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The Prosodic Contribution to the Expression of Sarcasm in British English

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THE PROSODIC CONTRIBUTION TO THE EXPRESSION OF SARCASM IN BRITISH ENGLISH

ABSTRACT

The current research analysed the use of accentuation, pitch span, pitch minimum and maximum and duration in conveying sarcasm in different sentence types in British English. Sentence types that were included are simple declaratives, wh- exclamations, and sentences with negative question tags. Special attention was paid to the semantically most important word to the expression of sarcasm within an utterance. The results show that native speakers of British English do not use the absence or presence of accentuation on the semantically most important word to mark sarcasm. Moreover, the pitch span within the semantically most important word did not change if sarcasm was expressed. Interestingly, speakers lengthen the semantically most important word in sentences in order to convey sarcasm, and they employ a lower pitch minimum, and a lower pitch maximum in the semantically most important word. The discussed sentence types influence the placement of accentuation, duration, pitch minimum and pitch maximum of the semantically most important word in sentences, but no interaction effect with the use of sarcasm was found.

1. INTRODUCTION

Irony can fulfil different roles. Brown and Levinson (1978) state that irony can be used to make a criticism more polite. Dews and Winner (1995) use different terms, and say

that people come across as less threatening and aggressive if they use irony. Moreover, they argue that irony can create a humorous atmosphere. Research done by Dress et al. (2008) shows that there are regional differences between the function people subscribe to sarcasm.

Whatever the goal of irony and sarcasm may be, it is important that it is recognised by the addressee. According to Capelli, Nakagawa, and Madden (1990) irony indicates that a speaker wants to convey a meaning that is opposite to the literal meaning of the words the speaker uses. Therefore, if irony is not recognised, the message will be interpreted literally. Gibbs and O'Brien (1991) show that irony is not always used to convey the opposite meaning of what is literally said. For example, when a mother says to her child that she loves children who keep their room clean with an ironic tone of voice, she does not mean the opposite of what the words literally mean. In this example it is probably the case that the child has not kept his or her room clean. By stating her opinion with an ironic tone of voice, the mother is trying to convey that it would be nice if her child would clean the room. In other words, by using this tone of voice the mother suggests that the room has not been cleaned and that it should be cleaned, not that she does not like cleaned rooms. Again, irony has to be recognised in order for the addressee, in this case the child, to understand that the mother is saying something different from the literal meaning of her words.

Up until now, the terms irony and sarcasm have been used interchangeably, but they mean different things. Sarcasm is seen as a subclass of irony by Kreuz and Glucksberg (1989). They state that it is used to convey a negative attitude towards people or events. Anolli et al. (2002) also distinguish between different types of irony, namely kind irony and sarcastic irony. Kind irony entails expressing praise by using words that are normally used to express blame. Sarcastic irony entails the opposite, namely expressing blame by using words that are usually used to praise. The researchers split up this latter kind of irony in scornful

sarcastic irony and bantering sarcastic irony. The definition of sarcasm that is used in the current study is bantering sarcastic irony.

In order to make adults recognise sarcasm, Capelli et al. (1990) state that recognition of a discrepancy between what is said and the context in which it is said is enough. However, others showed that prosody also plays an important part in conveying sarcasm (Sperber & Wilson, 1981; Kreuz & Roberts, 1993). Several researchers have attempted to pinpoint what prosodic variables are important in communicating sarcasm and/or irony (Anolli et al., 2002; Attardo et al., 2003; Bryant, 2010; Cheang and Pell, 2008; Cheang and Pell, 2009; González Fuente, 2013; Loevenbruck et al., 2013; Niebuhr, 2014; Rao, 2013; Rockwell, 2000). Finding these variables is not a straightforward task, if only because of the employment of different prosodic cues in different languages (Niebuhr, 2014).

1.1 Prosodic cues to sarcasm across languages

Anolli et al. (2002) investigated prosodic expression of sarcasm in Italian. They distinguished between irony used in a cooperation context and irony used in a conflict context. The latter was referred to as sarcastic irony. Fifty male students from the Catholic University of Milan were asked to read out loud three different texts: a plain text that served as a baseline, a text in which irony was used in a context of conflict, and a text in which irony was used in a context of cooperation. The contexts consisted of small narratives in simple language in which two people had a conversation about an everyday topic. Information about the situation, about sense, and information that was relevant to the ironic remark were included in the narrative. The context of conflict included a sarcastic remark that was meant as blame, and the context of cooperation included a sarcastic remark that was meant as praise. Both irony texts were compared to the baseline text, and to each other. Variables that were included in this research are pitch mean, pitch minimum, pitch maximum, pitch range, and

Met opmerkingen [AC1]: → [Binnenlandse](#)

Met opmerkingen [AC2]: → [Binnenlandse](#)

pitch standard deviation, the length of the whole phrase, the length of pauses within the whole phrase, the length of the spoken segments, the number of pauses, and the rate of articulation, amplitude mean, amplitude minimum, amplitude maximum, amplitude range, and amplitude standard deviation of the spoken segments. All variables were measured on sentence level. The researchers found an increase in pitch mean, pitch maximum, pitch range, and pitch standard deviation when comparing both types of irony to the baseline. Amplitude mean and range increased as well. Moreover, pauses were found to be shorter. When comparing the two types of irony to each other, pitch mean, and standard deviation were found to be significantly higher in the sarcastic irony type, while no difference between the two types was found with regard to amplitude and duration.

As opposed to Anolli et al. (2002), Rao (2003) had participants read out loud only the sarcastic utterance. Rao (2003) compared prosody that was used by speakers of Mexican Spanish in sincere and sarcastic utterances. Sarcasm is defined here as a way to express a negative message in a less offensive way. Five speakers were provided with 15 positive contexts, and 15 negative contexts. After reading the context, they were asked to read out loud a short response. Beforehand, the participants had received definitions of sarcastic and sincere, and were told in which contexts sarcastic and sincere expressions were normally used. Cues that were analysed at the sentence level were pitch mean, pitch range, and number of syllables per second. Cues that were analysed at the word level were duration of the stressed syllable, pitch movement, and stressed vowel intensity. Rao (2013) found that sarcastic utterances had a lower speech rate, and a lower pitch mean. Apart from this, a longer syllable length in the attitudinally most important word was found. Moreover, Rao (2013) found a difference between men and women. Sarcasm resulted in a decreased pitch range, less movement in relevant words, and lower vowel intensity in all words in the utterance in the male speakers', but not in the female speakers' production.

