# Reproduction of Verbeke und Simon (2023)

**Listening to accents: Comprehensibility, accentedness and intelligibility of native and non-native English speech**

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## 1 About the study/ background

The aim of the study by Verbeke and Simon (2023) is to examine the multidialectal listening skills of proficient English learners, i.e. how well English learners (EFL) understand different

accents of English. They establish three concepts: **comprehensibility** refers to the self-reported ease of understanding a speaker, **intelligibility** describes the actual understanding measured by the performance in a transcription task, and **accentedness** reports how strong the listener perceived the accent to be.

Verbeke and Simon (2023: 5) apply the model of 'World Englishes' which was constructed by Kachru (1985). This model sorts the English-speaking and English-using world into three circles: The **Inner Circle** contains native English-speaking countries, the **Outer Circle** includes countries where English is an official language and that have a history of English occupation (largely colonisation, e.g. India, Nigeria, Kenya). Lastly, in countries of the **Expanding Circle**, English is not the first, dominant, or official language, but instead as an international language.

- Research questions (Verbeke and Simon (2023): 5-6)
  - RQ1: How comprehensible are speakers with different native and non-native accents of English to EFL learners in higher education and to what extent do the perceived strength of the speaker's accent and listeners' familiarity with the speaker's accent impact on their comprehensibility ratings?
  - RQ2: How intelligible are speakers with native and non-native accents of English to EFL learners enrolled at an institute of higher education in Flanders?
  - RQ3: To what extent are EFL learners' comprehensibility ratings of speakers with native and non-native accents of English related to their intelligibility scores for these speakers?
- Hypotheses:
  - listeners' judgements of comprehensibility vary as function of which circle speakers represent, i.e. speakers with Inner circle accents are more comprehensible than speakers with non-Inner Circle accents
  - speakers with Expanding Circle accents are slightly easier to understand than speakers with Outer Circle accents, hypothesised to be rated more accented because further removed from expectation

# 2 Method

## 2.1 Reading and Preprocessing the Data

First, we read in the data provided by the authors of the study. The data is available at the Tromsø Repository of Language and Linguistics.

In the `ComprAcc.data`, comprehensibility and accentedness are rated from the EFL learners on a scale from 1 to 10 (for comprehensibility: 1 = easy to understand; 9 = hard to understand; for accentedness: 1 = no accent; 9 = strong accent) (Verbeke and Simon 2023: 8)). The intelligibility data (`Intell.data`) represents the transcription performance of the EFL learners when listening to each accent (accuracy, so whether the word was correctly or falsely transcribed). The dataframe `ComprIntell.data` includes comprehensibility ratings and intelligibility scaled on the range of 0 to 1.

We convert the character variable "Accent" in all three data frames to factor to get its levels.

```
[1] "ChinEng" "GAE"     "GBE"     "IndEng"  "NBE"     "NigEng"  "SAE"
[8] "SpanEng"
```

Next, the levels of the factor are renamed for more transparent labeling.

```
[1] "Chinese English"          "General American English"
[3] "General British English"  "Indian English"
[5] "Newcastle English"        "Nigerian English"
[7] "Texan English"            "Spanish English"
```

Levels are reordered according to Kachru (1985)' model of 'World Englishes' (Inner Circle: Standard British, Standard American, Dialect British, Dialect American; Outer circle: Indian English, Nigeran English; Expanding Circle: Chinese English, Spanish English).

```
[1] "General British English"  "General American English"
[3] "Newcastle English"        "Texan English"
[5] "Indian English"           "Nigerian English"
[7] "Chinese English"          "Spanish English"
```

## 2.2 Data Exploration (Descriptive Statistics)

### 2.2.1 Comprehensibility

Table 1 summarises the descriptive statistics of the comprehensibility measurements grouped by accent. Interpret???

### 2.2.2 Accentedness

Table 2 summarises the descriptive statistics of the comprehensibility measurements grouped by accent. What does this tell us?

