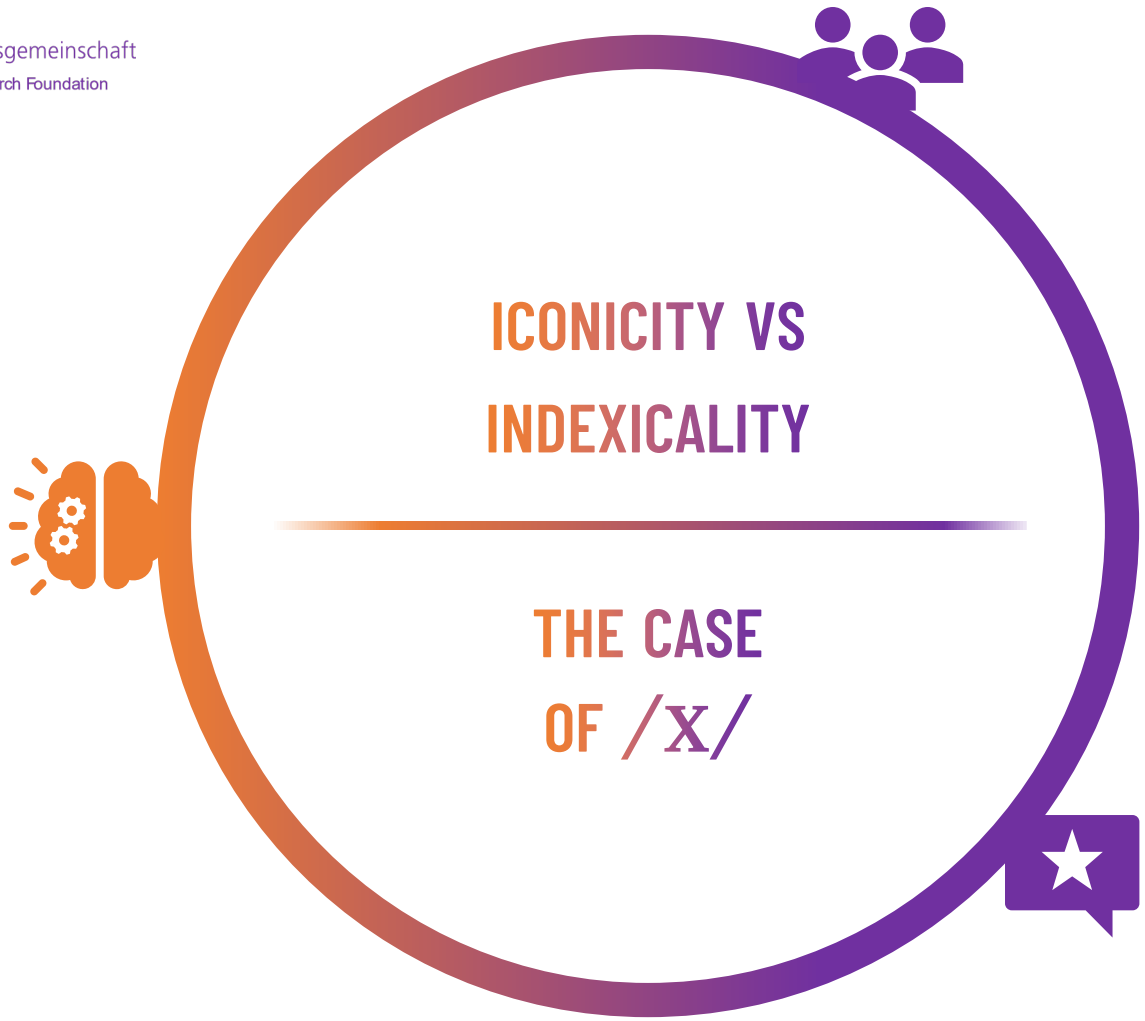
SOUNDS, ATTITUDES, AND MEANING
Funded by
DFG Deutsche Forschungsgemeinschaft
German Research Foundation

hhu Heinrich Heine Universität Düsseldorf



ICONICITY VS INDEXICALITY

THE CASE OF /x/

IcoSem 3

Simon David Stein

2025-02-09


Background

Language attitudes

German is ugly and harsh.

French sounds romantic.

You can almost hear Scottish people mining in a shaft when they talk.

Southern speech sounds uneducated.

If it's weird, it's Welsh.

New York English sounds rude.

Orkish sounds evil.

examples adapted from Stein 2023, Tamasi & Antieau 2015: 2–254, Mooshammer et al. 2023, and Reiterer et al. 2020; also see Silverstein 2003; Irvine & Gal 2000

Language attitudes

Language attitudes

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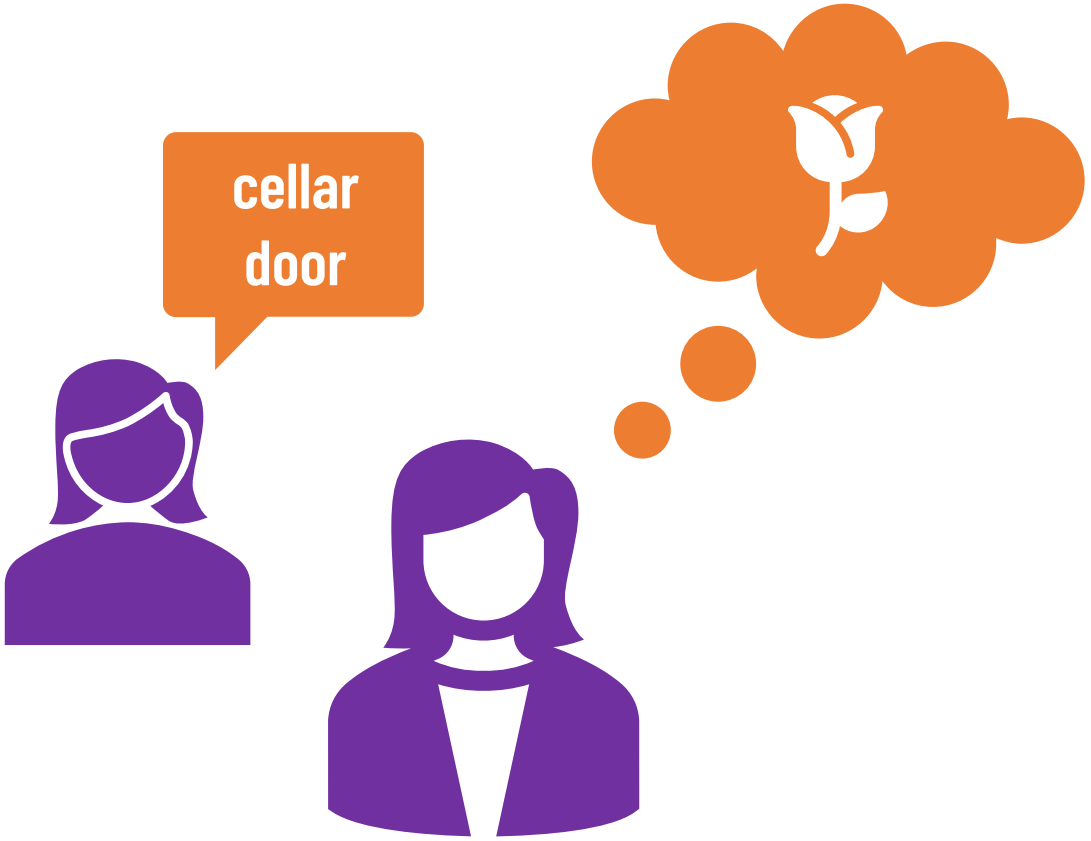
Language attitudes



Language attitudes

The big unsolved question

Why attitudes?

Why do listeners have attitudes towards language?

⇩

Two groups of explanations

INDEXICALITY	ICONICITY

Two groups of explanations

INDEXICALITY

ICONICITY

Peirce 1958; Silverstein 2003; Giles and Niedzielski 1998
Kawahara et al. 2021; Winter et al. 2022

Some studies looking at both groups of explanations

INDEXICALITY

Reiterer et al. 2020
evidence for both social and phonetic factors

Mooshammer et al. 2023
evidence for both social and phonetic factors

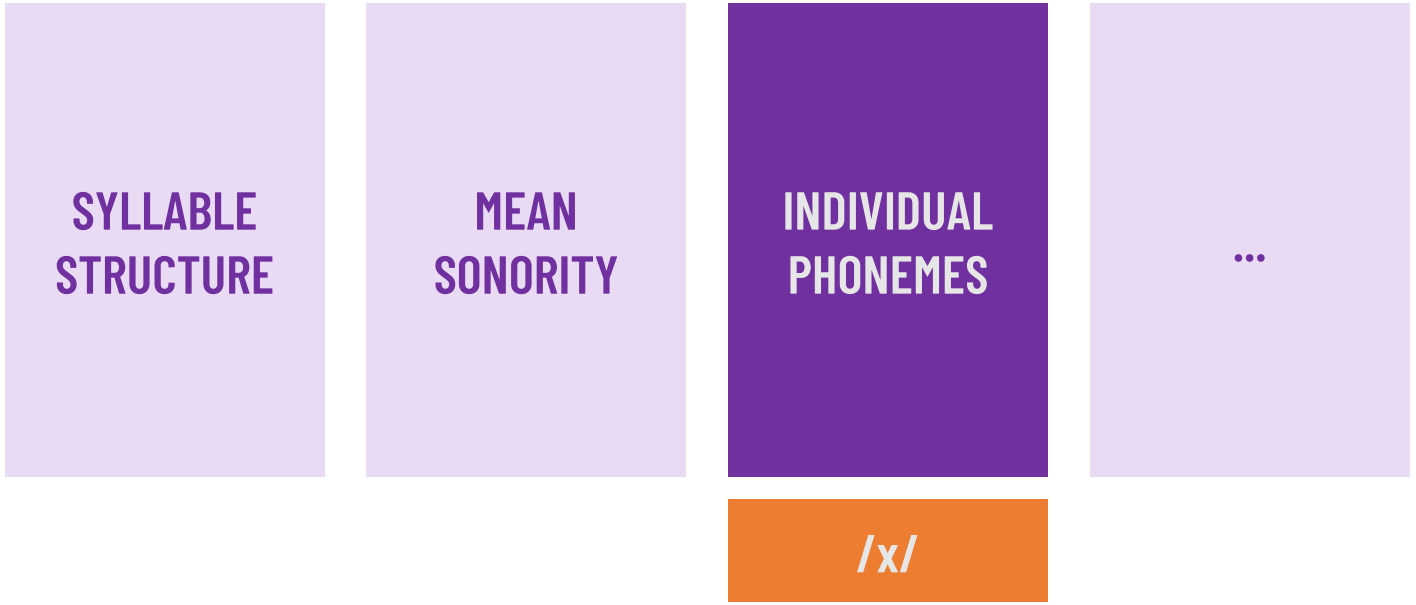
ICONICITY

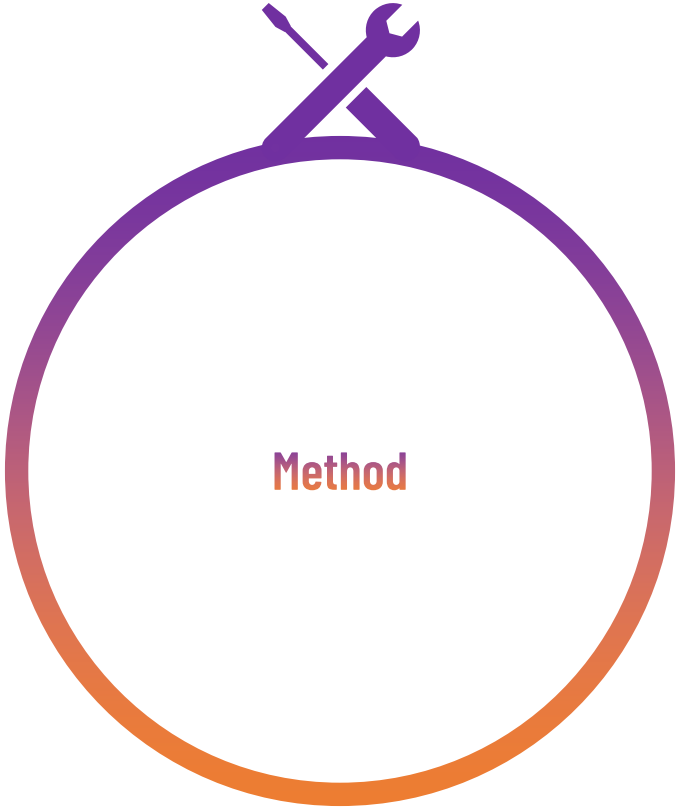
Anikin et al. 2023
evidence for only social factors

Hilton et al. 2022
evidence for only phonetic factors

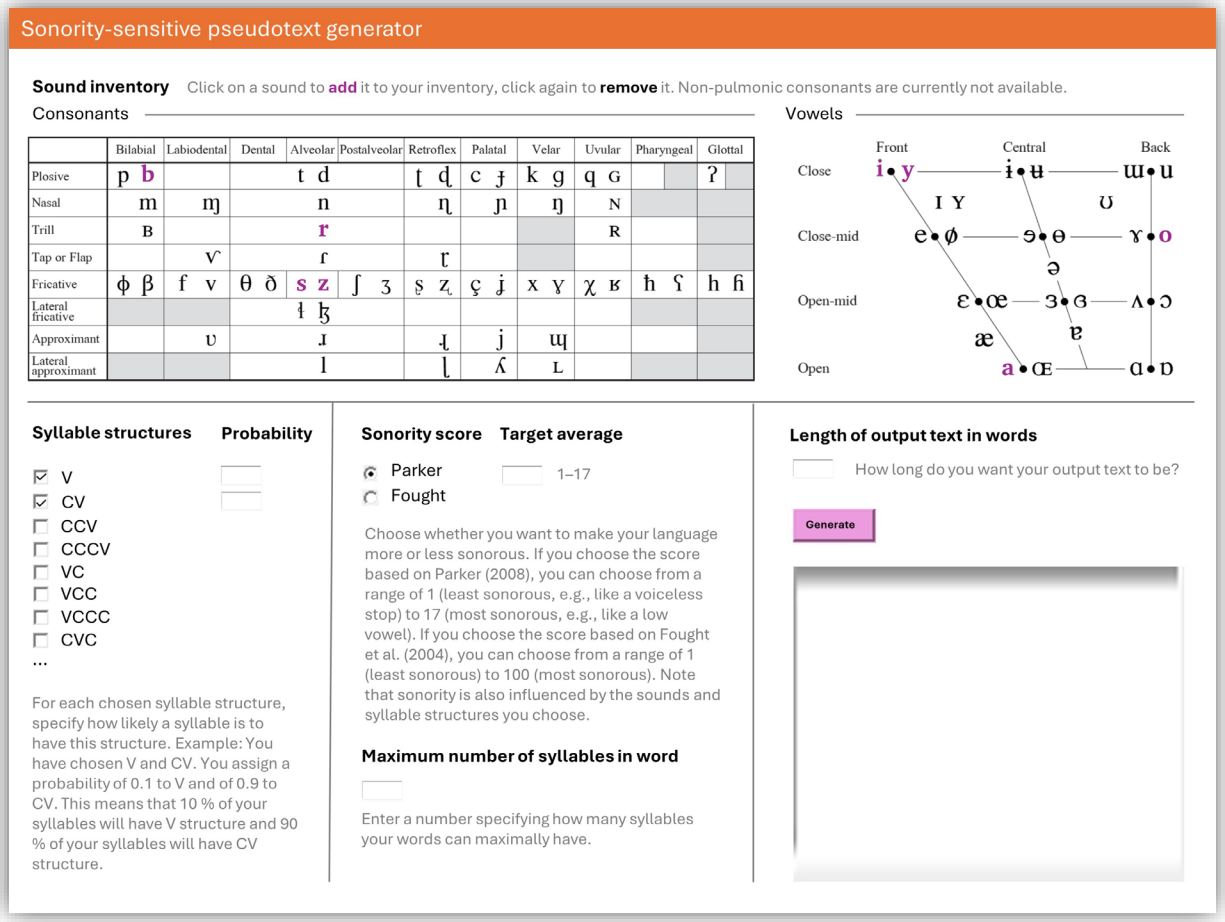
This series of studies:

- uses languages never heard before, created from scratch.
- can play with sounds and social attributes in a controlled way.
- isolates specific, potentially iconic phonetic-phonological features.




Method

SSPG Sonority-sensitive pseudotext generator



In development.
GUI is a draft concept.

SSPG Sonority-sensitive pseudotext generator

Control

Consonants = ['m', 'k', 'j', 'p', 'w', 'n', 't', 'l', 's', 'b']
Vowels = ['i', 'u', 'a', 'e', 'o']

Sounds['SonorityWeight'] = 1

MaxSyllableNumber = 4

SyllableStructures = ['V', 'CV']

SyllableWeights = [1, 9]

TextLength = 100

SenLength = max(1, int(random.gauss(12, 5))

Stimulus

Consonants = ['m', 'k', 'j', 'p', 'w', 'n', 't', 'b', 'X']
Vowels = ['i', 'u', 'a', 'e', 'o']

Sounds['SonorityWeight'] = 1

MaxSyllableNumber = 4

SyllableStructures = ['V', 'CV']

SyllableWeights = [1, 9]

TextLength = 100

SenLength = max(1, int(random.gauss(12, 5))

cf. Gordon 2016, Maddieson 2013, Moran et al. 2019, Goodall 2020

SSPG Sonority-sensitive pseudotext generator

	Control			Stimulus		
Speaker	1	2	3	1	2	3
Mean sonority 1–17	10.91	10.94	10.92	10.94	10.95	10.92
Consonants %	47.62	46.9	47.26	47.33	47.44	47.13
Obstruents %	25.32	23.97	23.73	24.52	26.07	26.43
Vowels %	52.4	53.1	52.7	52.7	52.6	52.9
Voicing %	79.44	80.37	79.51	79.53	78.21	78.28
Syllable structure	CV, V	CV, V	CV, V	CV, V	CV, V	CV, V
Syllable weights 0–1	0.9, 0.1	0.9, 0.1	0.9, 0.1	0.9, 0.1	0.9, 0.1	0.9, 0.1
Number of words in text	100	100	100	100	100	100
Max number of syllables	4	4	4	4	4	4
Sound inventory	base	base	base	base, x	base, x	base, x

SSPG Sonority-sensitive pseudotext generator

Example for control condition

Mo mutu kima le napo soteoi lubita bisi mabumopi tapesi satiu sue sobabise si painu nopu wupeto je sipawi bu nake muba no pa. Pe ne jako u po munilawi o jetuwi nu mo kuloa wiwiji somawejo. Nosobape juji pu kopopobo waka toajonu mi takeka jabakeja tisu tuelu kepe jewo luwo jesoa wejoniwe kasajo jujianu. Wulusa sa ma mieto ta tojimu motutasa lo we no pika. Nomewiju sau ta seili ni puwoja nase ju lelemi wawamonu bo pukebopo. Wa bakolimu kuuali jiku ke sobi tosisabo kikitebi nitiwusu jupike lipu enibu mopobewa ti iwibaja kinotu wa busu bibuase kuine kosumewe. Toinu.

SSPG Sonority-sensitive pseudotext generator

Example for stimulus condition

Sauxi nuopo pu xo boxiliwa limuwua muneu tasasupe banepoku bano jumabise kuta wi pu pa tixu meja tupi tobimo boma. Ku jewia mujaxito li ta. Teloju ana epoo xitexi xotiwo no pexu kuwuto epa muwubu isiju. Wipoxai nubunipe niopawa xane joluxoka xo buipu owilu no pu mile sitokame mupaje. Xine nekosu. Mapejo ja xunujiwi esi si epa naji nuxu to. Ma naemexe beame jesobu betetumu bajotu mioxi lalo. Pibila bi wuneomo nonamito wo pelejiwe xo pa jo. Wokiwabi jopu xia ta masa ne jubuja sunasato ataxibu josakuto buxuwuxu telouna mele ku. Misa monapo ta miwi jeu so jumu enilepe lolami.