Met opmerkingen [AC3]: Ambiguous.

Met opmerkingen [AC4]: Number of syllables?

Met opmerkingen [AC5]: And how about the female speakers' production?

Loevenbruck et al. (2013) investigated prosody used for conveying sarcasm based on declarative utterances produced by 12 native speakers of French. According to the researchers, sarcasm is used to communicate a negative or critical meaning. In total, 48 utterances were produced by each speaker, 24 sarcastic utterances, and 24 literal utterances. A context was provided, so speakers would feel as if a sarcastic or literal utterance would be appropriate. Afterwards, a stimulus validation task was performed. Twenty native speakers of French judged whether each utterance was either sarcastic or sincere. Moreover, the judges rated their confidence level on a 5-point Likert scale. Only the utterances that were judged as fitting to the intended category by 70% of the judges, with a confidence level of 4 or 5 were included in the analysis. Prosodic cues that were under investigation were pitch mean, pitch span, and duration. All cues were measured at the sentence level. The researchers found that sarcastic utterances were spoken with a higher pitch mean, and a wider pitch span. Moreover, the sarcastic utterances were significantly longer than the literal utterances.

Lastly, Niebuhr (2014) provided his participants with even less information. The participants had to utter sentences without being provided with a context. Niebuhr (2014) analysed pitch, intensity, voice quality, and duration in German. Specifically, he looked into pitch minimum, pitch maximum, pitch range, and pitch mean, intensity minimum, intensity maximum, intensity range, and intensity mean, voice quality mean, voice quality standard deviation, and total sentence duration. The researcher (2014) states sarcasm is being used in order to convey a negative attitude. Ten speakers uttered 20 sentences in a neutral tone, and the same 20 sentences in a sarcastic tone. If participants asked for this, they received comic strips to explain the concept of sarcasm. Niebuhr (2014) found pitch maximum, pitch minimum, and pitch mean were significantly lower in sarcastic utterances. Also, sarcastic utterances had a narrowed pitch range, and a lower intensity minimum, intensity maximum, and intensity mean. The sentences were found to be significantly longer if the tone was

Met opmerkingen [AC6]: By whom?

sarcastic. Moreover, the standard deviation of voice quality was much larger for sarcastic utterances.

1.2 Prosodic cues to sarcasm in English

Attardo et al. (2003) looked into 41 sarcastic utterances and the utterances surrounding these from scenes of American comedies. Apart from stating that irony and sarcasm are not considered to be separate variables in this study, sarcasm remains undefined. Attardo et al. (2003) paid attention to both facial cues and pitch contours. They came up with three groups in which these contours could be placed: strong within-statement contrasts, compressed pitch patterns, and pronounced pitch accents. For the first group, within-statements contrasts, the authors suggested that it was the sudden switch to “a compressed, flat intonation pattern which signals the ironic content” (p. 247). In the second group, compressed pitch patterns, very little pitch movement was said to signal a sarcastic content. Finally, the third group, pronounced pitch accents, consisted of contours that showed “pronounced pitch accents placed throughout the entire utterance, on all content words, and often on multiple syllables of the same word” (p. 250). Attardo et al (2003) conclude that pitch in relation to conveying sarcasm cannot be analysed by only looking at the sarcastic utterance. They state that utterances surrounding the sarcastic utterances should be included in order to draw firm conclusions with regard to pitch. Furthermore, they state that there is not one cue that indicates sarcasm, and that the context in which the utterance occurs plays a role in the prosody used in order to convey sarcasm.

Cheang and Pell (2008) also studied the English language. They state that sarcasm indicates a negative attitude towards people or events. In total, 6 native speakers of English were asked to utter 96 sentences in total, 24 utterances uttered with a humorous attitude, 24 with a sincere attitude, 24 with a sarcastic attitude, and 24 with a neutral attitude. Each target

Met opmerkingen [AC7]: Be consistent in your use of tense: simple past tense would be appropriate.

Met opmerkingen [AC8]: Start sentence from the beginning of scene of

Met opmerkingen [AC9]: Start on the scene

Met opmerkingen [AC11]: So, what is your point?

Met opmerkingen [AC10]: → Give the conclusion

sentence, except for the neutral sentences, was preceded by a biasing sentence in order to provide a small context that encouraged the speaker to use the attitude that was asked of him or her. Moreover, participants were provided with definitions of the various attitudes. Apart from paying attention to attitudes, the authors also wanted to include different utterance forms in their analysis. They distinguished between utterances consisting of a key phrase (*I suppose*), utterances without a key phrase (*It's a respectful gesture*), and utterances with both a key phrase and a part without a key phrase (*I suppose; it's a respectful gesture*). They expected that key phrases were more likely to convey sarcasm, and were therefore interested in the prosody used in the different forms. The cues under investigation were: pitch mean, standard deviation, and range, amplitude mean, amplitude range, speech rate in terms of syllables per second, harmonics-to-noise ratio (HNR), and one-third octave spectral values. Cheang and Pell (2008) found that a lower mean pitch distinguished sarcasm from all other attitudes. Sarcasm was different from sincerity due to reductions in the HNR and smaller pitch standard deviations. Furthermore, sarcasm also “had a more restricted pitch range than sincerity” (p. 372), however, this was only the case in keyphrases. Something that also only occurred in keyphrases was a decrease in syllables per second when sarcasm was compared to humour and sincerity. Lastly, a greater amplitude of /i/ vowels was found in sarcasm tokens relative to that of the other token types.

