when they spoke ironically, and they also contrasted more dimensions simultaneously. These speakers often contrasted pitch in ironic speech, but there was no consistent directional change. When they did contrast pitch, they did so to a greater degree than when they contrasted pitch in nonironic contexts.

One acoustic consistency was revealed — speakers often slowed down their speech when using verbal irony. Bryant (2010a) suggested that slowing down speech when using irony might be due to speakers' efforts to accommodate listeners' needs for more processing time — another example of how the prosodic form is shaped by the communicative function. Ironic meaning often takes extra effort to process, as evidenced by work showing slower reading times of ironic tokens compared to their metaphorical counterparts (Colston and Gibbs 2002). Speakers might be slowing down their speech not only to signal ironic intent, but also to facilitate listeners' comprehension. Future work on prosodic contrasts should examine how these acoustic changes affect listeners' judgments of speakers' intentions, and their on-line processing of implied meaning.

In the following descriptive analyses, ironic exchanges are examined with respect to their verbal and nonverbal content. These particular examples are used for explanatory purposes only and the accounts are sometimes admittedly speculative. My goal is not to report new data, but rather describe (using real occurrences if verbal irony) how specific acoustic forms can help serve pragmatic functions — and how this form-function relationship manifests itself in conjunction with speakers' attempts to contrast prosodic features for communicative effect.

2.   Descriptive analyses

The following are detailed analyses of several noteworthy occurrences of verbal ironic exchanges taken from the same conversations as those analyzed in Bryant (2010a). In all cases the conversationalists were familiar speakers, and were attempting to use humor through various ironic subtypes, including rhetorical questions, hyperbole, understatement, and jocularity (see Gibbs 2000b). For a complete description of the recording and analytical details, see Bryant (2010a). These examples are described here with particular attention being paid to the form-function relationships between prosodic features and communicative intentions. Many of the suppositions concerning speaker intentions were confirmed by the conversation participants. I will describe a variety of ways conversationalists employ prosodic contrasts, laughter, and other disambiguation devices in

their communicative behavior. These four excerpts reveal just a fraction of the enormous variation in delivery styles speakers adopt when communicating with implied language, and demonstrate the diversity of affective and linguistic features that concurrently operate in ironic language use.

As described earlier, verbal irony in spontaneous speech manifests itself either as a single utterance or an ironic exchange. When analyzing prosodic contrasts in verbal irony, single instances are often easier to handle. Ironic exchanges more often involve the imitation of others' voices, overlapping speech, special disambiguation for embedded comments within the exchange, and other prosodic phenomena associated with the intentional/emotional content. The players may use vocal signals to initiate the pretense, similar to how many non-human animals use metamessage play signals (Bekoff and Byers 1998; Vettin and Todt 2005), and they may continue the vocal behavior to indicate their continued participation. The voice is not acting as a mere disambiguation device for the irony itself, but is signaling additional information regarding the playing out of the pretense (e.g., turn taking, person identification, etc.). Interestingly, laughter in humans and similarly structured vocalizations in other primates is closely associated with play (Vettin and Todt 2005), and is also often closely associated with pretense and ironic play in spoken conversations.

In many ways the prosodic elements of the initial ironic instance can affect the prosodic features of the entire exchange. This could be due to conversationalists' tendency to align multiple aspects of their speech. Garrod and Pickering (2004: 8) suggested that this "interactive alignment" eases processing demands of dialogue by making shared representations readily available. In verbal irony exchanges, this accommodation also likely helps interlocutors communicate their mutual understanding of the pretense. Interlocutors quickly adopt one another's vocal behavior in order to mutually signal participation in whatever conversational play they perceive to be materializing. In the following example, the ironic exchange is initiated by an utterance that illustrates a complex phenomenon common in figurative language and indirect speech:

> Mike   Cause I never did (deal drugs), like it was, I just never had…
> Mary   No one's asked me. *laughs*
> Mike   *ahh-fsss,* I wonder why?