Table 1: Descriptive Statistics for Comprehensibility Rating

| Accent | Mean | Median | SD | Min | Max | IQR |
|---|---|---|---|---|---|---|
| General British English | 2.030303 | 2 | 0.8833476 | 1 | 5 | 0 |
| General American English | 1.121212 | 1 | 0.3314340 | 1 | 2 | 0 |
| Newcastle English | 2.242424 | 2 | 1.2754975 | 1 | 6 | 2 |
| Texan English | 2.393939 | 2 | 1.5194447 | 1 | 8 | 2 |
| Indian English | 3.606061 | 3 | 1.6382039 | 2 | 8 | 2 |
| Nigerian English | 3.939394 | 4 | 1.6190158 | 1 | 7 | 2 |
| Chinese English | 3.303030 | 3 | 1.4248870 | 1 | 7 | 1 |
| Spanish English | 3.303030 | 3 | 1.2370542 | 1 | 6 | 1 |

Table 2: Descriptive Statistics for Accentedness Rating

| Accent | Mean | Median | SD | Min | Max | IQR |
|---|---|---|---|---|---|---|
| General British English | 4.151515 | 4 | 2.152342 | 1 | 9 | 4 |
| General American English | 2.303030 | 2 | 1.570924 | 1 | 6 | 2 |
| Newcastle English | 5.060606 | 5 | 2.135114 | 1 | 9 | 4 |
| Texan English | 6.303030 | 7 | 1.811161 | 3 | 9 | 3 |
| Indian English | 6.939394 | 7 | 1.248484 | 4 | 9 | 2 |
| Nigerian English | 6.878788 | 7 | 1.691109 | 3 | 9 | 3 |
| Chinese English | 6.424242 | 7 | 1.677616 | 3 | 9 | 3 |
| Spanish English | 6.575758 | 6 | 1.521313 | 4 | 9 | 3 |

# 3 Results

## 3.1 Accentedness

Figure 1 visualises the accentedness ratings for each accent. It illustrates that General American English was rated the least accented; General British English was rated second least accented but more than General American. Participants assessed Newcastle English (British dialect) as slightly more accented than General British English while Texan, Indian, Nigerian, Chinese and Spanish English were all rated pretty similarly the most accented.