Bryant (2010) also defines sarcasm as something negative, namely ironic criticism. He looked into pitch mean, and pitch standard deviation, amplitude mean, and amplitude standard deviation, and finally mean syllable duration. He extracted 25 ironic utterances from 11 conversations in a corpus of spontaneous speech recorded at the University of California. The ironic utterances were compared to baseline utterances. The baseline utterances consisted of utterances immediately preceding the ironic utterances. Moreover, baseline utterances were compared to pre-baseline utterances. Bryant (2010) found that ironic utterances were

Met opmerkingen [AC12]: Check the use of the definite article throughout the thesis.

generally pronounced slower. There were no significant results found for pitch. However, there was more change in pitch when ironic and baseline utterances were compared, than when baseline and utterances that were uttered just before the baseline were compared. These changes did not always go in the same direction, i.e. sometimes pitch mean was higher, and sometimes pitch mean was lower.

Met opmerkingen [AC13]: ??

1.3 Similarities and differences

What becomes apparent from these results, is that there is no consensus on what prosodic parameters signal sarcasm yet. Niebuhr (2014) claims that a pattern can be found if language family is taken into account. He states that Germanic languages differ from non-Germanic languages. Germanic languages such as English and German are said to be comparable, since native speakers appear to lower their pitch and narrow their pitch span in sarcastic utterances. On the other hand, Germanic languages differ from, for example, Romance languages, since Romance languages appear to raise their pitch and widen their pitch span. The findings by Cheang and Pell (2008) that the pitch mean is lower, and the pitch range is narrowed in sarcastic utterances in English are indeed in line with what Niebuhr (2014) found for the German language. Moreover, in accordance with the 'language family' hypothesis, the findings are not in agreement with what Anolli et al. (2002) and Loevenbruck et al. (2013) found in respectively the Italian and the French language, since they found that pitch mean is higher, and pitch range is generally wider.

Met opmerkingen [AC14]: → the reviews in sections 1.1 and 1.2

Met opmerkingen [AC15]: Leave out the comma

Met opmerkingen [AC16]: → language family

However, the literature indicates that there are also differences within language families. For example, a finding with regard to English that is partly in line with research into non-Germanic languages by Anolli et al. (2002) and Loevenbruck et al. (2013) is the finding by Bryant (2010) that mean pitch was sometimes higher in sarcastic utterances. Moreover, also contrary to the 'language family' hypothesis, the findings by Cheang and Pell (2008) and

Met opmerkingen [AC17]: → pitch

Met opmerkingen [AC18]: → language family

Niebuhr (2014), who studied Germanic languages, are congruent with the results of Rao (2003), who looked into a non-Germanic language, namely Mexican Spanish. The differences between languages of the same family seem partly due to differences in the operationalisation of sarcasm, to differences in the analysed materials, and to differences in the elicitation methods. The current study aims to combine the strengths of the different studies, in order to produce solid results that can be reproduced and compared to the outcomes of future studies.

Met opmerkingen [AC19]: → **operationalisation of sarcasm**

Met opmerkingen [AC20]: → **materials**

1.3 The current study

The questions that this study aims to answer are whether native speakers of British English use prosodic parameters such as accentuation, pitch, and duration in the semantically most important word in an utterance to convey sarcasm, and whether the use of these parameters differs between sentence types. Before explaining the reasons for this research focus, it needs to be said that the current study was conducted as part of a larger project on prosodic expression of sarcasm in L1 and L2 English led by Aoju Chen at Utrecht University. It was built on two previous studies, one by Chen and De Jong (2015), and the other one by Smorenburg et al. (2015). In this project, production data has been collected from both Dutch learners of British English, and native speakers of British English. The investigation conducted here is a preliminary analysis of some of the production data that was gathered from the native speakers of British English. The current study proposes which prosodic parameters may be relevant based on earlier research, and analyses some of these parameters in order to determine whether the proposed prosodic parameters can indeed be of influence. In the larger project 17 speakers were tested, but the data from 10 speakers were used here. Due to limitations on time, and the exploratory nature of the current study, only the prosodic parameters that seemed most promising based on earlier research were annotated and analysed here. Therefore pitch minimum, pitch maximum, pitch span, and duration of the

Met opmerkingen [AC21]: → **which prosodic parameters**

Met opmerkingen [AC22]: Not all of these are really goals of the current investigation. Rephrase.

semantically most important word in each utterance have been investigated. The focus of our analysis was placed on the semantically most important word, since prosody in this word proved essential to the expression of sarcasm in the research done by Rao (2003). In addition, accentuation was also analysed. Based on the auditory perception of the current researcher, it was hypothesised that accent placement might play a role in conveying sarcasm. For example, semantically more important words may be accented in sarcastic utterances, but not in sincere utterances. An analysis was therefore performed on the presence of accentuation on the semantically most important word in both sarcastic and sincere utterances.

Met opmerkingen [AC23]: → The focus of our analysis

This study contributes to the field by extending the research done on American English to British English. Moreover, different sentence types, namely simple declaratives, wh-exclamations, and sentences with negative question tags, were included here, because research done by Cheang and Pell (2008) shows that different outcomes may arise due to the use of different sentence types. Also, Attardo et al. (2003) found that context matters, and different sentence types may be used in different contexts. Finally, sarcasm is defined here as the bantering type of sarcasm, and can be used to convey both a positive message and a negative message.

Met opmerkingen [AC24]: → An American English

Met opmerkingen [AC25]: Rephrase

Met opmerkingen [AC26]: → the bantering type of sarcasm

2. METHOD

2.1 Participants

Ten native speakers of British English, eight women and two men, were analysed in the current study. They were all students at the University of Leeds, and between 18 and 23 years old (mean age = 20.4, SD = 1.52). Participants were paid for their participation.

2.2 Experimental stimuli

The materials used were the same as the materials used by Smorenburg, Rodd, and Chen (2015) in their study of the prosodic production of sarcasm in English by Dutch learners of English. Some of the test items were adapted from previous studies by Ackerman (1983), Capelli et al. (1990), Cheang and Pell (2008), Chen and De Jong (2015), and Kreuz and Glucksberg (1989). Participants produced the same 48 sentences that were produced by the participants in the study of Smorenburg et al. (2015) (Appendix). However, two trials were conducted here. First, after a practice test consisting of six sentences that were to be pronounced sarcastically, participants were asked to pronounce all sentences in a sarcastic manner. After a break, participants were asked to pronounce the sentences in a sincere manner. Each participant therefore produced 96 utterances during the real trials.

