

ŁUKASZ STOLARSKI
lukasz.stolarski@ujk.edu.pl
Jan Kochanowski University

RENDERING OF GENDER WHEN READING FICTION ALOUD

The height of the fundamental frequency (F0) is frequently cited as the major acoustic feature that distinguishes the female voice from the male voice. Women tend to have a significantly higher mean F0 than men. Some studies have indicated that the variability of the fundamental frequency also differs between the two genders and women's voices may involve higher prosodic explicitness than men's voices. This study investigates the way in which these features are utilised in rendering the voice of male and female characters in the reading aloud of fiction. To achieve this aim, a representative sample of dialogues selected from audiobooks was analysed acoustically. The results reveal that the reader's F0 tends to slightly increase in fragments with female characters, but other predictions have not been confirmed. There is no decrease of F0 in dialogues with male characters and, in general, the reader's variability of F0 seems not to be influenced by the character's gender.

1. Background

The topic of differences in male and female language use has received a significant amount of attention in linguistic publications. Chosen acoustic characteristics of voice are among the aspects discussed. For instance, early studies on voice acoustics data reported differences in vowels produced by men, women and children (Chiba and Kajiyama 1941; Peterson and Barney 1952; Potter and Steinberg 1950). Later publications have explored dissimilarity in terms of such features as breathiness (Henton and Bladon 1985; Holmberg, Hillman, and Perkell 1988; Klatt 1987; Klatt and Klatt 1990; Mendoza, Valencia, Muñoz, and Trujillo 1996), loudness (Childers and Wu 1991; Henton 1995), speaking rate (Fitzsimons, Sheahan and Staunton 2001; Schötz 2006), and timbre, defined as a "multidimensional waste-basket category for everything that cannot be labelled pitch or loudness" (McAdams and Bregman 1979: 34).

Of particular interest to the present study are two other acoustic features which are encountered in the debate: the mean voice pitch and the variability of the voice pitch. The first is probably the major acoustic feature used in differentiating women's voices from men's and it has been widely discussed (Abdulla and Kasabov 2001; Carlson 1981; Childers and Wu 1991; Elyan 1978; Fitzsimons et al. 2001; Gelfer and Mikos 2005; Henton 1989, 1995; Hollien and Malcik 1967; Hu, Wu and Nucci 2012; Jung, Schwarzbacher, Humphreys and Lawlor 2002; Kent and Read 1992; Latinus and Taylor 2012; Machado, Duarte, Teles, Reis and Rebelo 2012; Ohara 2003; Parris and Carey 1996; Whiteside 1996; Wu and Childers 1991; Yuasa 2008). Men tend to have a distinctly lower F0 than women (Linke 1973 suggests that the difference is about one octave) and this results from the fact that, on average, the male larynx is 1.7 times larger than the female larynx (Childers and Wu 1991; Jung et al. 2002; Titze 1989). Because this acoustic feature plays such a major role in gender identification, it has been used in various voice recognition systems (Abdulla and Kasabov 2001; Hu et al. 2012; Jung et al. 2002; Parris and Carey 1996) However, it must be emphasised that there is much variability among individual speakers. Titze (1989) proposes that the range of F0 for men is from 100 Hz to 200 Hz, whereas for women it ranges from 120 Hz to 350 Hz. The results of the analysis described in Hollien and Shipp (1972) for men are within such predicted limits (from 112 Hz to 146 Hz), and so are the results for women reported in Stoicheff (1981) (from 170 Hz to 275 Hz). It is also worth adding that some publications suggest that the fundamental frequency may be not sufficient by itself to distinguish the gender of the speaker (Childers and Wu 1991; Klatt and Klatt 1990).

The role of the variability of the voice pitch in gender identification is less definite because there are different options for measuring this variable. In a number of studies, the voice pitch variability has been defined as the range of the fundamental frequency on the linear Hz scale, in which case the range of F0 for women has been observed to be greater than the range of F0 for men (Elyan 1978; Fant 1973; Fitch and Holbrook 1970; Fitzsimons et al. 2001; Graddol and Swann 1983; Kent and Read 1992; McConnell-Ginet 1983; Peterson and Barney 1952; Waksler 2001; Whiteside 1996; Wu and Childers 1991). Nevertheless, there are at least two problems with drawing meaningful conclusions from such data. For instance, Henton observes that "the ear is known to judge pitch range not by measuring hertz, but by using a logarithmic, on non-linear scale, such as semitones" (1989: 301) and proposes to convert the values measured in Hertz into semitones. The results of her analysis indicate that, on the logarithmic scale, the variability of the female voice pitch is, actually, lower than the variability of the male voice pitch. Such a conclusion is also supported by Fitzsimons et al. (2001) who use methods similar to those applied by Henton (1989). Moreover, it is doubtful whether the pitch range is the best method for measuring pitch variability, regardless of a potential transformation from the linear Hz scale to the logarithmic semitone scale. This statistic provides only two extreme values which are not necessarily representative of a given dataset.

There are ways to partially overcome this problem. One is to narrow down the analysis to the data within three standard deviations (Jassem 1971). However, a much better solution is to measure the standard deviation of the fundamental frequency (SD of F0) instead. This statistic provides information on the most typical distance from the average and is not significantly influenced by outliers, but, again, it is reported in different ways in the literature. When measured in Hz, SD of F0 tends to be larger for women than for men (Chen 1974; Gradol 1986; Johns-Lewis 1986; Pegoraro Krook 1988; Rappaport 1958; Takefuta, Jancosek and Brunt 1972; Xue and Deliyski 2001), but when the same data are converted into semitones, the differences disappear (Traunmüller and Eriksson 1995, 2009). Nevertheless, the possible conclusion that there are no significant dissimilarities in the variability of F0 between the two genders still cannot be confirmed. Firstly, the use of the logarithmic semitone scale focuses on possible auditory impressions that the listener may have and not on what is really happening in both the acoustic and articulatory sense. Secondly, even if the aim is actually to concentrate on the auditory perception of speech, the use of semitones is not necessarily the best option. For example, Hermes and Gestel show that pitch movements in speech intonation are judged neither on a linear (Hz), nor on a logarithmic (semitones) frequency scale. Instead, they are perceived on “a psychoacoustic scale representing the frequency selectivity of the auditory system” which is “intermediary between the other two scales” (1991 p. 97). In other words, Hermes and Gestel claim that judgements are made along the equivalent-rectangular-bandwidth-rate scale, or ERB-rate scale (Glasberg and Moore 1990; Moore and Glasberg 1983; Patterson 1976), which is a newer variety of the Bark scale (Traunmüller 1990; Zwicker and Terhardt 1980).

2. Aims and limitations of the study

The major aim of the study is to establish the effects of the character’s gender on the voice fundamental frequency (F0) and the variability of the voice fundamental frequency (SD of F0) when reading aloud fiction. According to the discussion summarised in the previous section, the mean value of F0 is expected to increase in fragments with female characters and decrease in fragments with male characters. The behaviour of SD of F0 is more difficult to predict, but the initial assumption is that the values of this feature may also be higher for excerpts involving female characters than in excerpts involving male characters.

It must be emphasised that these major aims do not include testing the actual voice characteristics of men and women. Instead, the present study examines only the way in which such aspects are utilised in imitating male and female voices in fiction reading. If any of the assumptions mentioned above are proven, one may claim that the reader is probably aware of the different behaviour of F0 and/or SD of F0 in the speech of the two genders and considers these differences important enough to be communicated to the listener. Nevertheless, such results would not

necessarily confirm the findings summarised in Section 1. Conversely, results indicating no clear patterns or shifts in F0 and/or SD of F0 opposite to that which was predicted would not necessarily deny the findings discussed in Section 1.

Additional aims of the present paper involve examining the possible effects of the reader's gender and dialect. These two supplementary factors may interact with the variable of character's gender and need to be analysed as well.

3. Methods

In order to accomplish the aims of the study, a representative sample of audiobook fragments involving dialogues of female and male characters needed to be collected. For statistical reasons, the size of such a sample had to be no less than 30 for each gender. It was also necessary to control for potential confounding variables such as the readers' gender and dialect. Given all these considerations, the target sample had to include the elements specified below¹.

1. 32 excerpts with male characters (Appendix A)
 1. read by 16 male readers including
 1. 8 speakers of American English
 2. 8 speakers of British English
 2. read by 16 female readers including
 1. 8 speakers of American English
 2. 8 speakers of British English
2. 32 excerpts with female characters (Appendix B)
 1. read by 16 male readers including
 1. 8 speakers of American English
 2. 8 speakers of British English
 2. read by 16 female readers including
 1. 8 speakers of American English
 2. 8 speakers of British English

The subsequent stages of gathering the data are similar to the ones applied in Stolarski (2015). A collection of works by Charles Dickens was downloaded from the official web page of Project Gutenberg (www.gutenberg.org). Next, the corresponding audiobooks were searched at "librivox.org". Recordings for as many as 28 of Dickens's novels were found. Some of them were read by more than one reader making the ultimate number of audiobook versions which could be analysed 53. All of the recordings were downloaded as mp3 files with a bit rate of 64 or 128 kbit/s.