SSPG Sonority-sensitive pseudotext generator

Example for stimulus condition

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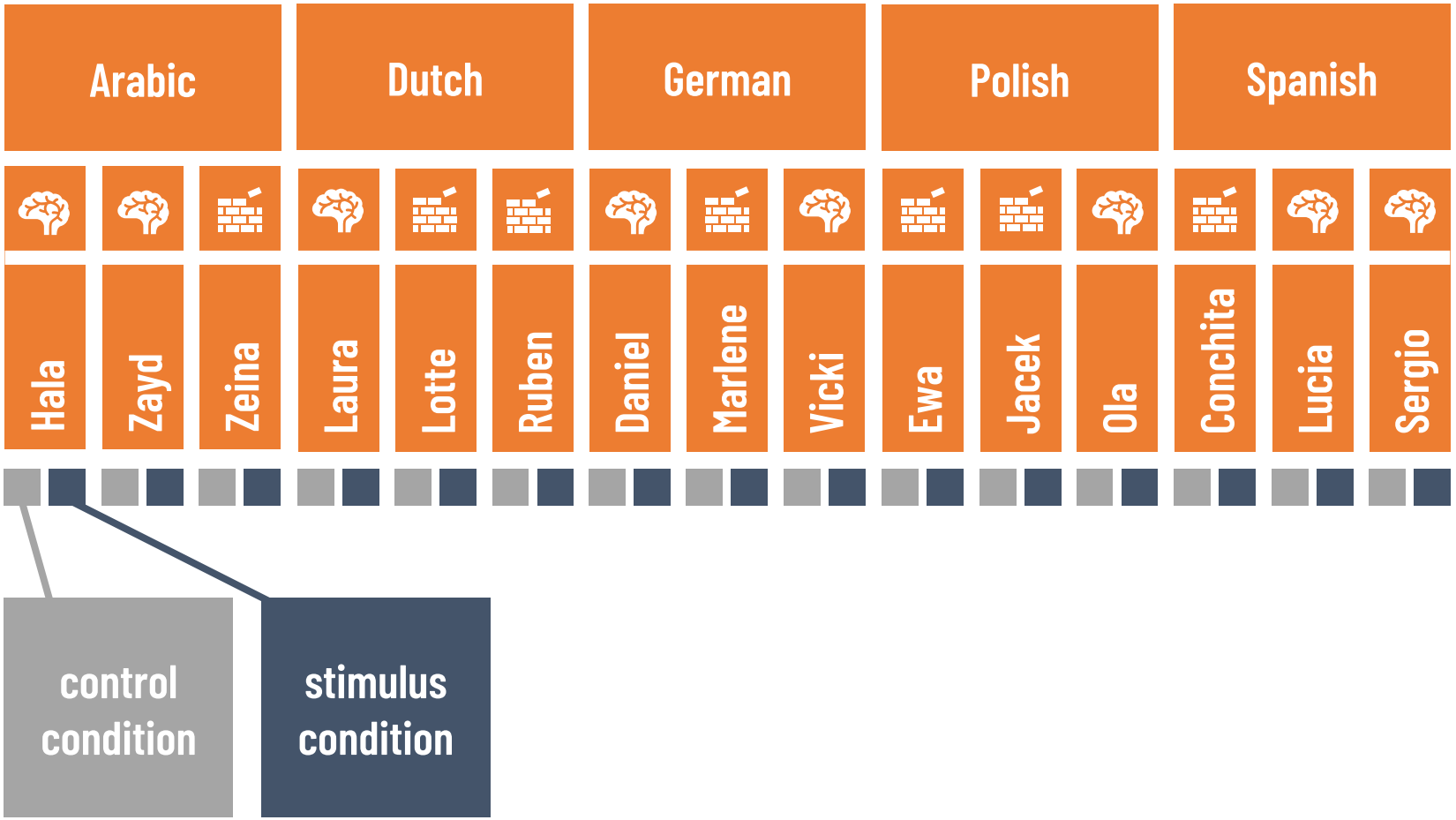
Speech synthesis with Amazon Polly



Participant quota sampling by PRIMARY LANGUAGE

Arabic	Dutch	German	Polish	Spanish
10 %	10 %	10 %	10 %	10 %
50	50	50	50	50

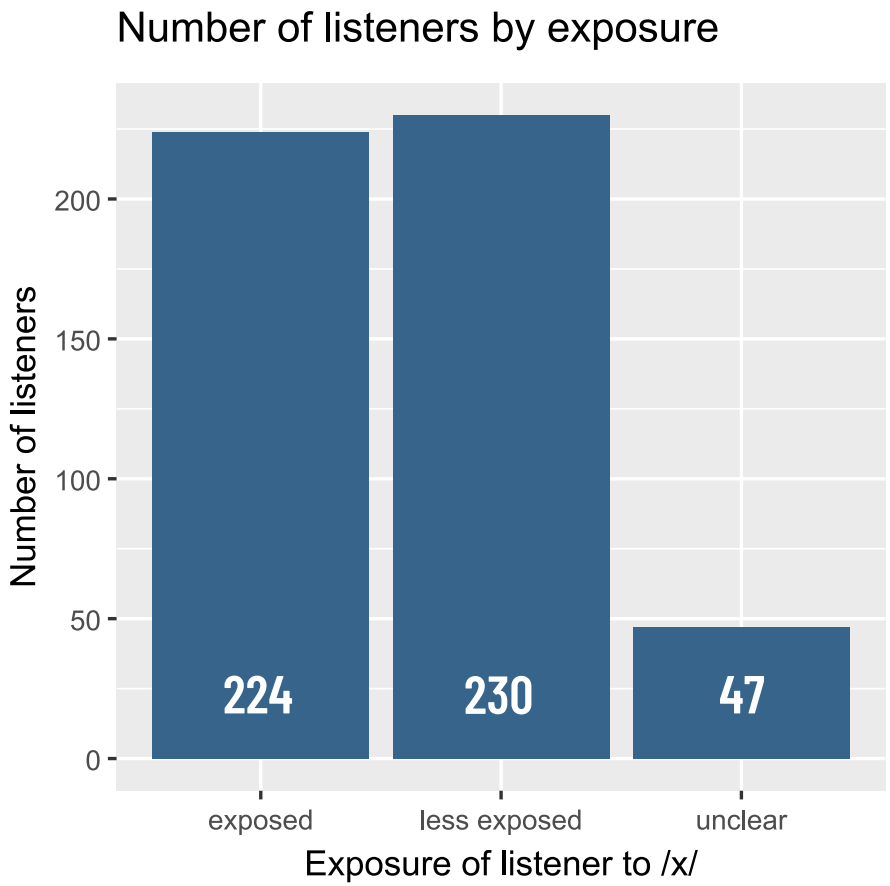
English	Italian	Japanese
17 %	17 %	16 %
86	85	80

Prolific

= 100 %

= 500

Participant demographics n = 501



Response variables

SCALE	NEGATIVE VALENCE 1		POSITIVE VALENCE 100
PLEASANTNESS	unpleasant	—	pleasant
BEAUTY	ugly	—	beautiful
SOFTNESS	hard	—	soft
SHAPE	spiky	—	round
EDUCATION	uneducated	—	educated
INTELLIGENCE	stupid	—	intelligent
FRIENDLINESS	unfriendly	—	friendly
ORDINARINESS	strange	—	normal
GOODNESS	evil	—	good
EROTICISM	unerotic	—	erotic

Questionnaire

hhu Heinrich Heine Universität Düsseldorf

19% completed

Rate speech

In the far future, you encounter a colony of human-like robots on a distant planet. Your task on this expedition is to try to understand robot society and communication.

Every individual robot speaks in a different language, accent, or dialect, but they can all understand each other by using internal translation programs. Some of the robots sound very similar, for example because they happened to get a similar voice program when they were built, or because their dialects happen to be close to each other. But you quickly notice that just like humans, every robot is unique.

You want to improve your ability to distinguish the robots and their roles in society based on their speech. To do this, you will listen to three pairs of robots. Each of the two robots in a pair will sound similar, but slightly different. You will try to rate the speech of each robot on different attributes.

When you are ready, click "Next."

Questionnaire

Rate speech

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Questionnaire

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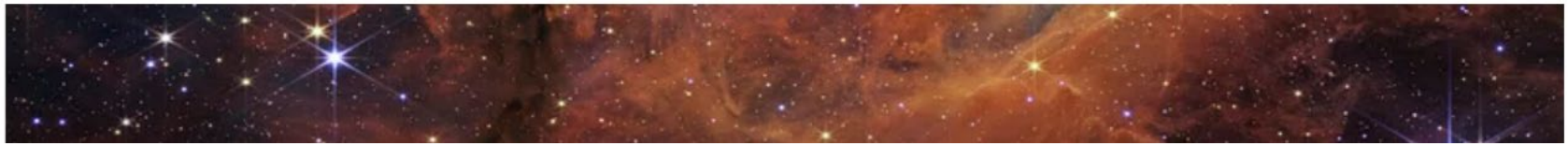

Questionnaire

You will now listen to the first pair of robots.

Please make sure you have sound enabled on your device and click "Next".

Next

Questionnaire

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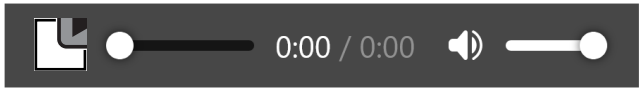
30% completed

Please listen to the recording of the first robot:

To listen, click the play button.



Questionnaire

How does the robot sound?

unpleasant	———	pleasant
ugly	———	beautiful
hard	———	soft
spiky	———	round
uneducated	———	educated
stupid	———	intelligent
unfriendly	———	friendly
strange	———	normal
evil	———	good
unerotic	———	erotic

Questionnaire

How familiar does this language sound to you?

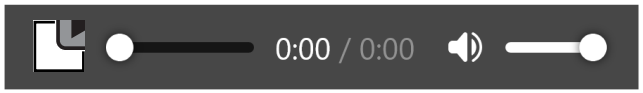
not at all familiar — very familiar

Which real language or dialect, do you think, does this language resemble the most?

Questionnaire

Please listen to the recording of the second robot:

To listen, click the play button.



Questionnaire

You will now listen to the second pair of robots.

Please make sure you have sound enabled on your device and click "Next".

Next

Modeling

cf., e.g.,
Hilton et al. 2022
Anikin et al. 2023
Reiterer et al. 2020
Mooshammer et al. 2023

Modeling One model with all scales

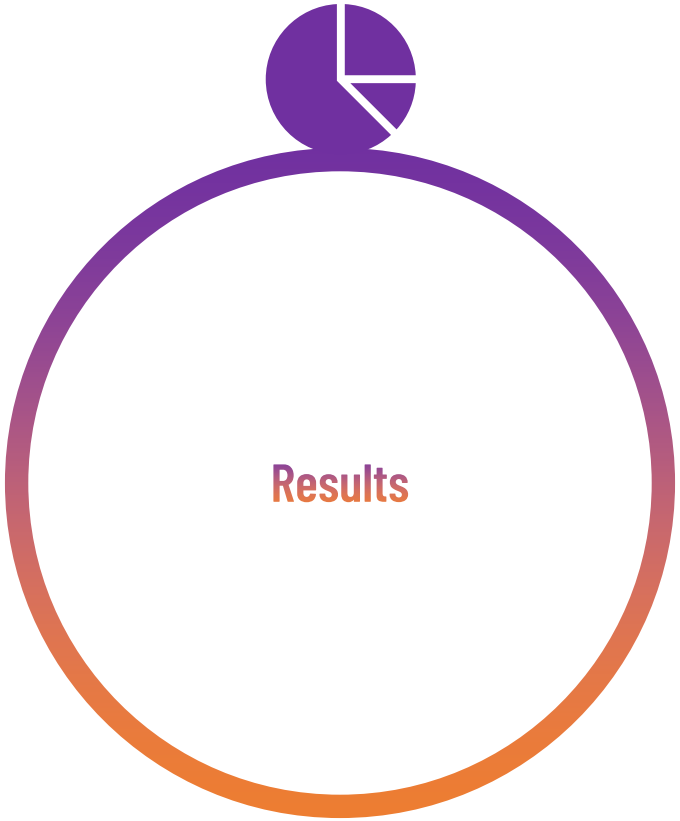
RATING ~ CONDITION * EXPOSURE +
RECOGNITION +
FAMILIARITY +
LANGUAGE +
LISTENER GENDER * VOICE GENDER +
POLYGLOT +
AGE + MUSICALITY + LINGUISTICS +
INPUT + OUTPUT + LOCATION +
SCALE +
(1 | PARTICIPANT)

cf., e.g.,
Hilton et al. 2022
Anikin et al. 2023
Reiterer et al. 2020
Mooshammer et al. 2023

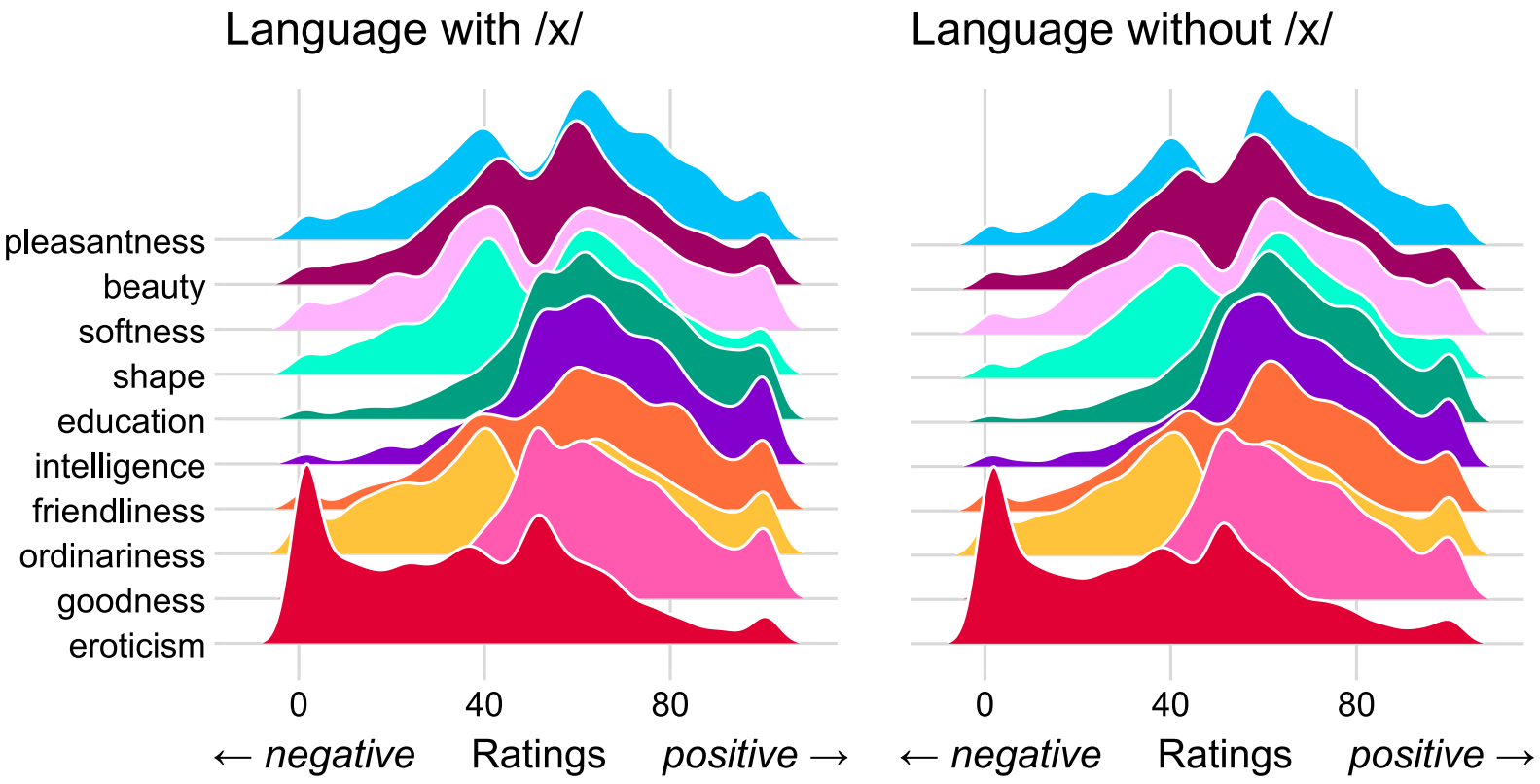
Modeling One model for each scale

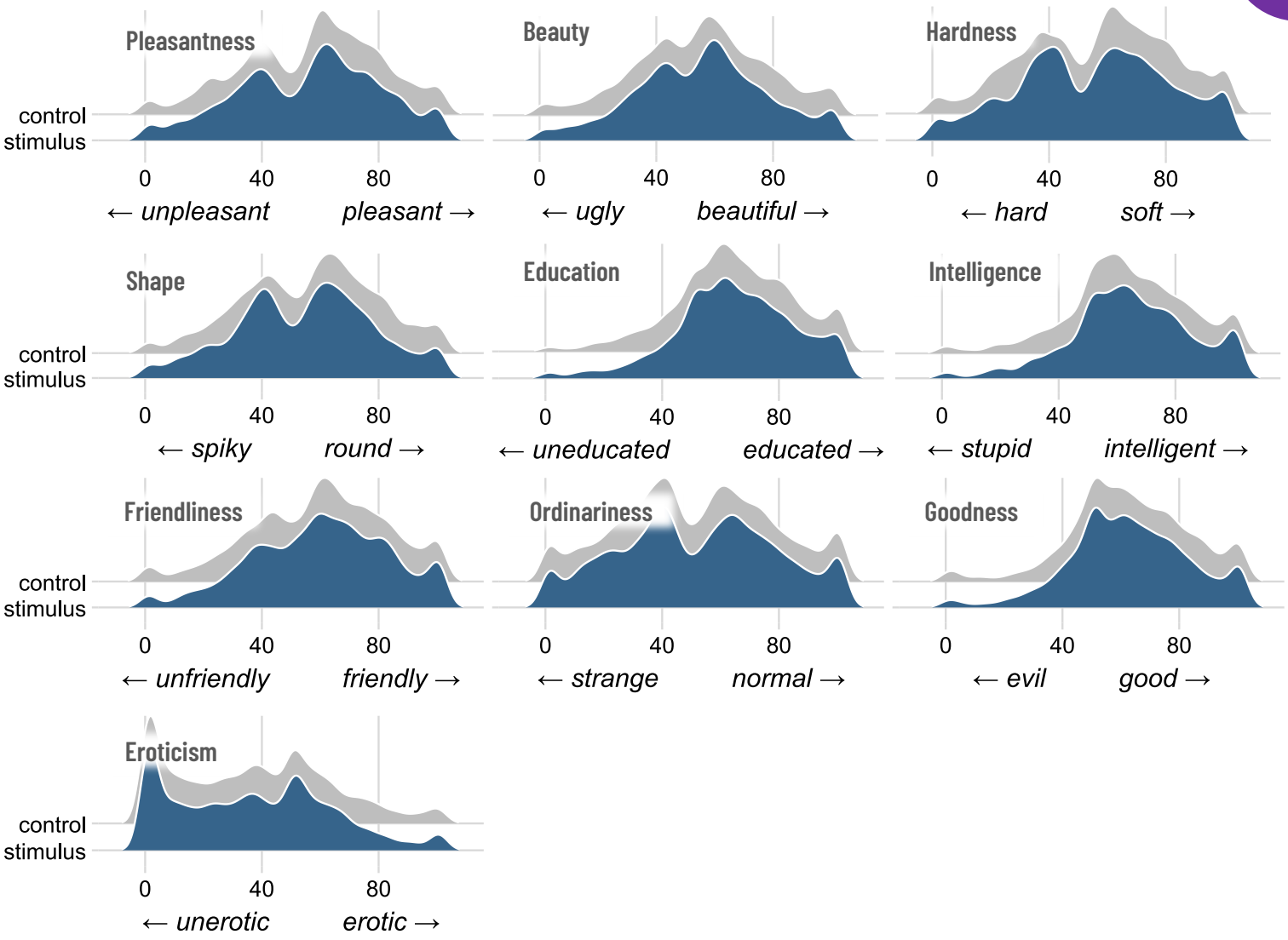
PLEASANTNESS ~ CONDITION * EXPOSURE +
example RECOGNITION +
FAMILIARITY +
LANGUAGE +
LISTENER GENDER * VOICE GENDER +
POLYGLOT +
AGE + MUSICALITY + LINGUISTICS +
INPUT + OUTPUT + LOCATION +
~~SCALE +~~
(1 | PARTICIPANT)

cf., e.g.,
Hilton et al. 2022
Anikin et al. 2023
Reiterer et al. 2020
Mooshammer et al. 2023


Results

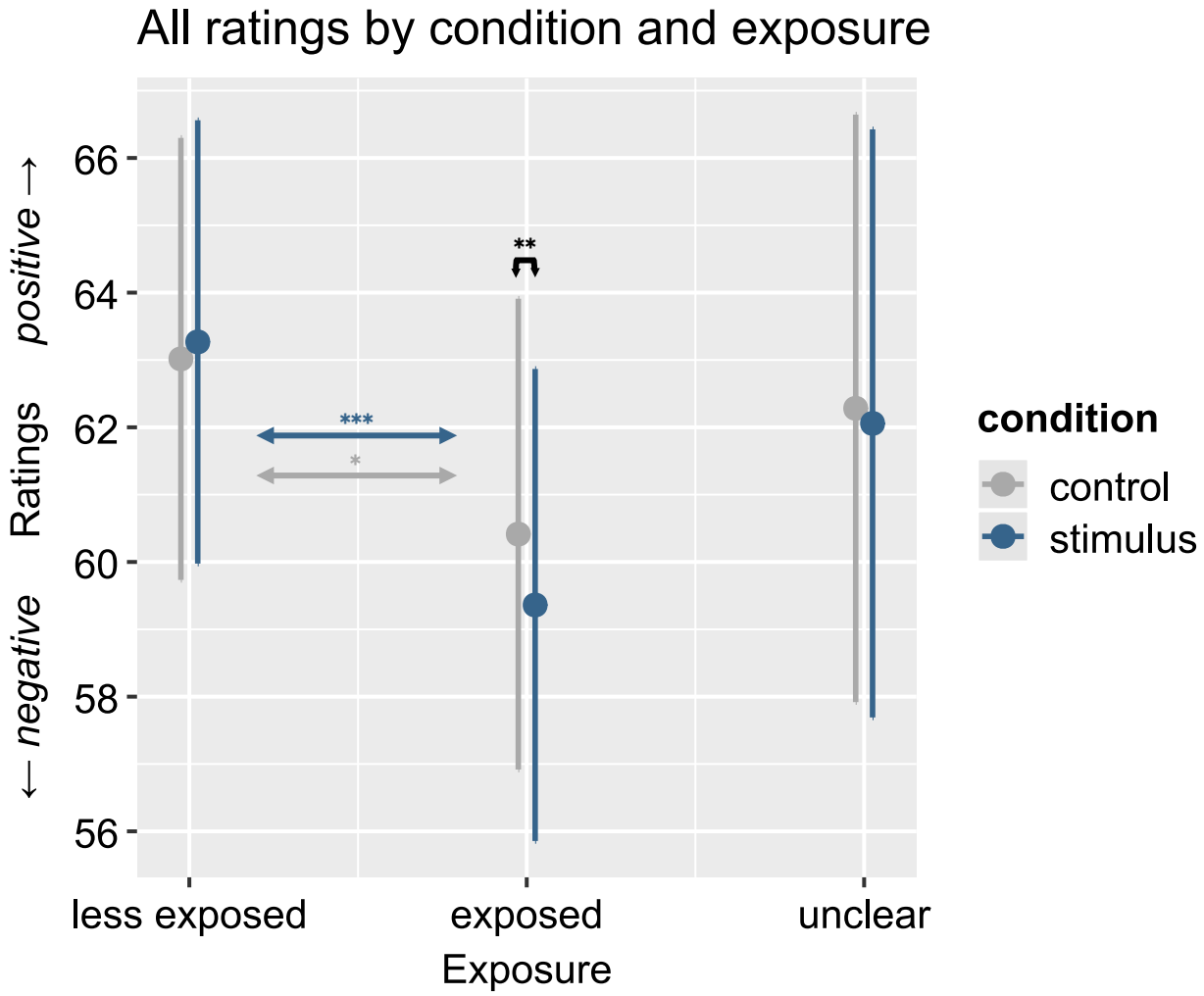
Distribution of ratings by scale for each condition