The 48 sentences in each trial were subdivided into three sentence type categories. Sixteen sentences were simple declarative sentences (*She's a healthy lady.*), sixteen sentences contained wh-exclamations (*What a respectful gesture!*), and sixteen sentences included negative question tags (*You're sister's sweet, isn't she?*). The different sentence types were randomly distributed over the test items in both the sarcastic trial and the sincere trial. Special care was taken to ensure maximum comparability in length and syntactic complexity within the different groups of sentence types. Apart from this, three native speakers of British English that were not involved in this study in any other way commented on the possibility of responses being either sarcastic or sincere, in order to ensure acceptability of the responses.

2.3 Task

In order to create a situation in which a sarcastic remark could be appropriate, telephone conversations with a 'friend' were simulated on the sarcastic trials. The 'friend' started the conversation with a remark. The remarks were pre-recorded at a sampling frequency of 44.1 kHz (16 bits accuracy) in a sound-attenuated booth at the Linguistics Lab of

the Utrecht Institute of Linguistics. A male native speaker of British English recorded the remarks after having familiarised himself with the remark-response sequences. He was instructed to speak with a slightly mocking tone, and to sound as if he was expecting a response from his 'friend'. After hearing the remark, participants responded to its contents. The participants were shown a transcription of the remark, the response the participants had to give, and the way in which they had to answer (sarcastic) on a computer screen using Microsoft PowerPoint. In some cases some additional information about the situation was provided in brackets, again in order to make the situation more natural (see Figure 1).

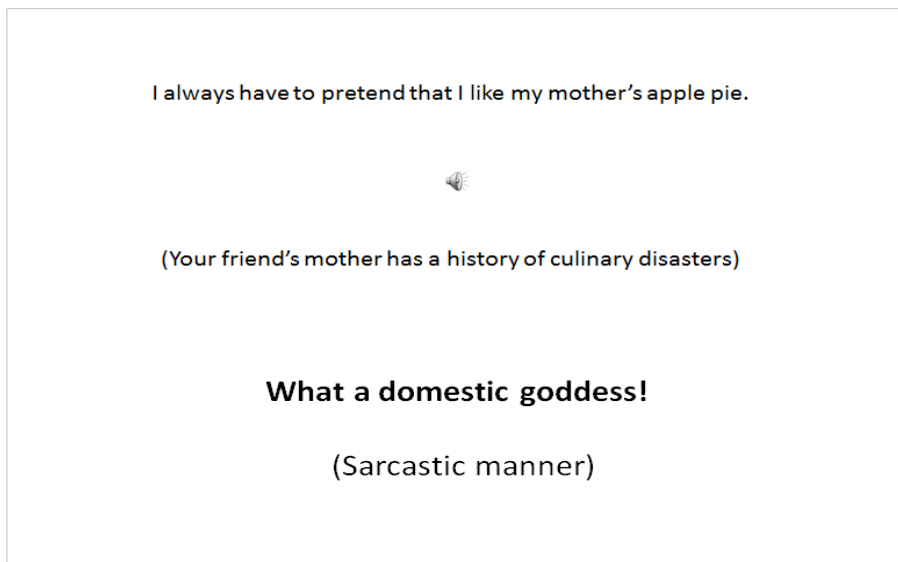


Figure 1. Example of a slide that was presented to the participants in the sarcastic trial.

The context provided was purposefully limited, in order to encourage the participants to use prosody to convey sarcasm. If more context would have been provided, the participants might have felt that the context was enough to signal sarcasm. The pre-recorded remark by the 'friend' played when the participants clicked on a sound icon. They were allowed to listen to it three times. However, the participants produced the responses nearly always after listening to the remarks only once. In case of the sincere utterances, the participants were provided with

Met opmerkingen [AC27]: The use of the definite particle is problematic in the thesis. You often omitted the definite particle. When you refer to something or someone again, you should use the definite article. 'The participants' referred to on those who participated in 'your' study; whereas 'participants' is a generic term and can refer to anyone who participates in something.

Met opmerkingen [AC28]: → The participants produced the responses nearly always

Met opmerkingen [AC29]: → listening to the remark

the response they had to give, and the way in which they had to answer (sincere). During both types trials ('sarcastic' and 'sincere' trials), the participants were allowed to improve their response. In the analysis, the final response on each trial was included.

Met opmerkingen [AC30]: Both types trials
Sarcastic and sincere trials

2.4 Procedure

All participants were tested individually. Recordings were made in a sound-attenuated booth at the labs of Leeds University with a ZOOM 1 digital recorder. Two annotators, of which one was the author, annotated the data by using Praat (Boersma, 2002). One researcher annotated the utterances of seven speakers ($n = 672$), and the other annotated the utterances of five speakers ($n = 480$). Two speakers that were annotated by the first researcher were also annotated by the second researcher, in order to determine inter-rater reliability ($n = 192$). The number of annotated trials that were used in the final analysis was 960 ($N=10$).

2.4.1 Identifying the semantically most important words

Only the semantically most important word of each sentence was annotated and consequently analysed. The researchers jointly decided what the semantically most important words were. For example, in the wh-exclamation *What an amazing result* it was decided that *amazing* is the semantically most important word, since it explains what kind of result there was, and it denotes whether the sentence is semantically positive or negative. In the sentence *They were gracious guests, weren't they, gracious* was marked as the semantically most important word, since it was considered most important to know what kind of guests there were. Moreover, it again shows whether the sentence is semantically negative or positive. Also, in the simple declarative *I'm having a great time*, it was decided that *great* is the semantically most important word, since it again makes clear whether this sentence is semantically positive or negative. A list of the chosen words placed in their original contexts,

and the sentences to which these sentences were a reply in the sarcastic trial, can be found in the Appendix.