¹ Only two of the possible readers' dialects have been used as only American English and British English are encountered frequently in the collection of audiobooks from which the excerpts were taken

The corpus containing the 28 works by Dickens includes over 4.5 million tokens and 40 thousand types. At first glance this would seem large enough for the current purposes, but there are additional restrictions which make the number of possible choices much smaller. Firstly, there are the criteria for the samples concerning the readers' characteristics described above. Secondly, the statistical methods applied in this work include tests for paired data (see the discussion below). As a consequence, it was important not to use the same reader in one sample more than once. Since the present study focuses primarily on two data sets, one with fragments involving male characters (Appendix A) and another one with fragments involving female characters (Appendix B), a given audiobook version could only be used twice, although the same fragment could be analysed more than once if more than one version of an audiobook was found. These limitations substantially reduced the number of acceptable examples. Nevertheless, there was only one case in which a fragment had to be taken from a work by a different author. In Appendix B the last excerpt involving a female character read by a female speaker of British English was taken from an audiobook of "Northanger Abbey" by Jane Austin.

The fragments were searched with the use of *AntConc* (Anthony 2014). It was important that the examples were taken from neutral contexts which were not indicative of additional guidelines for reading the text, such as emotional attitude. As indicated in Stolarski (2015), emotions ascribed to characters may exert strong effects on the reader's pitch. Therefore, most of the extracts follow "neutral" reporting verbs, such as *said*, *responded*, *explained*, *returned*, *answered*, *added*, etc., and no additional information is given on the manner in which they should be read. The reader is, however, fully aware of which character utters each extract. The fragments chosen for analysis are underlined in both appendices. In many cases they constitute a second part of a longer utterance, separated by narratorial comments, which do not suggest any particular emotional attitude, either.

Next, the extracts were found in the corresponding audiobooks and analysed in *Praat* (Boersma and Weenink 2014) in terms of the mean F0 as well as the mean SD of F0 for the whole duration of each fragment. The immediate problem which needed to be dealt with was speaker normalisation. Each reader has a different value of the fundamental frequency and the data obtained in the extracts do not mean much without a particular frame of reference. To overcome this obstacle, the individual results were compared to the values measured in the whole chapters from which the fragments were taken. It is actually the same strategy as that which was used in Stolarski (2015). The values measured in whole chapters are treated as typical values for a given reader making it possible to compare the data obtained in the fragments to these typical values.

It is also possible to control for individual characteristics of the reader's voice by converting the results measured in Hz into percentages. For instance, in example 60 in Appendix B the reader raises her pitch by 10.63 Hz in comparison to the value measured in the corresponding chapter. In percentage terms,

this shift amounts to 5.05%. However, even though in example 45 the reader lowers her fundamental frequency by a very similar value on the linear Hz scale (-10.27 Hz), this time the difference expressed as a percentage is much larger (-9.73%). A shift of 10 Hz may have a different proportional value for different speakers.

In Section 4 the tests are performed with the shifts expressed both in Hz and in percentages. Even though the second alternative seems preferable in terms of normalising the results, performing tests on paired data (see the description of statistical methods below) is already an effective way of controlling for individual voice characteristics and it is predicted that the results will be similar regardless of which of the two units of measurement are used.

In the present study the character's gender is treated as the major categorical explanatory variable and investigating its effects is the primary aim of the paper. The other two factors, the reader's gender and dialect, are included mostly to control for their possible confounding effects. As explained above, the samples were collected in such a way as to contain an equal number of examples for each of the additional independent variables. The response variables are shifts in F_0 , counted as the difference between the values of F_0 measured in extracts and the corresponding whole chapters (columns 11 and 12 in both appendices) and shifts in SD of F_0 , counted as the difference between the values of SD of F_0 measured in extracts and the corresponding whole chapters (columns 15 and 16 in both appendices).

As far as statistical analysis is concerned, the initial intention was to run a three-way ANOVA for both dependent variables. This would have answered not only the major question of whether or not the character's gender affects F_0 and SD of F_0 , but would also have indicated possible interactions between all the three independent variables. Nevertheless, for some of the samples which would be used in ANOVA, normal distribution cannot be assumed. Figure 1 shows histograms as well as the results of the Shapiro-Wilk test conducted on the response variables divided according to the character's gender. It is readily visible that some of the histograms involve outliers (for instance, the third graph at the top) and in other cases they are altogether asymmetric (the first two graphs at the bottom). Analysis of the data sets divided according to two and three factors also reveals problematic cases. For instance, the sample of 16 measurements of F_0 shifts involving female characters read by female readers shows marked deviation from normality, regardless of the unit of measurement. As a result, the first series of tests summarised in Sections 4.1 and 4.2 include either the paired t-test (for data sets which may be compared with parametric methods) or the Wilcoxon signed-rank test (for data sets which require nonparametric statistics). The ANOVA analysis summarised in Section 4.3 serves only to estimate the potential effects of the two additional factors and its results should be treated with caution.

All the statistical tests in this study were performed in *R* 3.0.3 (R Development Core Team 2013).

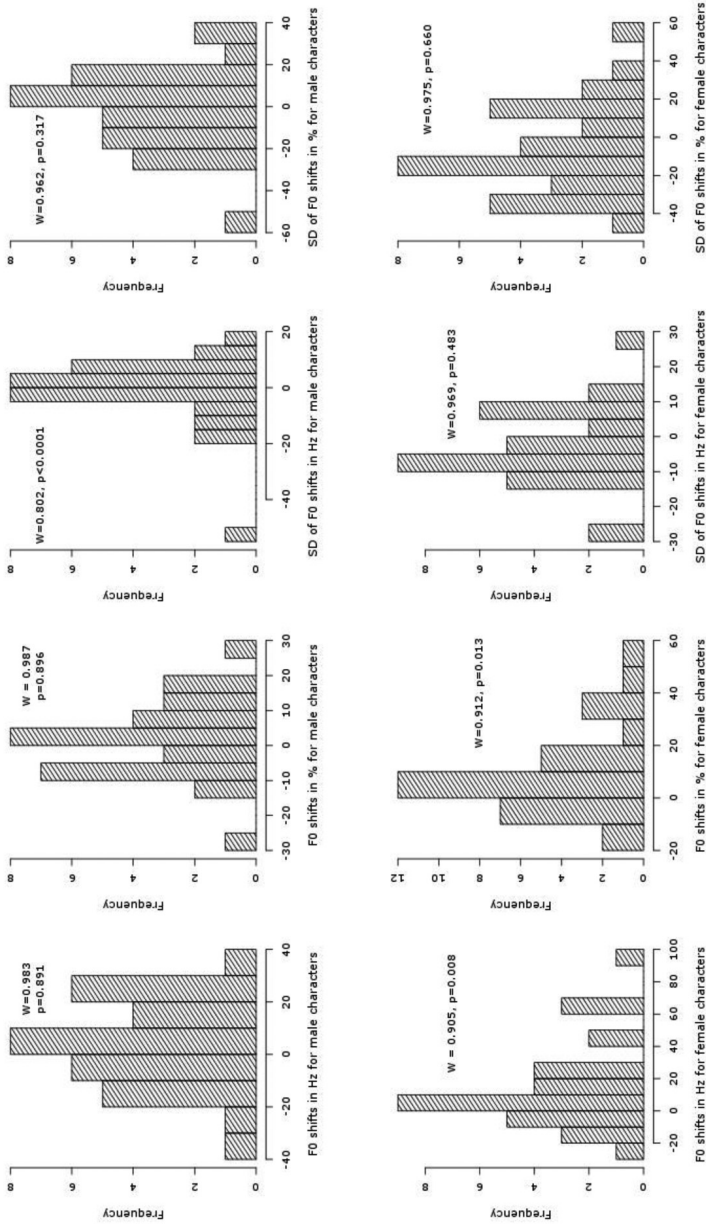


Figure 1. Histograms of all the response variables divided according to character's gender (in cases n = 32).

4. Results

4.1. Effects of the character's gender on F0

Figure 2 illustrates the difference between the shifts of F0 in the data divided according to the character's gender. On the left side, in which the shifts are analysed in Hz, the readers' voices tend to have, on average, a higher F0 for fragments with female characters than with male characters. The difference is, however, not very large. What is probably more interesting is that the shift is positive in both groups. This could suggest that the reader's voice pitch tends to be raised while reading dialogues in general. While the increase is larger for female characters, it seems to exist for male characters as well. Nevertheless, the results of one sample tests do not support such a conclusion. The p-value obtained in the Wilcoxon signed-rank test for the sample of female characters is low (0.0025 for the measurements in Hz, and 0.01 for the shifts measured as proportions), so the higher F0 may be regarded as statistically relevant for this data set. The result of the Student's t-test performed on the sample with male characters indicates, however, that in this case the raised voice pitch should not be interpreted as statistically significant ($p = 0.362$ for the shifts measured in Hz, and $p = 0.368$ for the shifts measured as proportions).

The results of the Wilcoxon signed-rank test for the differences between the F0 level in the sample of male characters versus the sample of female characters are marginally significant. When the differences are measured in Hz, the p-value is 0.0796. This is close to the alpha level of 0.05, but still too large to reliably conclude that the medians of the two samples differ. Moreover, when the same comparison is made for the corresponding data expressed in percentages, the p-value is even larger (0.0974), so there is not enough evidence to confirm the difference.