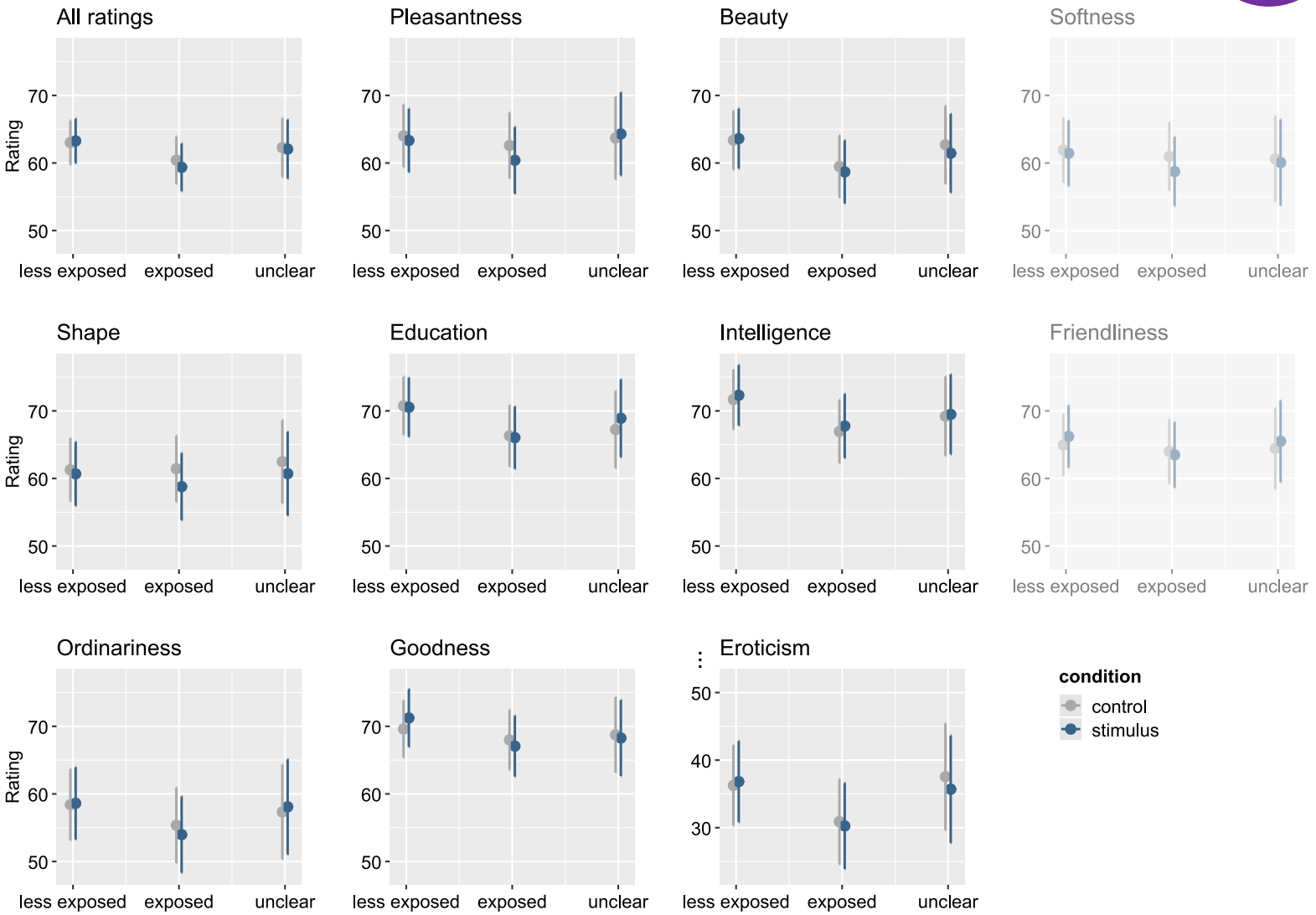


Distribution of ratings by condition for each scale

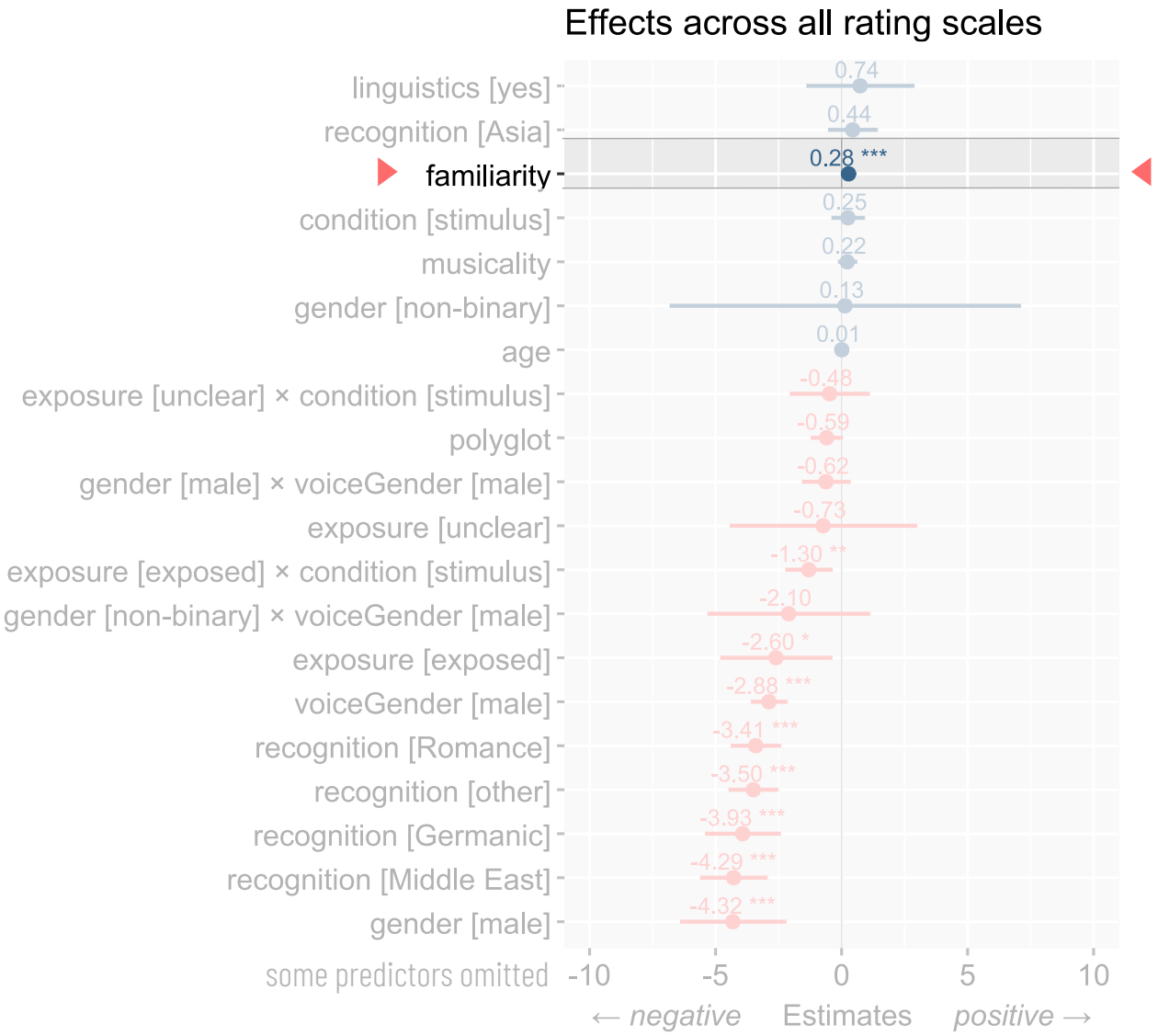
Overview of model with all scales



Condition by exposure for model with all scales

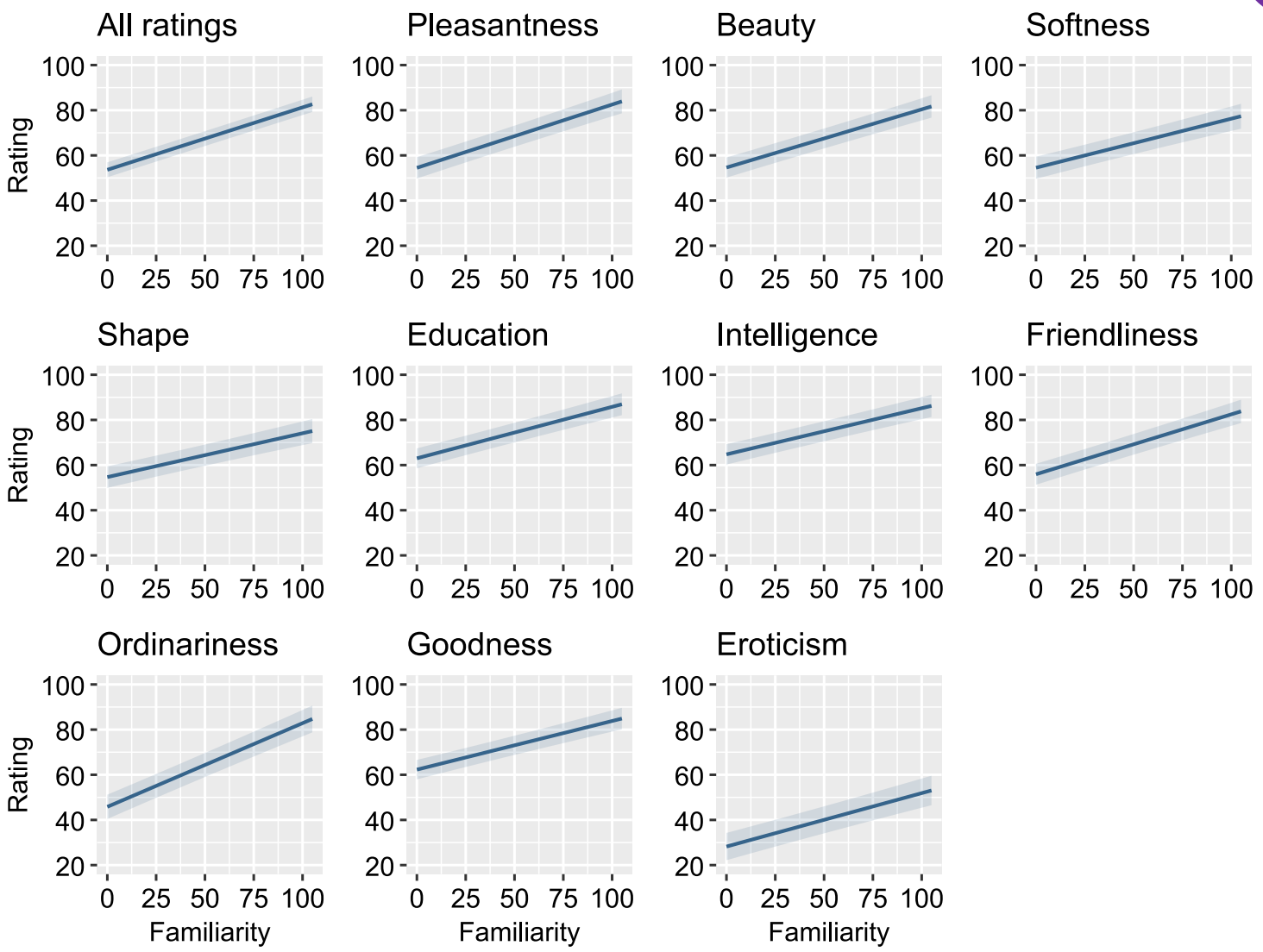


Overview of condition by exposure



Overview of model with all scales

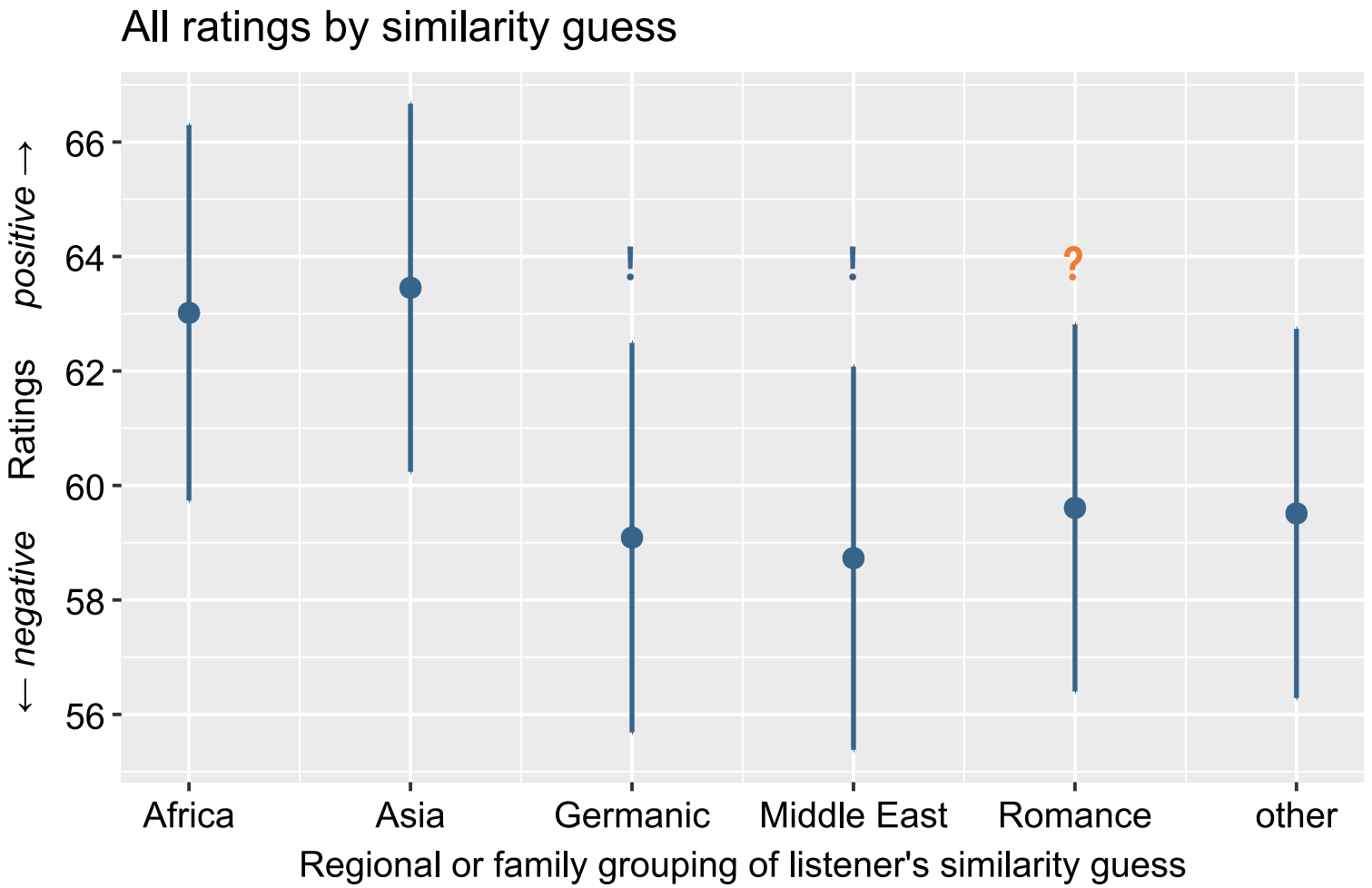
Familiarity for model with all scales



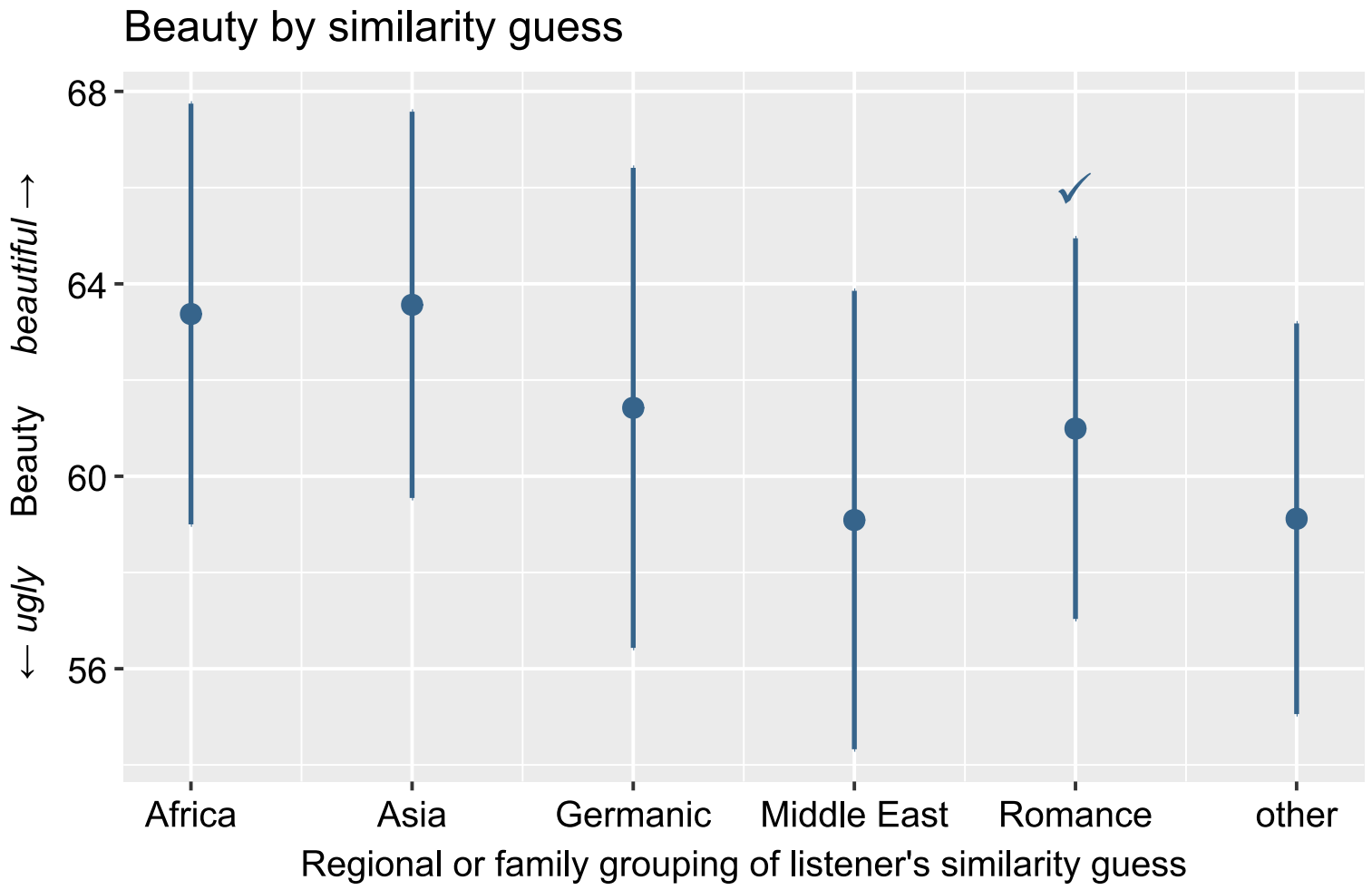
Overview of familiarity

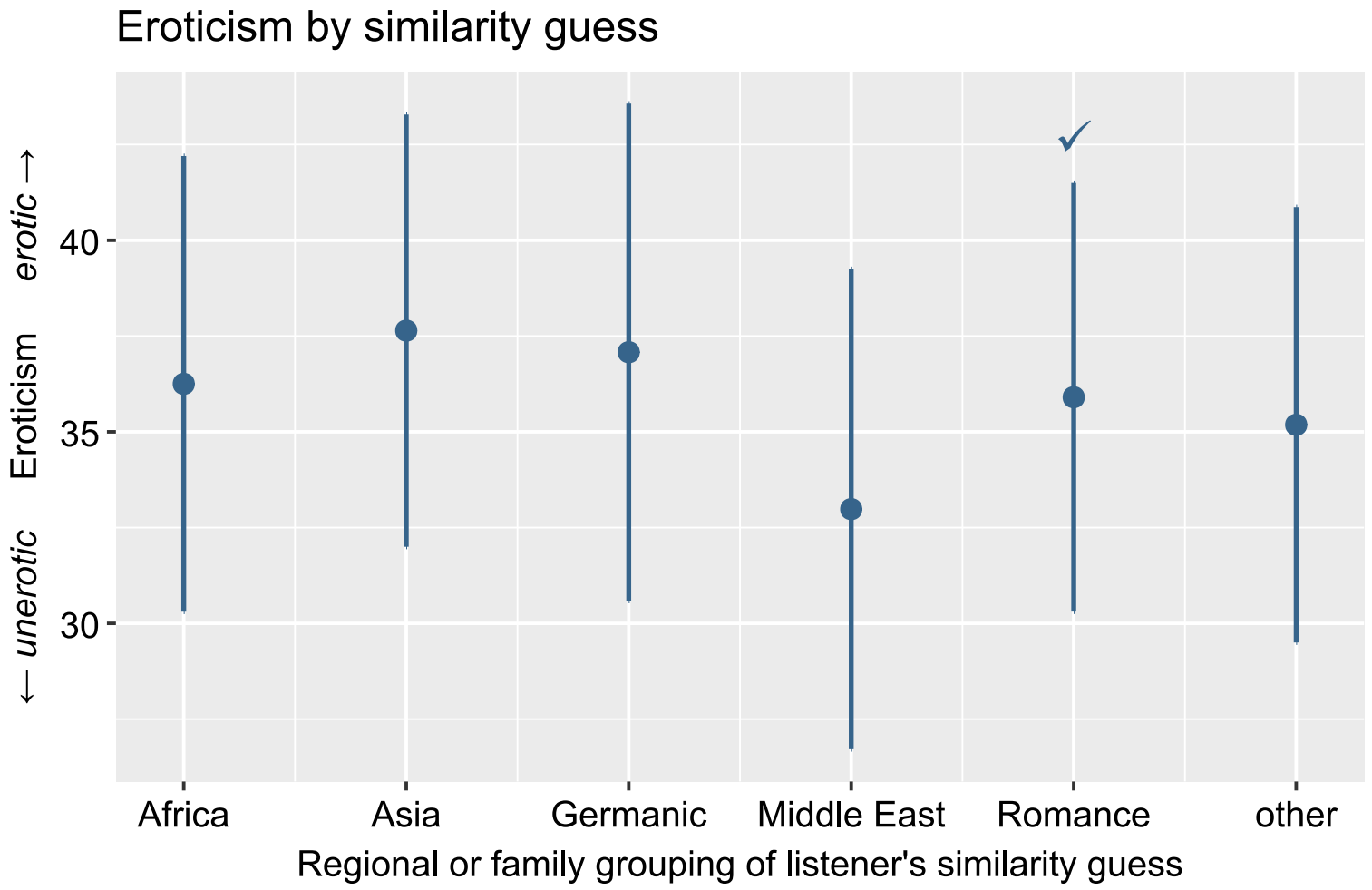
Overview of model with all scales

Overview of model with all scales



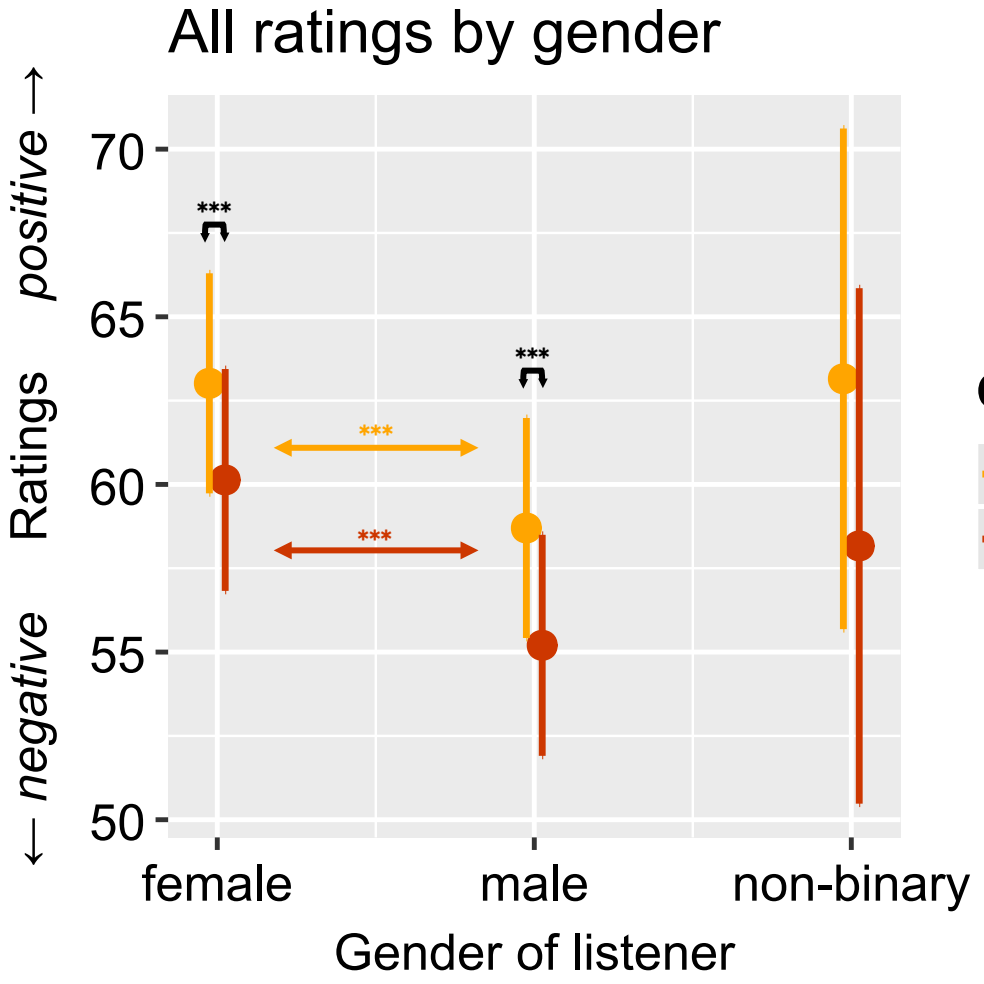
Recognition for model with all scales


Beauty by similarity guess
68
64
60
56
← ugly Beauty beautiful →
Africa
Asia
Germanic
Middle East
Romance
other
Regional or family grouping of listener's similarity guess
Recognition for beauty model