2.4.2 Accent placement

After having identified the semantically most important word, it was decided whether the words under investigation were accented or not. To be clear, accentuation is not the same as word stress, but it refers to words that are accented within a sentence. These sentence accents can occur on more than one word within an utterance (Gussenhoven et al., 1999). A very clear example is the accent on the word *carrots* in the sentence *Rabbits like carrots* that is uttered in response to the question *What do rabbits like to eat*.

Auditory perception and visual information were combined to determine whether a word was accented or not using Praat (Boersma, 2002). These pitch contours were interpreted following Transcription of Dutch intonation (ToDI), which was developed by Gussenhoven et al. (1999), and which is closely related to Tone and Break Indices (ToBI). As the developers of ToDI point out, ToDI can also be applied to other West Germanic languages than Dutch (Gussenhoven et al., 1999). If the visual information differed significantly from what the annotator expected based on auditory perception, the second annotator was consulted, and a joint decision was made.

An accented word can be recognised by a clear change in pitch within the word. This change can be realised by using different types of pitch accents (Gussenhoven et al., 1999). Examples of pitch accents in ToDI are H*L, L*, and L*HL. Pitch contours can have the form of a rise, a fall, a combination of these, or none of these, which would result in a level tone. In Figure 2, an example of the word *help* is shown. The contour is quite flat, and the word does not sound prominent either. It was consequently decided that the word *help* is not accented in this utterance. This lack of accentuation is indicated by the *x* in the second tier.

2.4.3 Phonetic annotation

First, pitch settings were adjusted to every speaker, so that there were at least 100 hertz between the highest pitch setting and the highest pitch occurrence in the utterances, and 40 hertz between the lowest pitch setting and the lowest pitch occurrence. Duration of the semantically most important word was annotated in the third tier. Spectrograms, formants, and waveforms, together with auditory perception were used to determine the onset and the end of a word. The annotation of the word *help* can be seen in Figure 2. The onset of the word can be found without much difficulty, due to a change in formants, and due to the starting activity in the waveform. Moreover, a change can be seen in some spectrograms. The ending of the word is clearly marked by a final outburst of air for the plosive *p*. This outburst can be seen in the waveform. Again, there is also a change in the spectrograms.

Pitch maximum (H) and minimum (L) of the semantically most important word were annotated in the fourth tier. These were automatically determined in Praat (Boersma, 2002). If tracking errors occurred in the pitch contour, pitch minimum and maximum were not annotated. Pitch span was obtained by subtracting pitch minimum from pitch maximum.

Met opmerkingen [AC31]: What do you mean? Tracking errors in the pitch contour?

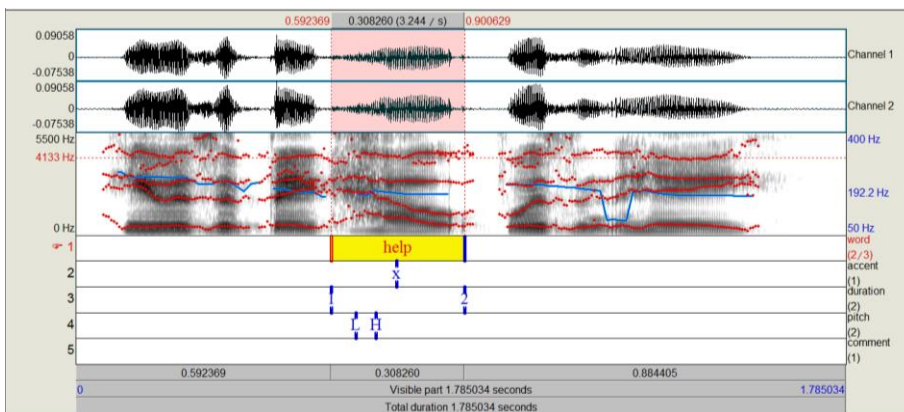


Figure 2. Spectrogram and waveform of the sentence *He was a big help, wasn't he?*. Boundary 1 indicates the onset of the semantically most important word *help*, boundary 2 indicates the end of the word *help*. L marks minimum pitch, and H marks maximum pitch. The x indicates that *help* was not accented.

2.4.4 Interrater agreement

To determine inter-rater reliability, the intraclass-correlation coefficient was computed. Based on the annotation of two speakers ($n = 192$), a high degree of inter-rater agreement was found between the two raters concerning accentuation. A two-way mixed model was used, since the same two raters rated the speakers. The average measures ICC was .850 with a 95% confidence interval from .801 to .887 ($F(191) = 6.702, p < .001$). A very high degree of agreement was found for duration with an ICC of .993 with a 95% confidence interval from .991 to .995 ($F(191) = 142.451, p < .001$). Sufficient agreement was also found for pitch range with an ICC of .845 with a 95% confidence interval from .678 to .912 ($F(181) = 8.224, p < .001$).

3. ANALYSIS AND RESULTS

3.1 Perception validation

Since speakers can differ in their ability in prosodic expression of sarcasm, a perception validation task was performed to check whether the speakers in the production experiment sounded sarcastic to others as intended. A different group of nine native speakers of British English that were recruited from Southampton (4 females, 5 males, mean age = 20.3, $SD = 0.7$) rated how sarcastic each utterance sounded on a five point scale (1 = not sarcastic, 5 = very sarcastic). On average, the sarcastic utterances scored 3.04 (out of 5), which indicates that the utterances sounded sufficiently sarcastic to native speakers of British English.

3.2 Missing cases

Due to noise in the recording, not all utterances could be included in the analysis. The number of missing cases per variable were 0.3% (n = 957) for accentuation, 4.1% (n = 921) for pitch related measures, and 0.3% (n = 957) for accentuation. The number of missing cases per speaker never exceeded 9.4% of the total number of their utterances. Moreover, there were only small differences in the number of missing cases between the different sentence types, with 5% (n = 304) for simple declaratives, 3.4% (n = 309) for wh-exclamations, and 3.8% (n = 308) for sentences with a negative question tag.