In this exchange, Mike describes how his dreadlocks cause many people to assume he is a drug user, and often a drug dealer. He notes how he, in fact, has never dealt drugs but on a recent occasion was asked if he did. Mary then reports that she has never been asked by strangers if she sells drugs ("No one's asked me"). Mike responds with an ironic rhetorical question ("I wonder why?") that satisfies the basic traditional criterion for verbal irony (i.e., saying the opposite of what you

mean). One interesting feature of this exchange is that it is initiated by a remark that fails to satisfy any criteria suggested for being verbal irony, but clearly has elements that qualify as ironic. When speaking ironically, speakers ordinarily say something other than what they mean, and the utterance, not the implied meaning, is considered ironic. But in this example, the implicature is ironic (implied understatement) and the utterance itself is literal. Mary laughs immediately after her comment presumably signaling her acknowledgement that the assertion is absurd to point out because it is patently obvious why she has never been asked if she sells drugs (i.e., she appears particularly straight-laced and ordinary). The laughter quite plausibly could have been the initiating play signal that launched the brief ironic exchange.

Mike responds to this by making a vocal noise (ahh-fsss) that signals his acknowledgement of an obvious truth (or disbelief of an obvious falsity) and vocally imitates (and potentially indicates) exasperation. This could be thought of as a literal response (although nonverbal). He then follows it immediately with his ironic question/comment, "I wonder why?". Mike contrasts this utterance from his preceding speech with only overall amplitude (he says it softly). The acoustic form of very low amplitude in his speech could be signaling an acknowledgement of the implied understatement — the soft form facilitates the understatement function. Moreover, because Mike produced the vocal noise that communicated his attitude towards Mary's assertion (that she has never been asked to sell drugs), he likely did not need to vocally disambiguate his redundant intention contained in his ironic rhetorical question. He additionally may not have wanted to insult Mary by insinuating, for example, that she was not "cool enough" to be mistaken for a drug dealer. His understatement is conveyed verbally and prosodically, and these features function simultaneously at multiple communicative levels, mostly beyond the interlocutors' conscious awareness. The play is multimodal and embodied (Attardo et al. 2003; Gibbs 2000a).

The following example illustrates a similar chain of communicative events:

> Kristen I think that if like if it were for like three months I was stuck in like a cabin with the same people I'd be like, "get away from me I don't want to see you." You know cuz you can't necessarily go, like, away you know, like, when I get annoyed like with you or just plain annoyed in general
>
> Shayna It happens? [laughing]
>
> Kristen [laughing] No it never happens

Kristen is explaining to her roommate Shayna how she copes during moments when she is annoyed with her friends or roommates. They have already acknowledged earlier in this conversation that there have been incidents when they have

bickered. Shayna responds to Kristen's description with the ironic rhetorical question, "It happens?" The difference between this exchange and the example above with Mike and Mary is that the illocutionary force of Shayna's utterance here is not serious. In other words, in the previous example, Mary was actually providing information regarding the fact that she has never been asked to sell drugs. Shayna, however, was not actually requesting information with her question. Instead she was asking an absurd ironic question for the humorous effect. The similarity between these examples concerns the use of an ironic intention as opposed to an ironic utterance to start an ironic exchange. By asking the absurd question, Shayna draws attention to the mutually recognized fact that they both know Kristen has been annoyed before. Kristen responds to this question with an ironic answer, "No, it never happens". This example illustrates the common occurrence of what might be well described as an ironic adjacency pair.

Just as in the previous example with Mike and Mary, the response to the initial ironic intention follows traditional criteria (i.e., saying the opposite of what you mean) and is disambiguated with prosodic signals. Kristen's response to Shayna's question contrasted with her preceding speech on three dimensions. Kristen significantly lowered her pitch, increased her pitch variability, and reduced her loudness. The initial ironic utterance produced by Shayna overlapped somewhat with Kristen's speech and was unable to be acoustically analyzed, but perceptual judgment suggests some prosodic exaggeration of the interrogative intonation. Again, a form-function approach allows us to understand the prosody here better than a mere simple expectation of some typical ironic tone. In a case where one is asking a rhetorical question, and the speaker intends to either a) signal the irony in an effort to reduce the chance of being misunderstood, and/or b) exaggerate the appropriate prosodic features to amplify the humor in the speech act, we should expect not some stereotyped tone such as lowered F0 and louder speech (Rockwell 2000), but specific exaggeration of the interrogative intonation contour to highlight the rhetorical question, that includes emphasis on the terminal rise, and a pattern of pitch and duration accents that distinguish the sentence from its declarative alternative (Pell 2001).