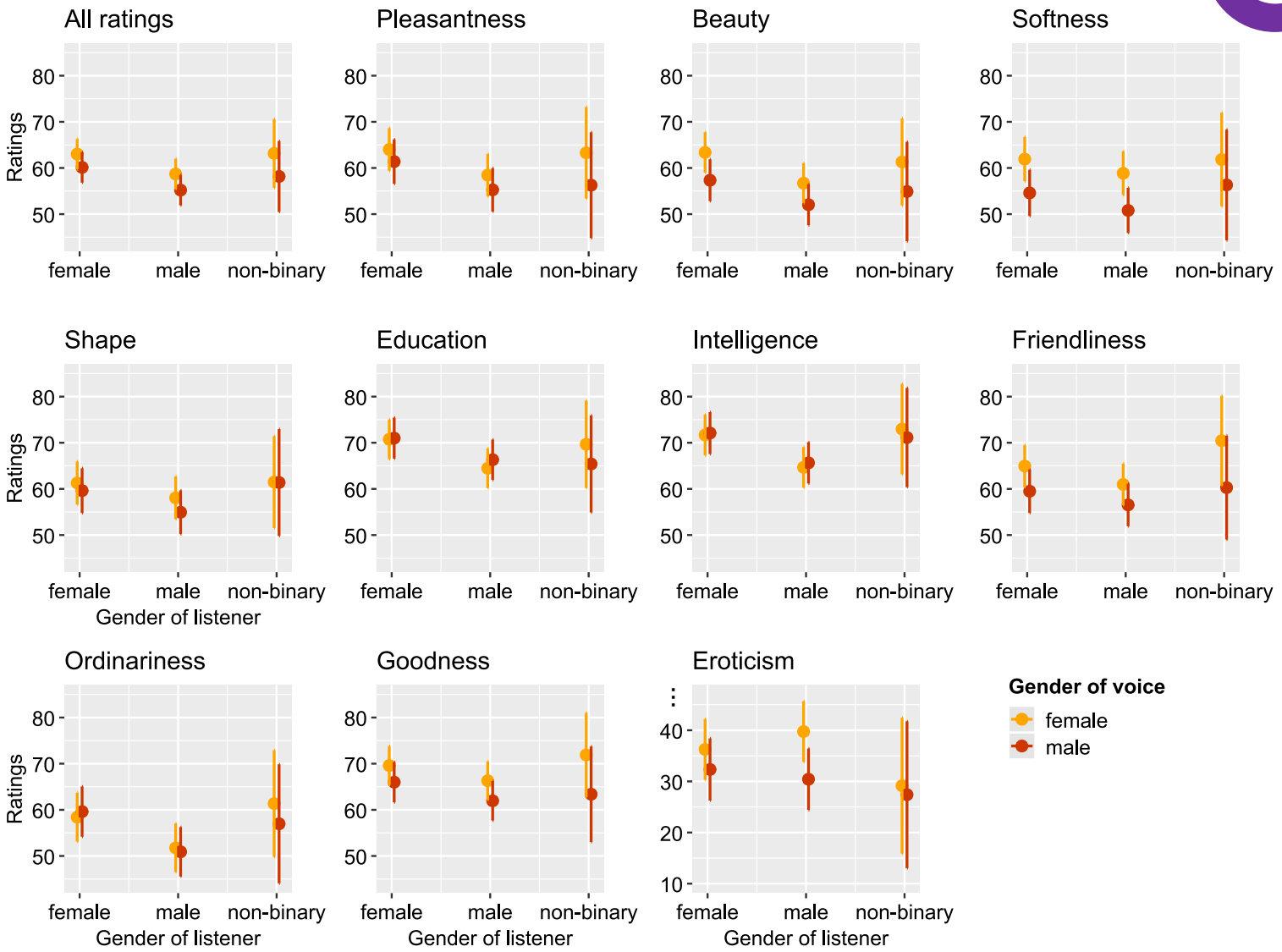


Recognition for eroticism model

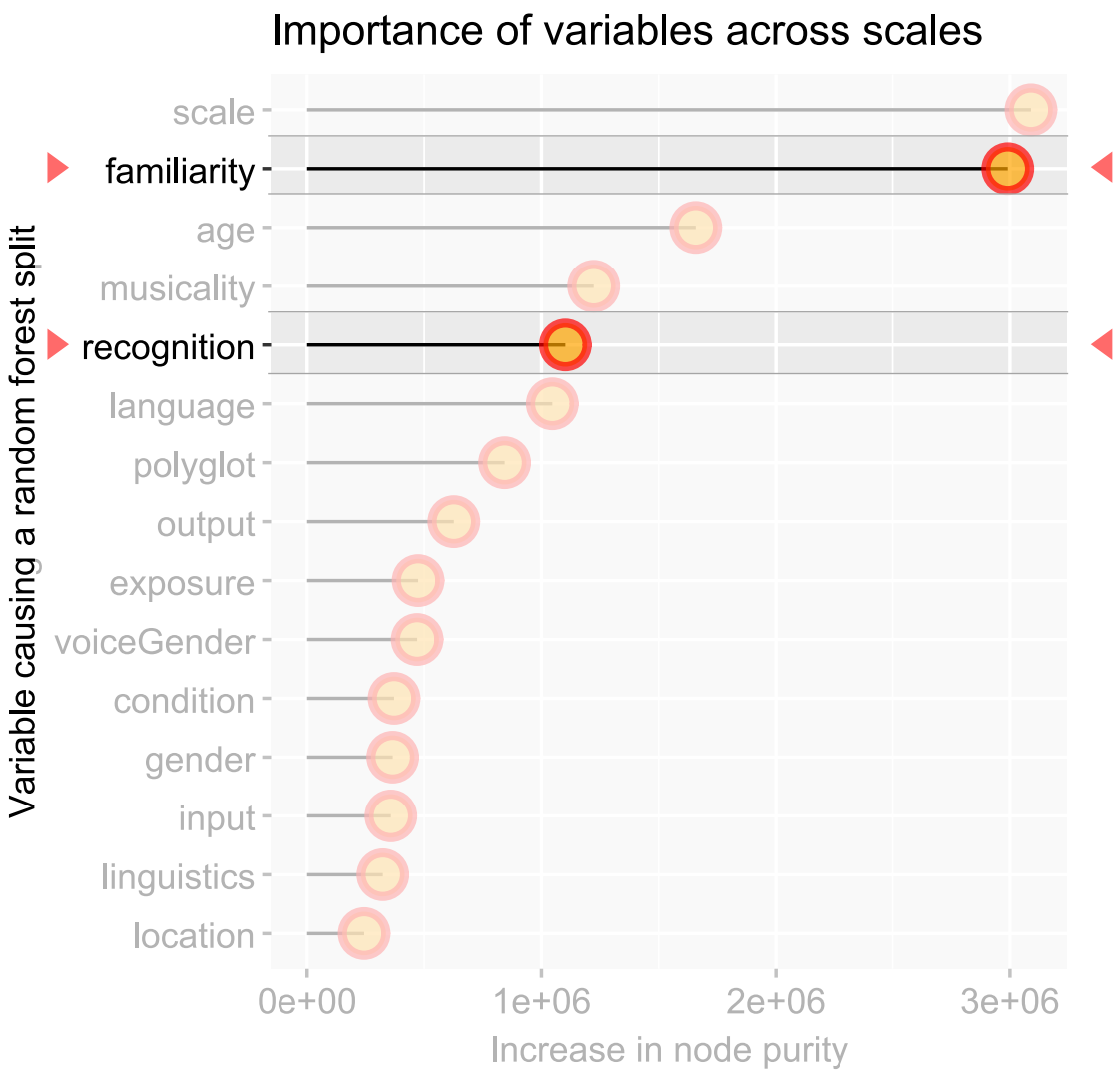
Overview of model with all scales



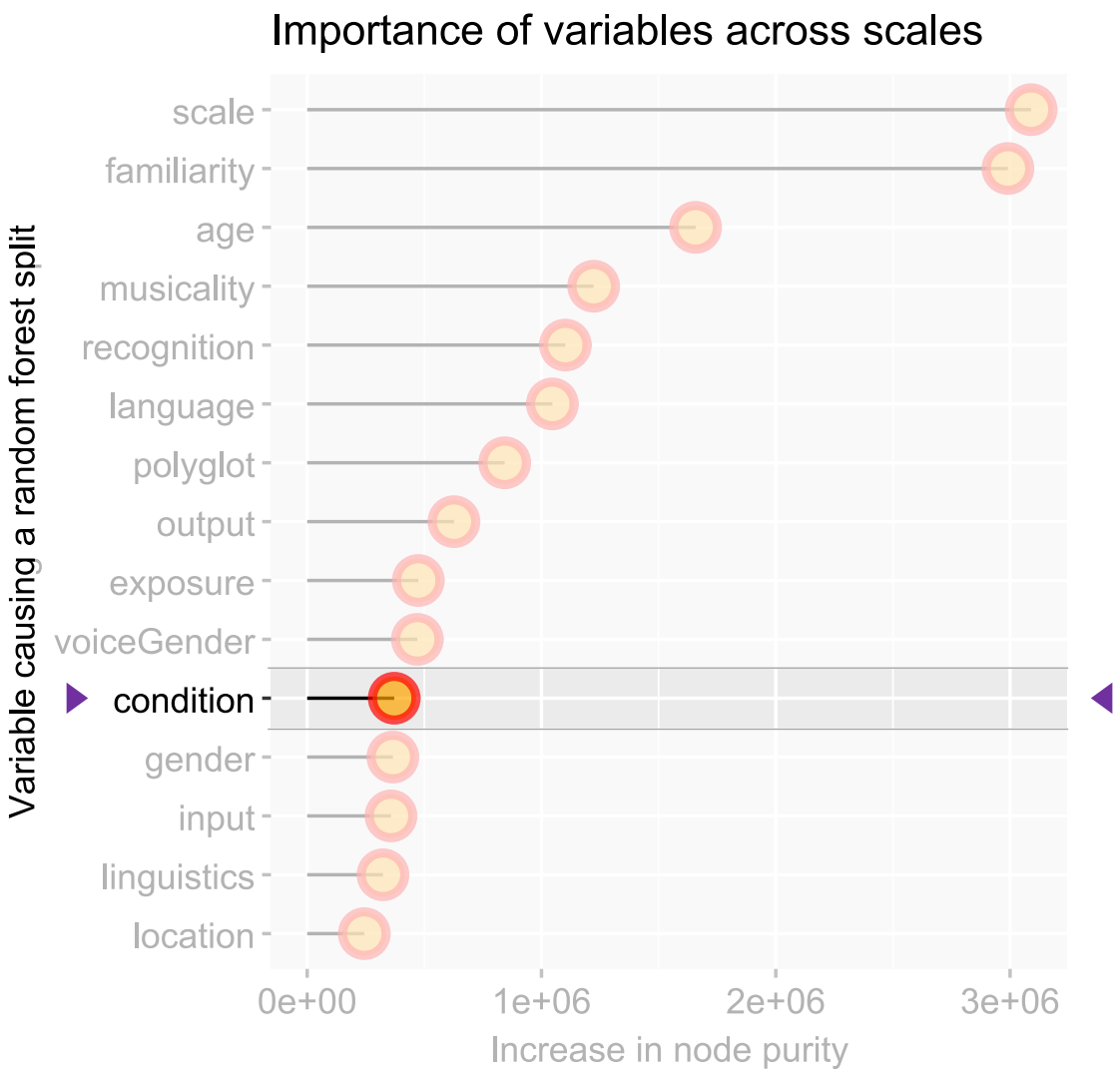
Gender for model with all scales



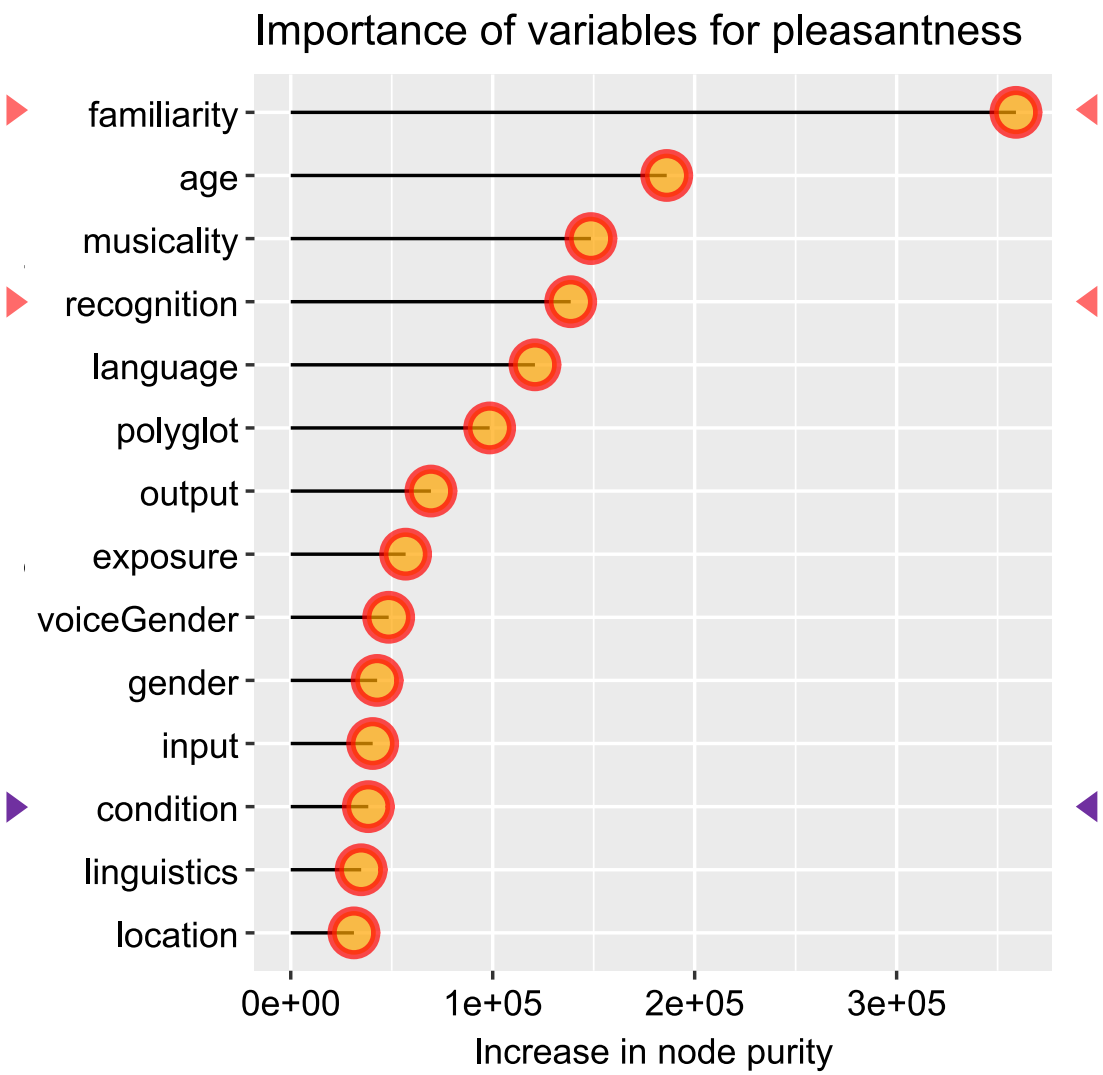
Overview of gender



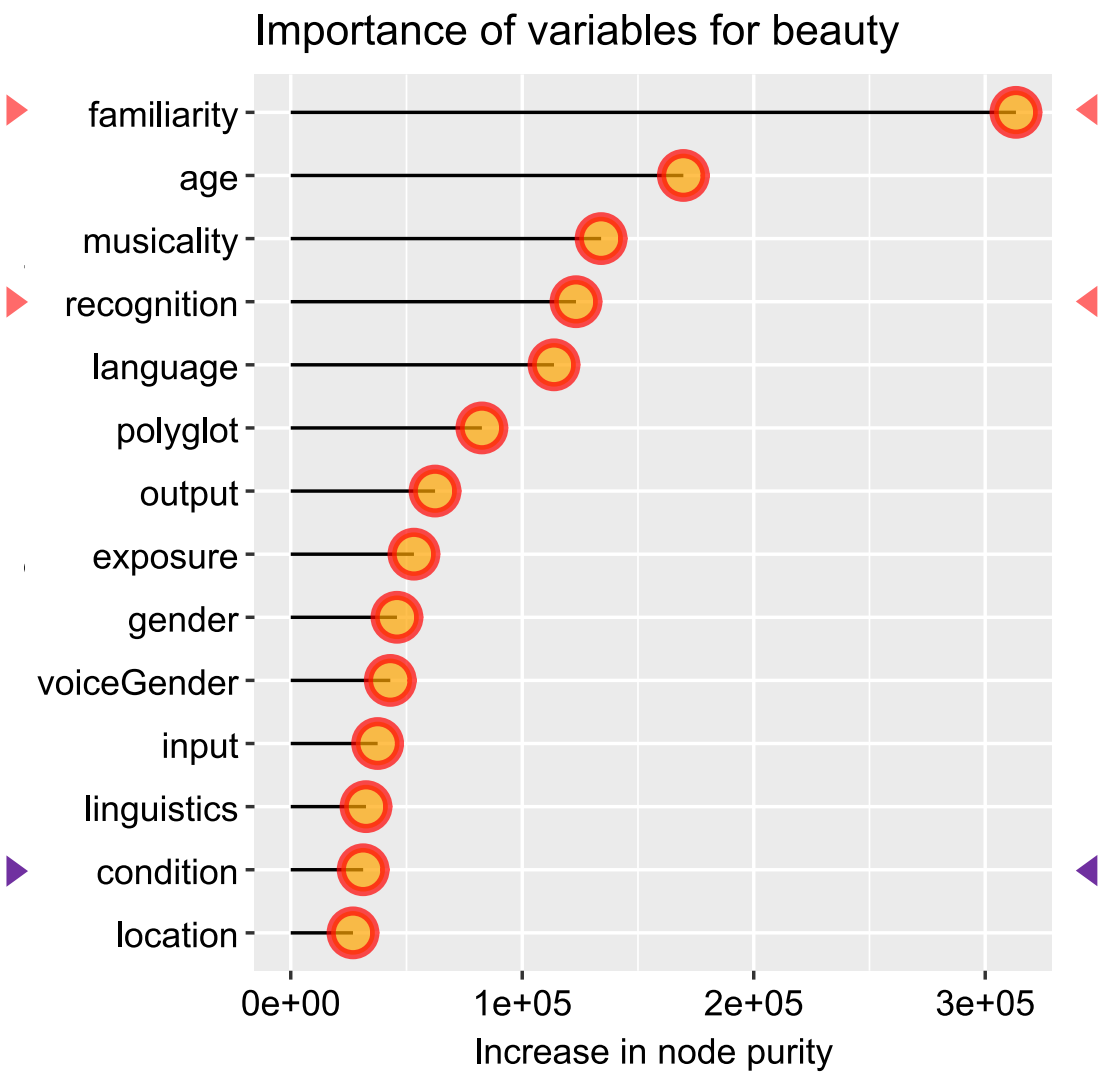
Random forest for model with all scales



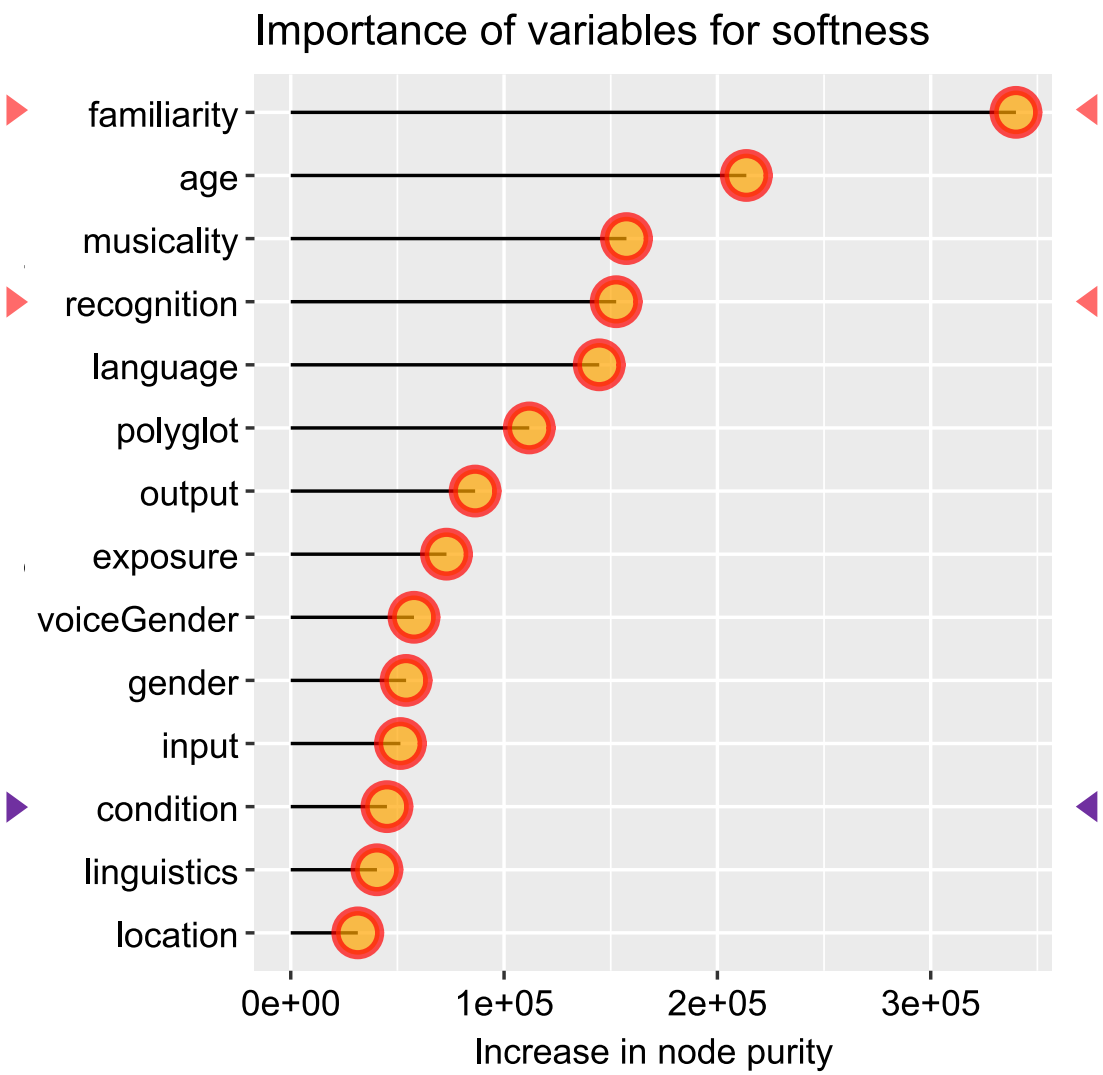
Random forest for model with all scales



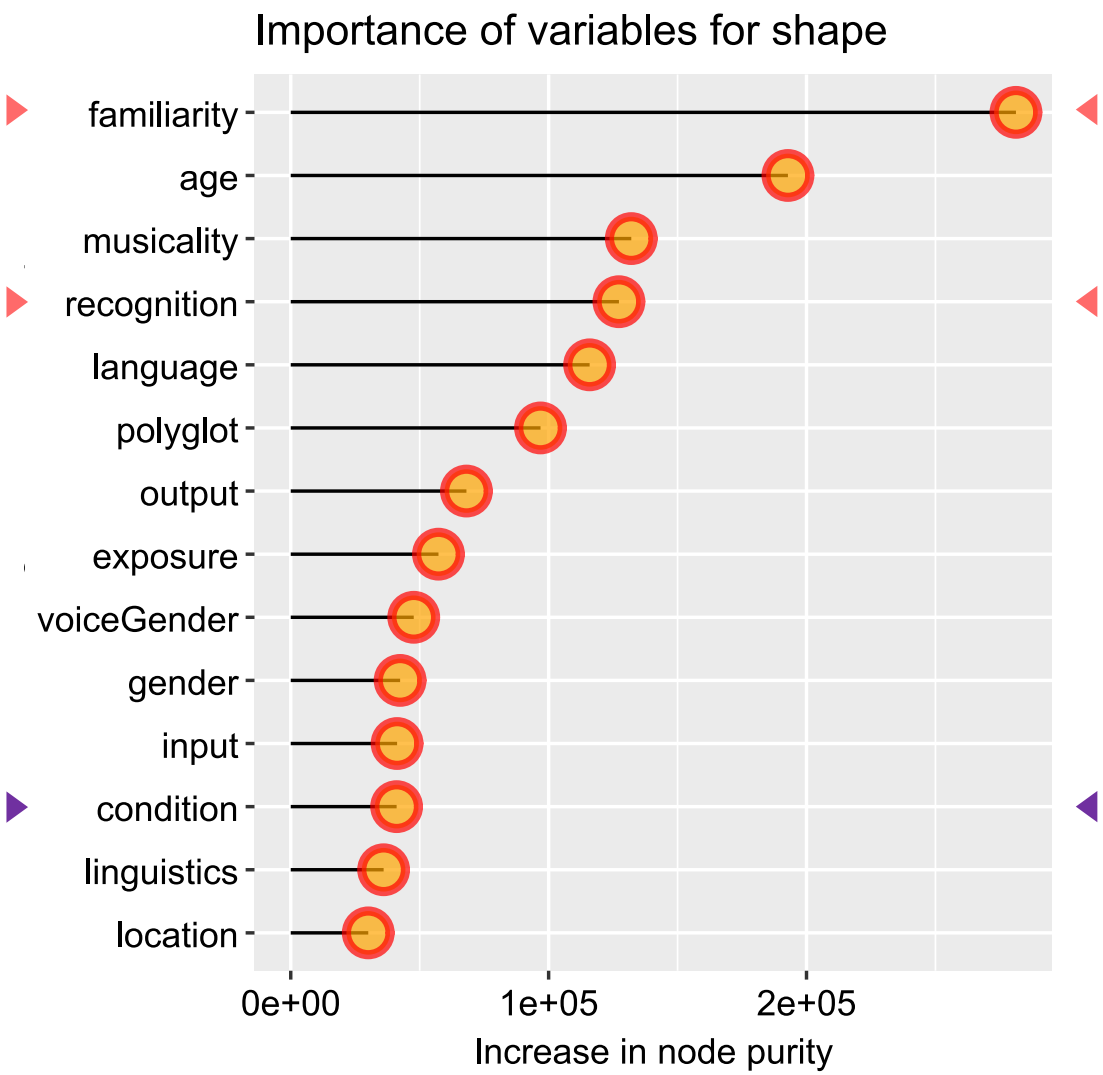
Random forest for pleasantness model



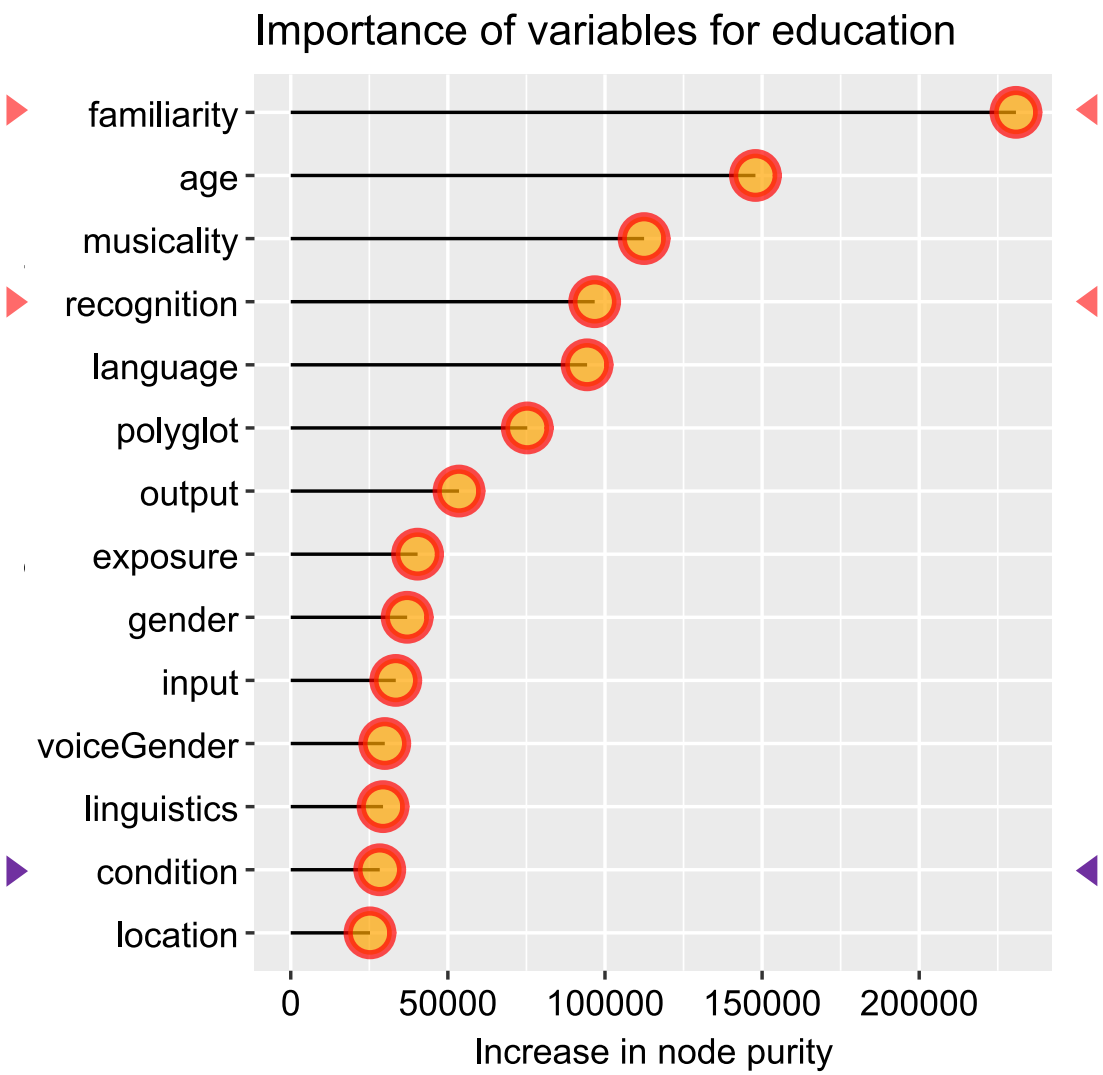
Random forest for beauty model



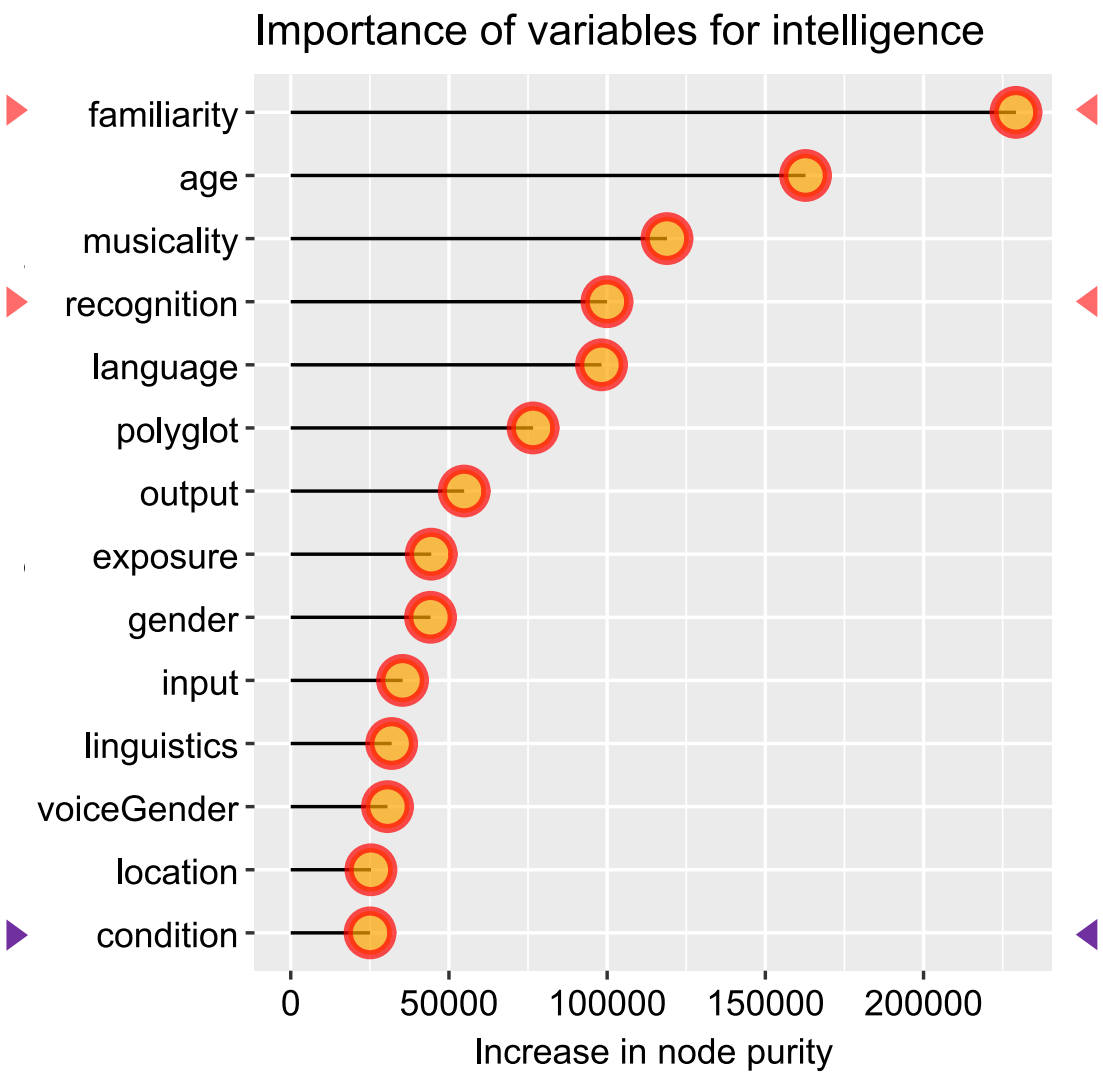
Random forest for softness model



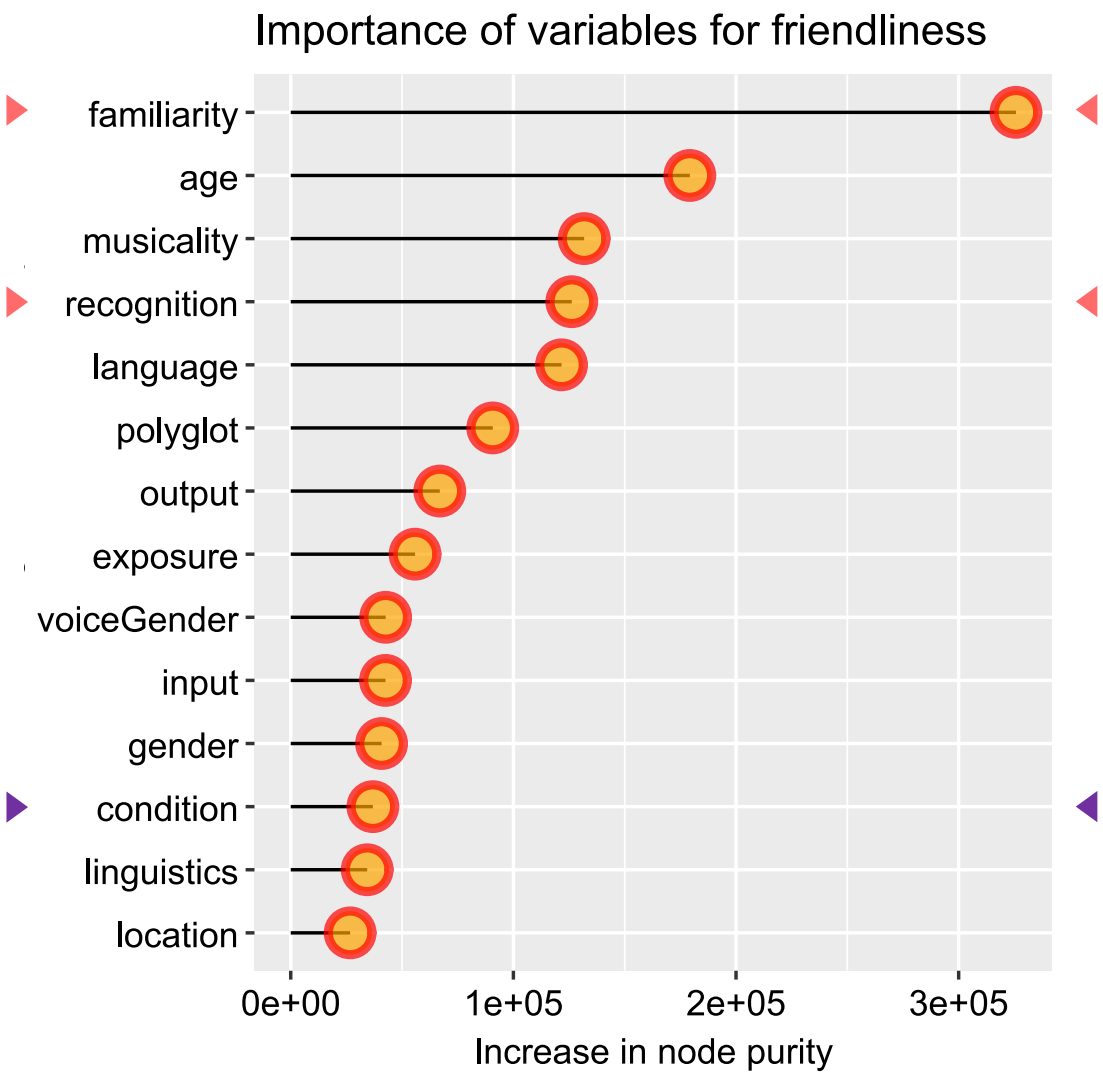
Random forest for shape model



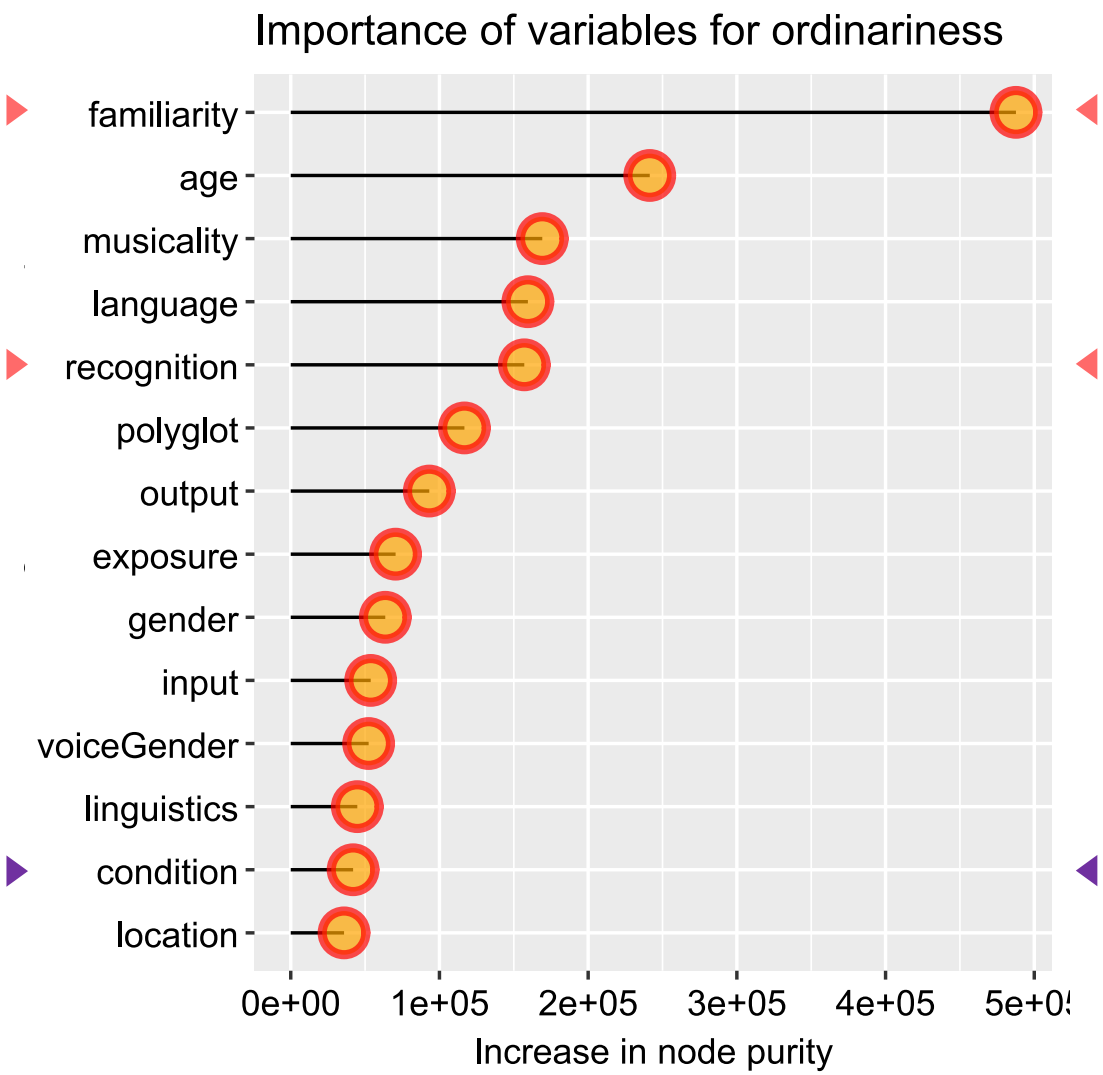
Random forest for education model



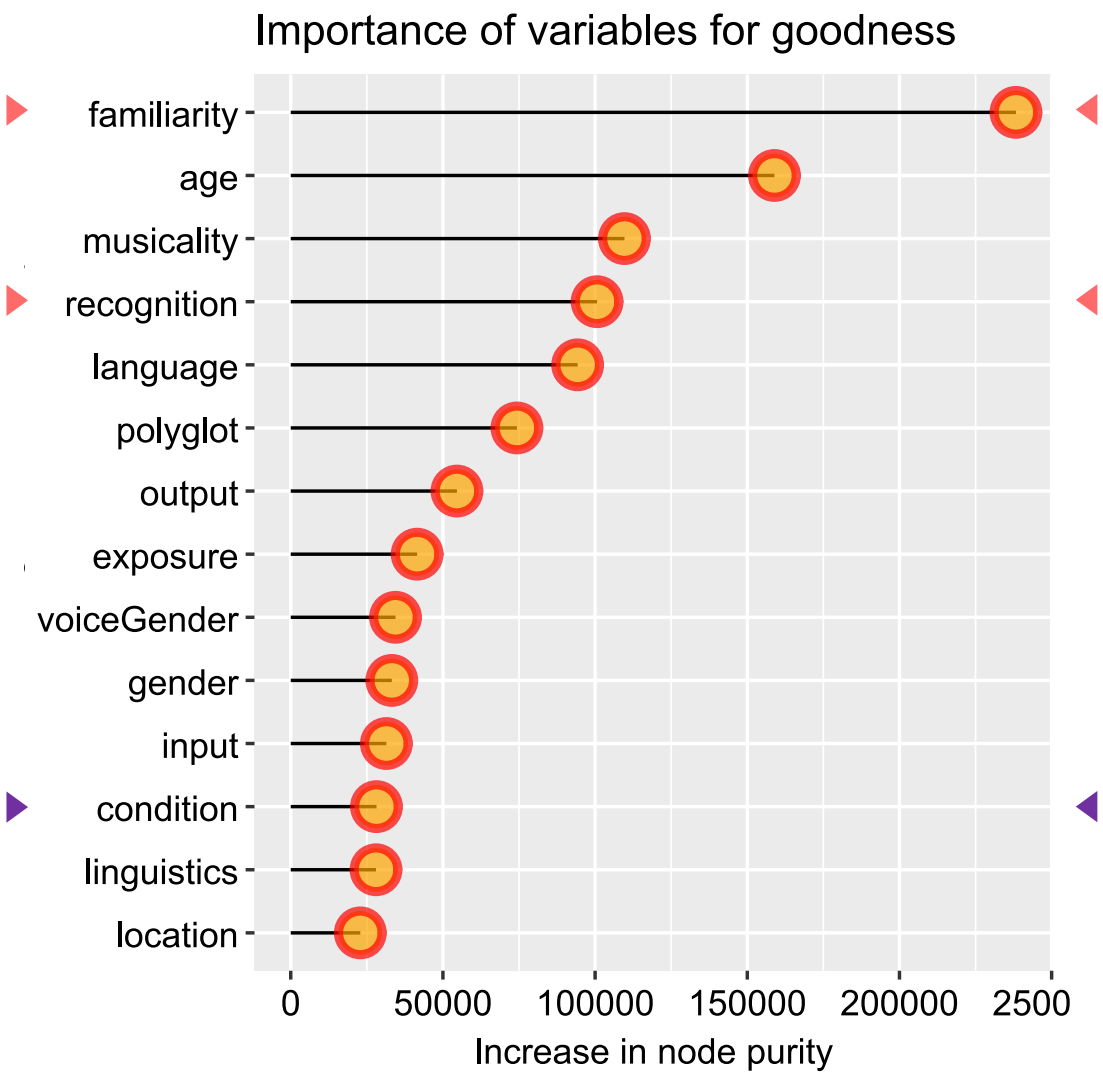
Random forest for intelligence model



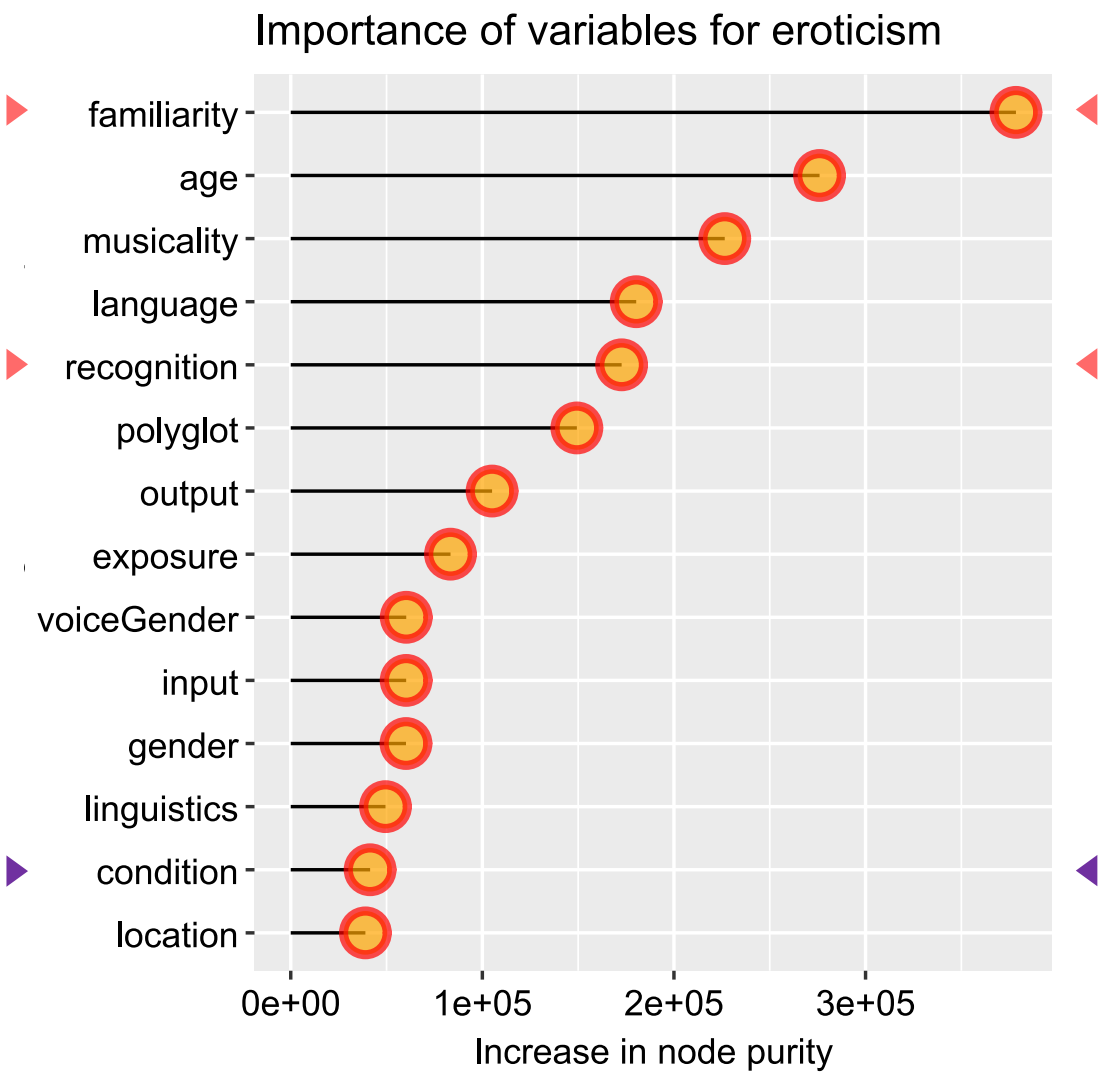
Random forest for friendliness model



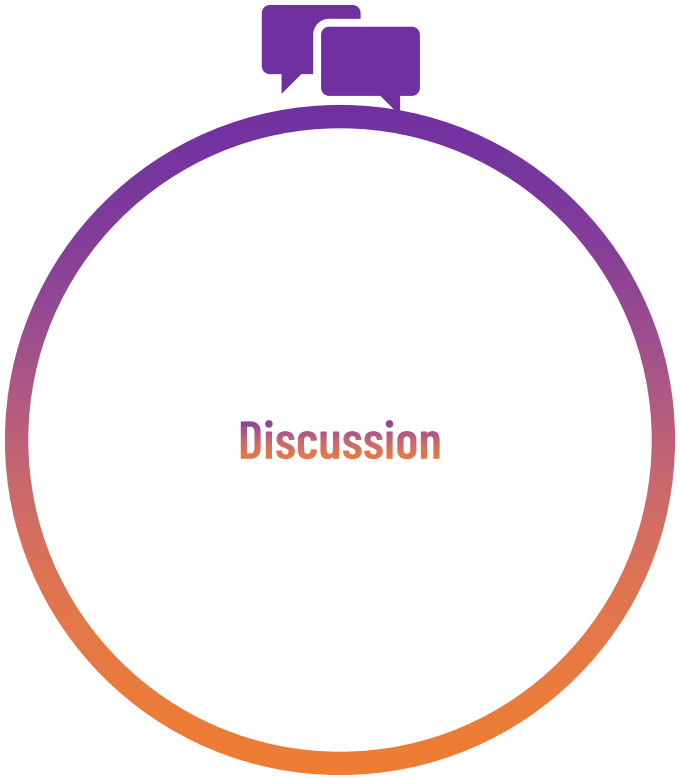
Random forest for ordinariness model



Random forest for goodness model



Random forest for eroticism model

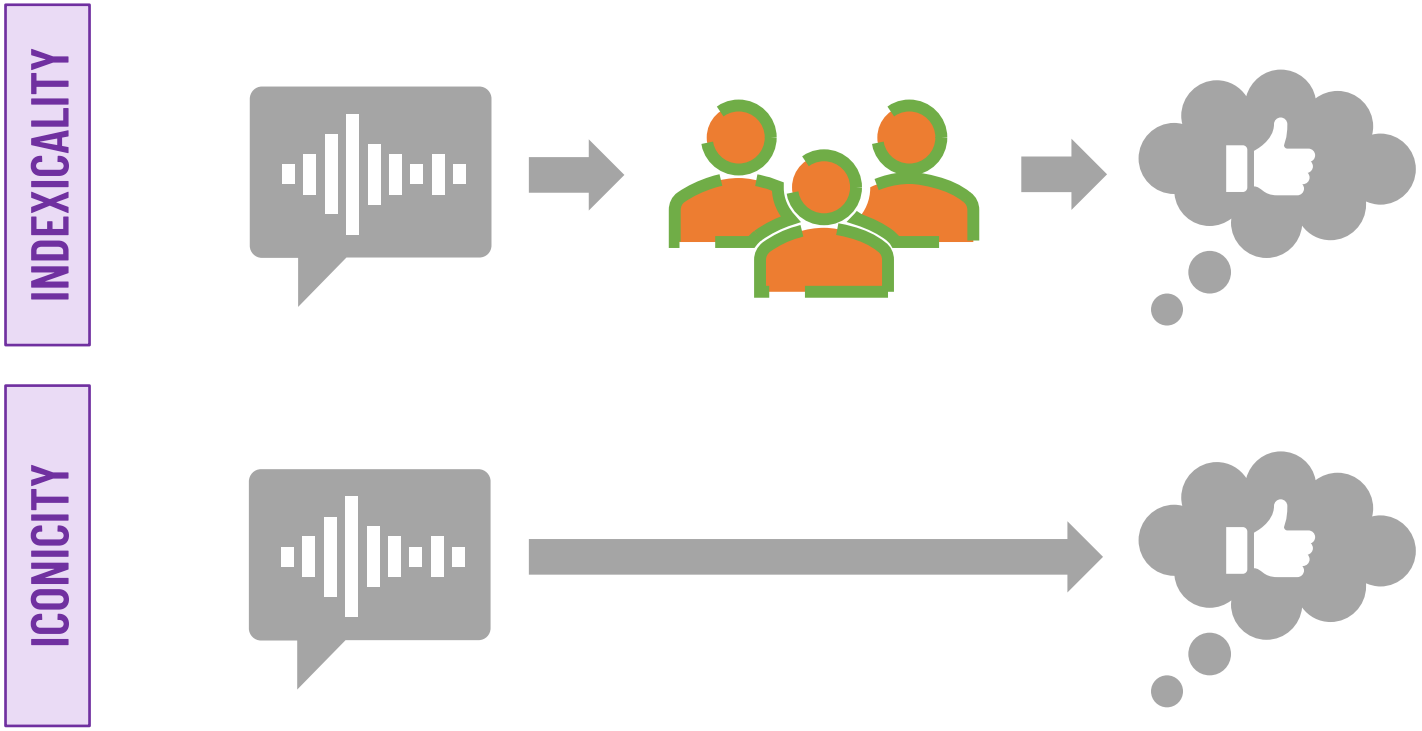

Discussion

Indexicality seems to be stronger than iconicity

- Ratings are not, or only weakly, affected by whether /x/ is present.
- /x/ is sometimes rated worse if the listener had been more exposed to it.
  - Exposed listeners may be more aware of respective stereotypes.
  - Thus, they rate /x/ worse despite being more used to it.

- The strongest predictors are sociocultural in nature.
- Listeners rate languages worse on almost all scales if:
  - they are male.
  - they perceive the language as being less familiar.
  - they felt it resembled a language from a specific region or family.

Indexicality seems to be stronger than iconicity



Peirce 1958; Silverstein 2003; Giles and Niedzielski 1998
Kawahara et al. 2021; Winter et al. 2022

makes a voiceless velar fricative

say it's from French:

say it's from German:

adapted from Grice's Maxmemes

Indexicality seems to be stronger than iconicity

Iconicity can be overridden by indexicality.
- e.g., dominance in frequency code vs. creaky voice

Ohala 2010; Winter et al. 2021; Fuchs & Ćwiek 2022

Both indexicality and iconicity can be subjective.
- e.g., different sound symbolism for different speakers

McLean & Motamedi 2022

What we label "iconicity" is not necessarily non-arbitrary
- e.g., onomatopoeia is also partly conventionalized

Kwon 2016; Anderson 1998; Occhino et al. 2017; Barker & Bozic 2024; Nielsen & Dingemanse 2021; Körtvélyessy & Štekauer 2024

Listeners evaluate the same linguistic features differently
- e.g., due to categorization and 'social pluripotentiality'

Dragojevic & Goatley-Soan 2022
Winter et al. 2019

Indexicality seems to be stronger than iconicity