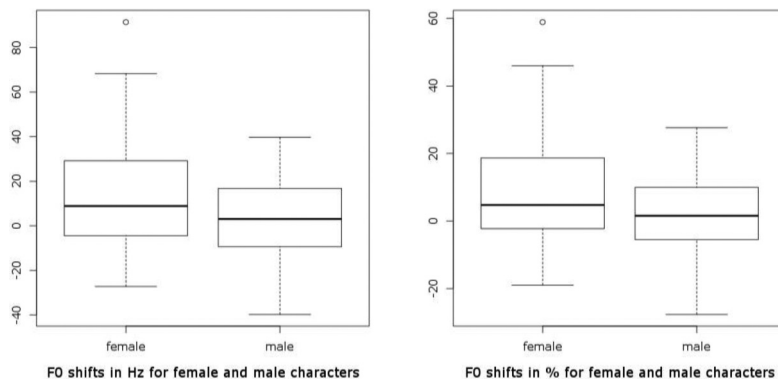


Figure 2. F0 shifts in samples divided according to the character's gender

The boxplots in Figure 2 provide additional insights. Firstly, the two units of measurement used in this study yield almost identical results. The distribution of the data on the left side of Figure 2 is practically the same as on the right side. This conclusion is also consistent with Figure 3, in which SD of F0 in samples with male characters is compared to SD of F0 in samples with female characters. Again, the left side is almost identical to the right side. Secondly, Figure 2 indicates that the data sets involving female characters have outliers with unusually high values. This has already been mentioned while discussing Figure 1 in Section 3, but the issue requires further clarification. The data reveal that in dialogues involving female characters the readers tend to raise their voice pitch by around 8.89 Hz, which constitutes a shift of 4.73% in comparison to their mean F0. These median values are marked as horizontal lines inside the boxes indicating the data within the 25th and the 75th percentile. There are, however, individual examples which involve a much more pronounced raise in pitch. Some of these concern male readers, for instance examples 39 and 47 in Appendix B (68.31 Hz or 46% and 47.79 Hz or 39.16%, respectively), and some concern female readers, as in examples 49 and 51 in Appendix B (63.01 Hz or 35.92% and 91.39 Hz or 58.9%, respectively). These exceptionally high shifts of F0 suggest that some readers try to imitate the female voice pitch in a very explicit way and conveying the information on the character's gender in this manner seems to be a crucial element of their performance. In other cases, which constitute the majority of the examples analysed in this study, communicating the female gender of the character by raising the pitch is not so important. Most of the readers tend to raise F0 to a limited degree, and in some cases there are no essential changes in the fundamental frequency at all.

4.2. Effects of the character's gender on SD of F0

Figure 3 compares the way in which the category of character's gender affects the shifts of SD of F0. It is readily observable that the median value of the dependent variable in samples involving male characters is close to 0. On the left side, in which the measurement unit is Hz, the exact median symbolised by the horizontal line amounts to 0.935, whereas on the right side, which summarises the data measured in percentages, the exact median is 1.58. In both cases, the corresponding one sample tests yield p-values which are much above the alpha level of 0.05. Therefore, no statistically relevant difference from 0 may be confirmed in either case and the conclusion that the readers do not change the variability of their pitch while reading fragments involving male characters can be drawn.

The results referring to the samples involving female characters are even more surprising. The boxplots in Figure 3 suggest that SD of F0 tends to decrease. The median for the downward shift measured in Hz is -4.86 (see the first boxplot on the left side of Figure 3), which corresponds to -11.23% (see the first boxplot on the right side of Figure 3). The mean values of the respec-

tive samples are -2.52 Hz and -6.36%. This is contrary to what could have been predicted on the basis of the discussion summarised in Section 1. Nevertheless, these differences are statistically insignificant. The p-value obtained in the one sample t-test for the data measured in Hz is 0.226, and for the data measured in percentages $p = 0.124$. These results lead to the conclusion that the readers do not change the variability of their pitch while reading fragments involving female characters. Taking into account the fact that the same finding was obtained for the samples with male characters, the variable of character's gender does not seem to have any clearly observable effects on the reader's SD of F0. In order to confirm such a conclusion, two sample tests were also performed. The results of the Wilcoxon signed-rank test comparing the samples of the shifts of SD of F0 measured in Hz divided according to the character's gender are statistically insignificant ($p = 0.339$), as are the results of the Student's t-test conducted on the corresponding data measured in percentages ($p = 0.375$). Therefore, the conclusion that the factor under analysis does not affect the reader's variability of pitch has been confirmed.

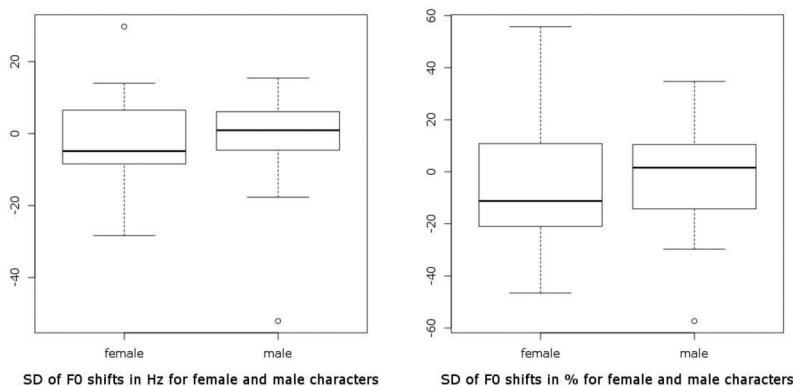


Figure 3. SD of F0 shifts in samples divided according to the character's gender

4.3. ANOVA results

As discussed in Section 3, some of the samples in the present analysis do not follow the normal distribution, so in many cases nonparametric methods are preferable. Nevertheless, in addition to fulfilling the major aims of the study, it is interesting to consider the effects which the reader's gender and dialect may have on F0 and SD of F0. What is more, it is important to identify possible interactions which could occur between the additional factors and the character's gender. To accomplish these supplementary objectives a three-way ANOVA for each of the two response variables measured as percentages was performed (the corresponding data sets in which the unit of measurement

was Hz yielded nearly identical results, so, for the sake of simplicity, they are not discussed here). Still, it must be stressed that the results obtained should be treated only as limited indications of possible trends rather than definitive findings.

Table 1 presents the possible effects of all the three factors on shifts of F0. The influence of the character's gender has been confirmed by a relatively low p-value (0.0261), but one needs to bear in mind that the sample involving female characters has outliers (see the first histogram in the lower part of Figure 1) and the less consistent results of the analysis described in Section 4.1 are probably more representative of what typically happens. A more intriguing area of investigation which is observable in Table 1 is a possible influence of the reader's dialect on F0 shifts. On average, American readers do not change their voice pitch in extracts in comparison to the corresponding whole chapters (mean = 0.35%, 95% CI: -3.72%, 4.43%, $p = 0.861$), but British readers raise their F0 quite distinctively. The corresponding mean is 10.65%, but because the p-value obtained with the Shapiro-Wilk test of normality for this sample is 0.0032, it is probably more appropriate to consider the median, which is 4.06%, in this case. This increase is statistically significant. The Wilcoxon signed-rank test yielded a very small p-value (0.0014). To the author's knowledge, no clear explanation may be offered for this phenomenon and the issue requires further study.

Table 1. ANOVA table for F0 as the response variable

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Character's gender	1	955.8	955.8	5.2162	0.0261 *
Reader's gender	1	34.7	34.7	0.1893	0.6651
Reader's dialect	1	1814	1814	9.9002	0.0026 **
Character's gender : Reader's gender	1	37.3	37.3	0.2035	0.6536
Character's gender : Reader's dialect	1	415.9	415.9	2.2698	0.1375
Reader's gender : Reader's dialect	1	1016.4	1016.4	5.5470	0.0220 *
Character's gender : Reader's gender : : Reader's dialect	1	0.5	0.5	0.0025	0.9605
Residuals	56	10260.8	183.2		

Signif. codes: 0 '****' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Table 1 provides another important insight. The reader's dialect may be affected by the reader's gender. While there is not much difference between the mean result for the sample of American female readers (5.07%) and British female readers (7.75%), the interaction of the two factors results in very

5. Final conclusions

The major conclusions of the present study are:

1. Excerpts with female characters are read with a slight increase of F0. In a few cases this increase is more distinct.
2. There is no decrease in F0 in fragments with male characters.
3. The variable of a character's gender does not affect SD of F0. The only exception that was observed occurred in the sample of male readers who tended to lower SD of F0 in extracts with female characters.

The first conclusion is consistent with the predictions of the study. However, the tendency to raise F0 in dialogues with female characters is, on average, rather weak. A distinct increase of the fundamental frequency was only observed in a few examples. The second conclusion is more surprising, because it was expected that F0 would decrease in fragments involving male characters. Instead, no statistically relevant change was observed. Finally, the conclusion that the character's gender does not affect SD of F0 may mean two different things. One interpretation is that pitch variability is perceived as a feature which does not have dissimilar values in the speech of men and women. As a consequence, the readers imitate the two categories of phonation without consistent changes in SD of F0. Alternatively, it is also possible that the readers actually recognise certain patterns, but do not consider them important in imitating the voices of women or men.