Shayna's question was also followed by very brief laughter (one bout with two calls of 370ms and 385ms) that was further followed up by a laughter bout by Kristen containing three calls (410ms, 210ms, and 220ms). This can be described as antiphonal laughter defined by Smoski and Bachorowski (2003) as laughter that immediately follows (and occasionally overlaps) laughter produced by a social partner. They present evidence that this behavior occurs significantly more between familiar speakers, and furthermore between familiar female speakers. Additionally, the authors proposed that antiphonal laughter functions to increase social cohesion and "reinforce positive shared affective experience" (ibid.: 327). Figure 1
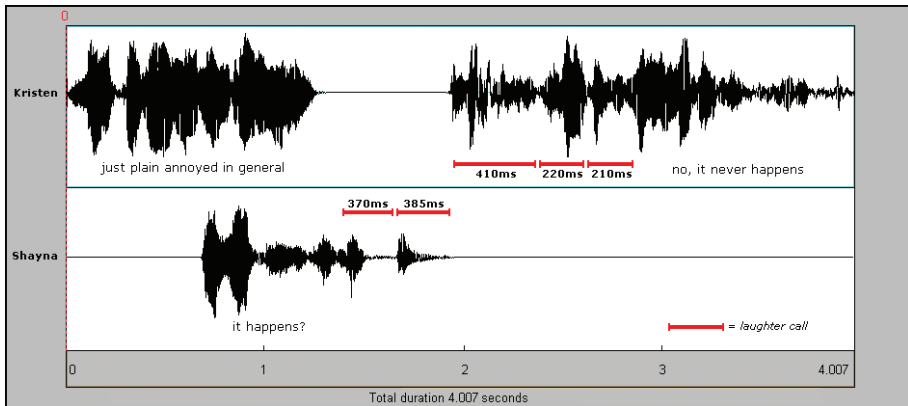
Figure 1. Waveform display of ironic exchange with antiphonal laughter.

displays the waveforms of the exchange with markers indicating the antiphonal laughter bouts.

Bryant (2010b) found that antiphonal laughter was acoustically distinct from solitary laughs produced by the same speakers — they were louder, longer, and more common between familiar speakers and between females. One possibility is that when friends are laughing together, they are not only mutually signaling positive emotions, but are also generating a synchronized signal that people outside the interaction could perceive. Verbal irony could be playing a role in this if it inspires laughing in conversationalists, and thus serves as a vehicle for friends to communicate their affiliation to others. The laughter sequences in the last two examples share some basic features, and can both be characterized as antiphonal. Research supports the idea that laughter is often used as a signal of ironic intent. For example, Bryant (2010a) found that in well over half of all spontaneous irony in a dozen natural conversations, laughter occurred either right before, during, or just after the ironic speech. In another study, Eisterhold, et al. (2006) found that laughter was the most common response to verbal irony with 35% of all ironic utterances eliciting that response. As mentioned earlier, laughter could be thought of as a play signal, potentially homologous to laugh-like behavior in nonhuman primates (Vettin and Todt 2005). Its close association with verbal irony certainly supports the idea of ironic exchanges as playful, staged communicative acts.

The overall sequence in both examples above can be simply described as follows:

1. Speaker A provides information (telling a story, describing something, etc.).
2. Speaker B initiates ironic exchange with absurd, but literal utterance (statement or question) followed by laughter.
3. Speaker A produces antiphonal laughter.

4. Speaker B retorts with an ironic utterance (with prosodic contrasts) and con-
    tinues with preceding discourse.

In these two examples, multiple collaborative events are happening between the
conversationalists. These signals communicate information that helps each person
engage successfully in the conversation, and in particular, have an ironic exchange
that allows for efficient information sharing, social bonding, and possibly coali-
tion signaling. The devices employed to facilitate this process (such as antiphonal
laughter) are used in other communicative contexts besides verbal irony of course.
All of these features align mechanistically in collaborative joint projects, and pro-
sodic elements are particularly salient. Research should explore the circumstances
that give rise to extended ironic exchanges, and the pragmatic motivations and
associated costs and benefits of participating in them.