INDEXICALITY

- imposed norm hypothesis, social connotations hypothesis
  - differences in power
  - differences in prestige
  - cultural stereotypes
  - social conditioning

ICONICITY

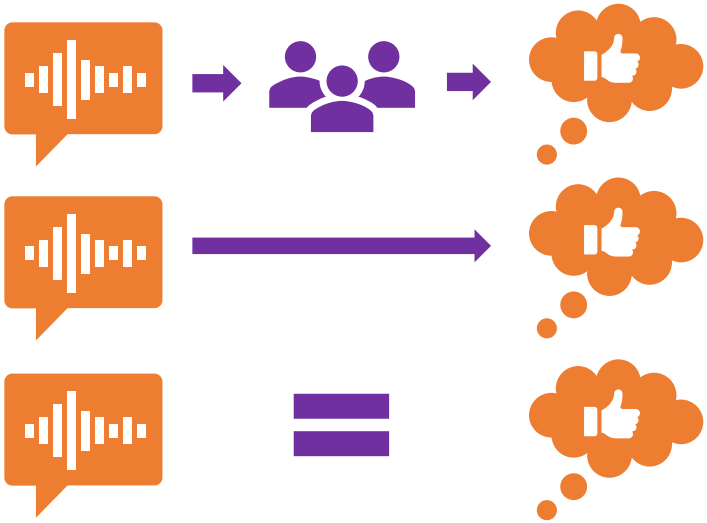
- inherent value hypothesis, sound-driven hypothesis, lámatyávë
  - co-occurrence
  - evolved associations
  - shared properties
  - patterns
  - context
  - embodiment and imitation

Both can conspire to ontogenetically and phylogenetically bootstrap language

Giles et al. 1979; 1974;
Giles and Niedzielski 1998;
Podhorodecka 2007; Baker & Bozic 2024;
but see Li & Roberts 2023; Rácz et al. 2020
Berthele 2010; Madden 2014; Reiterer et al. 2020

Can indexicality lead to iconicity?

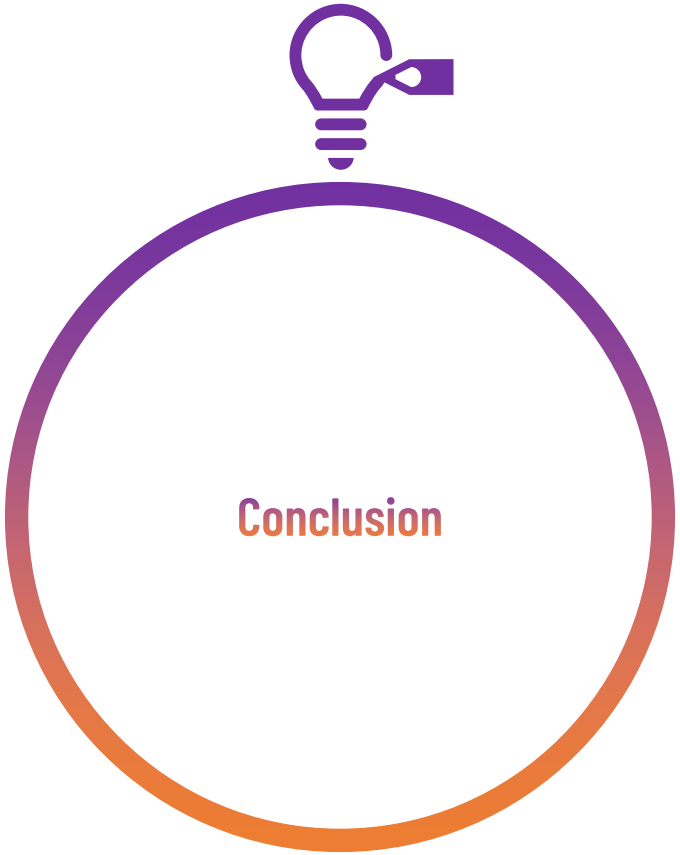
e.g., iconization, indexical iconicity



Irvine & Gal 2000, Silverstein 2003

e.g., systematicity

cf., e.g., Haslett & Cai 2023


Conclusion

The takeaway

/x/ is not as bad as people think it is!
... unless social meaning *makes* it sound bad.


THANK YOU

- Abercombie, David. 2013. *The North Wind and the Sun*, 1951–1978. University of Edinburgh. School of Philosophy, Psychology, and Language Sciences. Department of Linguistics and English Language. https://doi.org/10.7488/ds/157.
- Anderson, Earl R. 1998. *A grammar of iconism*. Madison, Teaneck: Fairleigh Dickinson University Press.
- Anikin, Andrey, Nikolay Aseyev & Niklas Erben Johansson. 2023. Do some languages sound more beautiful than others? *Proceedings of the National Academy of Sciences of the United States of America* 120.17: e2218367120. https://doi.org/10.1073/pnas.2218367120.
- Barker, Harry & Mirjana Bozic. 2024. The forms, mechanisms, and roles of iconicity: A review. *Advance Preprints*. https://doi.org/10.31124/advance.171233725.51126728/v1.
- Barthes, Roland. 1972. Mythologies. New York: Hill and Wang.
- Baugh, John. 2003. Linguistic profiling. In Sinfree Makoni, Geneva Smitherman, Arnetha Ball & Arthur K. Spears (eds.), *Black linguistics: Language, society and politics in Africa and the Americas*, 155–168. London: Routledge.
- Bayard, Donn, Ann Weatherall, Cynthia Gallois & Jeffery Pittam. 2001. Pax Americana? Accent attitudinal evaluations in New Zealand, Australia and America. *Journal of Sociolinguistics* 5.1: 22–49. https://doi.org/10.1111/1467-9481.00136.
- Bellamy, John. 2022. Discourse analysis of spoken interaction. In Ruth Kircher & Lena Zipp (eds.), *Research methods in language attitudes*, 51–65. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781108867788.006.

- Berthele, Raphael. 2010. Investigations into the folk's mental models of linguistic varieties. In Dirk Geeraerts, Gitte Kristiansen & Yves Peirsman (eds.), *Advances in Cognitive Sociolinguistics* (Cognitive Linguistics Research 45), 265–290. Berlin, New York: De Gruyter Mouton.