The last observation concerning the sample of male readers who tended to lower SD of F0 in extracts with female characters is contrary to the initial predictions made in Section 2. It suggests that male readers perceive female speech as involving less pitch variability (regardless whether or not a decrease of SD of F0 really exists in the female voice) and consider this feature to be important enough to be conveyed to the listener.

Additional conclusions reached in this study include:

1. British readers tend to raise their pitch while reading dialogues, irrespective of the character's gender.
2. The reader's gender comes into interaction with the reader's dialect for both F0 and SD of F0.

Both of these observations were made on the basis of the ANOVA analysis conducted in Section 4.3. Their full significance is, however, unknown and more research on the variable of reader's dialect and its possible interaction with the reader's gender in relation to F0 and SD of F0 in fiction reading needs to be done.

References

- Abdulla, W.H. and N.K. Kasabov 2001. Improving speech recognition performance through gender separation. In *Proceedings of Artificial Neural Networks and Expert Systems International Conference (ANNES)*, 218-222. Dunedin, New Zealand.
- Anthony, L. 2014. *AntConc (version 3.4.3w) [computer Software]*. Tokyo: Waseda University.
- Boersma, P. and D. Weenink 2014. *Praat, a system for doing phonetics by computer (version 5.4.01) [computer Software]*. Amsterdam: University of Amsterdam.
- Carlson, D.E. 1981. *Some acoustical and perceptual correlates of speaker gender identification*. Gainesville: Ph.D. dissertation proposal, University of Florida.
- Chen, G. 1974. The pitch range of English and Chinese speakers. *Journal of Chinese Linguistics* 2: 159-171.
- Chiba, T. and M. Kajiyama 1941. *The vowel: its nature and structure*. Tokyo: Tokyo-Kaiseikan Publishing Company.
- Childers, D. G. and K. Wu 1991. Gender recognition from speech. Part II: Fine analysis. *The Journal of the Acoustical Society of America* 90(4): 1841-1856.
- Elyan, O.H. 1978. Sex-differences in speech style. *Women Speaking* 4: 4-8.
- Fant, G. 1973. *Speech Sounds and Features*. Cambridge, MA: MIT Press.
- Fitch, J.L. and A. Holbrook 1970. Modal vocal fundamental frequency of young adults. *Archives of Otolaryngology* 92(4): 379-382.
- Fitzsimons, M., N. Sheahan and H. Staunton 2001. Gender and the integration of acoustic dimensions of prosody: Implications for clinical studies. *Brain and Language* 78(1): 94-108.
- Gelfer, M.P., and V.A. Mikos 2005. The relative contributions of speaking fundamental frequency and formant frequencies to gender identification based on isolated vowels. *Journal of Voice* 19(4): 544-554.
- Glasberg, B.R., and B.C. Moore 1990. Derivation of auditory filter shapes from notched-noise data. *Hearing Research* 47(1): 103-138.
- Graddol, D. 1986. Discourse specific pitch behaviour. In C. Johns-Lewis (ed.), *Intonation in Discourse*, 221-237. London and Sidney: Croom Helm.
- Graddol, D., and J. Swann 1983. Speaking fundamental frequency: some physical and social correlates. *Language and Speech* 26(4): 351-366.
- Henton, C.G. 1989. Fact and fiction in the description of female and male pitch. *Language & Communication* 9(4): 299-311.
- Henton, C.G. 1995. Pitch dynamism in female and male speech. *Language & Communication* 15(1): 43-61.
- Henton, C.G., and R.A. W. Bladon 1985. Breathiness in normal female speech: Inefficiency versus desirability. *Language & Communication* 5(3): 221-227.
- Hermes, D.J., and J.C. Van Gestel 1991. The frequency scale of speech intonation. *The Journal of the Acoustical Society of America* 90(1): 97-102.

- Hollien, H., and E. Malcik 1967. Evaluation of cross-sectional studies of adolescent voice change in males. *Communications Monographs* 34(1): 80-84.
- Hollien, H., and T. Shipp 1972. Speaking fundamental frequency and chronological age in males. *Journal of Speech, Language, and Hearing Research* 15(1): 155-159.
- Holmberg, E.B., R.E. Hillman and J.S. Perkell 1988. Glottal airflow and translottal air pressure measurements for male and female speakers in soft, normal, and loud voice. *The Journal of the Acoustical Society of America* 84(2): 511-529.
- Hu, Y., D. Wu and A. Nucci 2012. Pitch-based gender identification with two-stage classification. *Security and Communication Networks* 5(2): 211-225.
- Jassem, W. 1971. Pitch and compass of the speaking voice. *Journal of the International Phonetic Association* 1(02): 59-68.
- Johns-Lewis, C. 1986. Prosodic differentiation of discourse modes. In C. Johns-Lewis (ed.), *Intonation in Discourse*, 199-219. London and Sidney: Croom Helm.
- Jung, E., A.T. Schwarzbacher, K. Humphreys and R. Lawlor 2002. Application of real-time AMDF pitch-detection in a voice gender normalisation system. In J.H.L. Hansen and B. Pellom (eds.), *Proceedings of 7th International Conference on Spoken Language Processing*, 2521-2524. Denver, Colorado: University of Colorado at Boulder.
- Kent, R.D., and C. Read 1992. *The acoustic analysis of speech*. San Diego, California: Singular Publishing Group.
- Klatt, D.H. 1987. Acoustic correlates of breathiness: First harmonic amplitude, turbulence noise, and tracheal coupling. *The Journal of the Acoustical Society of America* 82(1): 91.
- Klatt, D.H., and L.C. Klatt 1990. Analysis, synthesis, and perception of voice quality variations among female and male talkers. *The Journal of the Acoustical Society of America* 87(2): 820-857.
- Latinus, M., and M.J. Taylor 2012. Discriminating male and female voices: Differentiating pitch and gender. *Brain Topography* 25(2): 194-204.
- Linke, C.E. 1973. A study of pitch characteristics of female voices and their relationship to vocal effectiveness. *Folia Phoniatica et Logopaedica* 25(3): 173-185.
- Machado, S., E. Duarte, J. Teles, L. Reis and F. Rebelo 2012. Selection of a voice for a speech signal for personalized warnings: the effect of speaker's gender and voice pitch. *Work* 41: 3592-3598.
- McAdams, S., and A. Bregman 1979. Hearing musical streams. *Computer Music Journal* 3(4): 26-60.
- McConnell-Ginet, S. 1983. Intonation in a man's world. In B. Thome, C. Kramarae and N. Henly (eds.), *Language, gender, and society*, 69-88. Rowley, MA: New Bury House.
- Mendoza, E., N. Valencia, J. Muñoz and H. Trujillo 1996. Differences in voice quality between men and women: use of the long-term average spectrum (LTAS). *Journal of Voice* 10(1): 59-66.

- Moore, B.C., and B.R. Glasberg 1983. Suggested formulae for calculating auditory-filter bandwidths and excitation patterns. *The Journal of the Acoustical Society of America* 74(3): 750-753.
- Ohara, Y. 2003. Performing gender through voice pitch: A cross-cultural analysis of Japanese and American English. In U. Pasero and F. Braun (eds.), *Wahrnehmung und Herstellung von Geschlecht*, 105-116. Opladen/Wiesbaden: Westdeutsche Verlag.
- Parris, E.S., and M.J. Carey 1996. Language independent gender identification. In *IEEE International Conference on Acoustics, Speech, and Signal Processing*, Vol. 2, 685-688.
- Patterson, R.D. 1976. Auditory filter shapes derived with noise stimuli. *The Journal of the Acoustical Society of America* 59(3): 640-654.
- Pegoraro Krook, M.I. 1988. Speaking fundamental frequency characteristics of normal Swedish subjects obtained by glottal frequency analysis. *Folia Phoniatica et Logopaedica* 40(2): 82-90.
- Peterson, G.E., and H.L. Barney 1952. Control methods used in a study of the vowels. *The Journal of the Acoustical Society of America* 24(2): 175-184.
- Potter, R.K., and J.C. Steinberg 1950. Toward the specification of speech. *The Journal of the Acoustical Society of America* 22(6): 807-820.
- Rappaport, W. 1958. Über Messungen der Tonhöhenverteilung in der deutschen Sprache. *Acustica* 8(4): 220-225.
- R Development Core Team. 2013. *R: A language and environment for statistical computing (version 3.0.3) [computer Software]*. Vienna, Austria.
- Schötz, S. 2006. *Perception, analysis and synthesis of speaker age*. Lund: Lund University.
- Stoicheff, M.L. 1981. Speaking fundamental frequency characteristics of nonsmoking female adults. *Journal of Speech, Language, and Hearing Research* 24(3): 437-441.
- Stolarski, Ł. 2015. Pitch patterns in vocal expression of 'happiness' and 'sadness' in the reading aloud of prose on the basis of selected audiobooks. *Research in Language* 13(2): 141-162.
- Takefuta, Y., E.G. Jancosek and M. Brunt 1972. A statistical analysis of melody curves in the intonation of American English. In A. Rigault and R. Charbonneau (eds.), *Proceedings of the 7th International Congress of Phonetic Sciences*, 1035-1039. The Hague: Mouton.
- Titze, I.R. 1989. Physiologic and acoustic differences between male and female voices. *The Journal of the Acoustical Society of America* 85(4): 1699-1707.
- Trautmüller, H. 1990. Analytical expressions for the tonotopic sensory scale. *The Journal of the Acoustical Society of America* 88(1): 97-100.
- Trautmüller, H., and A. Eriksson 1995. The frequency range of the voice fundamental in the speech of male and female adults. *Unpublished Manuscript*.
- Trautmüller, H., and A. Eriksson 2009. The size of F0 excursions in speech production and perception. *Working Papers in Linguistics* 43: 136-139.