   While there is some variation in the reported frequency of extended ironic
exchanges across different corpora, they certainly do occur in some contexts. In
this exchange, friends Pat and Chris discuss the topic assigned to start their con-
versation:

   1. Pat   Well I think this one will be pretty easy
   2. Chris Yeah, bad roommates, wow, we lucked out
   3. Pat   Hmm, who can we talk about first?
   4. Chris Hmmm, bad roommates…
   5. Pat   I think we should talk about Ryan
   6. Chris Ryan? Okay
   7. Pat   [laugh]
   8. Chris if you, if you think he's a bad roommate…
   9. Pat   [sigh] Yes, I do, very much so…

See Table 1 for acoustic data.

   In (1) and (2) they exchange a literal assessment of the situation that reflects
their agreement that the topic of bad roommates affords much discussion for them.
But the assertion made in (2) does echo the implicit notion that drives the pretense
to come — this is a topic they immediately mutually acknowledge as familiar. The
first ironic play happens in (3) when Pat echoes the implicit assertion that there
is an obvious candidate to discuss by pretending to think about it ("hmm"). In
this utterance Pat prosodically contrasts his voice with his earlier statement (1)
by increasing the loudness variability (dB SD) and slowing down his speech —
exaggerated pretense of contemplation for humorous effect. Chris responds with
ironic understatement in (4) by repeating the topic and echoing not only himself
explicitly from (2), but the implicit notion that this is a topic discussed at length
previously in their relationship. In this utterance Chris contrasts three acoustic
dimensions from his utterance (2) by increasing his pitch and pitch variability, and

Table 1. Acoustic measurements of extended ironic exchange example.

Utterance Pairs		Acoustic Dimensions				
Name	Line	F0	F0 SD	dB	dB SD	MSD
Pat	1	115	15.8	51.9	6.7	171
	3	125 *	16.7	48.5	8.5	228 *
Chris	2	113	13.2	46.5	7.8	316
	4	130 *	40.6 *	48.7	7.4	450 *
Pat	3	125	16.7	48.5	8.5	228
	5	128	26.6 *	46.7	8.6	265 *
Chris	4	130	40.6	48.7	7.4	450
	6	134	39.0	40.8 *	10.3	408 *
Pat	5	128	26.6	46.7	8.6	265
	9	132	20.7	49.1	10.2	198 *
Chris	6	134	39.0	40.8	10.3	408
	8	118 *	11.9 *	45.5	7.5	228 *

Note: F0 = fundamental frequency in Hz (pitch); F0 SD = fundamental frequency standard deviation in Hz (pitch variability); dB = decibels (loudness); dB SD = decibel standard deviation (loudness variability); MSD = mean syllabic duration (speech rate). * indicates a perceptible contrast.

dramatically slowing down his speech. Pat responds (5) to his own ironic question (3) by explicitly answering it, and contrasts only pitch variability. This contrast subjectively makes the declaration sound surprising, highlighting how unsurprising it is. Chris responds to this suggestion (6) by repeating Pat's roommate's name back in pretend surprise that signals continued participation in the pretense. The response is reduced in loudness (dB), increased in loudness variability (dB SD), and very close to the slowed down speech rate begun in his previous utterance (4). This elicits laughter from Pat (7) after which Chris continues in (8) with the pretense of surprise (and understatement) by asking if in fact Pat thinks that Ryan is a bad roommate. In this question Chris contrasts four prosodic dimensions (increased F0 SD, overall dB, mean syllabic duration, and decreased dB SD) from his speech in (6). His increased speech rate (MSD) went back to the baseline rate of utterance (2). Pat responds first with a sigh, and then the literal answer that in fact he did think Ryan was a bad roommate, though ironic in intention given that Pat knows full well that Chris is aware of his feelings on the matter. In this response he increases the loudness variability and increases his speech rate. His speech rate also goes back to the baseline rate of his initial utterance. Pat's and Chris's speech rates coordinate quite closely with the ironic play such that they both slow down for the pretense and speed up when it is concluded.

One important aspect of this entire exchange is that the participants were quite aware of being recorded, so many of these vocal signals can be understood as possibly for the implicit audience of potential listeners. The recording had just begun and this exchange represented the very beginning of their conversation. The pretense of sharing new information is likely related to this circumstance. But this does not necessarily present an ecological validity problem. The situation of being asked to discuss such a topic precipitated the ironic play. This was one of the motivations for the topic suggestion, and in this case, it worked quite effectively. These speakers engaged in a prolonged ironic exchange that was clearly marked by prosodic signals. The particular form of the contrasts in this exchange reflected the attributed implied emotions and intentions, as well as helped the conversationalists mark their pretense.