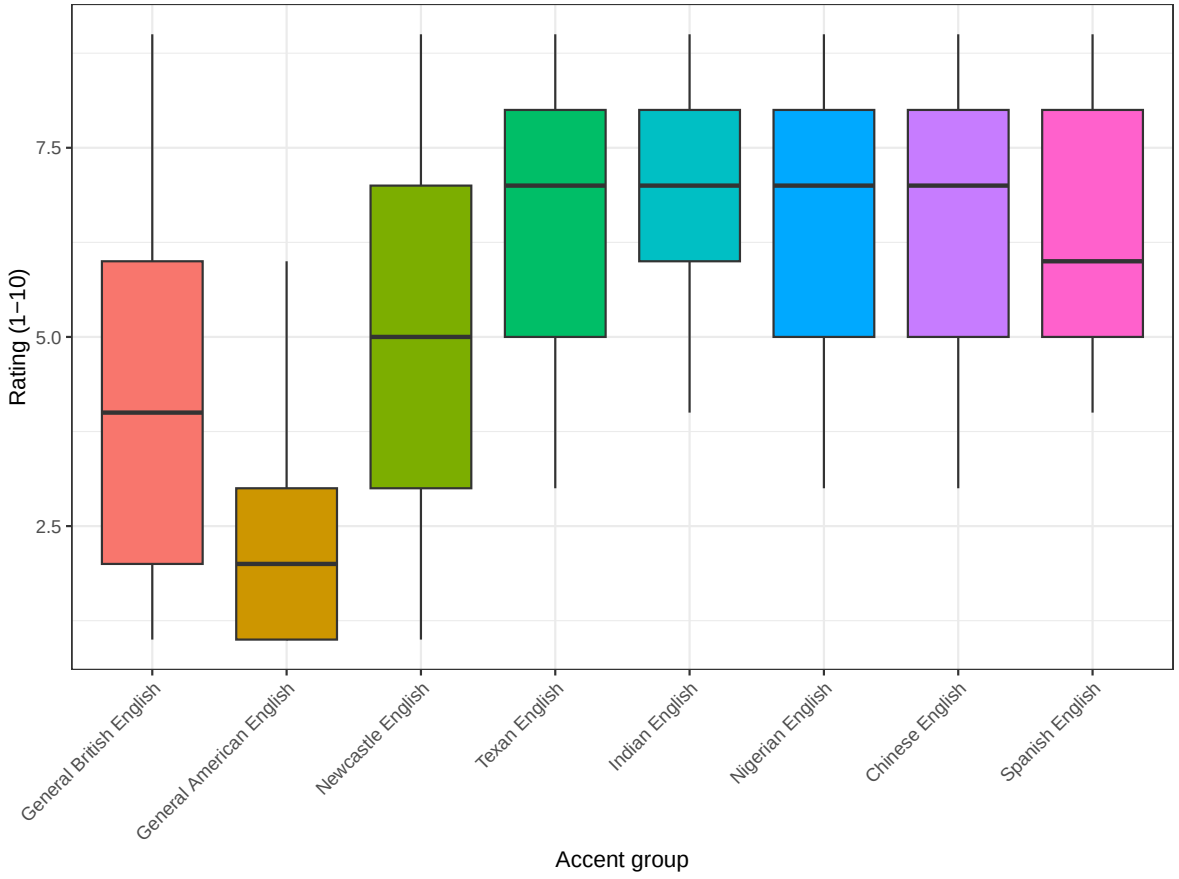


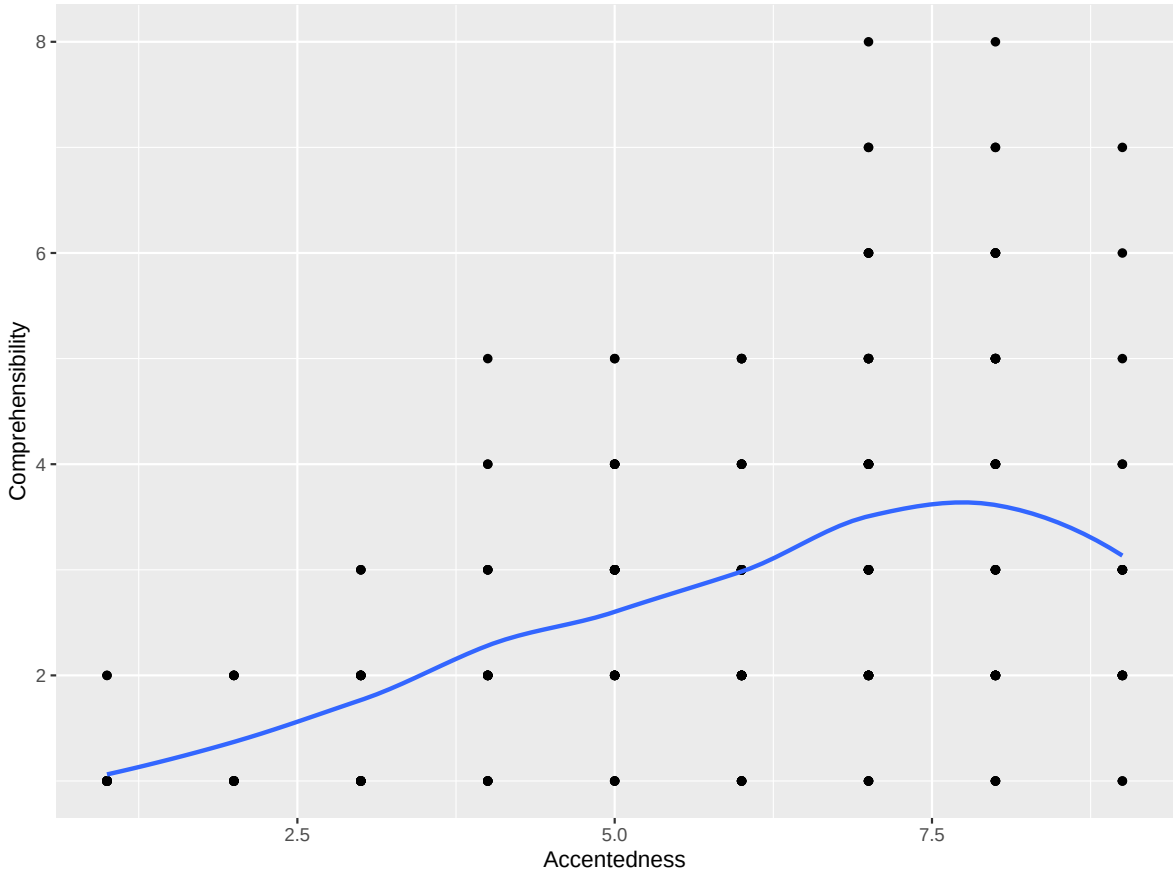

Figure 1: Rated Accentedness Grouped by Accent

## 3.2 Accentedness and Comprehensibility

RQ1: How comprehensible are speakers with different native and non-native accents of English to EFL learners in higher education and to what extent do the perceived strength of the

speaker's accent and listeners' familiarity with the speaker's accent impact on their comprehensibility ratings?