- Waksler, R. 2001. Pitch range and women's sexual orientation. *Word* 52(1): 69-77.
- Whiteside, S.P. 1996. Temporal-based acoustic-phonetic patterns in read speech: Some evidence for speaker sex differences. *Journal of the International Phonetic Association* 26(01): 23-40.
- Wu, K., and D.G. Childers 1991. Gender recognition from speech. Part I: Coarse analysis. *The Journal of the Acoustical Society of America* 90(4): 1828-1840.
- Xue, S.A., and D. Deliyski 2001. Effects of aging on selected acoustic voice parameters: Preliminary normative data and educational implications. *Educational Gerontology* 27(2): 159-168.
- Yuasa, I.P. 2008. *Culture and gender of voice pitch: A sociophonetic comparison of the Japanese and Americans*. London, Oakville: Equinox Publishing.
- Zwicker, E., and E. Terhardt 1980. Analytical expressions for critical-band rate and critical bandwidth as a function of frequency. *The Journal of the Acoustical Society of America* 68(5): 1523-1525.

Appendix A – male characters

Example number	Source	Extract	Character's name
1	<i>A Tale of Two Cities</i> . Book 2, Chapter 4	“Nevertheless,” pursued Darnay, rising to ring the bell, <u>“there is nothing in that, I hope, to prevent my calling the reckoning, and our parting without ill-blood on either side.”</u>	Charles Darnay
2	<i>A Tale of Two Cities</i> . Book 2 Chapter 4	“Nevertheless,” pursued Darnay, rising to ring the bell, <u>“there is nothing in that, I hope, to prevent my calling the reckoning, and our parting without ill-blood on either side.”</u>	Charles Darnay
3	<i>Our Mutual Friend</i> . Book 1, Chapter 15	“Another staircase,” said Mr Boffin, unlocking the door, <u>“leading down into the yard. We’ll go down this way, as you may like to see the yard, and it’s all in the road. When the son was a little child, it was up and down these stairs that he mostly came and went to his father. He was very timid of his father. I’ve seen him sit on these stairs, in his shy way, poor child, many a time. Mr and Mrs Boffin have comforted him, sitting with his little book on these stairs, often.”</u>	Nicodemus (Noddy) Boffin
4	<i>Our Mutual Friend</i> . Book 1, Chapter 15	“Another staircase,” said Mr Boffin, unlocking the door, <u>“leading down into the yard. We’ll go down this way, as you may like to see the yard, and it’s all in the road. When the son was a little child, it was up and down these stairs that he mostly came and went to his father. He was very timid of his father. I’ve seen him sit on these stairs, in his shy way, poor child, many a time. Mr and Mrs Boffin have comforted him, sitting with his little book on these stairs, often.”</u>	Nicodemus (Noddy) Boffin
5	<i>Little Dorritt</i> . Book 1, Chapter 7	“Well, Amy, well. I don’t quite follow you, but it’s natural I suppose that Fanny should prefer to be outside, and even that you often should, too. So, you and Fanny and you and uncle, my dear, shall have your own way. Good, good. I’ll not meddle; don’t mind me.”	William Dorritt
6	<i>The Haunted Man and the Ghost’s Bargain</i> . Chapter 1	“Spare me another moment, Philip. William, you were going to tell me something to your excellent wife’s honour. It will not be disagreeable to her to hear you praise her.”	Professor Redlaw
7	<i>The Pickwick Papers</i> . Chapter 38	“No, no,” said Mr. Ben Allen, laying aside the poker, and looking very cunning; <u>“I didn’t think Wardle’s exactly the place for a headstrong girl; so, as I am her natural protector and guardian, our parents being dead, I have brought her down into this part of the country to spend a few months at an old aunt’s, in a nice, dull, close place. I think that will cure her, my boy. If it doesn’t, I’ll take her abroad for a little while, and see what that’ll do.”</u>	Ben Allen

Character's gender	Reader's initials	Reader's gender	Reader's dialect	Reader's mean F0 in the whole chapter in Hz	Mean F0 in extract in Hz	F0 shift in Hz	F0 shift in percentages	Reader's mean SD of F0 in the whole chapter in Hz	SD of F0 in extract in Hz	SD of F0 shift in Hz	SD of F0 shift in percentages
male	B.F.	male	AmE	154.12	167.04	12.92	8.38%	59.38	41.71	-17.67	-29.76%
male	P.A.	male	BrE	164.57	158.73	-5.84	-3.55%	53.76	51.74	-2.02	-3.76%
male	M.	male	AmE	135.54	116.73	-18.81	-13.88%	32.04	23.11	-8.93	-27.87%
male	D.J.	male	AmE	143.22	135.71	-7.51	-5.24%	36.89	30.59	-6.3	-17.08%
male	E.C.	male	BrE	156.34	158.07	1.73	1.11%	44.31	48.44	4.13	9.32%
male	R.F.	male	AmE	174.27	176.54	2.27	1.30%	41.16	54.68	13.52	32.85%
male	S.E.	male	BrE	143.82	183.58	39.76	27.65%	57.06	63.18	6.12	10.73%

Appendix A. cont.

Example number	Source	Extract	Character's name
8	<i>Oliver Twist.</i> Chapter 31	"The more I think of it," said the doctor, " <u>the more I see that it will occasion endless trouble and difficulty if we put these men in possession of the boy's real story. I am certain it will not be believed; and even if they can do nothing to him in the end, still the dragging it forward, and giving publicity to all the doubts that will be cast upon it, must interfere, materially, with your benevolent plan of rescuing him from misery.</u> "	Mr. Losberne
9	<i>Oliver Twist.</i> Chapter 2	" <u>I, Mrs. Mann. We name our fondlings in alphabetical order. The last was a S, – Swubble, I named him. This was a T, – Twist, I named him. The next one comes will be Unwin, and the next Vilkins. I have got names ready made to the end of the alphabet, and all the way through it again, when we come to Z.</u> "	Mr. Bumble
10	<i>Christmas Carol.</i> Stave 4	" <u>And I know," said Bob, "I know, my dears, that when we recollect how patient and how mild he was, although he was a little, little child, we shall not quarrel easily among ourselves, and forget poor Tiny Tim in doing it."</u>	Bob Cratchit
11	<i>Christmas Carol.</i> Stave 4	" <u>And I know," said Bob, "I know, my dears, that when we recollect how patient and how mild he was, although he was a little, little child, we shall not quarrel easily among ourselves, and forget poor Tiny Tim in doing it."</u>	Bob Cratchit
12	<i>Christmas Carol.</i> Stave 3	" <u>As good as gold," said Bob, "and better. Somehow, he gets thoughtful, sitting by himself so much, and thinks the strangest things you ever heard. He told me, coming home, that he hoped the people saw him in the church, because he was a cripple, and it might be pleasant to them to remember upon Christmas-day who made lame beggars walk and blind men see."</u>	Bob Cratchit
13	<i>Christmas Carol.</i> Stave 4	" <u>And I know," said Bob, "I know, my dears, that when we recollect how patient and how mild he was, although he was a little, little child, we shall not quarrel easily among ourselves, and forget poor Tiny Tim in doing it."</u>	Bob Cratchit
14	<i>Life and Adventures of Martin Chuzzlewit.</i> Chapter 2	" <u>Ye-es, a youth," said Mr Pecksniff. "He will avail himself of the eligible opportunity which now offers, for uniting the advantages of the best practical architectural education with the comforts of a home, and the constant association with some who (however humble their sphere, and limited their capacity) are not unmindful of their moral responsibilities."</u>	Seth Pecksniff

Character's gender	Reader's initials	Reader's gender	Reader's dialect	Reader's mean F0 in the whole chapter in Hz	Mean F0 in extract in Hz	F0 shift in Hz	F0 shift in percentages	Reader's mean SD of F0 in the whole chapter in Hz	SD of F0 in extract in Hz	SD of F0 shift in Hz	SD of F0 shift in percentages
male	R.D.	male	BrE	137.67	144.21	6.54	4.75%	50.22	52.38	2.16	4.30%
male	P.A.	male	BrE	164.56	169.65	5.09	3.09%	62.48	63.51	1.03	1.65%
male	J.F.	male	AmE	113.62	106.45	-7.17	-6.31%	28.61	23.76	-4.85	-16.95%
male	G.H.	male	AmE	143.69	103.94	-39.75	-27.66%	90.79	38.71	-52.08	-57.36%
male	K.M.	male	AmE	110.16	126.34	16.18	14.69%	33.64	45.31	11.67	34.69%
male	H.M.	male	AmE	105.57	95.04	-10.53	-9.97%	31.66	27.67	-3.99	-12.60%
male	P.K.	male	BrE	135.23	159.03	23.8	17.60%	36.46	40.24	3.78	10.37%

Appendix A. cont.