When speakers use verbal irony, they communicate an attitude toward an attributed proposition — that is, speakers echo a belief, utterance, or event with an explicit stance thereby expressing an implied attitude toward that referent (Sperber and Wilson 1986/1995). Through an interaction of local and global prosodic signals, speakers attempt to disambiguate propositional information (e.g., word focus), as well as attitudinal information (e.g., indicating implied meaning and affect). The prosodic information should differ for different attitudes and emotions just as in direct emotional speech. The following example illustrates well how echoic interpretation can predict the specific prosodic form of an ironic instance:

> Kristen It's just, you know, I like sometimes to have music out loud instead of just in *my earphones*
> Shayna *yeah I hate* having to turn on my computer, open, turn on my computer to like listen to music
> Kristen Yeah, I'm sorry
> Shayna Well yeah….whatever Kristen

In this exchange, roommates Shayna and Kristen are discussing the stereo situation in their dormitory room. Kristen explains why she took her stereo home that resulted in there being no stereo in the room, and Shayna remarks how she does not like to have to turn on her computer just to hear some music. Kristen apologizes semi-ironically, that is, there is genuine guilt, but she recognizes that it is her property after all. Shayna responds with the ironic comment, "whatever Kristen!" In this utterance Shayna pretends to be angry (though perhaps feels some genuine annoyance) and acts as if Kristen's reasons for taking her stereo home are not good enough. In doing so she implies that it is unreasonable for her to complain since the stereo is not hers. In order to communicate this effectively, Shayna not only uses words that convey this attitude, but uses a prosodic contour that imitates a
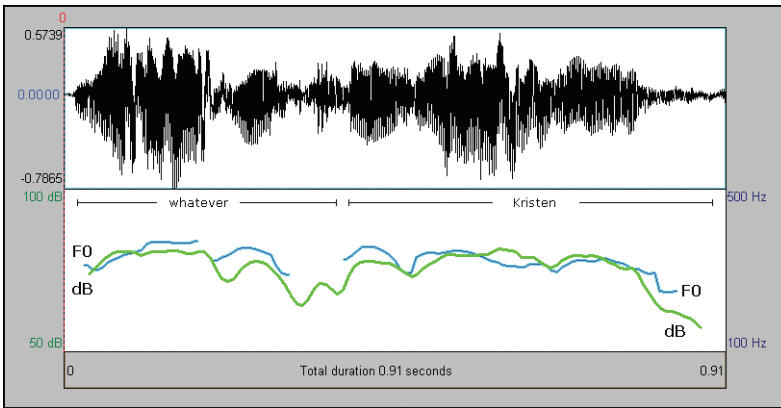
Figure 2. Fundamental frequency (F0) and amplitude (dB) contours of a verbal irony instance ("Whatever Kristen!").

stereotypical angry vocal style. Figure 2 displays the fundamental frequency and amplitude contours of the ironic target, "whatever Kristen!"

Prosodically, Shayna's utterance contrasted from her preceding speech on four acoustic dimensions, and contains the acoustic signature of cold anger (lowered mean F0, descending F0 with lowered F0 variability, and high amplitude) (Banse and Scherer 1996). Anger is often also expressed with a rapid speech rate, but Shayna's speech rate contrasts from her preceding speech by slowing down. By contrasting the ironic segment from her earlier speech, Shayna likely alerted her listener to the ironic intention, and through the stereotyped angry contour, engaged Kristen in the pretense of anger. The particular features of any prosodic contour in an ironic utterance (and nonironic, for that matter) will vary according to affective intentions. Had Shayna used a different emotional script in her pretense, the contour would have likely reflected that emotion, and not anger. Her particular prosodic features made the pretense relevant and specific. This is precisely why the notion of an ironic tone of voice is difficult to conceptualize — the variability in vocal signals associated with emotional expression creates an infinite number of ways to communicate ironically. But one thing does happen in this example that differs from typical (i.e., stereotyped) angry vocal behavior — Shayna decreases her speech rate significantly. This could be the one vocal signal that clearly disambiguates the ironic intention, and helps her avoid the potentially costly misunderstanding that she is actually angry. Alternatively, if Shayna was portraying vocal affect associated with moral disgust, it would explain the affect-related contrasted prosody as well as the slowed down speech rate. By this interpretation, the speech rate contrast was not a direct signal of irony, but instead contributed to the emotional pretense that affected the listener's interpretation.