Exploring the (potential) correlation of Accentedness and Comprehensibility:




```
    Pearson's product-moment correlation

data:  ComprAcc.data$Accentedness and ComprAcc.data$Comprehensibility
t = 9.4502, df = 262, p-value < 2.2e-16
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
 0.4083213 0.5890646
sample estimates:
      cor
0.5041938
```

A statistically significant positive correlation ($p < 2.2e\text{-}16$) of ratings of comprehensibility and accentedness is observed, which makes intuitive sense: higher comprehensibility ratings (which, perhaps counterintuitively, mean harder to understand) occur often with higher accentedness ratings (i.e. stronger accent). The data reflects that more accented speech was more difficult to understand for speakers than less accented speech (But keep in mind that this rating is entirely subjective, as Verbeke and Simon (2023: 3) emphasise).

Statistical significance test (t-test, two-sample Wilcoxon test) ?

## 3.3 Intelligibility

RQ2: How intelligible are speakers with native and non-native accents of English to EFL learners enrolled at an institute of higher education in Flanders?

Absolute frequencies:

| | FALSE | TRUE |
|---|---|---|
| General British English | 255 | 1362 |
| General American English | 67 | 1319 |
| Newcastle English | 170 | 1381 |
| Texan English | 86 | 1135 |
| Indian English | 283 | 1103 |
| Nigerian English | 271 | 1049 |
| Chinese English | 139 | 851 |
| Spanish English | 201 | 1086 |

Barplot relative frequencies (proportional):

As Figure 2 demonstrates, participants performed better than chance for all accents, although there was some variation between languages that match the Circle model. Most errors were made for Nigerian English and Indian English, which belong to the Outer Circle according to Kachru (1985), i.e. participants had most trouble understanding these accents. Participants had least trouble transcribing General American English & Texan English, i.e. participants understood these accents best.

Notably, there were more errors in understanding Standard British English than American English (British English similar to Expanding Circle Accents). For American English, transciption performance for dialect speech (Texan English) was slightly worse than for the Standard variant (though Accuracy was still very high) while for British English, the Newcastle dialect improved intelligibility slightly compared to General British English.