3.3 Accent placement

A binary logistic regression was performed using SPSS at a significance level of 0.05, with type of message (2 levels: sarcastic & sincere) and sentence type (3 levels: declarative, tag & wh) as fixed factors, and accentuation as the outcome variable. The sarcastic type of message was the reference category for type of message, and the simple declarative was the reference category for sentence type. Type of message did not significantly improve the model with no predictor variables. Whether an utterance was sarcastic or sincere therefore did not predict use of accentuation on the semantically most important word. However, the fit of the model was significantly improved after 'sentence type' was added to the model ($\chi^2(2) = 16.94$, $p < .01$). The Wald statistics revealed that sentence type significantly predicted whether the semantically most important word in the utterance was accented or not (Wald = 16.85, $df = 2$, $p < .001$). The odds-ratios (Exp(B) in the SPSS output) show that the odds of a semantically important word being accented were 48.9% lower in wh-utterances ($p < .001$) and 39.7% lower in tag-utterances ($p < .01$), than in declarative utterances (Table 1). After turning tag-utterances into the reference category, it was found that there was no significant difference in accentuation between tag-utterances, and wh-utterances ($p = .25$).

	B(SE)	Lower	Odds Ratio	Upper
Included				
Constant	-.170 (.110)		.844	
SentenceType Wh-utterance	-.653 (.166)	.376	.521	.721
SentenceType Tag-utterance	-.458 (.161)	.461	.633	.868

Note: $R^2 = .018$ (Cox & Snell), $.024$ (Nagelkerke).

Table 1. Output binary logistic regression with ‘declarative’ as reference category.

3.4 Pitch-related measures

In order to measure the variables related to pitch, mixed effect modelling was performed by using R. The factors type of message and sentence type were used as fixed factors. Pitch span, pitch minimum, and pitch maximum of the semantically most important word functioned as dependent variables in three separate models. In mixed effect modelling, random factors such as speaker and sentence are factored into the analysis. The data contained two hierarchical levels, including speaker (level 1), and sentence (level 2).

It turned out that pitch range did not significantly vary between types of messages, nor between sentence types ($p = .42$). However, both pitch minimum and pitch maximum varied. For pitch minimum, adding the fixed factor ‘type of message’ to the model with only the two random factors ‘speaker’ and ‘sentence’ improved the model significantly ($\chi^2(1) = 62.406$, $p < .001$). The model further improved after adding ‘sentence type’ to it ($\chi^2(2) = 18.793$, $p < .001$). However, there is no evidence of an interaction effect between ‘type of message’ and ‘sentence type’ ($p = .07$). As can be seen in Figure 3, the mean pitch minimum of the semantically most important words in the sarcastic message type (156.7 Hz, $SD = 47.7$) was 21.9 Hz lower than the minimum in the sincere type (178.6 Hz, $SD = 65.9$).

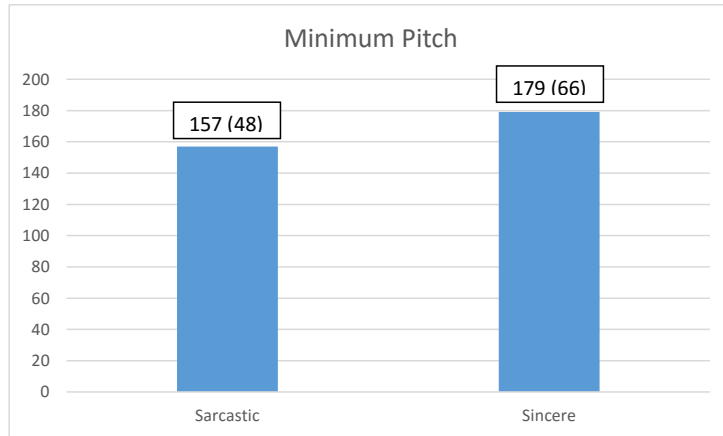


Figure 3. Mean pitch minimum (on the y-axis and mentioned above the bars) and standard deviation (between brackets above the bars) for the sarcastic and sincere types of messages.

For pitch maximum, adding ‘type of message’ to the model also proved significant ($\chi^2(1) = 57.287, p < .001$). ‘Sentence type’ further improved the model ($\chi^2(2) = 27.203, p < .001$). Again, no interaction-effect was found ($p = 0.12$). As can be seen in Figure 4, the mean pitch maximum was 24.7 Hz lower in the semantically most important word in the sarcastic type (214.5 Hz, SD = 67.9) compared to the average in the sincere type (239.2 Hz, SD = 75.7).

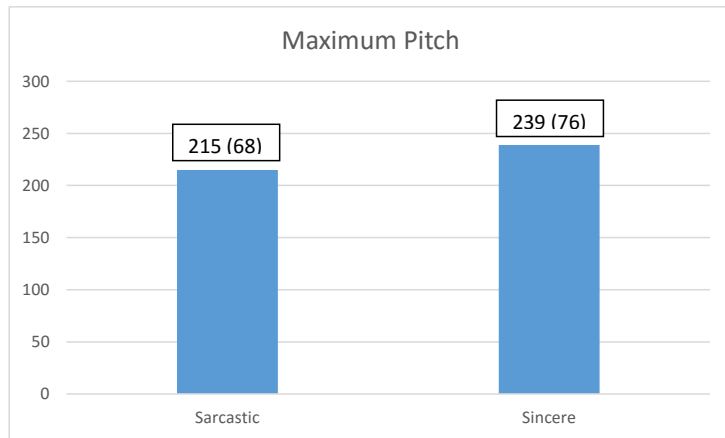


Figure 4. Mean pitch maximum (on the y-axis and mentioned above the bars), and standard deviation (between brackets above the bars) for the sarcastic and sincere types of messages.

Met opmerkingen [AC32]: Specify what is on the y-axis, and what the numbers in brackets are.

3.5 Duration

Mixed-effect modelling was also used to analyse duration. In this case the duration (ms) of the semantically most important word was the dependent variable. It turned out that duration also varies between types of messages, and sentence types. Adding ‘type of message’ to the model improved the model significantly ($\chi^2(1) = 69.773, p < .001$). Adding the fixed factor ‘sentence type’ to the model further improved the explanatory power ($\chi^2(2) = 11.764, p < .05$). No interaction-effect was found ($p = 0.14$). The mean duration of the semantically most important words was 50 ms longer (SD = 5.8) in the sarcastic type of message (Figure 5).