Example number	Source	Extract	Character's name
15	<i>The Mystery of Edwin Drood</i> . Chapter 6	"I am sure you will agree with me, Ma," said Mr. Crisparkle, after thinking the matter over, " <u>that the first thing to be done, is, to put these young people as much at their ease as possible. There is nothing disinterested in the notion, because we cannot be at our ease with them unless they are at their ease with us. Now, Jasper's nephew is down here at present; and like takes to like, and yo uth takes to youth. He is a cordial young fellow, and we will have him to meet the brother and sister at dinner. That's three. We can't think of asking him, without asking Jasper. That's four. Add Miss Twinkleton and the fairy bride that is to be, and that's six. Add our two selves, and that's eight.</u> "	Septimus Crisparkle
16	<i>A Tale of Two Cities</i> . Book 1, Chapter 5	"Gentlemen," said her husband, who had kept his bright eye observantly upon her, " <u>go od day. The chamber, furnishe d bache lor-fashion, that you wishe d to see, and were inquiring for when I stepped out, is on the fifth floor. The doorway of the staircase gives on the little courtyard close to the left here.</u> "	Monsieur Defarge
17	<i>Our Mutual Friend</i> . Book 1, Chapter 15	"Another staircase," said Mr Boffin, unlocking the door, " <u>leading down into the yard. We'll go down this way, as you may like to see the yard, and it's all in the road. When the son was a little child, it was up and down these stairs that he mostly came and went to his father. He was very timid of his father. I've seen him sit on these stairs, in his shy way, poor child, many a time. Mr and Mrs Boffin have comforted him, sitting with his little book on these stairs, often.</u> "	Nicodemus (Noddy) Boffin
18	<i>Bleak House</i> . Chapter 6	"As to Skimpole," said Mr. Jarndyce, " <u>a habitable doll's house with good board and a few tin people to get into debt with and borrow money of would set the boy up in life. He is in a child's sleep by this time, I suppose; it's time I should take my craftier head to my more worldly pillow. Good night, my dears.</u> "	John Jarndyce
19	<i>The Haunted Man and the Ghost's Bargain</i> . Chapter 1	"Spare me another moment, Philip. William, you were going to tell me something to yo ur exc ellent wife's ho nour. It will not be disagreeable to her to hear you praise her."	Professor Redlaw
20	<i>The Pickwick Papers</i> . Chapter 38	"No, no," said Mr. Ben Allen, laying aside the poker, and looking very cunning; " <u>I didn't think Wardle's exactly the place for a headstrong girl; so, as I am her natural protector and guardian, our parents being dead, I have brought her down into this part of the country to spend a few months at an old aunt's, in a nice, dull, close place. I think that will cure her, my boy. If it doesn't, I'll take her abroad for a little while, and see what that'll do.</u> "	Ben Allen

Character's gender	Reader's initials	Reader's gender	Reader's dialect	Reader's mean F0 in the whole chapter in Hz	Mean F0 in extract in Hz	F0 shift in Hz	F0 shift in percentages	Reader's mean SD of F0 in the whole chapter in Hz	SD of F0 in extract in Hz	SD of F0 shift in Hz	SD of F0 shift in percentages
male	A.C.	male	BrE	123.96	124.39	0.43	0.35%	45.8	51.87	6.07	13.25%
male	A.M.	male	BrE	125.53	147.02	21.49	17.12%	51.97	67.43	15.46	29.75%
male	M.N.	female	BrE	175.42	165.72	-9.7	-5.53%	64.16	53.9	-10.26	-15.99%
male	C.L.	female	AmE	206.18	226.68	20.5	9.94%	61.82	67.96	6.14	9.93%
male	R.G.	female	BrE	155.16	170.66	15.5	9.99%	43.74	47.23	3.49	7.98%
male	D.L.	female	AmE	188.65	170.94	-17.71	-9.39%	52.05	41.41	-10.64	-20.44%

Appendix A. cont.

Example number	Source	Extract	Character's name
21	<i>Oliver Twist</i> . Chapter 2	<u>"I, Mrs. Mann. We name our fondlings in alphabetical order. The last was a S, – Swubble, I named him. This was a T, – Twist, I named him. The next one comes will be Unwin, and the next Vilkins. I have got names ready made to the end of the alphabet, and all the way through it again, when we come to Z."</u>	Mr. Bumble
22	<i>Oliver Twist</i> . Chapter 36	<u>"I hope I may have good cause to do so," replied Mr. Losberne; "though I confess I don't think I shall. But yesterday morning you had made up your mind, in a great hurry, to stay here, and to accompany your mother, like a dutiful son, to the sea-side. Before noon, you announce that you are going to do me the honour of accompanying me as far as I go, on your road to London. And at night, you urge me, with great mystery, to start before the ladies are stirring; the consequence of which is, that young Oliver here is pinned down to his breakfast when he ought to be ranging the meadows after botanical phenomena of all kinds."</u>	Mr. Losberne
23	<i>David Copperfield</i> . Chapter 4	<u>"Jane Murdstone," said Mr. Murdstone to his sister, "any harsh words between us are, I hope, uncommon. It is not my fault that so unusual an occurrence has taken place tonight. I was betrayed into it by another. Nor is it your fault. You were betrayed into it by another. Let us both try to forget it."</u>	Edward Murdstone
24	<i>Christmas Carol</i> . Stave 3	<u>"As good as gold," said Bob, "and better. Somehow, he gets thoughtful, sitting by himself so much, and thinks the strangest things you ever heard. He told me, coming home, that he hoped the people saw him in the church, because he was a cripple, and it might be pleasant to them to remember upon Christmas-day who made lame beggars walk and blind men see."</u>	Bob Cratchit
25	<i>The Old Curiosity Shop</i> . Chapter 7	<u>"Why, Mr Trent," returned Dick, "there is a proverb which talks about being merry and wise. There are some people who can be merry and can't be wise, and some who can be wise (or think they can) and can't be merry. I'm one of the first sort. If the proverb's a good 'un, I suppose it's better to keep to half of it than none; at all events, I'd rather be merry and not wise, than like you, neither one nor t'other."</u>	Richard 'Dick' Swiveller
26	<i>A Tale of Two Cities</i> . Book 2, Chapter 6	<u>"True," said he, "and fearful to reflect upon. Yet, a doubt lurks in my mind, Miss Pross, whether it is good for Doctor Manette to have that suppression always shut up within him. Indeed, it is this doubt and the uneasiness it sometimes causes me that has led me to our present confidence."</u>	Jarvis Lorry

Character's gender	Reader's initials	Reader's gender	Reader's dialect	Reader's mean F0 in the whole chapter in Hz	Mean F0 in extract in Hz	F0 shift in Hz	F0 shift in percentages	Reader's mean SD of F0 in the whole chapter in Hz	SD of F0 in extract in Hz	SD of F0 shift in Hz	SD of F0 shift in percentages
male	K.P.	female	AmE	238.1	242.34	4.24	1.78%	53.32	55.13	1.81	3.39%
male	C.S.	female	BrE	218.13	215.15	-2.98	-1.37%	49.76	48.13	-1.63	-3.28%
male	L.A.	female	AmE	199.57	181.48	-18.09	-9.06%	44.2	39.91	-4.29	-9.71%
male	K.S.	female	AmE	177.51	207.11	29.6	16.68%	63.05	71.46	8.41	13.34%
male	E.	female	BrE	149.23	153.13	3.9	2.61%	27.18	24.43	-2.75	-10.12%
male	T.	female	AmE	223.53	246.83	23.3	10.42%	64.46	66.25	1.79	2.78%

Appendix A. cont.

Example number	Source	Extract	Character's name
27	<i>Our Mutual Friend</i> . Book 1, Chapter 1	<u>"How can you be so thankless to your best friend, Lizzie? The very fire that warmed you when you were a baby, was picked out of the river alongside the coal barges. The very basket that you slept in, the tide washed ashore. The very rockers that I put it upon to make a cradle of it, I cut out of a piece of wood that drifted from some ship or another."</u>	Jesse "Gaffer" Hexam
28	<i>Our Mutual Friend</i> . Book 1, Chapter 2	<u>"We must now return, as novelists say, and as we all wish they wouldn't, to the man from Somewhere. Being a boy of fourteen, cheaply educated at Brussels when his sister's expulsion befell, it was some little time before he heard of it – probably from her self, for the mother was dead; but that I don't know. Instantly, he absconded, and came over here. He must have been a boy of spirit and resource, to get here on a stopped allowance of five sous a week; but he did it somehow, and he burst in on his father, and pleaded his sister's cause. Venerable parent promptly resorts to anathematization, and turns him out. Shocked and terrified boy takes flight, seeks his fortune, gets aboard ship, ultimately turns up on dry land among the Cape wine: small proprietor, farmer, grower – whatever you like to call it."</u>	Mortimer Lightwood
29	<i>Our Mutual Friend</i> . Book 1, Chapter 16	<u>"No. But while I am in your employment, sir, I would rather be excused from going between the lawyer and the client. Of course if you press it, Mr Boffin, I am ready to comply. But I should take it as a great favour if you would not press it without urgent occasion."</u>	John Rokesmith (John Harmon)
30	<i>Our Mutual Friend</i> . Book 2, Chapter 3	<u>"My political opinions," says Veneering, not previously aware of having any, "are identical with those of Lord Snigsworth, and perhaps as a matter of public feeling and public principle, Lord Snigsworth would give me his name."</u>	Mr. Veneering
31	<i>Oliver Twist</i> . Chapter 41	<u>"Now, Miss Maylie," said Mr. Brownlow, "to return to the subject in which your humanity is so much interested. Will you let me know what intelligence you have of this poor child: allowing me to promise that I exhausted every means in my power of discovering him, and that since I have been absent from this country, my first impression that he had imposed upon me, and had been persuaded by his former associates to rob me, has been considerably shaken."</u>	Mr. Brownlow
32	<i>The Pickwick Papers</i> . Chapter 5	<u>"Ah! people need to rise early, to see the sun in all his splendour, for his brightness seldom lasts the day through. The morning of day and the morning of life are but too much alike."</u>	Samuel Pickwick