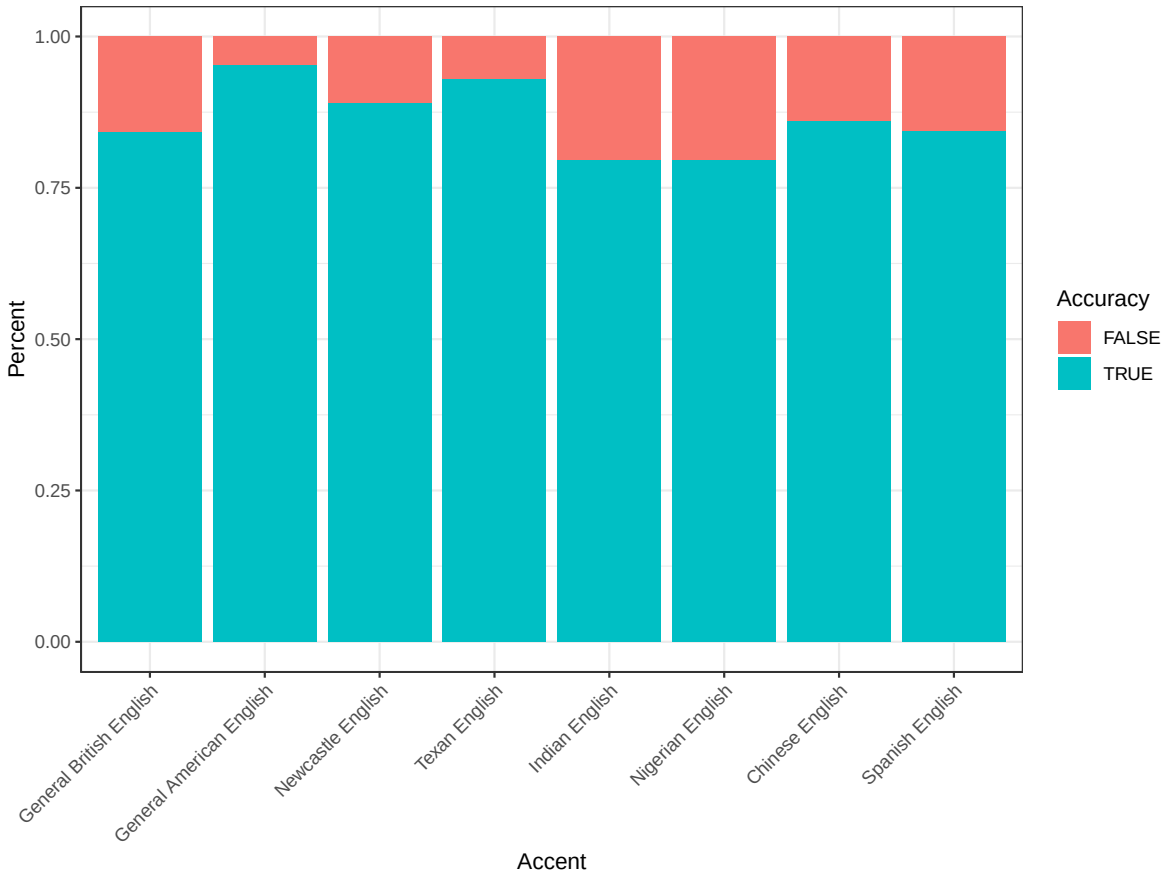
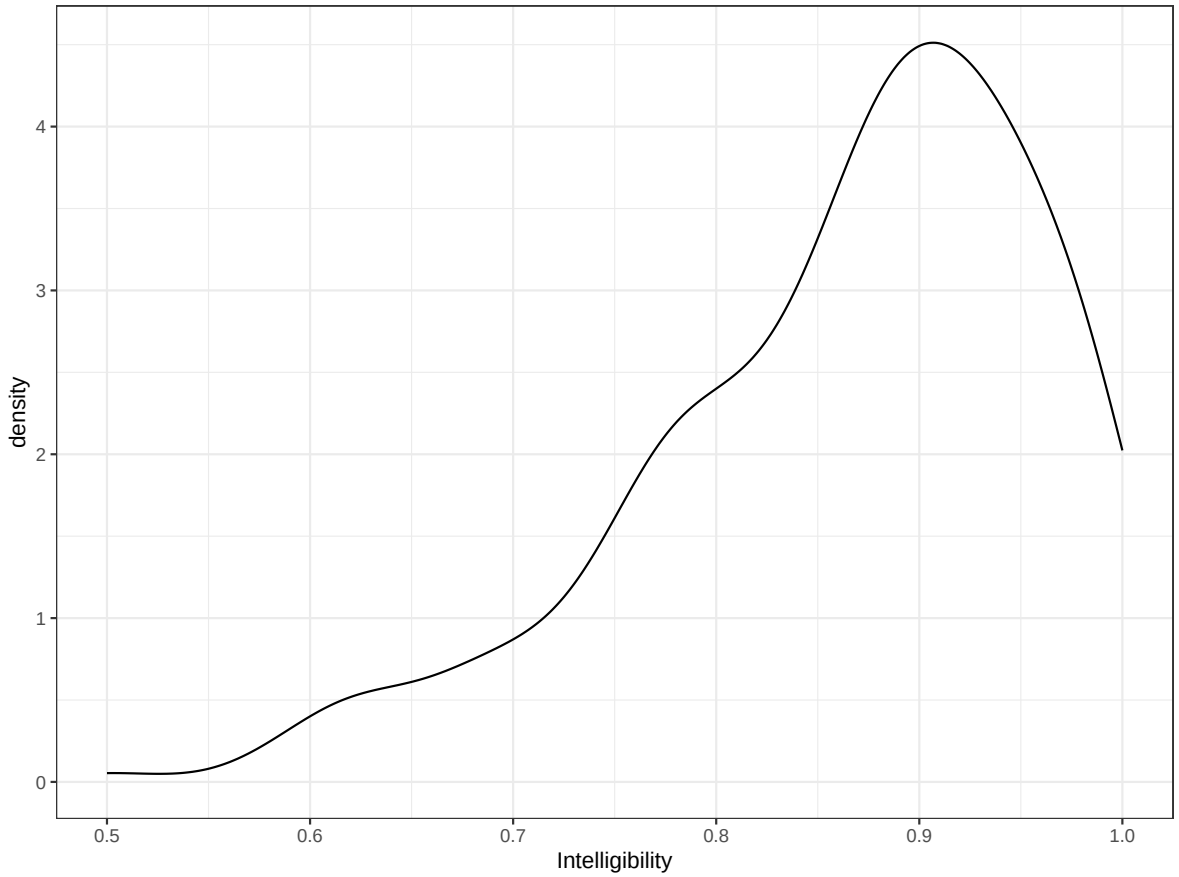

1.00
0.75
0.50
0.25
0.00
Percent
General British English
General American English
Newcastle English
Texan English
Indian English
Nigerian English
Chinese English
Spanish English
Accent
Accuracy
FALSE
TRUE

Figure 2

In the `ComprIntell.data`, intelligbility is scaled between 0 and 1 as a continuous variable (seemingly means: how much percent did the participant transcribe correctly (in that accent))