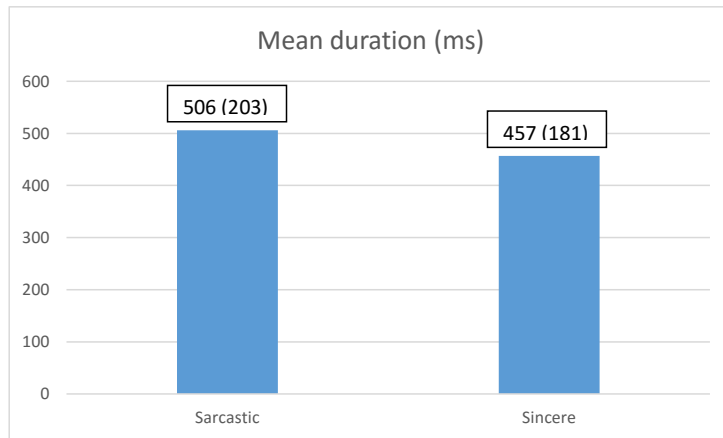


Figure 5. Mean duration (ms) and standard deviation for the sarcastic and sincere types of messages.

4. DISCUSSION AND CONCLUSIONS

Our results have shown that the semantically most important word is important in conveying sarcasm. This word tends to be lengthened, and pronounced with a lower pitch in sarcastic utterances. Pitch span and accentuation do not seem to play a role when only the semantically most important word is considered. Furthermore, simple declaratives, wh-exclamations, and sentences with a negative question tag do not seem to influence the relationship between the prosodic cues under investigation and an utterance being sarcastic or sincere.

4.1 Cross-linguistic differences

A lowered pitch in sarcastic utterances when compared to sincere utterances was also found by Attardo et al. (2003) for American English, and by Niebuhr (2014) for German. A lowered pitch therefore seems to be a prosodic cue people use to signal sarcasm in Germanic languages. The finding that the semantically most important words are lengthened in the sarcastic type of message is in agreement with the results of Bryant (2010), Cheang and Pell (2008), and Niebuhr (2014), who all investigated Germanic languages. However, there are

also similarities with non-Germanic languages, since lowered pitch also occurs in Mexican Spanish (Rao, 2008) and lengthening is also used to signal sarcasm in Italian (Anolli et al., 2002) and Mexican Spanish (Rao, 2008). This shows that the distinction between Germanic and non-Germanic languages regarding pitch and lengthening may not be very clear-cut.

Contrary to the findings presented here, apart from a lowered pitch span, Niebuhr (2014) also found a narrowed pitch span in sarcastic utterances. In other words, the mean pitch maximum was systematically lowered to a larger extent than the mean pitch minimum in Niebuhr's (2014) study. There could be several explanations for this difference in findings. First, it could be that participants in the current study used a narrowed pitch span not only in the sarcastic type of message but also in the sincere type of message due to repetitiveness; participants in the current study had to pronounce more sentences than the participants in Niebuhr's (2014) study, and also had to pronounce the sincere sentences last. Second, the difference in result could also be due to the difference in pitch span speakers usually use. On average, native speakers of British English tend to use a wider pitch span than for example native speakers of German (Mennen, Schaeffler & Docherty, 2007). Brits may therefore be less inclined to narrow their pitch span than Germans in sarcastic utterances. A third possibility is that pitch span was narrowed in the utterances produced in the current study as well, but not in the semantically most important word. Unfortunately, only the semantically most important word was analysed here. Finally, results from Rao's (2013) investigation into sarcasm in Mexican Spanish showed there was a difference in pitch span between men and women. Women did not significantly narrow their pitch span, but men did. Although only two men and three women were included in his study, and the results therefore should be interpreted with care, this difference between genders may have occurred in this study as well, since eight out of the ten participants that were included were women.

Met opmerkingen [AC33]: Are you discussing the finding that pitch range is not used to signal sarcasm in British English? The formulation of this sentence is not clear. Could you rephrase your idea? Maybe using two sentences.

I don't remember whether I have commented on this before and you have been using the terms pitch range and pitch span interchangeably throughout the thesis. They can mean the same thing and I think they do in your thesis. Then it would be more appropriate to just use one term and stick to it. Could you fix this?

Met opmerkingen [AC35]: This point is not clearly explained.

Met opmerkingen [AC34]: Add in sarcastic utterances when German

4.2 Suggestions for future research

In order to avoid possible negative consequences of repetitiveness in the trials, future studies should make sure they present half of the participants with a reversed trial order, and possibly spread multiple smaller trials over different points in time. Moreover, since there may be a difference between men and women with regard to prosody in sarcastic utterances, it would be wise to include a sufficient number of both men and women in the experiment. The larger project of which this research was a part included a more balanced division between sexes, therefore the researchers in the larger investigation may be able to distinguish between the two groups. Rao (2013) suggests that the difference between men and women might be due to women expressing sarcasm through other means than prosody, for example with body language and facial expressions. Another explanation that would be possible is that women prefer different prosodic variables, such as lowering of pitch. Research into the use of body language and facial expressions would help to remove some of these uncertainties.

Differences in outcomes between this study and other studies could also have arisen due to a difference in focus. Here, the semantically most important word was central to the investigation, in other studies the whole utterance was under investigation. In order to resolve this lack in agreement, future research should include analyses on both the word level, and the sentence level, such as Rao (2008) did. This way, it can also be concluded whether the differences between sarcastic and sincere utterances reside in the whole utterance or in a specific word within the utterance. Furthermore, words with a different role than being the semantically most important one might be interesting to look at, in order to shed light on the influence of different words in an utterance. The topic of an utterance might be important for example.