Character's gender	Reader's initials	Reader's gender	Reader's dialect	Reader's mean F0 in the whole chapter in Hz	Mean F0 in extract in Hz	F0 shift in Hz	F0 shift in percentages	Reader's mean SD of F0 in the whole chapter in Hz	SD of F0 in extract in Hz	SD of F0 shift in Hz	SD of F0 shift in percentages
male	O.D.	female	BrE	215.07	220.28	5.21	2.42%	48.41	46	-2.41	-4.98%
male	K.F.	female	AmE	217.82	208.74	-9.08	-4.17%	55.54	56.38	0.84	1.51%
male	J.B.	female	BrE	163.17	184.95	21.78	13.35%	62.26	68.86	6.6	10.60%
male	R.N.	female	AmE	247.82	265.37	17.55	7.08%	65.66	73.61	7.95	12.11%
male	A.V.	female	BrE	186.81	166.75	-20.06	-10.74%	55.13	51.54	-3.59	-6.51%
male	V.	female	BrE	247.84	234.27	-13.57	-5.48%	63.31	47.63	-15.68	-24.77%

Appendix B – female characters

Example number	Source	Extract	Character's name
33	<i>A Tale of Two Cities</i> . Book 2, Chapter 6	"I don't know, Mr. Darnay; I told you it was a foolish fancy, but you asked for it. When I have yielded myself to it, I have been alone, and then I have imagined them the footsteps of the people who are to come into my life, and my father's."	Lucie Manette
34	<i>A Tale of Two Cities</i> . Book 2, Chapter 6	"I don't know, Mr. Darnay; I told you it was a foolish fancy, but you asked for it. When I have yielded myself to it, I have been alone, and then I have imagined them the footsteps of the people who are to come into my life, and my father's."	Lucie Manette
35	<i>Our Mutual Friend</i> . Book 1, Chapter 15	"And I tell you, my deary," said Mrs Boffin, "that if you don't close with Mr Rokesmith now at once, and if you ever go a muddling yourself again with things never meant nor made for you, you'll have an apoplexy – besides iron-moulding your linen-and you'll break my heart."	Henrietta Boffin
36	<i>Our Mutual Friend</i> . Book 1, Chapter 15	"And I tell you, my deary," said Mrs Boffin, "that if you don't close with Mr Rokesmith now at once, and if you ever go a muddling yourself again with things never meant nor made for you, you'll have an apoplexy – besides iron-moulding your linen – and you'll break my heart."	Henrietta Boffin
37	<i>Little Dorrit</i> . Book 1, Chapter 3	"I am able," said Mrs Clennam, with a slight motion of her worsted-muffled right hand toward a chair on wheels, standing before a tall writing cabinet close shut up, "I am able to attend to my business duties, and I am thankful for the privilege. It is a great privilege. But no more of business on this day."	Mrs. Clennam
38	<i>The Haunted Man and the Ghost's Bargain</i> .Chapter 1	"Indeed I can't tell, sir," said Milly, after thinking a little, "because I am not at all clever, you know; and I wanted to be useful to him in making things neat and comfortable about him, and employed myself that way. But I know he is poor, and lonely, and I think he is somehow neglected too."	Milly Swidger
39	<i>The Pickwick Papers</i> . Chapter 4	"You were going to say that Isabel stoops – I know you were – you men are such observers. Well, so she does; it can't be denied; and, certainly, if there is one thing more than another that makes a girl look ugly it is stooping. I often tell her that when she gets a little older she'll be quite frightful."	Rachael Wardle
40	<i>Oliver Twist</i> . Chapter 30	"But even if he has been wicked," pursued Rose, "think how young he is; think that he may never have known a mother's love, or the comfort of a home; that ill-usage and blows, or the want of bread, may have driven him to herd with men who have forced him to guilt. Aunt, dear aunt, for mercy's sake, think of this, before you let them drag this sick child to a prison, which in any case must be the grave of all his chances of amendment."	Rose Maylie

Character's gender	Reader's initials	Reader's gender	Reader's dialect	Reader's mean F0 in the whole chapter in Hz	Mean F0 in extract in Hz	F0 shift in Hz	F0 shift in percentages	Reader's mean SD of F0 in the whole chapter in Hz	SD of F0 in extract in Hz	SD of F0 shift in Hz	SD of F0 shift in percentages
female	B.F.	male	AmE	149.83	169.11	19.28	12.87%	41.7	37.25	-4.45	-10.67%
female	P.A.	male	BrE	150.53	180.07	29.54	19.62%	58.36	46.61	-11.75	-20.13%
female	M.	male	AmE	135.54	128.01	-7.53	-5.56%	32.04	26.62	-5.42	-16.92%
female	D.J.	male	AmE	143.22	146	2.78	1.94%	36.89	22.56	14.33	-38.85%
female	E.C.	male	BrE	159.27	173.83	14.56	9.14%	41.22	35.45	-5.77	-14.00%
female	R.F.	male	AmE	174.27	182.73	8.46	4.85%	41.16	43.71	2.55	6.20%
female	S.E.	male	BrE	148.48	216.79	68.31	46.01%	48.05	56.06	8.01	16.67%
female	R.D.	male	BrE	136.51	180.57	44.06	32.28%	49.05	43.27	-5.78	-11.78%

Appendix B. cont.

Example number	Source	Extract	Character's name
41	<i>Oliver Twist.</i> Chapter 30	"But even if he has been wicked," pursued Rose, " <u>think how young he is; think that he may never have known a mother's love, or the comfort of a home; that ill-usage and blows, or the want of bread, may have driven him to herd with men who have forced him to guilt. Aunt, dear aunt, for mercy's sake, think of this, before you let them drag this sick child to a prison, which in any case must be the grave of all his chances of amendment.</u> "	Rose Maylie
42	<i>Christmas Carol.</i> Stave 4	"They're better now again," said Cratchit's wife. " <u>It makes them weak by candle-light; and I wouldn't show weak eyes to your father, when he comes home, for the world. It must be near his time.</u> "	Mrs Cratchit
43	<i>Christmas Carol.</i> Stave 4	"They're better now again," said Cratchit's wife. " <u>It makes them weak by candle-light; and I wouldn't show weak eyes to your father, when he comes home, for the world. It must be near his time.</u> "	Mrs. Cratchit
44	<i>Christmas Carol.</i> Stave 4	"They're better now again," said Cratchit's wife. " <u>It makes them weak by candle-light; and I wouldn't show weak eyes to your father, when he comes home, for the world. It must be near his time.</u> "	Mrs. Cratchit
45	<i>Christmas Carol.</i> Stave 4	"They're better now again," said Cratchit's wife. " <u>It makes them weak by candle-light; and I wouldn't show weak eyes to your father, when he comes home, for the world. It must be near his time.</u> "	Mrs. Cratchit
46	<i>Life and Adventures of Martin Chuzzlewit.</i> Chapter 2	"He slept last night at the Dragon," returned the young lady, " <u>and had Mr Pinch to dine with him. They spent the evening together, and Mr Pinch was not home till very late.</u> "	Charity Pecksniff
47	<i>The Mystery of Edwin Drood.</i> Chapter 6	"You must take some wine, sir," said Mrs. Tope, " <u>and the jelly that I had ready for you, and that you wouldn't put your lips to at noon, though I warned you what would come of it, you know, and you not breakfasted; and you must have a wing of the roast fowl that has been put back twenty times if it's been put back once. It shall all be on table in five minutes, and this good gentleman belike will stop and see you take it.</u> "	Mrs. Tope
48	<i>Our Mutual Friend.</i> Book 1, Chapter 6	"Well, Miss Abbey, respectfully meaning no offence to you, <u>it would be some satisfaction to a man's mind, to understand why the Fellowship Porters is not to be free to such as me, and is to be free to such as Gaffer.</u> "	Abbey Potterson
49	<i>Our Mutual Friend.</i> Book 1, Chapter 15	"And I tell you, my deary," said Mrs Boffin, " <u>that if you don't close with Mr Rokesmith now at once, and if you ever go a muddling yourself again with things never meant nor made for you, you'll have an apoplexy – besides iron-moulding your linen – and you'll break my heart.</u> "	Henrietta Boffin