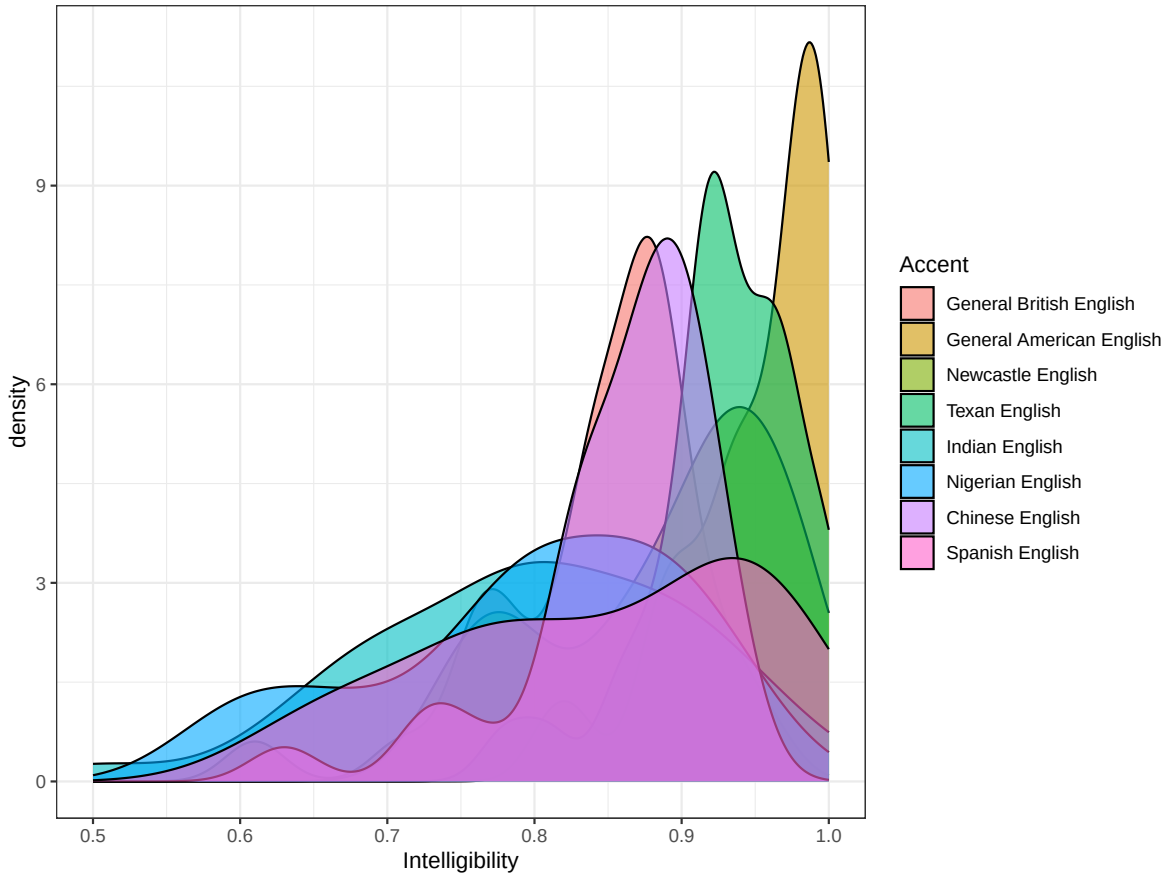
Distribution/ density:

```
 0.5 0.58  0.6 0.61 0.62 0.63 0.64 0.65 0.67 0.68 0.69 0.71 0.72 0.73 0.74 0.75
   1    1    2    1    2    2    2    1    2    2    5    3    1    3    4    2
0.76 0.77 0.78 0.79  0.8 0.81 0.82 0.83 0.84 0.85 0.86 0.87 0.88 0.89  0.9 0.91
   5    8    6    9    5    6    2   12    6    7    6   13   20    3   20    6
0.92 0.93 0.94 0.95 0.96 0.97 0.98    1
  18   12    7   16    4   10   15   14
```




Bell-shaped curve but left-skewed: overall, participants performed above chance in the transcription task.