3.   Conclusion

I have drawn from real examples of spontaneous ironic speech to illustrate important issues in understanding form-function relationships between prosodic signals and verbal irony. Prosodic features are used to disambiguate meaning at multiple levels, including specific local functions at the sentence level, up to global functions at the suprasegmental level. The global forms that occur are related in non-arbitrary ways to the emotional content of specific utterances; thus, these forms will be as varied as the emotional contents in people's ironic language. Moreover, spontaneous speakers seem to change their voice as a means to signal ironic intentions — and these contrasting phonetic features operate in conjunction with global emotional vocal signaling. This idea is not mutually exclusive with some version of the ironic tone of voice idea. For example, there might be some set of vocal signals often associated with the negative affect of sarcasm (e.g., Cheang and Pell 2008; Rockwell 2000). The more narrow researchers zoom in on subtypes within the large category of verbal irony, the more likely they might find consistent patterns of prosodic phenomena. Problems arise, however, when these patterns are generalized beyond some narrowed set of emotional communicative intentions.

One potential strategy for developing an ecologically valid categorization scheme within the broad category of verbal irony would be to carve the categories of utterances according to intended communicative outcomes. For example, ironic language used to reveal in-group versus out-group status of audience members through the use of encryption might be expected to not have many, if any, associated acoustic features (for a similar analysis on humor, see Flamson, Bryant, and Barrett, this issue). That is, by seeing who responds appropriately to some ironic utterance that is not prosodically marked, one can ascertain the actual possession of particular knowledge. Conversely, if the intent is to ensure the recognition of the irony, which could be associated with, for example, trying to be funny or reduce the risk of being taken literally, one should expect vocal disambiguation. Anolli et al. (2002) found that utterances distinguished by blame-by-praise or praise-by-blame were produced differently by actors. These authors differentiated between ironies in cooperative versus conflictual contexts — exactly a dimension one should expect to be relevant given its ecological importance. However, from a behavioral ecological perspective, the strategy of praising or blaming another through a negative or positive remark rarely, if ever, necessarily entails actual cooperation or conflict. I prefer a distinction of conflict versus cooperation in the sense laid out by Pinker et al. (2008) where the relative costs and benefits of differential interactive outcomes play into indirect speech strategies. Overall, the types of irony described by Gibbs (2000b) can all be subdivided according to ecological dimensions such as cooperation versus conflict and in-group versus out-group.

This is the kind of scheme that would facilitate a form-function approach to the prosody of verbal irony.

There are other general issues that must be considered as well. First, common ground between speakers is clearly going to determine a good deal about what degree of paralinguistic disambiguation will be needed to communicate effectively (Bryant and Fox Tree 2002). Related to this, audience design needs to be considered — for example, if there are overhearers (Clark and Schaeffer 1987). Second, the speech production context is also going to constrain the types of prosodic movements a speaker can generate — disambiguation at one level might disrupt optimal production at another level, and thus speakers must allocate prosodic production according to the demands of the communicative situation (Bryant 2010a; Bryant and Fox Tree 2005; Pell 2001). Related to this, research examining acoustic measures of voice quality should be continued (e.g., Cheang and Pell 2008). Finally, disambiguating implied intentions is a multi-modal affair (Attardo et al. 2003) so researchers need to examine how conversationalists recognize communicative intentions using multiple sources of information including body movements and various cues of cognitive processing such as eye movements (e.g., Williams, Burns, and Harmon 2009).

Overall, in the analysis of the pragmatic intricacies of verbal irony production and comprehension, the central theoretical concern should be to understand the cognitive and physiological machinery underlying communicative behaviors more generally, and give those principles a chance to explain specific phenomena like ironic speech patterns. In this sense, we should be looking at prosodic signaling as a functional system that allows language users to convey relevant information in an efficient form. These forms need to be understood with reference to affective and intentional goals, and not necessarily tied to abstract categories of language use like verbal irony. Prosodic production associated with verbal irony can only be understood in the larger framework of language use, vocal signaling, and the evolution of communication and cognition.

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