- Blasi, Damián E., Søren Wichmann, Harald Hammarström, Peter F. Stadler & Morten H. Christiansen. 2016. Sound-meaning association biases evidenced across thousands of languages. *Proceedings of the National Academy of Sciences of the United States of America* 113.39: 10818–10823. https://doi.org/10.1073/pnas.1605782113.
- Brown, Bruce L. & Wallace E. Lambert. 1976. A cross-cultural study of social status markers in speech. *Canadian Journal of Behavioural Science* 8.1: 39–55. https://doi.org/10.1037/h0081933.
- Cargile, Aaron C., Howard Giles, Ellen B. Ryan & James J. Bradac. 1994. Language attitudes as a social process: A conceptual model and new directions. *Language & Communication* 14.3: 211–236. https://doi.org/10.1016/0271-5309(94)90001-9.
- Chambers, Jack K. 1995. *Sociolinguistic theory: Linguistic variation and its social significance* (Language in Society 22). Oxford: Blackwell.
- Clopper, Cynthia G. & David B. Pisoni. 2004. Some acoustic cues for the perceptual categorization of American English regional dialects. *Journal of Phonetics* 32.1: 111–140. https://doi.org/10.1016/S0095-4470(03)00009-3.
- Clopper, Cynthia G., Bartłomiej Plichta & Jennifer Hay. 2011. Experimental speech perception and perceptual dialectology. In Marianna Di Paolo & Malcah Yaeger-Dror (eds.), *Sociophonetics: A student's guide*, 149–162. London: Routledge.

- Coupland, Nikolas & Hywel Bishop. 2007. Ideologised values for British accents. *Journal of Sociolinguistics* 11.1: 74–93. https://doi.org/10.1111/j.1467-9841.2007.00311.x.
- Ćwiek, Aleksandra, Susanne Fuchs, Christoph Draxler, Eva Liina Asu, Dan Dediu, Katri Hiovain, Shigeto Kawahara, Sofia Koutalidis, Manfred Krifka, Pärtel Lippus, Gary Lupyan, Grace E. Oh, Jing Paul, Caterina Petrone, Rachid Ridouane, Sabine Reiter, Nathalie Schümchen, Ádám Szalontai, Özlem Ünal-Logacev, Jochen Zeller, Marcus Perlman & Bodo Winter. 2022. The bouba/kiki effect is robust across cultures and writing systems. *Philosophical Transactions of the Royal Society B: Biological Sciences* 377.1841: 20200390. https://doi.org/10.1098/rstb.2020.0390.
- Dixon, John A., Berenice Mahoney & Roger Cocks. 2002. Accents of guilt? Effects of regional accent, race, and crime type on attributions of guilt. *Journal of Language and Social Psychology* 21.2: 162–168. https://doi.org/10.1177/02627X02021002004.
- Domizi, Alessandra. 2024. *Die ästhetische Wahrnehmung der deutschen Sprache im europäischen Raum*. Mannheim: IDS-Verlag.
- Dragojevic, Marko & Sean Goatley-Soan. 2022. The verbal-guise technique. In Ruth Kircher & Lena Zipp (eds.), *Research methods in language attitudes*, 203–218. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781108867788.017.
- Durham, Mercedes. 2022. Content analysis of social media. In Ruth Kircher & Lena Zipp (eds.), *Research methods in language attitudes*, 35–50. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781108867788.005.