Compare across Accent groups:

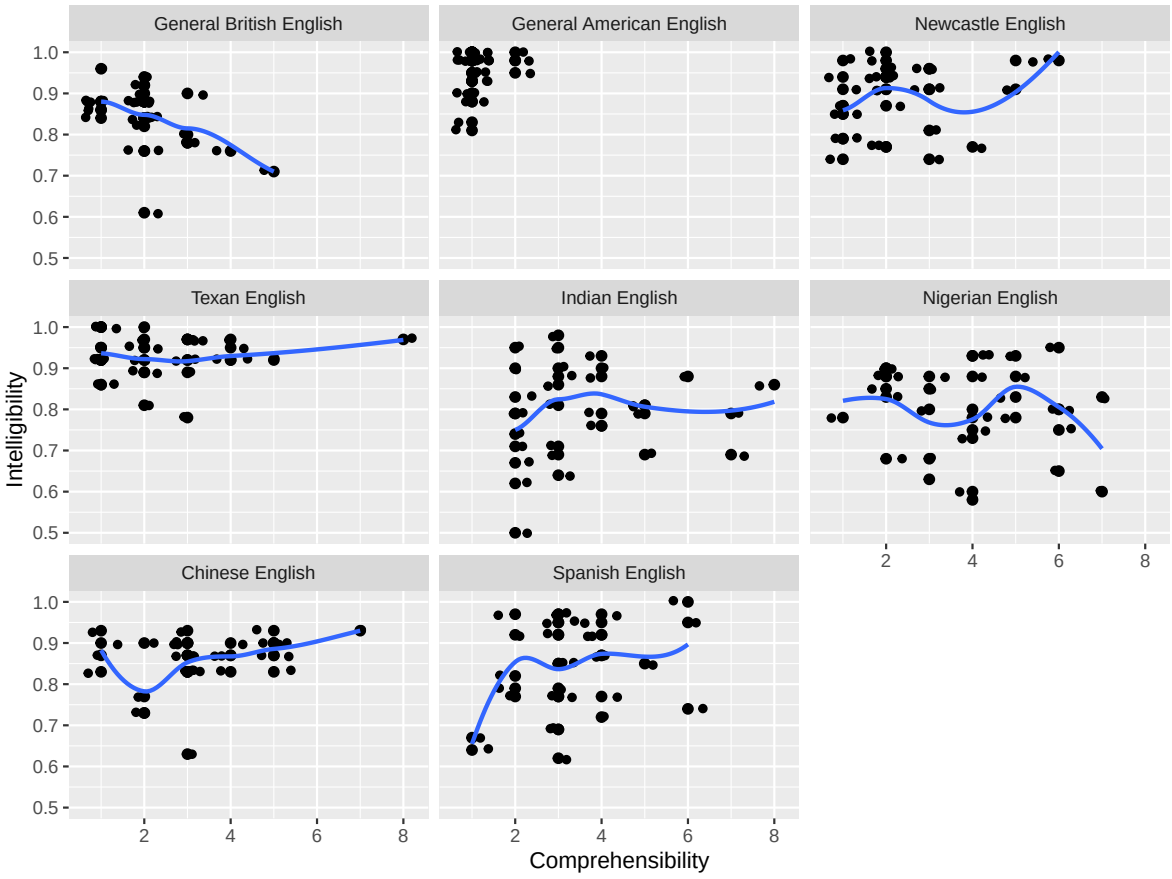



Not sure how helpful this is… looks a little overloaded with colour (graphs can be isolated by `facet_grid(~ Accent)`). But it demonstrates that the general tendency of left skew exists for all accents, i.e. on average, participants scored better than chance for all accents, and (again) that General American English was the most intelligible, which aligns with it being rated as least accented and most comprehensible. Notably, Spanish English, Nigerian English and Indian English (as far as I can tell) have quite a flat curve, while the others are really steep with a pointed peak.

## 3.4 Intelligibility and Comprehensibility

Exploring the correlation of intelligibility and comprehensibility, i.e. did self-reported comprehensibility align with objective, measured intelligibility? (RQ3: To what extent are EFL learners' comprehensibility ratings of speakers with native and non-native accents of English related to their intelligibility scores for these speakers?)

Checking correlation of comprehensibility and intelligibility for each accent using a scatterplot:




Looks really similar to the one from the paper (was not on purpose)! What does it tell us?

## 4 Notes

R-Markdown script provided but takes forever to render (like more than 1 hour) and heats up the system (because it fits several highly complex models)

- first goal: work with .csv files to reproduce descriptive results
  - properties of speech samples used for the tasks → tables
  - comprehensibility ratings; accentedness ratings → violin plots
  - self-reported familiarity → tables
  - transcription accuracy (number & proportion of correctly transcribed content and function words of each speaker of English); which types of transcription errors occurred most frequently
  - self-reported ease of understanding speakers with different accents - match with their actual understanding? (linear correlation?) → scatterplots

# 5 References

Kachru, Braj B. 1985. "Standards, Codification and Sociolinguistic Realism: The English Language in the Outer Circle." *English in the World: Teaching and Learning the Language and Literatures/Cambridge UP*.