Character's gender	Reader's initials	Reader's gender	Reader's dialect	Reader's mean F0 in the whole chapter in Hz	Mean F0 in extract in Hz	F0 shift in Hz	F0 shift in percentages	Reader's mean SD of F0 in the whole chapter in Hz	SD of F0 in extract in Hz	SD of F0 shift in Hz	SD of F0 shift in percentages
female	P.A.	male	BrE	159.77	188.75	28.98	18.14%	59.6	49.17	-10.43	-17.50%
female	J.F.	male	AmE	113.62	106.39	-7.23	-6.36%	28.61	19.41	-9.2	-32.16%
female	G.H.	male	AmE	143.69	116.41	-27.28	-18.99%	90.79	62.4	-28.39	-31.27%
female	K.M.	male	AmE	113.43	101.81	-11.62	-10.24%	31.04	23.38	-7.66	-24.68%
female	H.M.	male	AmE	105.57	95.3	-10.27	-9.73%	31.66	25.76	-5.9	-18.64%
female	P.K.	male	BrE	135.23	124.75	-10.48	-7.75%	36.46	22.94	-13.52	-37.08%
female	A.C.	male	BrE	122.03	169.82	47.79	39.16%	37.54	46.68	9.14	24.35%
female	A.M.	male	BrE	147.05	151.85	4.8	3.26%	57.13	54.7	-2.43	-4.25%
female	M.N.	female	BrE	175.42	238.43	63.01	35.92%	64.16	70.82	6.66	10.38%

Appendix B. cont.

Example number	Source	Extract	Character's name
50	<i>Bleak House.</i> Chapter 7	<u>"Yes, child. She is daughter of a widow in the village. Maids are so hard to teach, now- a-days, that I have put her about me young. She's an apt scholar and will do well. She shows the house already, very pretty. She lives with me at my table here."</u>	Mrs. Rouncewell
51	<i>The Haunted Man and the Ghost's Bargain.</i> Chapter 1	<u>"Indeed I can't tell, sir," said Milly, after thinking a little, "because I am not at all clever, you know; and I wanted to be useful to him in making things neat and comfortable about him, and employed myself that way. But I know he is poor, and lonely, and I think he is somehow neglected too."</u>	Milly Swidger
52	<i>The Pickwick Papers.</i> Chapter 4	<u>"You were going to say that Isabel stoops – I know you were – you men are such observers. Well, so she does; it can't be denied; and, certainly, if there is one thing more than another that makes a girl look ugly it is stooping. I often tell her that when she gets a little older she'll be quite frightful."</u>	Rachael Wardle
53	<i>Oliver Twist.</i> Chapter 2	<u>"I'm sure Mr. Bumble, that I was only a telling one or two of the dear children as is so fond of you, that it was you a coming,"</u> replied Mrs. Mann with great humility.	Mrs. Mann
54	<i>Oliver Twist.</i> Chapter 35	<u>"It is,"</u> replied Rose, <u>"that you must endeavour to forget me; not as your old and dearly- attached companion, for that would wound me deeply; but, as the object of your love. Look into the world; think how many hearts you would be proud to gain, are there. Confide some other passion to me, if you will; I will be the truest, warmest, and most faithful friend you have."</u>	Rose Maylie
55	<i>David Copperfield.</i> Chapter 8	<u>"Well then, don't talk about such uncomfortable things, there's a good soul,"</u> said my mother. <u>"Miss Betsey is shut up in her cottage by the sea, no doubt, and will remain there. At all events, she is not likely ever to trouble us again."</u>	Clara Copperfield
56	<i>Christmas Carol.</i> Stave 4	<u>"They're better now again,"</u> said Cratchit's wife. <u>"It makes them weak by candle-light; and I wouldn't show weak eyes to your father, when he comes home, for the world. It must be near his time."</u>	Mrs. Cratchit
57	<i>The Old Curiosity Shop.</i> Chapter 4	<u>"Very well,"</u> said Mrs Quilp, nodding her head, <u>"as I said just now, it's very easy to talk, but I say again that I know – that I'm sure – Quilp has such a way with him when he likes, that the best looking woman here couldn't refuse him if I was dead, and she was free, and he chose to make love to her."</u>	Betsy Quilp
58	<i>A Tale of Two Cities.</i> Book 2, Chapter 6	<u>"I don't know, Mr. Darnay; I told you it was a foolish fancy, but you asked for it. When I have yielded myself to it, I have been alone, and then I have imagined them the footsteps of the people who are to come into my life, and my father's."</u>	Lucie Manette

Character's gender	Reader's initials	Reader's gender	Reader's dialect	Reader's mean F0 in the whole chapter in Hz	Mean F0 in extract in Hz	F0 shift in Hz	F0 shift in percentages	Reader's mean SD of F0 in the whole chapter in Hz	SD of F0 in extract in Hz	SD of F0 shift in Hz	SD of F0 shift in percentages
female	C.L.	female	AmE	199.65	226.68	27.03	13.54%	56.19	67.96	11.77	20.95%
female	R.G.	female	BrE	155.16	246.55	91.39	58.90%	43.74	57.72	13.98	31.96%
female	D.L.	female	AmE	199.53	204	4.47	2.24%	47	39.51	-7.49	-15.94%
female	K.P.	female	AmE	238.1	302.05	63.95	26.86%	53.32	83.06	29.74	55.78%
female	C.S.	female	BrE	220.2	22.43	2.23	1.01%	37.65	32.37	-5.28	-14.02%
female	L.A.	female	AmE	198.05	207.2	9.15	4.62%	47.16	45.56	-1.6	-3.39%
female	K.S.	female	AmE	177.13	183.43	6.3	3.56%	62.63	62.49	-0.14	-0.22%
female	E.	female	BrE	152.85	182.3	29.45	19.27%	33.28	26.01	-7.27	-21.84%
female	T.	female	AmE	223.53	235.84	12.31	5.51%	64.46	64.26	-0.2	-0.31%

Appendix B. cont.

Example number	Source	Extract	Character's name
59	<i>Our Mutual Friend.</i> Book 1, Chapter 4	"Yes," said Mrs Wilfer, "the man came himself with a pair of pincers, and took it off, and took it away. He said that as he had no expectation of ever being paid for it, and as he had an order for another LADIES' SCHOOL door-plate, it was better (burnished up) for the interests of all parties."	Mrs Wilfer
60	<i>Our Mutual Friend.</i> Book 2, Chapter 2	<u>"I have been thinking," Jenny went on, "as I sat at work to-day, what a thing it would be, if I should be able to have your company till I am married, or at least courted. Because when I am courted, I shall make Him do some of the things that you do for me. He couldn't brush my hair like you do, or help me up and down stairs like you do, and he couldn't do anything like you do; but he could take my work home, and he could call for orders in his clumsy way. And he shall too."</u>	Jenny Wren (Fanny Cleaver)
61	<i>Our Mutual Friend.</i> Book 2, Chapter 16	<u>"For I aint, you must know," said Betty, "much of a hand at reading writing-hand, though I can read my Bible and most print. And I do love a newspaper. You mightn't think it, but Sloppy is a beautiful reader of a newspaper. He do the Police in different voices."</u>	Betty Higden
62	<i>Our Mutual Friend.</i> Book 2, Chapter 4	<u>"Alfred, my dear, Mr Fledgeby very justly says, apropos of the last scene, that true constancy would not require any such stimulant as the stage deems necessary."</u>	Mrs. Sophronia Lammle
63	<i>Oliver Twist.</i> Chapter 41	<u>"I believe," interposed Miss Maylie, "that at this period of our interview, I need not give that gentleman the trouble of going away. If I am correctly informed, he is cognizant of the business on which I wish to speak to you."</u>	Mrs. Maylie
64	Jane Austen. <i>Northanger Abbey.</i> Chapter 6	<u>"I will read you their names directly; here they are, in my pocketbook. Castle of Wolfenbach, Clermont, Mysterious Warnings, Necromancer of the Black Forest, Midnight Bell, Orphan of the Rhine, and Horrid Mysteries. Those will last us some time."</u>	Isabella Thorpe

Character's gender	Reader's initials	Reader's gender	Reader's dialect	Reader's mean F0 in the whole chapter in Hz	Mean F0 in extract in Hz	F0 shift in Hz	F0 shift in percentages	Reader's mean SD of F0 in the whole chapter in Hz	SD of F0 in extract in Hz	SD of F0 shift in Hz	SD of F0 shift in percentages
female	O.D.	female	BrE	218.68	210.97	-7.71	-3.53%	49.33	34.53	-14.8	-30.00%
female	K.F.	female	AmE	210.36	220.99	10.63	5.05%	55.58	61.94	6.36	11.44%
female	J.B.	female	BrE	163.17	161.48	-1.69	-1.04%	62.26	71.01	8.75	14.05%
female	R.N.	female	AmE	239.47	231.12	-8.35	-3.49%	64.06	71.29	7.23	11.29%
female	A.V.	female	BrE	186.81	195.86	9.05	4.84%	55.13	29.42	-25.71	-46.64%
female	V.	female	BrE	259.42	268.15	8.73	3.37%	68.12	70.64	2.52	3.70%