Besides including multiple levels of analysis, future studies may want to include more variables than the ones that were included here. Variables that might be worth looking at are

mean pitch, intensity, and the use of pauses. The lowered pitch minimum and maximum found here already hint towards a lower mean pitch. With regard to intensity, Niebuhr (2014) and Anolli et al. (2002) had conflicting results. Rao (2013) also investigated this variable, and found a difference between men and women for this variable. More research into (British) English, and the difference between genders could complement these findings on intensity. The third variable, the use of pauses, seemed to be used by some of the speakers in the current research. Sometimes speakers seemed to use a pause before the semantically most important word to indicate their insincerity. Anolli et al. (2002) already examined the use of pausing, and found the opposite, namely shorter pauses in sarcastic utterances. Future research can further explore the use of pauses.

The fact that uttering a sentence in a sincere or in a sarcastic manner had no influence on the accentuation of the semantically most important words does not mean that it should not be included in future research. Although accentuation did not seem to play a role in the semantically most important word, it may prove an informative variable for other words. The same argument goes for the lack of interaction between type of message and sentence type in the analyses of accentuation, pitch minimum, pitch maximum, and duration. This absence of interaction does not necessarily exclude sentence type as a possible variable effecting the prosody of sarcastic utterances. Further research on the influence of different sentence types on the prosody used for conveying sarcasm can show whether other types do have an influence. Cheang and Pell (2008) already found that very short keyphrases have a more narrow pitch span in the sarcastic type than in the sincere type of message, so it would definitely be interesting to further explore this.

The findings that were presented here can be useful to extend the work done by Smorenburg, Rodd, and Chen (2015). As was mentioned before, these researchers investigated how sarcastic L2 Dutch learners of English sound to native speakers of English.

It would be interesting to annotate and analyse these speakers, in order to see in which prosodic cues they differ from native speakers. Future training sessions on prosody used for conveying sarcasm in English **can** then benefit from these findings by targeting the problematic variables.

In conclusion, the current study adds to the existing research by investigating prosodic cues used for expressing sarcasm in British English, a variety of English that has not been investigated in earlier work, in particular, by including different sentence types, by focusing on the semantically most important word, and by investigating accentuation as a possible cue. Moreover, the current research field can benefit from the many interesting possibilities for future research that have arisen from the current results.

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Met opmerkingen [AC36]: You often use the subjunctive mood when presenting ideas and suggestions for future research. This is not appropriate in academic English. Please remove all instances of subjective mood, unless you discuss a hypothetical and very unlikely scenario. If you don't want to sound too certain about your ideas, then use 'can, may, might' instead of 'should, will'.

Met opmerkingen [AC37]: And Anqi's help with binomial logistic regression?

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APPENDIX

My aunt smokes a pack a day.	She's a healthy lady.
I went for a run and I came back dripping wet.	It's a beautiful day outside.
I haven't seen a waiter yet since we were shown a table half an hour ago.	The service's really good here.
My plane was an hour late.	Ryanair's always reliable .
I bought a new game and I'd thought it would be too hard, but I learned in five minutes.	You're a smart gamer.
Tomorrow's class is going to be about plants.	That'll be great fun .
I heard Peter, that skinny kid with glasses, is gonna beat you up after school.	That's very scary .
My brother was accepted to the police academy.	Your parents must be proud .
My mother-in-law always smirks and snorts loudly when I misspeak	What a respectful gesture!
The arrogant front-runner finished dead last.	What an amazing result!
Today, playing football, I slipped and fell and the ball bounced off my head.	What a brilliant header!
My piano performance has been cancelled.	What a terrible shame!
My sister phoned just now and told me that her job interview went very badly.	What a surprising outcome!
My father had made a five course Christmas dinner; the next day we were all sick with food poisoning.	What an accomplished chef!
I failed my essay on parliamentary process. I guess I just don't know much about politics.	What a shocking announcement!
My grandma bought me a yellow sweater for my birthday.	What a lovely colour!
I traded my cricket bat for a toy truck, but now I find out it's broken.	You got a bargain , didn't you?
My brother wanted to help me move and he dropped my grandfather's clock.	He was a big help , wasn't he?
I put my homework off for two hours, but then it only took ten minutes.	That took a lot of effort , didn't it?

I think I didn't even get one right on that test.	You did well this time, didn't you?
My little sister kicked me in the shins.	Your sister's sweet , isn't she?
My first football training coach made us run 5 miles; some of the guys threw up.	You lot are in shape , aren't you?
I went fishing but didn't catch anything.	They're biting this season, aren't they?
I've joined a running club and go for a run every evening.	You're a devoted athlete, aren't you?
I got one of the lowest grades in the maths test.	That's never happened before.
I heard that the camping trip has been cancelled.	You must be really disappointed .
My uncle keeps telling that stupid joke over and over again.	That joke's hilarous .
My baby sister fell asleep on her dinner plate.	That sounds comfortable .
My dance partner keeps stepping on my toes.	She's a graceful dance partner.
Only three people showed up to my housemate's party last night.	That sounds wild .
How's being stuck at home after your accident?	I'm having a great time.
Did you see my art coursework?	You could be a professional artist.
My cat left me a present on the doormat.	What a nice surprise !
I ordered soup for lunch and found a hair in it.	What a tasty lunch!
I can touch my nose with my elbow.	What a useful skill!
My sister's boyfriend ran out of the haunted house screaming like a little girl.	What a brave man!
I got a lift from Mary. She kept indicating the wrong way at roundabouts.	What a great driver!
People left the cinema halfway through the film.	What a gripping film!
My brother's friend came to our house just because he wanted to play our new game.	What a considerate friend!
I almost fell asleep in class today.	What an engaging lecture!
I warned Mark about washing his whites and coloureds together.	He takes advice well , doesn't he?
The weather forecast didn't say it would rain today.	The weather forecast is always right , isn't it?
My nephew showed his brand new Iphone to everyone at the party.	He's modest , isn't he?
I had a busy morning, walking the dog and doing the dishes	You've worked hard , haven't you?
Kim turned up at my party even though she wasn't invited.	You were pleased to see her, weren't you?
My father helped me paint my flat; there's paint splatters everywhere.	He's done a beautiful job, hasn't he?
I had to serve all my aunts and uncles drinks all afternoon.	They were gracious guests, weren't they?
I caught my cat eating the fish from next door's pond.	You're a nice neighbour, aren't you?