Verbeke, Gil, and Ellen Simon. 2023. "Listening to Accents: Comprehensibility, Accentedness and Intelligibility of Native and Non-Native English Speech." *Lingua* 292: 103572.

## 5.1 Packages used

```
R version 4.4.1 (2024-06-14)
Platform: aarch64-apple-darwin20
Running under: macOS 15.5

Matrix products: default
BLAS:   /Library/Frameworks/R.framework/Versions/4.4-arm64/Resources/lib/libRblas.0.dylib
LAPACK: /Library/Frameworks/R.framework/Versions/4.4-arm64/Resources/lib/libRlapack.dylib;  L

locale:
[1] en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8

time zone: Europe/Berlin
tzcode source: internal

attached base packages:
[1] stats     graphics  grDevices utils     datasets  methods   base

other attached packages:
 [1] kableExtra_1.4.0 here_1.0.1       lubridate_1.9.3  forcats_1.0.0
 [5] stringr_1.5.1    dplyr_1.1.4      purrr_1.0.2      readr_2.1.5
 [9] tidyr_1.3.1      tibble_3.2.1     ggplot2_3.5.1    tidyverse_2.0.0

loaded via a namespace (and not attached):
 [1] utf8_1.2.4        generics_0.1.3    xml2_1.3.6        lattice_0.22-6
 [5] stringi_1.8.4     hms_1.1.3         digest_0.6.37     magrittr_2.0.3
 [9] evaluate_1.0.0    grid_4.4.1        timechange_0.3.0  fastmap_1.2.0
[13] Matrix_1.7-0      rprojroot_2.0.4   jsonlite_1.8.9    mgcv_1.9-1
[17] fansi_1.0.6       viridisLite_0.4.2 scales_1.3.0      cli_3.6.3
[21] rlang_1.1.4       splines_4.4.1     munsell_0.5.1     withr_3.0.1
[25] yaml_2.3.10       tools_4.4.1       tzdb_0.4.0        colorspace_2.1-1
[29] vctrs_0.6.5       R6_2.5.1          lifecycle_1.0.4   pkgconfig_2.0.3
[33] pillar_1.9.0      gtable_0.3.5      glue_1.8.0        systemfonts_1.1.0
```

```
[37] xfun_0.48          tidyselect_1.2.1  rstudioapi_0.16.0 knitr_1.48
[41] farver_2.1.2       nlme_3.1-164      htmltools_0.5.8.1 rmarkdown_2.28
[45] svglite_2.1.3      labeling_0.4.3    compiler_4.4.1
```

## 5.2 Package references

The code to generate these package references was written by Elen Le Foll.


[1] G. Grolemund and H. Wickham. "Dates and Times Made Easy with lubridate". In: *Journal of Statistical Software* 40.3 (2011), pp. 1-25. https://www.jstatsoft.org/v40/i03/.

[2] K. Müller. *here: A Simpler Way to Find Your Files*. R package version 1.0.1. 2020. https://here.r-lib.org/.

[3] K. Müller and H. Wickham. *tibble: Simple Data Frames*. R package version 3.2.1. 2023. https://tibble.tidyverse.org/.

[4] R Core Team. *R: A Language and Environment for Statistical Computing*. R Foundation for Statistical Computing. Vienna, Austria, 2024. https://www.R-project.org/.

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[11] H. Wickham, W. Chang, L. Henry, et al. *ggplot2: Create Elegant Data Visualisations Using the Grammar of Graphics*. R package version 3.5.1. 2024. https://ggplot2.tidyverse.org.

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[14] H. Wickham, J. Hester, and J. Bryan. *readr: Read Rectangular Text Data*. R package version 2.1.5. 2024. https://readr.tidyverse.org.

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[16] Y. Xie. *Dynamic Documents with R and knitr*. 2nd. ISBN 978-1498716963. Boca Raton, Florida: Chapman and Hall/CRC, 2015. https://yihui.org/knitr/.

[17] Y. Xie. "knitr: A Comprehensive Tool for Reproducible Research in R". In: *Implementing Reproducible Computational Research*. Ed. by V. Stodden, F. Leisch and R. D. Peng. ISBN 978-1466561595. Chapman and Hall/CRC, 2014.

[18] Y. Xie. *knitr: A General-Purpose Package for Dynamic Report Generation in R*. R package version 1.48. 2024. https://yihui.org/knitr/.

[19] H. Zhu. *kableExtra: Construct Complex Table with kable and Pipe Syntax*. R package version 1.4.0. 2024. http://haozhu233.github.io/kableExtra/.