- Fasoli, Fabio & Anne Maass. 2020. The social costs of sounding gay: Voice-based impressions of adoption applicants. *Journal of Language and Social Psychology* 39.1: 112–131. https://doi.org/10.1177/0261927X19883907.
- Fletcher, Harvey. 1929, 1953. *Speech and hearing in communication*. Toronto: D. Van Nostrand.
- Fought, John G., Robert L. Munroe, Carmen R. Fought & Erin M. Good. 2004. Sonority and climate in a world sample of languages: Findings and prospects. *Cross-Cultural Research* 38.1: 27–51. https://doi.org/10.1177/1069397103259439.
- Fraser, Bruce. 1973. Some 'unexpected' reactions to various American-English dialects. In Roger W. Shuy & Ralph W. Fasold (eds.), *Language attitudes: Current trends and prospects*, 28–35. Washington: Georgetown University Press.
- Fuchs, Susanne & Aleksandra Ćwiek. 2022. Sounds full of meaning and the evolution of language. *Acoustics Today* 18.2: 43–51. https://doi.org/10.1121/AT.2022.18.2.43.
- Giles, Howard & Mikaela L. Marlow. 2011. Theorizing language attitudes: Existing frameworks, an integrative model, and new directions. *Annals of the International Communication Association* 35.1: 161–197. https://doi.org/10.1080/23808985.2011.11679116.
- Giles, Howard & Nancy Niedzielski. 1998. Italian is beautiful, German is ugly. In Laurie Bauer & Peter Trudgill (eds.), *Language myths*, 85–93. London: Penguin.
- Giles, Howard & Peter F. Powesland. 1975. *Speech style and social evaluation* (European Monographs in Social Psychology 7). London, New York, San Francisco: Academic Press.

- Giles, Howard, Pamela Wilson & Anthony Conway. 1981. Accent and lexical diversity as determinants of impression formation and perceived employment suitability. *Language Sciences* 3.1: 91–103. https://doi.org/10.1016/S0388-0001(81)80015-0.
- Giles, Howard, Richard Bourhis & Ann Davies. 1979. Prestige speech styles: The imposed norm and inherent value hypotheses. In William C. McCormack & Stephen A. Wurm (eds.), *Language and society* (World Anthropology), 589–596. The Hague; Paris; New York: De Gruyter Mouton.
- Giles, Howard, Richard Bourhis, Alan Lewis & Peter Trudgill. 1974. The imposed norm hypothesis: A validation. *Quarterly Journal of Speech* 60.4: 405–410. https://doi.org/10.1080/00335637409383249.
- Giles, Howard. 1970. Evaluative reactions to accents. *Educational Review* 22.3: 211–227. https://doi.org/10.1080/0013191700220301.
- Goodall, Grant. 2020. The design(ing) of language. In Jeffrey Punske, Nathan Sanders & Amy V. Fountain (eds.), *Language invention in linguistics pedagogy*, 69–85. Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780198829874.003.0006.
- Gooskens, Charlotte, Wilbert Heeringa & Karin Beijering. 2008. Phonetic and lexical predictors of intelligibility. *International Journal of Humanities and Arts Computing* 2.1–2: 63–81. https://doi.org/10.3366/E1753854809000317.
- Gordon, Matthew K. 2016. *Phoneme inventories*. Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199669004.001.0001.

- Grant, Tim, Urszula Clark, Gertrud Reershemius, David Pollard, Sarah Hayes & Garry Plappert. 2017. Survey of the sexiness of Klingon. In Tim Grant, Urszula Clark, Gertrud Reershemius, David Pollard, Sarah Hayes & Garry Plappert (eds.), *Quantitative research methods for linguists*, 55–66. London: Routledge. https://doi.org/10.4324/9781315181707-4.
- Hall, Stuart. 1999. Encoding, decoding. In Simon During (ed.), *The cultural studies reader*, 2nd edn., 507–517. London: Routledge.
- Haslett, David A. & Zhenguang G. Cai. 2023. Systematic mappings of sound to meaning: A theoretical review. *Psychonomic Bulletin & Review* 31.2: 627-648. https://doi.org/10.3758/s13423-023-02395-y.
- Hawkey, James. 2022. Variable analysis. In Ruth Kircher & Lena Zipp (eds.), *Research methods in language attitudes*, 79–96. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781108867788.008.
- Hilton, Nanna H., Charlotte Gooskens, Anja Schüppert & Chaoju Tang. 2022. Is Swedish more beautiful than Danish? Matched guise investigations with unknown languages. *Nordic Journal of Linguistics* 45.1: 30–48. https://doi.org/10.1017/s0332586521000068.
- Hofmann, Valentin, Pratyusha Ria Kalluri, Dan Jurafsky & Sharese King. 2024. AI generates covertly racist decisions about people based on their dialect. *Nature*. https://doi.org/10.1038/s41586-024-07856-5.
- Hornsby, Michael. 2022. Focus groups. In Ruth Kircher & Lena Zipp (eds.), *Research methods in language attitudes*, 114–128. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781108867788.011.
- Irvine, Judith T. & Susan Gal. 2000. Language ideology and linguistic differentiation. In Paul V. Kroskrity (ed.), *Regimes of language: Ideologies, polities, and identities* (School of American Research Advanced Seminar Series), 35–83. Santa Fe, Oxford: School of American Research Press.

- Kalin, Rudof, Donald S. Rayko & Norah Love. 1980. The perception and evaluation of job candidates with four different ethnic accents. In Howard Giles, W. P. Robinson & Philip M. Smith (eds.), *Language: Social psychological perspectives*, 197–202. Oxford: Pergamon Press. https://doi.org/10.1016/B978-0-08-024696-3.50034-X.
- Karatsareas, Petros. 2022. Semi-structured interviews. In Ruth Kircher & Lena Zipp (eds.), *Research methods in language attitudes*, 99–113. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781108867788.010.
- Kawahara, Shigeto, Mahayana C. Godoy & Gakuji Kumagai. 2021. English speakers can infer Pokémon types based on sound symbolism. *Frontiers in Psychology* 12: 648948. https://doi.org/10.3389/fpsyg.2021.648948.
- Kircher, Ruth. 2022. Questionnaires to elicit quantitative data. In Ruth Kircher & Lena Zipp (eds.), *Research methods in language attitudes*, 129–144. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781108867788.012.
- Köhler, Wolfgang. 1929. *Gestalt psychology*. New York: Horace Liveright.
- Körtvélyessy, Lívia & Pavol Štekauer. 2024. Introduction: Why onomatopoeia? In Lívia Körtvélyessy & Pavol Štekauer (eds.), *Onomatopoeia in the world's languages* (Comparative Handbooks of Linguistics 10). Berlin, Boston: De Gruyter Mouton. https://doi.org/10.1515/9783111053226.
- Kristiansen, Tore & Howard Giles. 1992. Compliance-gaining as a function of accent: Public requests in varieties of Danish. *International Journal of Applied Linguistics* 2.1: 17–35. https://doi.org/10.1111/j.1473-4192.1992.tb00021.x.

- Kristiansen, Tore. 2011. Attitudes, ideology and awareness. In Ruth Wodak, Barbara Johnstone & Paul Kerswill (eds.), *The SAGE handbook of sociolinguistics*. London: SAGE. https://doi.org/10.4135/9781446200957.
- Kroskrity, Paul V. (ed.). 2000. *Regimes of language: Ideologies, polities, and identities* (School of American Research Advanced Seminar Series). Santa Fe, Oxford: School of American Research Press.
- Kwon, Nahyun. 2016. Empirically observed iconicity levels of English phonaesthemes. *Public Journal of Semiotics* 7.2: 73–93. https://doi.org/10.37693/pjos.2016.7.16470.
- Lambert, Wallace E., Richard C. Hodgson, Robert C. Gardner & Samuel Fillenbaum. 1960. Evaluational reactions to spoken languages. *Journal of Abnormal and Social Psychology* 60: 44–51. https://doi.org/10.1037/h0044430.
- Lev-Ari, Shiri & Boaz Keysar. 2010. Why don't we believe non-native speakers? The influence of accent on credibility. *Journal of Experimental Social Psychology* 46.6: 1093–1096. https://doi.org/10.1016/j.jesp.2010.05.025.
- Lev-Ari, Shiri & Ryan McKay. 2022. The sound of swearing: Are there universal patterns in profanity? *Psychonomic Bulletin & Review*. https://doi.org/10.3758/s13423-022-02202-0.
- Levon, Erez, Devyani Sharma, Yang Ye, Amanda Cardoso & Dominic Watt. 2019. Real-time evaluations of accent and professional competence. Paper presented at *Experimental Approaches to Perception and Production*, Münster, 26–28 September 2019.
- Li, Aini & Gareth Roberts. 2023. Co-occurrence, extension, and social salience: The emergence of indexicality in an artificial language. *Cognitive Science* 47.5: e13290. https://doi.org/10.1111/cogs.13290.

- Lippi-Green, Rosina. 2012. *English with an accent: Language, ideology and discrimination in the United States*, 2nd edn. London, New York: Routledge.
- Loureiro-Rodríguez, Verónica & Elif F. Acar. 2022. The matched-guise technique. In Ruth Kircher & Lena Zipp (eds.), *Research methods in language attitudes*, 185–202. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781108867788.016.
- Maddieson, Ian. 2013a. Consonant inventories. In Matthew S. Dryer & Martin Haspelmath (eds.), *The World Atlas of Language Structures Online*. Zenodo. https://doi.org/10.5281/zenodo.7385533.
- Maddieson, Ian. 2013b. Syllable structure. In Matthew S. Dryer & Martin Haspelmath (eds.), *The World Atlas of Language Structures Online*. Zenodo. https://doi.org/10.5281/zenodo.7385533.
- Malik-Moraleda, Saima, Maya Taliaferro, Steve Shannon, Niharika Jhingan, Sara Swords, David J. Peterson, Paul Frommer, Marc Okrand, Jessie Sams, Ramsey Cardwell, Cassie Freeman & Evelina Fedorenko. 2023. Constructed languages are processed by the same brain mechanisms as natural languages. *BioRxiv*. https://doi.org/10.1101/2023.07.28.550667.
- Mays, David V. 1982. Cross cultural social status perception in speech. *Studies in Second Language Acquisition* 5.1: 52–64. https://doi.org/10.1017/s0272263100004599.
- McLean, Bonnie & Yasamin Motamedi. 2022. A robustness approach to operationalisations of iconicity. Paper presented at *Iconicity Seminar* 2022 (IcoSem2022), 14 November 2022.
- Montgomery, Chris. 2022. Perceptual dialectology. In Ruth Kircher & Lena Zipp (eds.), *Research methods in language attitudes*, 160–182. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781108867788.014.

- Mooshammer, Christine, Dominique Bobeck, Henrik Hornecker, Kierán Meinhardt, Olga Olina, Marie Christin Walch & Qiang Xia. 2023. Does Orkish sound evil? Perception of fantasy languages and their phonetic and phonological characteristics. *Language and Speech*: 238309231202944. https://doi.org/10.1177/00238309231202944.
- Moran, Steven & Daniel McCloy (eds.). 2019. *PHOIBLE 2.0*. Jena: Max Planck Institute for the Science of Human History. https://phoible.org/.
- Moreau, Marie-Louise, Ndiassé Thiam, Bernard Harmegnies & Kathy Huet. 2014. Can listeners assess the sociocultural status of speakers who use a language they are unfamiliar with? A case study of Senegalese and European students listening to Wolof speakers. *Language in Society* 43.3: 333–348. https://doi.org/10.1017/s0047404514000220.
- Munson, Benjamin. 2007. The acoustic correlates of perceived masculinity, perceived femininity, and perceived sexual orientation. *Language and Speech* 50.1: 125–142. https://doi.org/10.1177/00238309070500010601.
- Nielsen, Alan K. S. & Mark Dingemanse. 2021. Iconicity in word learning and beyond: A critical review. *Language and Speech* 64.1: 52–72. https://doi.org/10.1177/0023830920914339.
- Occhino, Corrine, Benjamin Anible, Erin Wilkinson & Jill P. Morford. 2017. Iconicity is in the eye of the beholder. *Gesture* 16.1: 100–126. https://doi.org/10.1075/gest.16.1.04occ.
- O'Connor, Jillian J. M. & Pat Barclay. 2017. The influence of voice pitch on perceptions of trustworthiness across social contexts. *Evolution and Human Behavior* 38.4: 506-512. https://doi.org/10.1016/j.evolhumbehav.2017.03.001.

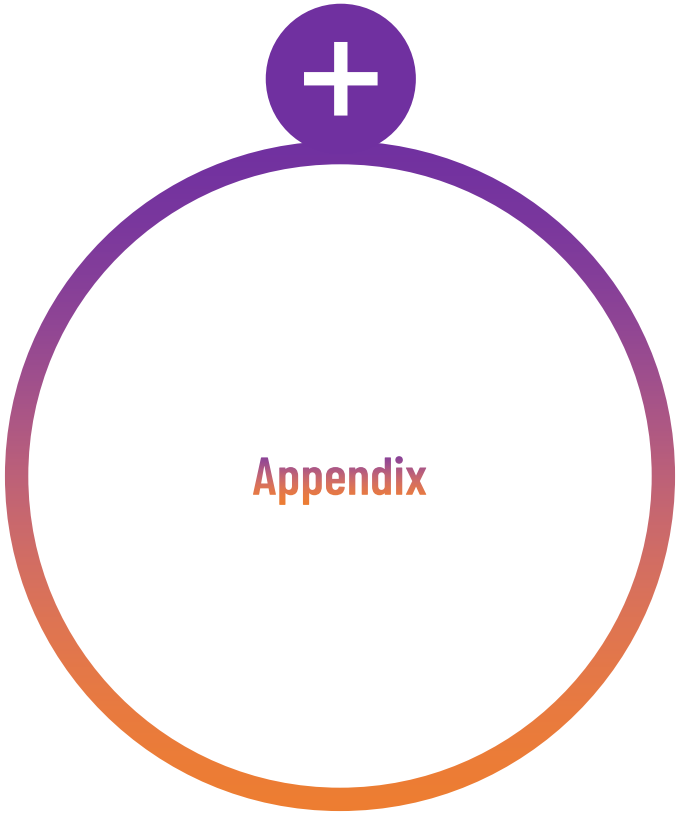
- Ohala, John J. 2010. The frequency code underlies the sound-symbolic use of voice pitch. In Leanne Hinton, Johanna Nichols & John J. Ohala (eds.), *Sound symbolism*, 325–347. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511751806.022.
- Parker, Steve. 2008. Sound level protrusions as physical correlates of sonority. *Journal of Phonetics* 36.1: 55–90. https://doi.org/10.1016/j.wocn.2007.09.003.
- Peirce, Charles S. 1958. *Selected writings* (Dover Books on Philosophy). New York: Dover.
- Preston, Dennis R. 1999. A language attitude approach to the perception of regional variety. In Dennis R. Preston (ed.), *Handbook of perceptual dialectology*, 359–373. Amsterdam: John Benjamins. https://doi.org/10.1075/z.hpd1.30pre.
- Preston, Dennis R. 2017. Perceptual dialectology. In Charles Boberg, John Nerbonne & Dominic Watt (eds.), *The handbook of dialectology*, 177–203. Oxford: Wiley. https://doi.org/10.1002/9781118827628.ch10.
- Podhorodecka, Joanna. 2007. Is lámatyáve a linguistic heresy? In Elżbieta Tabakowska, Christina Ljungberg & Olga Fischer (eds.), *Insistent images* (Iconicity in Language and Literature 5), 103–110. Amsterdam: John Benjamins. https://doi.org/10.1075/ill.5.11pod.
- Purnell, Thomas, William Idsardi & John Baugh. 1999. Perceptual and phonetic experiments on American English dialect identification. *Journal of Language and Social Psychology* 18.1: 10–30. https://doi.org/10.1177/0261927X99018001002.
- Ramachandran, Vilayanur S. & Edward Hubbard. 2001. Synaesthesia — A window into perception, thought and language. *Journal of Consciousness Studies* 8.12: 3–34.

- Reiterer, Susanne M., Vita Kogan, Annemarie Seither-Preisler & Gašper Pesek. 2020. Foreign language learning motivation: Phonetic chill or Latin lover effect? Does sound structure or social stereotyping drive FLL? In Kara D. Federmeier & Hsu-Wen Huang (eds.), *Adult and second language learning* (Psychology of Learning and Motivation 72), 165–205. Cambridge; San Diego; Oxford; London: Elsevier.
- Rickford, John R. & Sharese King. 2016. Language and linguistics on trial: Hearing Rachel Jeantel (and other vernacular speakers) in the courtroom and beyond. *Language* 92.4: 948–988. https://doi.org/10.1353/LAN.2016.0078.
- Rosseel, Laura. 2022. The implicit association test paradigm. In Ruth Kircher & Lena Zipp (eds.), *Research methods in language attitudes*, 250–268. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781108867788.020.
- Ryan, Ellen B. 1973. Subjective reactions toward accented speech. In Roger W. Shuy & Ralph W. Fasold (eds.), *Language attitudes: Current trends and prospects*, 60–73. Washington: Georgetown University Press.
- Sachdev, Itesh, Nita Elmufti & Pat Collins. 1998. Oral assessment and accent evaluation: Some British data. In Rama K. Agnihotri, Amrit L. Khanna & Itesh Sachdev (eds.), *Social psychological perspectives on second language learning* (Research in Applied Linguistics 4), 187–203. New Delhi, London: SAGE.
- Schüppert, Anja, Nanna H. Hilton & Charlotte Gooskens. 2015. Swedish is beautiful, Danish is ugly? Investigating the link between language attitudes and spoken word recognition. *Linguistics* 53.2. https://doi.org/10.1515/ling-2015-0003.
- Sebeok, Thomas A. 2001. *Signs: An introduction to semiotics*, 2nd edn. (Toronto Studies in Semiotics and Communication). Toronto, London: University of Toronto Press.

- Silverstein, Michael. 2003. Indexical order and the dialectics of sociolinguistic life. *Language & Communication* 23.3–4: 193–229. https://doi.org/10.1016/S0271-5309(03)00013-2.
- Stein, Simon D. 2023. Space rednecks, robot butlers, and feline foreigners: Language attitudes toward varieties of English in videogames. *Games and Culture* 18.8. https://doi.org/10.1177/15554120221150156.
- Stewart, Mark A., Ellen B. Ryan & Howard Giles. 1985. Accent and social class effects on status and solidarity evaluations. *Personality and Social Psychology Bulletin* 11.1: 98–105. https://doi.org/10.1177/0146167285111009.
- Tamasi, Susan & Lamont Antieau. 2014. *Language and linguistic diversity in the US*. New York: Routledge. https://doi.org/10.4324/9780203154960.
- Thomas, Erik R. & Jeffrey Reaser. 2004. Delimiting perceptual cues used for the ethnic labeling of African American and European American voices. *Journal of Sociolinguistics* 8.1: 54–87. https://doi.org/10.1111/j.1467-9841.2004.00251.x.
- van Bezooijen, Renée. 1988. The relative importance of pronunciation, prosody, and voice quality for the attribution of social status and personality characteristics. *Language attitudes in the Dutch language area*, 85–104. https://doi.org/10.1515/9783110857856.85.
- Walsh, Olivia. 2022. Discourse analysis of print media. In Ruth Kircher & Lena Zipp (eds.), *Research methods in language attitudes*, 19–34. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781108867788.004.
- Weinberger, Steven. 2015. *Speech Accent Archive*. George Mason University. http://accent.gmu.edu.

- Williams, Frederick. 1973. Some research notes on dialect attitudes and stereotypes. In Roger W. Shuy & Ralph W. Fasold (eds.), *Language attitudes: Current trends and prospects*, 113–128. Washington: Georgetown University Press.
- Winter, Bodo, Paula Pérez-Sobrino & Lucien Brown. 2019. The sound of soft alcohol: Crossmodal associations between interjections and liquor. *PLoS ONE* 14.8. https://doi.org/10.1371/journal.pone.0220449.
- Winter, Bodo & Marcus Perlman. 2021. Size sound symbolism in the English lexicon. *Glossa: A Journal of General Linguistics* 6.1: 1–13. https://doi.org/10.5334/gjgl.1646.
- Winter, Bodo, Grace E. Oh, Iris Hübscher, Kaori Idemaru, Lucien Brown, Pilar Prieto & Sven Grawunder. 2021. Rethinking the frequency code: A meta-analytic review of the role of acoustic body size in communicative phenomena. *Philosophical Transactions of the Royal Society B: Biological Sciences* 376.1840: 20200400. https://doi.org/10.1098/rstb.2020.0400.
- Winter, Bodo, Márton Sóskuthy, Marcus Perlman & Mark Dingemanse. 2022. Trilled /r/ is associated with roughness, linking sound and touch across spoken languages. *Scientific Reports* 12.1: 1035. https://doi.org/10.1038/s41598-021-04311-7.
- Wong, Li S., Jinhwan Kwon, Zane Zheng, Suzy J. Styles, Maki Sakamoto & Ryo Kitada. 2022. Japanese sound-symbolic words for representing the hardness of an object are judged similarly by Japanese and English speakers. *Frontiers in sychology* 13: 830306. https://doi.org/10.3389/fpsyg.2022.830306.
- Wright, Kelly & Kevin McGowan. 2018. Covert segregation: Investigating dialect discrimination in the housing market. Paper presented at *Linguistic Society of America Annual Meeting* 2018, Grand America Salt Lake City, January 4–7.

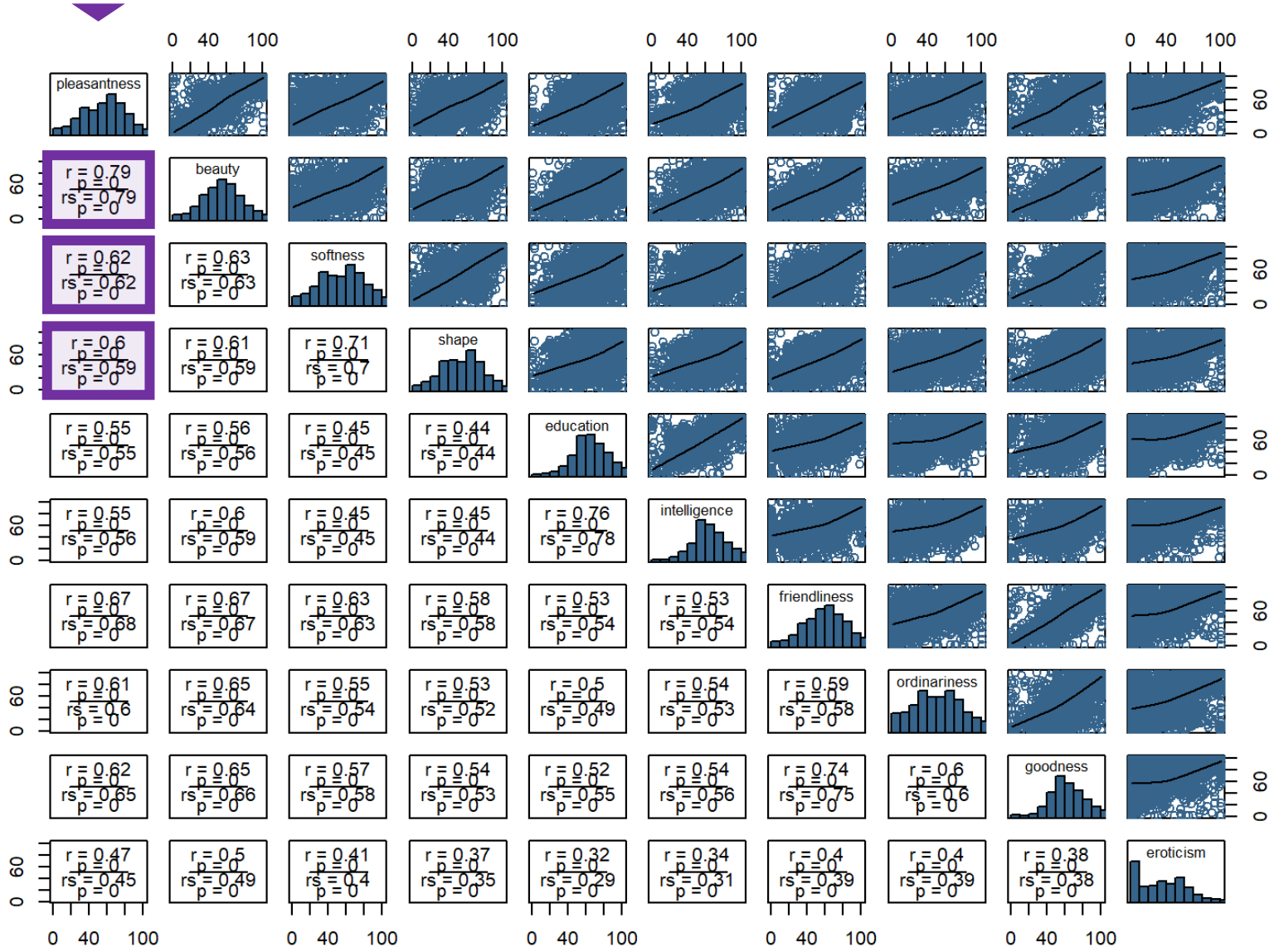
- Zipp, Lena. 2022. Questionnaires to elicit qualitative data. In Ruth Kircher & Lena Zipp (eds.), *Research methods in language attitudes*, 145–159. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781108867788.013.


Appendix

SSPG Sonority-sensitive pseudotext generator

Low vowels	17
Mid peripheral vowels (not ə)	16
High peripheral vowels (not ɨ)	15
Mid interior vowels (ə)	14
High interior vowels (ɨ)	13
Glides	12
Rhotic approximants (ɹ)	11
Flaps	10
Laterals	9
Trills	8
Nasals	7
Voiced fricatives	6
Voiced affricates	5
Voiced stops	4
Voiceless fricatives	3
Voiceless affricates	2
Voiceless stops	1

Parker 2008

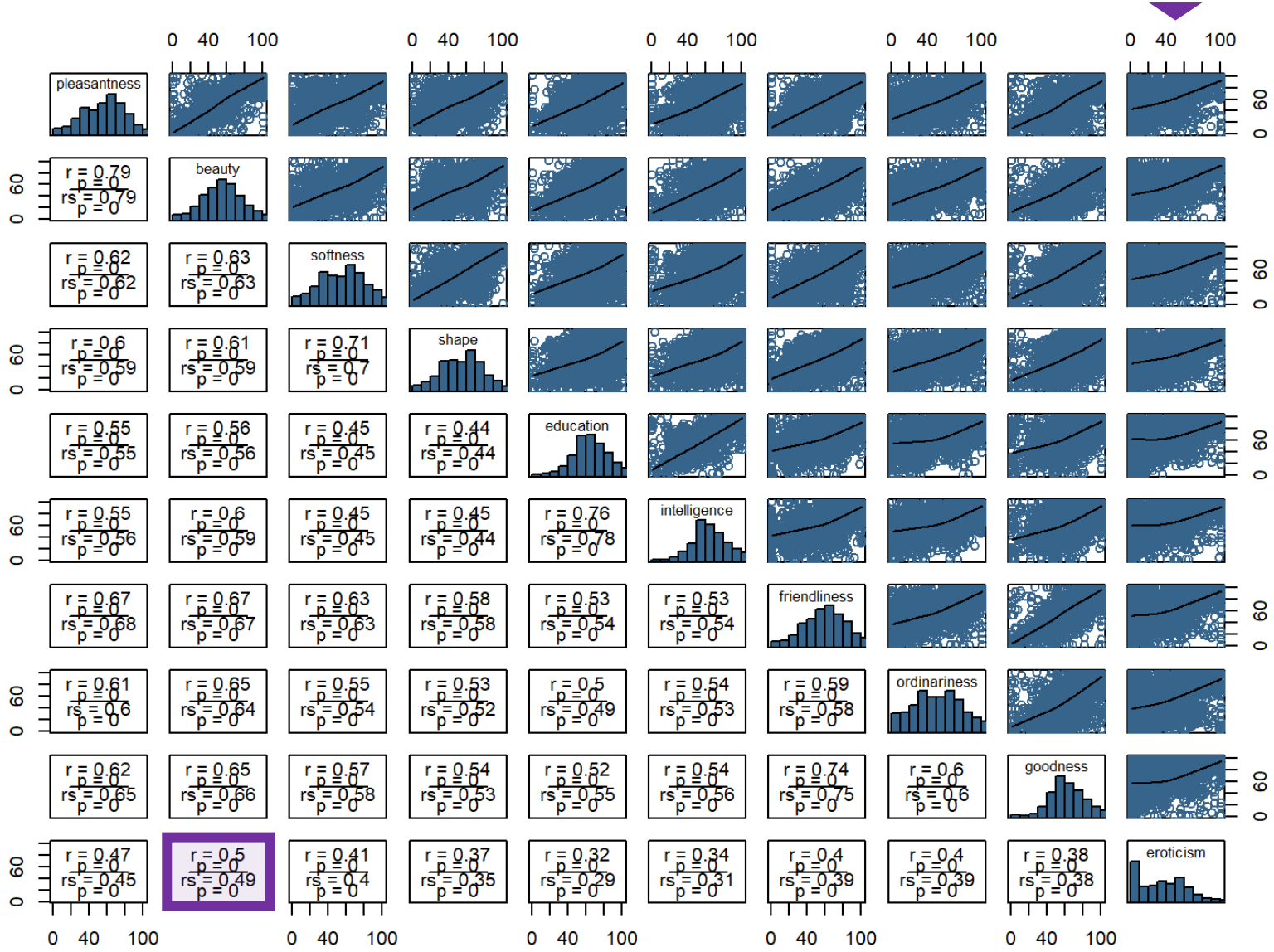


Correlation matrix of all semantic scales

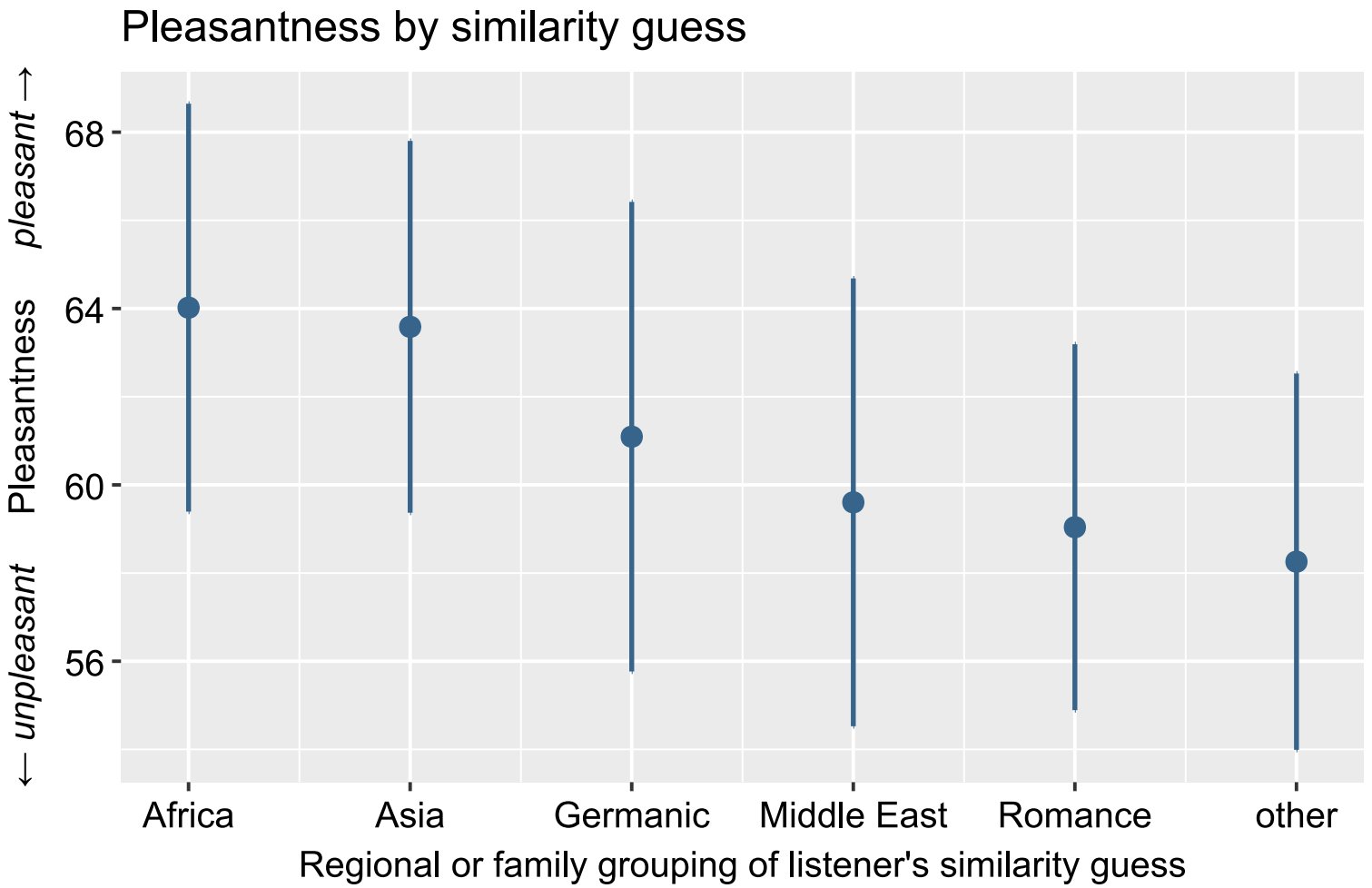
Correlation matrix of all semantic scales

Correlation matrix of all semantic scales

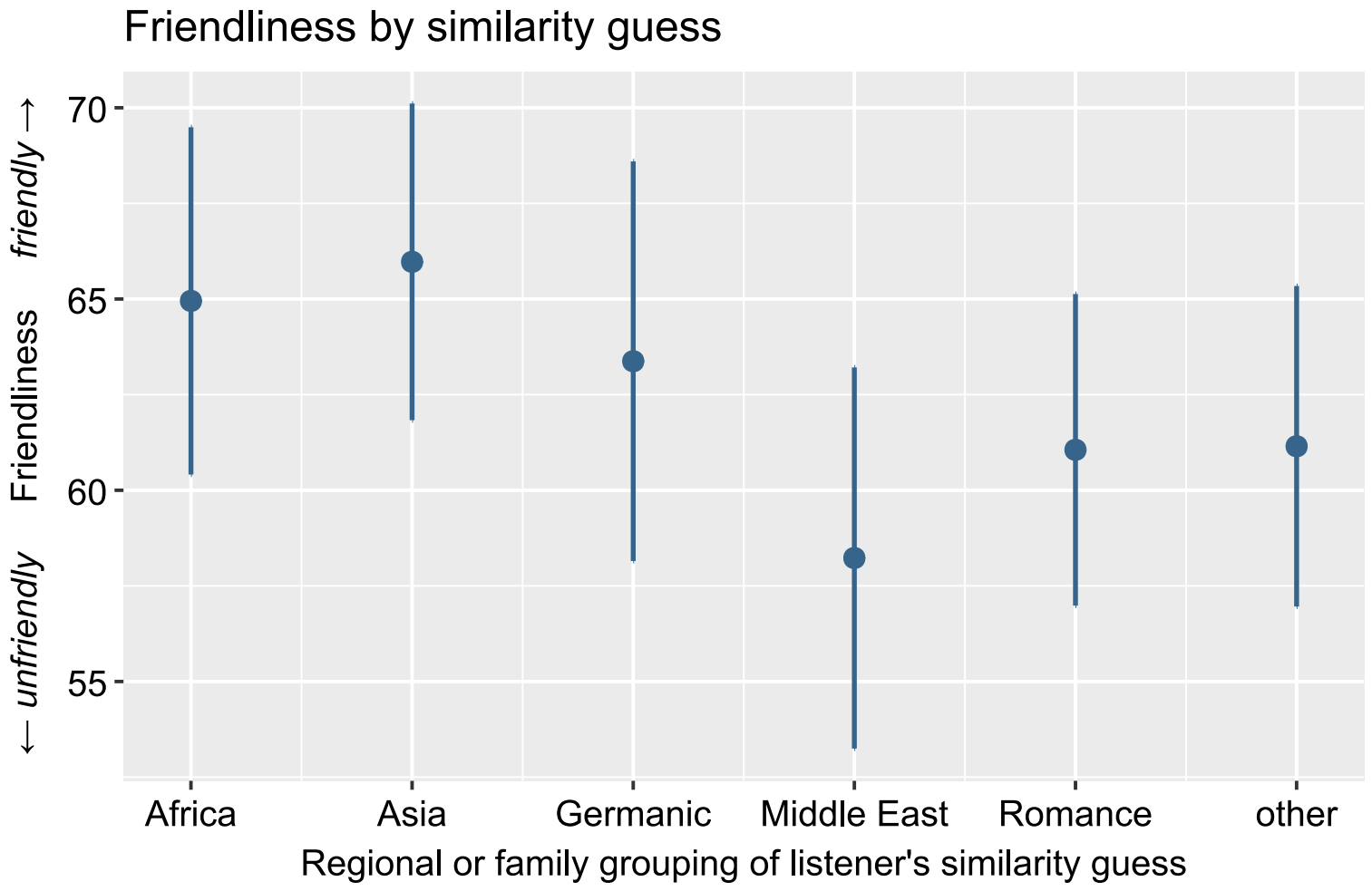
Correlation matrix of all semantic scales

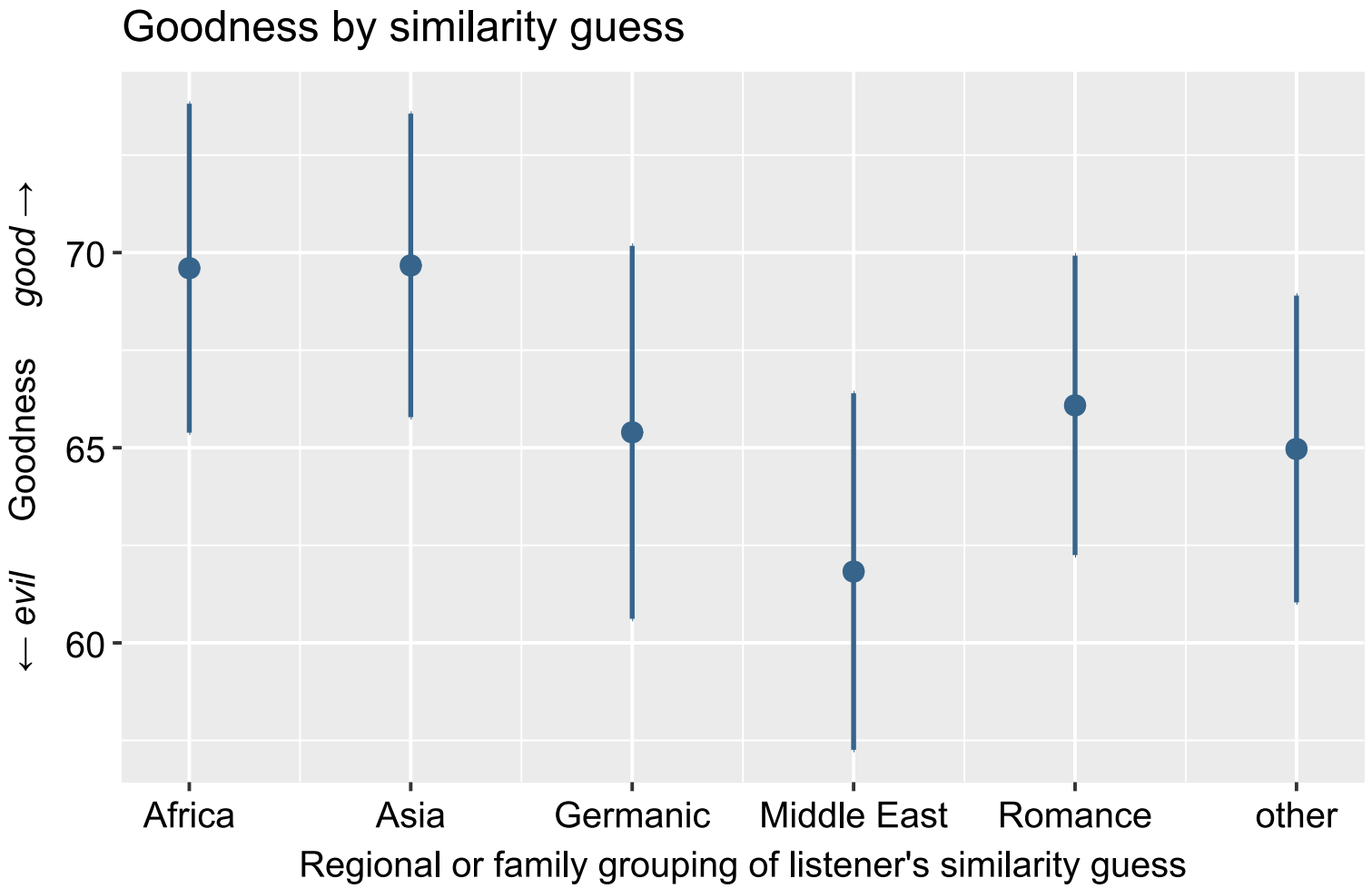


Correlation matrix of all semantic scales

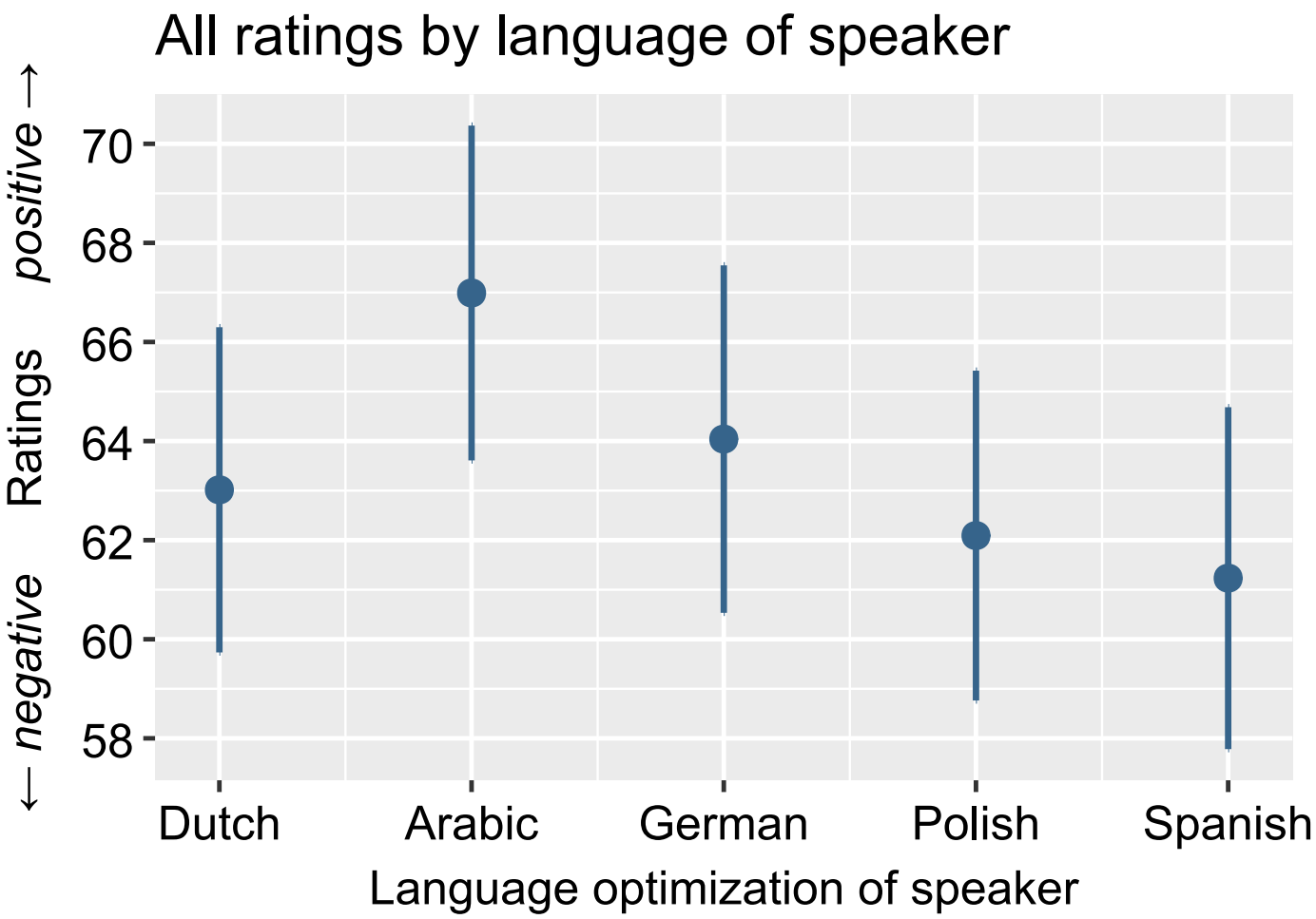


Recognition for pleasantness model


Friendliness by similarity guess
← unfriendly Friendliness friendly →
70
65
60
55
Africa
Asia
Germanic
Middle East
Romance
other
Regional or family grouping of listener's similarity guess
Recognition for friendliness model



Recognition for goodness model


All ratings by language of speaker
← negative Ratings positive →
70
68
66
64
62
60
58
Dutch
Arabic
German
Polish
Spanish
Language optimization of speaker
Language for model with all scales